

Assal, Ella-Marie; Panagamuwa Gamage, Sakura; Verbist, Gerlinde

**Working Paper**

## Social protection in old age through taxes? An empirical analysis of the equity impact of taxes on pensions in the EU

EUROMOD Working Paper, No. EM 04/23

**Provided in Cooperation with:**

Institute for Social and Economic Research (ISER), University of Essex

*Suggested Citation:* Assal, Ella-Marie; Panagamuwa Gamage, Sakura; Verbist, Gerlinde (2023) : Social protection in old age through taxes? An empirical analysis of the equity impact of taxes on pensions in the EU, EUROMOD Working Paper, No. EM 04/23, University of Essex, Institute for Social and Economic Research (ISER), Colchester

This Version is available at:

<https://hdl.handle.net/10419/300368>

**Standard-Nutzungsbedingungen:**

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

**Terms of use:**

*Documents in EconStor may be saved and copied for your personal and scholarly purposes.*

*You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.*

*If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.*

EUROMOD WORKING PAPER SERIES

EM 04/23

## **Social protection in old age through taxes? An empirical analysis of the equity impact of taxes on pensions in the EU**

Ella-Marie Assal, Sakura Panagamuwa Gamage, Gerlinde Verbist

July 2023

---



# **Social protection in old age through taxes? An empirical analysis of the equity impact of taxes on pensions in the EU<sup>1</sup>**

Ella-Marie Assal <sup>a</sup>

Sakura Panagamuwa Gamage <sup>a</sup>

Gerlinde Verbist <sup>a</sup>

<sup>a</sup> Centre for Social Policy Herman Deleeck, University of Antwerp

## **Abstract**

Living standards in old age are affected both by the pension system and the tax system. Yet, little research analyses the interaction between both systems. In this paper, we connect the principles of the pension system (solidarity vs. insurance) to the principles of the tax system (vertical equity vs. horizontal equity), and analyse to what extent they are in line with each other for 28 European countries. We find that horizontal equity is not relatively more important in insurance-based countries, nor is vertical equity relatively more important in solidarity-based countries. Countries that deviate from horizontal equity are able to do so without taxing pensioners into poverty. In contrast, where the tax system deviates from horizontal equity in favour of workers, this comes at the cost of taxing relatively larger shares of pensioners into poverty. Our results highlight the interlinkages of both systems and the importance of studying them together.

**JEL codes:** D04, D31, H22, I38, I32

**Keywords:** tax-benefit system, pension system, old age poverty, pension taxation, equity principles

## **Corresponding author/Contact:**

Sakura Panagamuwa Gamage

[sakura.panagamuwagamage@uantwerpen.be](mailto:sakura.panagamuwagamage@uantwerpen.be)

---

<sup>1</sup> This study has received support from the CIRCLE-project, funded by Belgian Science Policy BELSPO (Contract BR/165/A4/CIRCLE\_JPIMYBL) and supported by the Joint Programming Initiative ‘More Years, Better Lives’ (Part of Horizon 2020, Grant Agreement 643850).. The results presented here are based on EUROMOD model I3.0+, software version v3.4.3 and 2017 data. Having been originally maintained, developed and managed by the Institute for Social and Economic Research (ISER), since 2021 EUROMOD is maintained, developed and managed by the Joint Research Centre (JRC) of the European Commission, in collaboration with Eurostat and national teams from the EU countries. We are indebted to the many people who have contributed to the development of EUROMOD. We make use of microdata from the EU Statistics on Incomes and Living Conditions (EU-SILC) made available by Eurostat. The results and their interpretation are the authors’ responsibility.

## 1. Introduction

In this paper, we aim to study the interaction between the pension and the tax system from a social inequality perspective. Both systems are in general studied in isolation, but there are important, often neglected, links between the two. Two main objectives of public pension systems are on the one hand safeguarding living standards acquired during working life and on the other hand providing an adequate living standard in order to avoid poverty in old age. These two dimensions of pensions have been extensively studied, but very little attention has been paid to the way the tax system relates to these two objectives. The way pensions are taxed may reinforce these objectives, or, on the contrary, operate in opposite directions. One would expect e.g. that a pension system that puts much weight on the objective of guaranteeing an adequate living standard in old age, will take care in its tax system not to put too heavy a burden on these pensions. Otherwise, these old age individuals may be taxed into poverty. This might also imply that pension income is taxed in a different way as income from work. For a system that aims for consumption smoothing through insurance, one might expect pension income is to be taxed in a similar way as income from work.

In this paper we draw a link between the main objectives of pensions on the one hand and the two principles of horizontal and vertical equity for taxation as put forward in the public finance literature (see e.g. Musgrave 1959; Gruber, 2016) on the other. We empirically investigate for 28 European countries the following questions regarding the way both systems interact: Do governments in Europe use the tax system as a social policy tool when it comes to the elderly, e.g. by treating (minimum) pensions and old-age benefits in a favourable way? To what extent are elderly persons taxed into poverty? Do pensioners face a similar tax burden as workers, or are there differences overall and across the income distribution?

To answer these questions, we first provide a framework in which countries are classified according to the characteristics of their tax-benefit system, departing from the idea that the underlying principle of the welfare state will affect key decisions regarding pension systems and their taxation. In the empirical analysis, we use the European microsimulation tax-benefit model EUROMOD to calculate for the EU-27 countries and the United Kingdom the tax burden for pensioners and workers and to study how the burden differs across the distribution of pre-tax income. We investigate whether any cross-country (dis)similarities can be discerned related to the welfare state types presented in the literature.

The paper is structured as follows. In section 2, we set up our conceptual framework, starting from the identification of possible links between welfare state types and the characteristics of pension systems in the EU-27 and the United Kingdom, which we then connect to the literature on principles of taxation. In section 3, we introduce the data and the methodology used. Section 4 presents our results, while section 5 concludes.

## 2. Key principles of pension and income tax systems in Europe

Old age income is not only determined by the pension system, but also by the tax system. Yet there is relatively little research that analyses how the interaction between both systems influences outcomes of poverty and inequality in old age. To guide our analysis, we assume that the type of welfare state shapes both parts of the tax-benefit system in distinct but related ways. In this sense, we follow the reasoning of Kammer et al. (2012, p. 458), who “claim that welfare state institutions even affect the redistributive capacity of individual welfare state instruments as well as the emergence of a complementary fiscal policy mix”. In other words, even though the objectives of the tax system differ from those of the pension system, our analysis departs from the idea that the underlying principles of the welfare state type influence decisions regarding key elements of both systems. At the very least, this would imply that the characteristics of the tax system do not counteract the objectives of the pension system. Table 1 provides an overview of the connection between the key elements of the pension and the taxation system. In the following sections, we explain more in detail how these elements are connected.

**Table 1: Key principles of pension and taxation systems**

<b>Welfare state principle</b>	<b>Solidarity</b>	<b>Insurance</b>
<b>Pension system goal</b>	Adequate living standards for everyone	Consumption smoothing
<b>Result</b>	Poverty alleviation	Reproduction of living standards in old age
<b>Taxation principle</b>	Vertical equity	Horizontal equity

### 2.1 Pension systems: solidarity and insurance

In general, pension systems have two fundamental objectives (Zaidi, 2010). The first is to provide protection against poverty at old age. This can be linked to the solidarity principle, whereby the system aims to guarantee a minimum income to everyone. The second objective is to safeguard, to a certain extent, the living standard a person had during their working life. The underlying insurance principle focuses on consumption smoothing over the lifecycle.

The relative importance of each objective differs across countries. In part, it is related to the Beveridge/Bismarck dichotomy of social security systems and the typology of welfare states as proposed by Esping-Andersen (1990) and amended by Ferrera (1996). Esping-Andersen’s (1990) typology of welfare states distinguished three types: conservative, social-democratic and liberal, while Ferrera (1996) added the fourth type of Southern or Mediterranean states. Historically, in Beveridgean countries, poverty prevention has been the main objective of the state. To achieve this, the state provides flat-rate, universal benefits (albeit possibly means-tested), while maintaining working life living standards in old age is a personal responsibility. Beveridgean countries can be divided into two groups of welfare state types: the social-democratic or Nordic countries (Denmark, Finland, Sweden,

the Netherlands) and the liberal ones (the United Kingdom and Ireland) (Fuest et al., 2010; Hinrichs and Lynch, 2010). In liberal type welfare states, social security is provided in a universal, but means-tested way, while in Nordic countries it is universal with equal benefits to all.

In Bismarckian countries, on the other hand, the social security system is organized around the logic of social insurance, with benefits related to contributions made during working life (Fuest et al., 2010). This implies that contribution-based pension policies, aimed at income maintenance, are at the centre of the pension system (Ebbinghaus, 2021; Hinrichs and Lynch, 2010). Conservative, also referred to as Continental, and Southern welfare states are part of this type. According to Fuest et al. (2010), the differences between Continental and Southern countries are mainly found in the levels of social spending and of taxes and redistribution. Although there is discussion about their categorization, Central Eastern European (CEE) and Baltic countries are often considered as being similar to Continental and Southern welfare states. In a way, they can be seen as relatively smaller (or not yet mature) social insurance states (Fuest et al., 2010). Table 2 shows the country grouping (in line with Fuest et al., 2010) that is used in the empirical analysis.

Since their conception, both Beveridgean and Bismarckian countries have made changes to their pension systems, incorporating contribution-based and minimum protection elements, respectively (Hinrichs and Lynch, 2010). In addition, demographic ageing processes and fiscal budget constraints have led to pension reforms in many countries, with typically a shift towards privatisation and marketisation of pensions (Ebbinghaus, 2015). Due to these changes, pension systems have become more complex and now consist of multiple policies (OECD, 2019). Therefore, the Beveridge/Bismarck dichotomy alone is not sufficient to fully capture the diversity of pension systems. The OECD (2019) taxonomy provides a useful complementary instrument to understand the architecture of current pension systems. At the same time, we argue that even with increasingly complex pension systems, connections can be made between different types of pensions systems and the underlying principle of the welfare state type a country adheres to. In the OECD (2019) taxonomy, pension policies are categorized into three tiers, notably (1) mandatory public pensions, which are independent of past earnings<sup>2</sup> and aimed at providing an adequate standard of living (e.g. in the form of basic pensions, targeted plans or minimum pensions); (2) mandatory, earnings-related programs; (3) voluntary earnings-related provisions, which can be personal or provided by an employer. In the second tier of mandatory, earnings-related programs, the distinction between three different categories is relevant, notably (1) defined benefit (DB) schemes, such as pay-as-you-go plans, where pensions depend on the number of years one contributed, (pensionable) earnings and accrual rates; (2) point schemes, with workers earning pension points based on their earnings, which are converted into a pension income upon retirement; (3) defined

---

<sup>2</sup> Their receipt can however be conditional on fulfilling certain criteria (such as residing in the country, having made sufficient contributions or having income/assets below a threshold).

contribution (DC) plans, whereby contributions flow into an account (either funded (FDC) or notional (NDC)), which results in accumulated contributions and investment returns that are converted into a monthly pension upon retirement. DC schemes can be organised publicly or privately, either as part of the mandatory second tier or as the voluntary third tier. Countries that have a DC component in their pension system are marked in Table 2 with an asterisk.

**Table 2: Country groupings according to welfare state types**

<b>Welfare state type (principle)</b>	<b>Country group</b>	<b>Countries</b>
Beveridgean (solidarity)	Nordic	Denmark*, Finland, Sweden*, the Netherlands <sup>3</sup>
	Anglo-Saxon	Ireland, the United Kingdom
Bismarckian (insurance)	Continental	Austria, Belgium, France, Germany, Luxembourg
	Baltic	Estonia*, Latvia*, Lithuania
	CEE	Bulgaria*, Czech Republic, Hungary, Poland*, Romania*, Slovakia, Slovenia, Croatia*
	Southern	Cyprus, Greece, Italy*, Portugal, Spain, Malta

Note: \* indicates countries with a DC element in their second tier pension system.

## 2.2. Personal income tax principles: vertical and horizontal equity

Several authors argue that the welfare state principle shapes both the tax and the benefit systems, even though the objectives of taxes and benefits clearly differ (e.g. Feher and Jousten, 2018; Kammer et al., 2012). As such, it is important to study their interplay, both conceptually and empirically. In Table 1, we link the different welfare principles (solidarity and insurance) to the two principles of the tax system (vertical and horizontal equity). Governments aim to respect both principles, but the relative importance of each of them might differ across countries (Feher and Jousten, 2018). Horizontal equity implies that people in similar positions face similar tax burdens, which requires an agreement on which individuals are defined as “equals” (Elkins, 2006). Vertical equity requires that the tax burden is distributed over the entire population according to ability to pay, and is linked to progressive taxation. The decisions regarding the distributive effect of taxes are a matter of social taste and political debate (Musgrave, 1990). In this paper we focus on how these principles are put into practice<sup>4</sup>, and how they align with the objectives of pension systems.

<sup>3</sup> We categorize the Netherlands here among the Nordic countries because of its Beveridgean-inspired pension system (Hinrichs and Lynch, 2010) and because of similarities between these countries in the design of old-age minimum income schemes.

<sup>4</sup> Typically, the literature on the taxation of pensions considers three stages at which pensions can be taxed: at the time of saving, when investment gains accrue or when benefits are received. In this paper, we only focus on the taxation that happens at the last stage.

In solidarity-based countries, the state's main focus is to provide adequate income to its citizens. For two reasons, we expect the vertical equity objective to be relatively more important than the horizontal equity objective. First, it seems natural to expect that the minimum income protection for elderly is adequate also after taxation or to expect that low-income pensioners are taxed less heavily than high-income pensioners. Second, the notion of stronger shoulders carrying more of the burden that is inherent in vertical equity/progressive taxation, is compatible with the solidarity principle. In insurance-based countries, the horizontal equity concern might be relatively more important. If pension systems are seen as an instrument to maintain working life living standards in old age, then equal treatment in the tax system of employees and pensioners with similar incomes seems logical. Moreover, horizontal equity might be more important in countries with DC schemes than in countries with DB schemes, as the insurance principle is more present in DC schemes than in DB schemes. Deviations from horizontal equity can be practically implemented in the form of tax expenditures for pensions. Tax expenditures are used to lower the tax burden for certain categories of individuals, depending on characteristics such as age or family composition (Avram, 2018). They can take the form of tax credits, allowances, deductions, exemptions or preferential tax rates. As shown by Barrios et al. (2020), the tax system includes special provisions for pension income in almost every country in the EU-27 and the UK.

### 3. Data and methods

The empirical analysis is performed for the EU-27 countries and the United Kingdom on the basis of the European tax-benefit model EUROMOD, version I3.0+ (for further information on EUROMOD, see e.g. Sutherland and Figari, 2013; Barrios et al., 2020). It is very well suited to calculate taxes levied on employment and retirement income separately. The data used to calculate benefits, taxes and contributions is nationally representative and is based on the EU-SILC data of 2017 for the 27 EU countries and the Family Resource Survey for the United Kingdom. The simulations are performed using tax-benefit policies in place in (the middle of) 2019. Uprating indices are applied to adjust monetary amounts, so that they reflect the situation in 2019. All monetary values are expressed in PPPs to ensure cross-country comparability.

We define pensioners as individuals of 65 years old and over who have received a pension every month during the entire reference period of twelve months. Workers are defined as individuals between the ages of 18 and 60 who have received income from work during the entire reference period. We focus on two income components: income from work (or employment income) and income from old age or pensions. Income from work is defined as gross employee cash or near cash income. Income from pensions include both public and private pensions.

As income from pensions and employment can be combined by an individual or a tax unit, it is not always straightforward to allocate taxes to a specific income source. We use the following strategy to allocate personal income taxes to (1) pensions; (2)



income from work. We take a proportional approach, i.e. we allocate taxes to an income component according to the share of this income component in taxable income. For example, when income from work makes up 70% of total taxable income, 70% of taxes paid are allocated to employment income. Tax exempt income components, which are part of pre-tax income but not of taxable income, are allocated a tax amount of zero. In countries where joint taxation is applied, meaning that personal income taxes are not levied on an individual basis, we make additional assumptions to divide income over individuals in the tax unit<sup>5</sup>.

We show outcomes using quintile distributions and poverty rates. Income quintiles are based on equivalised pre-tax income, which includes gross income from different sources ((self-)employment, property, investment, private transfers) and benefits (both means-tested and non means-tested). For poverty measurement, we use the standard indicator for at-risk-of poverty in the European Union, i.e. an individual is at risk of poverty (or poor) if his/her equivalised income is below the poverty threshold defined as 60% of national median equivalised household incomes. Incomes are equivalised to correct for household size on the basis of the modified OECD equivalence scale, which gives a value of one for the first adult, a value of 0.5 for each additional adult (person of 14 and older) and 0.3 for each child (individuals younger than 14).

## 4. Results

We now look at the way the tax system adheres to the principles of horizontal and vertical equity with respect to the taxation of pensioners in European countries. In section 4.1 we analyse whether pensioners face as similar tax burden as compared to workers, or whether there are differences overall and across the income distribution. Section 4.2 focuses on the principle of vertical equity by looking at the extent to which pensioners are taxed into poverty. Finally, section 4.3 brings the two elements together.

### 4.1 Horizontal equity

We operationalise horizontal equity by comparing the tax burden on old age pensions with that on employment income, both on average and across income quintiles. These results are shown in Figure 1. Deviations from horizontal equity can go in two ways: either in favour of pensioners or in favour of workers.

In five countries we find that the average tax burden for pensioners is similar to that of workers (i.e. less than 0.5 percentage point difference), notably in Denmark, Austria, France, Luxembourg and Cyprus (panel A of Figure 1). In most of the countries, old age individuals pay on average less taxes than workers. In some cases, such as Ireland, Germany, Estonia, Latvia and Hungary the difference is quite

---

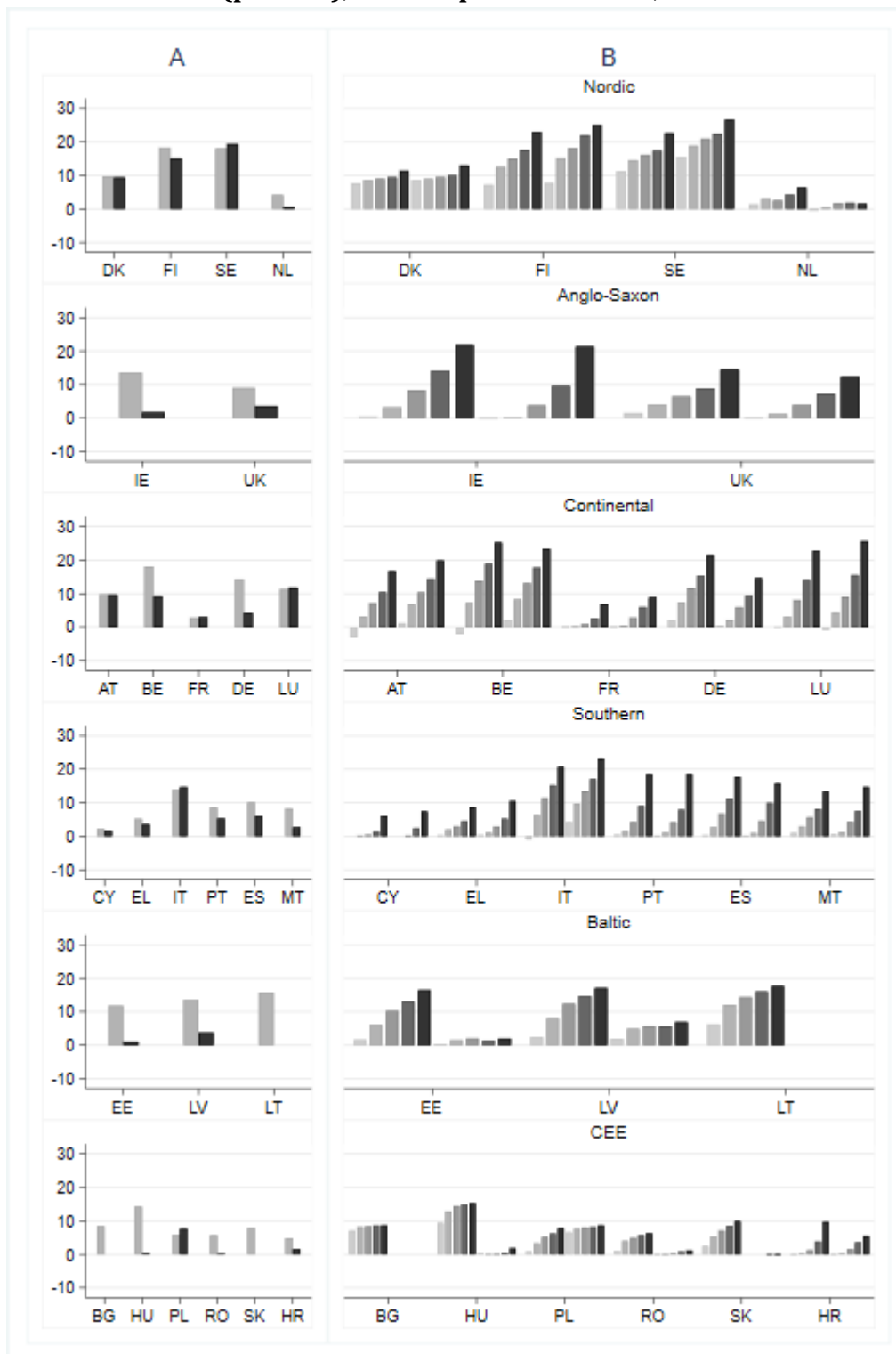
<sup>5</sup> In France, Germany, Poland, Portugal and Luxembourg there is income splitting. In Spain, Ireland and Malta taxes are calculated using pooled tax unit income. In Belgium, the marital quotient allows for the partner with highest income to allocate a part of their income to their (lower-earning) partner, under certain conditions. More information on the allocation of personal income taxes to income components is provided in Assal et al. (2021).

substantial (more than 10 percentage points). There are only three countries where personal income taxes on pension income are relatively larger than taxes on employment income (Italy, Poland and Sweden). The difference in average tax rate between pensioners and workers can be due to characteristics of the tax system or to a composition effect, i.e. that pensioners are overrepresented at the bottom of the income distribution. By comparing the tax burden on workers and pensioners within each income quintile, as shown in panel B of Figure 1, we largely filter out this composition effect. Panel B shows that the composition effect is indeed important, as we now find for more countries a similar tax rate for workers and pensioners per quintile. This is for instance the case for Ireland, where we find a large gap in overall average tax rate between both groups, but per quintile the gap is substantially smaller.

For other countries we still find deviations from horizontal equity in either direction. The deviation from horizontal equity is in favour of pensioners in the large majority of the countries, which means that old age individuals pay on average less taxes than workers in each quintile. This gap can be very large, e.g. when old age pension income is entirely tax exempt (as for instance in Bulgaria), or because there exist substantial tax expenditures for pensions, as for instance in Germany (see Barrios et al., 2020 for a detailed discussion of the distributional impact of pension-related tax expenditures). The fact that personal income taxes on retirement income are relatively larger than taxes on employment income in Italy, Poland and Sweden, is not only noticeable on average but also across quintiles. This points to a deviation from horizontal equity in favour of workers. In Sweden this follows from the Earned Income Tax Credit, which is a substantial tax expenditure for workers, while in Poland this is due to full taxation of pensions in combination with tax expenditures for other income sources. In Italy, the solidarity contribution on pensions plays an important role in this deviation from horizontal equity.

We have defined horizontal equity as a reflection of the insurance principle. Hence, we would expect Bismarckian countries to adhere more to the horizontal equity principle and to find more deviations from it in the Beveridgean countries. In the Anglo-Saxon countries and the Netherlands, who belong to the latter group, this is indeed the case, as we find close to zero tax rates on pensions for the bottom quintile. But for the other Nordic countries, we find a very different picture, with tax rates for pensioners that are similar to (or even higher than) those for employees throughout the quintile distribution. In the group of Bismarckian insurance-based countries, the picture is very mixed. In CEE and Baltic countries taxes on retirement income are much lower than taxes on employment income, throughout the distribution. In Southern countries (except Italy) tax rates for pensioners are also lower (although the difference is smaller than in CEE countries). Horizontal equity seems to be present to a greater extent only in Continental countries.

**Figure 1: Personal income tax rates for workers (left) and pensioners (right), overall average (panel A) and average across quintiles of equivalised pre-tax income distribution (panel B), 28 European countries, 2019**



Source: EUROMOD, own calculations

Note: Tax rates are expressed as percentages of pre-tax income.

What seems to explain the level of horizontal equity better than the welfare state type, is the presence of a DC element in the second-tier pension system. In DC schemes the link between contributions and benefits is strong, linking them closely to an insurance logic. Indeed, the tax system treats pensioners similarly to workers in countries with a DC element, such as Sweden, Poland, Denmark and Italy. In countries with DB systems, the picture is more mixed. Since the earnings-pensions link is relatively weaker in these countries, the presence of the insurance principle seems to be weaker too.

#### 4.2 Vertical equity

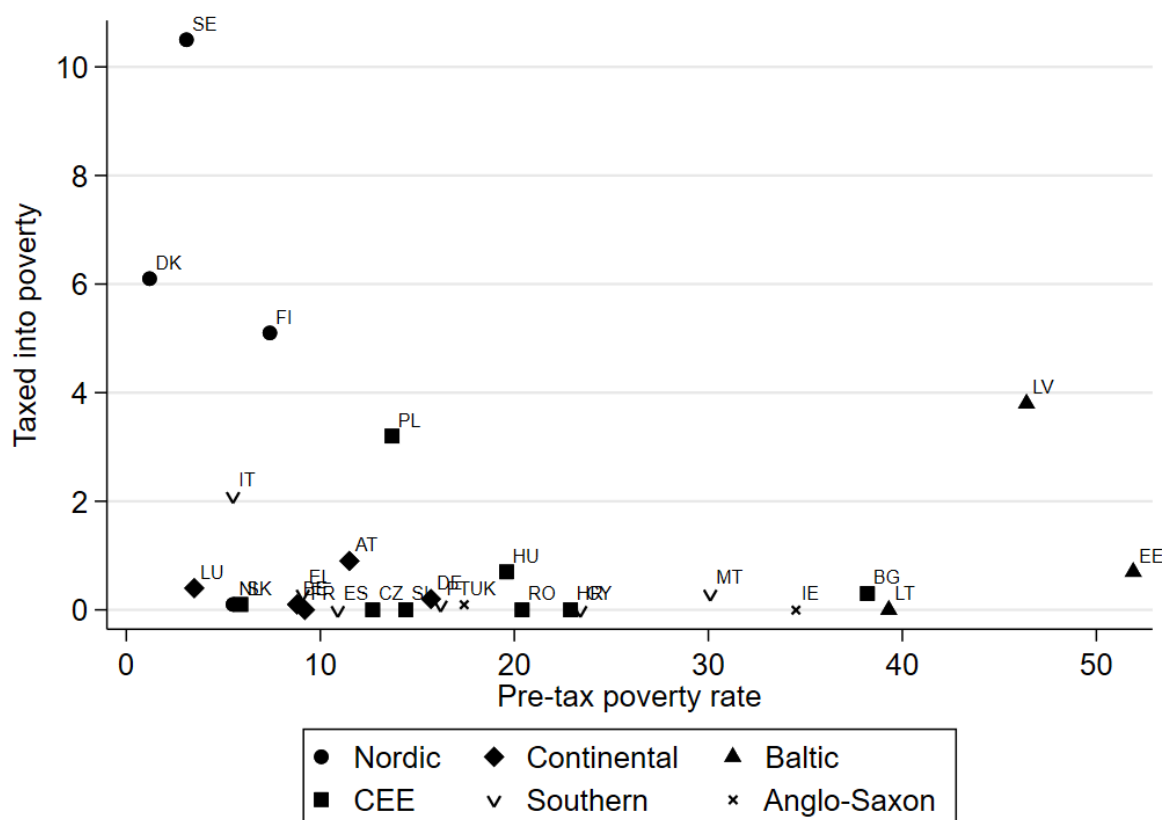
Next, as a measure for vertical equity, we focus on the bottom of the income distribution and calculate to what extent pensioners are taxed into poverty. This is the share of old-age individuals that are considered poor based on their disposable income, but not poor on the basis of their pre-tax income. Pre-tax income corresponds here to the hypothetical case that no personal income taxes are paid on pensions (i.e. it is defined as disposable income plus personal income taxes on pensions). We analyse this in relation to the at-risk of poverty rate for pensioners based on their pre-tax income<sup>6</sup>.

There is considerable variation across countries in the pre-tax poverty rates among the elderly. This reflects the fact that pension systems vary greatly when it comes to guaranteeing adequate living standards for the elderly (solidarity principle). The results are only partially in line with what we expected based on the dominating welfare state principle. We would expect the solidarity-based countries to prioritise poverty alleviation. This is indeed the case for the Nordic countries, but the Anglo-Saxon countries clearly underperform. This is especially true for Ireland, but also in the UK the poverty rate is higher than that of the worst-performing continental country. Pre-tax poverty rates in insurance-based countries range from around 5% (in Luxembourg) to over 50% (in Estonia). The Continental countries and Italy are here among the best performers, while in the three Baltic countries and Bulgaria, we find the highest pre-tax poverty rates for the elderly.

---

<sup>6</sup> We do not take into account the effect of social insurance contributions on pension income as they are levied only in a limited number of countries (notably the Netherlands, all five continental countries, Greece, Cyprus and Croatia, see Assal et al. (2021) for more details). In these countries, however, they can have a substantial impact on post-tax poverty.

**Figure 2: Scatter plot of pre-tax poverty rate and percentage taxed into poverty, pensioners only, 28 European countries, 2019**



*Source:* EUROMOD, own calculations

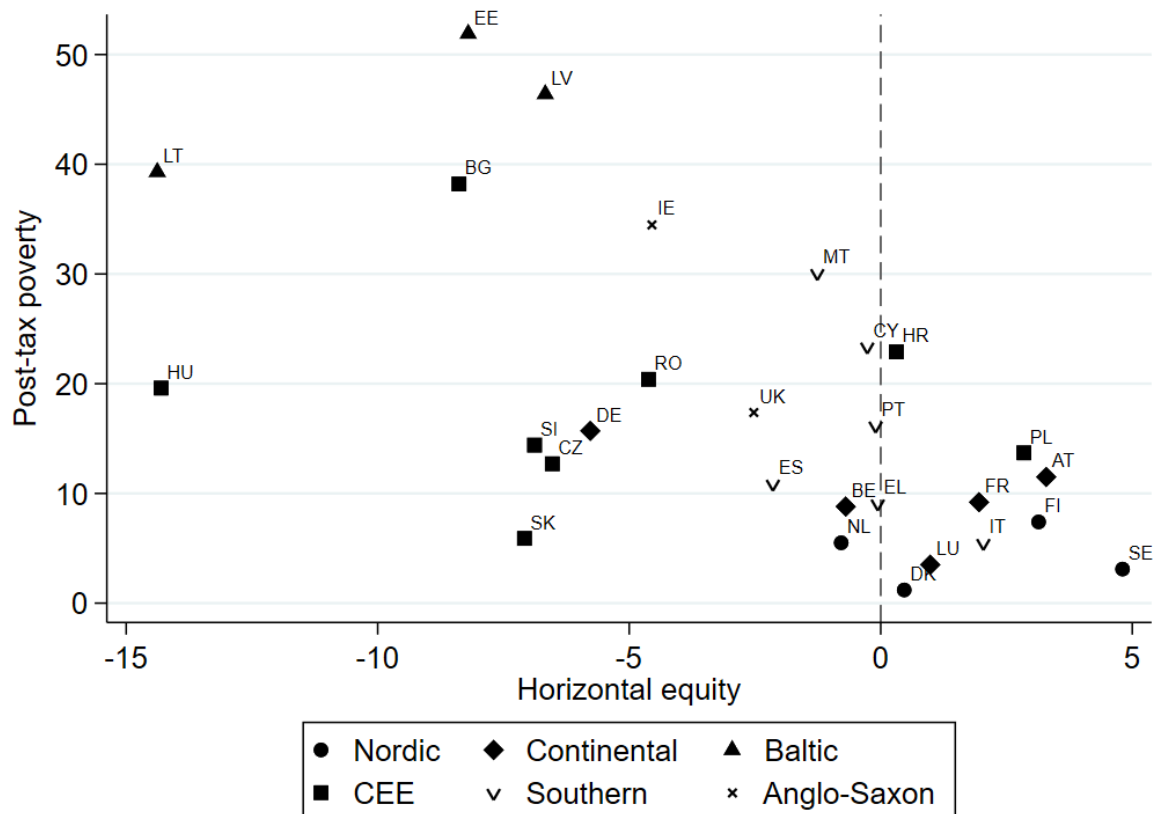
*Note:* Pre-tax poverty rates are based on equivalised disposable income plus personal income taxes on pensions.

Turning to the vertical axis, we observe that in most countries (almost) no pensioners are taxed into poverty. Exceptions are Italy, Poland and Latvia, where between 2% and 4% of the elderly are taxed into poverty due to taxes on pensions, and also Sweden, Denmark and Finland, where more than 5% of the elderly are taxed into poverty; in Sweden, this amounts even to 10%. As was shown in the previous section, these are indeed the countries with relatively high tax rates for pensioners in the bottom quintile. Paradoxically, in several countries where the pension system manages to provide adequate living standards in a pre-tax setting (as illustrated by their low pre-tax poverty rates), this is partly counteracted by the tax system. Especially in Sweden, Denmark and Finland, all solidarity-based countries, this “counteracting” effect may come as a surprise. A special case is Latvia, where the pension system not only results in inadequate pre-tax pensions, but where the tax system further reinforces the risk of poverty.

#### 4.3 Bringing both dimensions together

Finally, we bring both dimensions of vertical and horizontal equity together in Figure 3 to see if there might be a trade-off between both principles in the way pensions are taxed. As an indicator of vertical equity, we take post-tax poverty rates of pensioners. It shows to what extent old age individuals across countries are protected against poverty, resulting largely from the interaction between the pension and the tax system<sup>7</sup>.

**Figure 3: Scatter plot of poverty outcomes and horizontal equity, 28 European countries, 2019**



Source: EUROMOD, own calculations

Note: The measure of horizontal equity is the difference in tax rates of pensioners and employees in the third quintile. Negative values indicate that tax rates of pensioners are lower than tax rates of employees. Post-tax poverty is based on disposable income.

As an indicator of horizontal equity (on the horizontal axis), we use here the difference between the average tax rates of pensioners and workers in the third

<sup>7</sup> The income and poverty position of the elderly can also result from other income sources in the households, such as work income from active age individuals and the benefits they receive and the taxes they pay, e.g. because they live in a multigeneration household. Verbist et al. (2020), however, show that the direction of solidarity in multigeneration households is in general not pro-elderly, but pro-child, in the sense that pensions often protect children against child poverty. This is especially the case in countries with a relatively high prevalence of multigeneration households, such as the Baltic, CEE and Southern European countries.

quintile in order to filter out the composition effect. A negative value reflects a deviation from horizontal equity in favour of pensioners (i.e. the average tax rate on pension income is lower than on income from work), while positive values reflect a deviation in favour of workers.

Left on the horizontal axis are countries that deviate from the horizontal equity principle in favour of pensioners. In the case of the Baltics, Bulgaria, Hungary, Romania and Ireland, these deviations are paired with high post-tax poverty rates (all above 20% and in some countries even above 50%). Other countries, like the Czech Republic, the Slovak Republic and Germany also exhibit a relatively high deviation from horizontal equity in favour of pensioners, but in combination with lower poverty rates. What they all (with the exception of Latvia) have in common, however, is that in none of these countries, pensioners are taxed into poverty (see Figure 2). This indicates an attempt of the tax system to at the very least not further reinforce the unfavourable income position of pensioners that results from the (inadequate) pension system, as was also shown in the previous section by pre-tax poverty rates. It highlights the importance of adequate minimum protection before taxes, as even a very favourable tax system cannot salvage a high risk of elderly poverty.

For several countries, among which the UK, the Southern countries, the Netherlands, Denmark, Belgium and Luxembourg, the horizontal equity indicator centres around zero, pointing to little intervention from the tax system when it comes to improving the relative income position of pensioners as compared to workers. Indeed, for the majority of these the taxed into poverty indicator in the previous section was also very close to zero.

The countries in which pensioners are taxed in a less favourable way compared to workers are some Nordic countries, especially Finland and Sweden, as well as Poland and Italy. For all these countries, poverty rates for pensioners are quite low. Consequently, there is less need for the tax system to work in a poverty minimizing way. Still, these are also the countries with the highest degree of pensioners taxed into poverty, as shown in the previous section, thus calling for extra attention for the income position of individuals on a low pension. In a way, these results go against our expectations as some of these countries have solidarity-based systems. However, we find that it is precisely the presence of this solidarity principle in the pension system that exempts the tax system from focusing on vertical equity. Conversely, in certain insurance-based pension systems with high poverty rates for elderly, deviations from horizontal equity in the tax system might be related to prioritising vertical equity.

## 5. Conclusion

In this paper, we have studied how the interaction between the pension system and the tax system affects old age living standards in 28 European countries. We have made a conceptual link between the underlying principles of the pension system

(solidarity vs. insurance) and those of the tax system (vertical equity vs. horizontal equity).

Our analysis is complicated by two limitations. First, it is challenging to fully account for income differences between pensioners and employees when calculating average tax rates. We consider old-age individuals and employees with similar pre-tax equivalised income levels within quintiles of the distribution as equals. However, even within these quintiles there remain differences in income levels between both groups. Second, pension income is gradually accumulated over a lifetime. Hence, a life-cycle perspective would be an interesting complement to our research, which was not feasible for this paper given that we rely on cross-sectional data. We leave this for future research.

We hypothesised that a solidarity-based pension system would logically fit with a preponderance of the vertical equity principle in the tax treatment of pensions, while an insurance-based system would lean more towards the horizontal equity principle. Our results are contrary to our theoretical expectations on several points. The application of the horizontal equity principle (as measured by the difference in average tax rate between pensioners and workers) does not appear to be relatively more important in insurance-based countries. Only in the Continental countries are the tax burdens of pensioners and employees somewhat more similar. Unexpectedly, horizontal equity is more present in the Nordic countries. Similarly, while we expected vertical equity to be more important in solidarity-based countries, who prioritise poverty alleviation, this did not turn out to be the case. On the contrary, in three Nordic countries, we found the highest share of pensioners taxed into poverty. In most other countries, the pension system generates different levels of living standards for old age individuals, but almost nowhere does the tax system lead to a worsening of their living standards.

Bringing it all together, we find that countries that deviate from horizontal equity in favour of pensioners are also those countries that do not tax old age individuals into poverty, while those countries that deviate from horizontal equity in the other direction, do this to such an extent that a non-negligible share of pensioners is taxed into poverty.

Our results highlight the complexities of both the pension and the tax system and the importance of considering them together when reforming either system. Over the past decades, both the tax and pension systems in all countries have undergone major and minor reforms since their emergence. Decisions regarding such reforms are influenced by many different concerns and are hence often the outcome of a political compromise. Our results suggest that, when reforming the pension system, the consequences of the tax system are not always fully considered (and the same holds vice versa). Firm conclusions in this respect would however require an analysis that tracks the impact of reforms over time. Together, these factors clearly impact the link between the underlying principles of the pension and taxation system. As such, the conceptual link we propose is not always apparent when analysing this empirically.



We conclude that precisely because of the entanglement of the pension and tax system, it is necessary to study them jointly. Changes in minimum income protection policies, for example, might generate important changes in the equity effects of the tax system. The reverse also applies: changes in the tax treatment of old age incomes may generate adverse poverty outcomes if pension levels are left unchanged. Additionally, the interplay between tax expenditures in different fields might yield unexpected results. These effects are likely to go unnoticed if the focus is only on one specific field, giving further relevance to undertaking a comprehensive analysis of the effects of possible changes in tax and/or benefit systems.

## 6. References

- Assal E-M, Gamage, S P, & Verbist, G (2021) *Old age social protection through taxes? A comparison of the distributive effects of taxes on pensions and income from work in the EU*. (CIRCLE Working Paper n. 8).
- Avram S (2017) Who benefits from the 'hidden welfare state'? The distributional effects of personal income tax expenditure in six countries. *Journal of European Social Policy* 28(3): 271-293.
- Barrios S, Coda Moscarola F, Figari F, et al. (2019) Size and distributional pattern of pension-related tax expenditures in European countries. *International Tax and Public Finance* 27(5): 1287-1320.
- Ebbinghaus B (2015) The Privatization and Marketization of Pensions in Europe: A Double Transformation Facing the Crisis. *European Policy Analysis* 1(1): 56 - 73.
- Ebbinghaus B (2021) Inequalities and poverty risks in old age across Europe: The double-edged income effect of pension systems. *Social Policy & Administration* 55(3): 440-455.
- Elkins D (2006) Horizontal Equity as a Principle of Tax Theory. *Yale Law & Policy Review* 24(1): 43 - 90.
- Esping-Andersen G (1990) *The three worlds of welfare capitalism*. Princeton, N.J.: Princeton University Press.
- Ferrera M (1996) The 'Southern model' of Welfare in Social Europe. *Journal of European Social Policy* 6(1): 17-37.
- Fuest C, Niehues J and Peichl A (2010) The Redistributive Effects of Tax Benefit Systems in the Enlarged EU. *Public Finance Review* 38(4): 473-500.
- Gruber J (2016) *Public Finance and Public Policy*. New York, NY: MacMillan Education.
- Hinrichs K and Lynch JF (2010) Old-Age Pensions. In: Castles FG, Leibfried S, Lewis J, et al. (eds) *The Oxford Handbook of the Welfare State*. Oxford: Oxford University Press.
- Kammer A, Niehues J and Peichl A (2012) Welfare regimes and welfare state outcomes in Europe. *Journal of European Social Policy* 22(5): 455-471.
- Musgrave RA (1959) *The theory of public finance*. New York: McGraw-Hill.
- Musgrave RA (1990) Horizontal Equity, once more. *National Tax Journal* XLIII(2): 113-122.
- OECD (2019) *Pensions at a Glance 2019*. Paris: OECD Publishing.
- Sutherland H and Figari F (2013) EUROMOD: the European Union tax-benefit microsimulation model. *International journal of microsimulation* 6(1): 4-26.
- Verbist G, Diris R, Vandenbroucke, F (2020) Solidarity between generations in extended families. Direction, size and intensity. *European Sociological Review* 36(2): 317-332.
- Zaidi A (2010) *Poverty risks for older people in EU countries - An update*. Vienna: European Centre for Social Welfare Policy and Research.

## Supplementary material

**Table 1: Percentage of workers and old-age individuals within each specific quintile (% of quintile observations), 28 European countries, 2019**

Country	Q1		Q2		Q3		Q4		Q5	
	W	OA	W	OA	W	OA	W	OA	W	OA
Denmark	8.9	26.5	23.6	26.5	40	12.1	50.8	9.3	53.9	6.6
Finland	2.9	27	14.7	27.2	29.9	17	40.1	11.1	49.8	6.5
Sweden	8	20.2	23.9	26.3	37.4	14.7	47	7.9	52.3	6.3
Netherlands	10.1	22.3	22.7	28.6	35	15	42.8	9.7	45.8	7
Ireland	5.4	22.1	18.1	25.6	36.8	5.3	44.3	3.3	53.3	2
UK	12.4	21.3	24.4	24.8	40.7	19.9	54.2	12.8	58.8	9
Austria	10.2	15.5	26.9	18.2	35.7	17.5	48.6	12.7	53.7	10.7
Belgium	5	25.2	17.9	28.9	35.1	16.3	47.4	9.1	57.1	4.6
France	10.9	21.9	25.9	22.2	37.5	17	44.3	13.3	42.6	14
Germany	14.1	26	27.2	30.3	41.5	16.7	52.1	10.5	60	7.3
Luxembourg	23.4	9.5	36.8	9.8	35.9	15.8	40.9	13.9	50.2	12.5
Estonia	10.7	42.9	28	23.6	42.7	6.2	51.8	4.4	56.4	2.1
Latvia	5.4	40.3	25.1	25.2	37.6	9.3	48	5.9	55.4	3.6
Lithuania	1.9	41.9	13.4	26.6	28.8	9.7	43.2	5.3	49.8	2.9
Bulgaria	5.9	34.5	19.6	28.5	33.3	14.4	44.1	8.2	50.1	3.7
Czech Rep.	7.9	41.7	21.2	30.5	38.2	9.6	50.6	4.4	57	2.9
Hungary	12.5	4.3	20.7	5.6	36.6	3.2	50.7	2.2	56.6	1.2
Poland	8.2	20.2	18.3	21.7	29.9	16.8	40.4	11.9	50.5	6.2
Romania	0.6	18.9	13	25.7	31.9	18.9	48.6	10.9	63.8	5
Slovakia	10.8	27.7	25.8	22.4	38.2	10.8	51.5	8.5	61.2	4.6
Slovenia	7.5	22.7	23.5	18.7	38.9	10.8	47.7	7.4	55.7	3.8
Croatia	4	20.3	18.6	20.2	30.7	13.2	38.9	10.4	49	8.3
Cyprus	10.2	23.4	24.1	13.2	36.4	6.9	43	6.8	45.2	11.7
Greece	6	12.6	11.8	21.7	18.4	17.9	27.7	15.3	35.8	11.6
Italy	7.9	6.2	17.2	17.3	25.5	19.4	35.9	15.4	36.4	16.4
Portugal	11.6	25.4	28	23.3	41.3	15.4	47.2	12.9	44.6	15.8
Spain	14.1	8.2	23	15.2	33.6	14.5	42.3	11.7	47.9	10
Malta	9.7	23.1	25.3	19.1	39.7	9.6	50.9	5.6	61.9	3

Source: EUROMOD, own calculations

**Table 2: Pre-tax poverty rates and taxed into poverty rates, pensioners, 28 European countries, 2019**

Group	Country	Pre-tax poverty	Taxed into poverty
Nordic	Denmark	1.2	6.1
	Finland	7.4	5.1
	Sweden	3.1	10.5
	Netherlands	5.5	0.1
Anglo-Saxon	Ireland	34.5	0
	UK	17.4	0.1
Continental	Austria	11.5	0.9
	Belgium	8.8	0.1
	France	9.2	0
	Germany	15.7	0.2
	Luxembourg	3.5	0.4
Baltic	Estonia	51.9	0.7
	Latvia	46.4	3.8
	Lithuania	39.3	0
CEE	Bulgaria	38.2	0.3
	Czech Rep.	12.7	0
	Hungary	19.6	0.7
	Poland	13.7	3.2
	Romania	20.4	0
	Slovakia	5.9	0.1
	Slovenia	14.4	0
	Croatia	22.9	0
South.	Cyprus	23.4	0
	Greece	9.1	0.3
	Italy	5.5	2.1
	Portugal	16.2	0.1
	Spain	10.9	0
	Malta	30.1	0.3

Source: EUROMOD, own calculations