



Universiteit
Leiden
The Netherlands

Understanding and analyzing changes in poverty among the elderly across 16 European countries using decomposition approach

Caminada, C.L.J.; Goudswaard, K.P.; Liu, J.; Wang, C.; Wang, J.

Citation

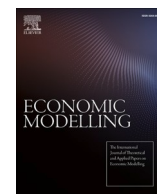
Caminada, C. L. J., Goudswaard, K. P., Liu, J., Wang, C., & Wang, J. (2025). Understanding and analyzing changes in poverty among the elderly across 16 European countries using decomposition approach. *Economic Modelling*, 151. doi:10.1016/j.econmod.2025.107175

Version: Publisher's Version

License: [Licensed under Article 25fa Copyright Act/Law \(Amendment Taverne\)](#)

Downloaded from: <https://hdl.handle.net/1887/4255221>

Note: To cite this publication please use the final published version (if applicable).



Understanding and analyzing changes in poverty among the elderly across 16 European countries using decomposition approach[☆]

Koen Caminada^a, Kees Goudswaard^a, Jingqi Liu^b, Chen Wang^b, Jinxian Wang^{c,*} 

^a Department of Economics, Leiden University, 2300RA, Leiden, Netherlands

^b School of Public Administration and Policy, Shanghai University of Finance and Economics, 200433, Shanghai, China

^c Business School, Central South University, 410083, Changsha, China

ARTICLE INFO

Handling editor: Angus Chu

Keywords:

Relative poverty

Elderly

Poverty decomposition

European countries

ABSTRACT

The issue of relative poverty is emerging as a prominent topic in research and society. However, studies focusing on the determinants of relative poverty among the elderly within a comparative context over time remain scarce. To address this gap, this study employs the reweighting Recentered Influence Function-Oaxaca Blinder decomposition method to understand the changes in relative poverty among the elderly across 16 European countries and utilizes microdata from the Luxembourg Income Study spanning approximately 2005–2022. The results indicate reduction in relative poverty among the elderly. The results demonstrate the following key factors that contributed to reducing poverty rates among the elderly: participation in the labor market, university attendance of the household head and access to public and private pensions. In contrast, living alone has been associated with an increase in poverty rates. These findings may have implications for policy. Hence, to alleviate poverty among the elderly, improvements in terms of job opportunities and the efficacy of pension systems can be extremely helpful.

1. Introduction

Rapid aging is a worldwide phenomenon. In 2022, 771 million people were aged 65 or older, accounting for 9.7 % of the global population. By 2030, this number is expected to increase to 994 million, accounting for 11.7 % of the global (United Nations, 2022). Both developed economies, such as those of the United States and Japan, and developing economies such as that of China, are facing the challenges of an aging society. Hence, the cruciality of the elderly's well-being is increasing in the present and for the future.

However, the majority of poverty studies have predominantly focused on the total population¹ and paid scant attention to elderly poverty.² Unfortunately, elderly poverty has been reported to be high and increasing in several countries. For example, according to the Luxembourg Income Study (LIS) data, the relative poverty rates among the elderly in the Netherlands, Poland, Luxembourg and Germany have increased since around 2005 (using a poverty line set at 60 % of median

equivalized income). In addition, some countries, such as Ireland and Belgium, are experiencing significant levels of poverty among the elderly.

Elderly poverty has many negative effects. First, it harms the physical and mental health of older individuals. Poverty can significantly impact the health of the elderly, despite their medical benefits. Pal and Palacios (2011) found a positive relationship between poverty and elderly mortality. Using cross-country data, Wang et al. (1997) demonstrated that poverty negatively impacts elderly mortality rates. Moreover, poverty can cause significant levels of stress to the elderly due to financial issues and social exclusion. Stolz et al. (2017), Lee and Chou (2019) and Li et al. (2023) have examined the negative impact of poverty on the elderly's mental health (such as depressive symptoms).

Second, rising poverty among older people places increases public social expenditure, which increases pressure on the prime-age workforce and weakens their work incentives (Walker, 1990; Becker and Urzhumova, 1998). Furthermore, the poor elderly typically requires more care, causing their primary caregivers to leave their paid employment,

[☆] We thank the editors and reviewers for the useful comments and suggestions.

* Corresponding author.

E-mail address: wangjinxian@csu.edu.cn (J. Wang).

¹ For example, Moller et al. (2003); OECD (2008); Suryahadi et al. (2009); Ravallion and Chen (2011); Wang et al. (2021); Burkhauser et al. (2024).

² For example, Engelhardt and Gruber (2004); Smeeding et al. (2008); Pal and Palacios (2011); Maes (2013); Chan and Chou (2018); Lefebvre et al. (2018); Calvi (2020).

retire early, or reduce their working hours and wages due to their caregiving obligations (Fahle and McGarry, 2017; Van Houtven et al., 2013; Skira, 2015), which leads to a decline in labor supply. Martey (2022) showed that time spent in caring for the elderly and family welfare reduces the time spent in labor market.

Unfortunately, little attention has been paid in the literature to the levels and determinants of poverty among the elderly in a comparative setting. While labor market is the main source of income for the working-age population, the income of the elderly relies primarily on public and/or private pension benefits. Pal and Palacios (2011), Kaushal (2014), and Zhang and Imai (2024) examined how pensions affect poverty among the elderly. However, its magnitude across countries remains underexplored. Delfani et al. (2015) observed that the risk of being poor among the elderly is somewhat alleviated in the case of a generous flat-rate public pension. Similarly, using data from OECD countries, Kuitto et al. (2023) demonstrated that pension systems and earnings-related schemes are efficient in reducing the risk of old-age poverty in which minimum income provision plays an important role (Ebbinghaus, 2021). However, using data from 27 European countries, Jacques et al. (2021) found the relationship between public pensions and old-age poverty as nonlinear. Yet, the impact of private pensions on elderly poverty has long been ignored. Van Vliet et al. (2012) and Been et al. (2016) showed that higher expenditure on private pensions did not cause higher levels of inequality and poverty among the elderly over time and across countries.

Labor market factors and demographics may also affect income distribution among the elderly. For example, welfare state reforms, such as the elimination of mandatory retirement ages, enable the elderly to earn more from work and increase their earnings. Those working beyond the official retirement age are usually wealthier than those depending on pension benefits alone. Disney and Whitehouse (2002) found that income generally declines with age. Furthermore, living alone is expected to increase poverty, as income sharing within a household is more likely to reduce relative poverty than living separately. Finally, as a key determinant of income, education's significant impact on poverty is evident (Houthakker, 1959; Morgan and David, 1963). Thus, the trend regarding the elderly's poverty rate, the role of public and private pension benefits over time and the impact of changes in the household working status and household composition in the elderly's poverty is worth exploring.

This paper contributes to the literature in three ways. First, it explores the determinants of elderly poverty across countries and over time and compare their relative contributions. These determinants include changes in the composition of pensions (public versus private), household working status and demographic factors (university attendance of household head, single-person household, and the share of people aged above 75). Second, it constructs a profile of elderly poverty across 16 European countries over time, offering a comparative perspective. Third, this study applies a new Recentered Influence Function (RIF) - based decomposition approach developed by Firpo et al. (2018), which allows decomposition of the overall change in relative poverty of the elderly into changes in the distribution of household characteristics (composition effect) and the returns of the characteristics (structural effect). The data were sourced from the LIS (2024) that provides detailed information on households' and individuals' labor market situations and the elderly's demographic status.

The paper is structured as follows. Section 2 discusses possible determinants of poverty and their impact. Section 3 outlines the research methodology. Section 4 presents trends in elderly poverty and its determinants across 16 countries from 2005 to 2022. Section 5 concludes the study and specifies its implications.

2. Determinants of poverty among the elderly

According to OECD (2008, pp. 288–292), three broad factors affect income distribution and poverty: public versus private pensions, labor market factors, and demographic factors.

2.1. Public and private pensions

The gross income of the elderly typically includes public and private pensions, labor income, other private and public transfers and capital income. This paper focuses on how changes in pensions, which account for a large part of gross income for the elderly, impact relative poverty. In general, public pensions aim to equalize income distribution and reduce elderly poverty (Been et al., 2016). Public pensions are pay-as-you-go systems with flat-rate benefits and income-related contributions. Since the elderly do not earn from work, public pensions are their main source of income. In contrast, private pensions are funded systems in which payments are related to benefits and previous earnings. Recent decades have witnessed increased female labor force participation, boosting private pension coverage. Furthermore, the maturation of voluntary private pension schemes may have increased private pensions.

The shift from public to private pensions is measured by changes in benefits received by the elderly. Private pension plans link contributions to benefits and lack income redistribution elements (Van Vliet et al., 2012). Consequently, private pensions are generally less redistributive than public social security; hence, transitioning to them may increase relative poverty among the elderly. Following the definition of LIS, public pension benefits include noncontributory pensions, universal pensions, assistance pensions and public contributory pensions, while private pensions consist of occupational and individual pensions.³

2.2. Labor market factors

Factors affecting the income distribution of the elderly are related to the labor market (OECD, 2008, p. 289). Since the mid-1990s, welfare state reforms have changed the labor market status of the elderly. In the recent years, OECD and European countries have experienced a rapid growth of the participation rate of the elderly in the labor force. Existing research indicates that reforming social security system, increasing the retirement age and implementing social investment policies are pivotal factors to the elderly's labour market participation (Staubli and Zweimüller, 2013; Riphahn and Schrader, 2020; Kuitto and Helmdag, 2021). Earning distribution among the elderly has also changed. For example, during 1997–2007, the largest change in earnings occurred among the 60–64-year-old and to a lesser extent among the 70–74-year-old in Denmark (Larsen and Pedersen, 2012). Hungerford et al. (2001) pointed out that earnings may become a more important source of retirement income in the future because of changes in the retirement earnings test for social security beneficiaries. Using decomposition approach, Maestas et al. (2023) found that one-third of the slowing effect of population aging on economic growth occurs due to a slowdown in employment growth. Hence, working for longer duration can ease the burden of an aging population (Burtless and Quinn, 2002; Laun, 2017).⁴

The employment of the elderly in the United States correlates positively with health, education and wealth (Haider and Loughran, 2001; Zhao and Burge, 2017; Blundell et al., 2023). Therefore, if wealthy elderly people have more earnings and a higher chance of working, their poverty risk should be lower; also, healthier elderly people in lower-income groups will have a higher chance to earn more. Larsen and Pedersen (2012) showed that, in Denmark, employment rates for elderly

³ In LIS codebook, total pension income is the sum of “public non-contributory pensions”, “public contributory pensions”, “private pensions” and “amounts that are directly placed at the level of total pension income.” We defined public pensions as the sum of “public non-contributory pensions” and “public contributory pensions.” In France and the Netherlands, large proportion of pensions were directly placed at the level of total pension income but not classified as public or private pensions. For these two countries, we put placed the unclassified pension income into public pensions.

⁴ Cahill et al. (2016), discussed the retirement patterns of elderly Americans since the turn of the last century.

people aged 60–64 increased from 1995 to 2005, while remaining stable for the group of people aged 65 and above.

Furthermore, labor market factors reflect broader forces, such as the business cycle, economic integration, technological changes and globalization. Many of these factors are independent of government transfers, yet important interactions may exist between the social policy structure and labor supply, particularly among low-income working-age population and to a lesser extent among the elderly people.

2.3. Demographics of the elderly

Aging is the key variable that affects poverty. In general, the income of the elderly generally declines with age for several reasons (Disney and Whitehouse, 2002; Casey and Yamada, 2002). First, pensions of the elderly are based on their past earnings, typically higher for younger cohorts with greater lifetime income. Second, elderly pensioners are usually women, who live longer than men and may be poorer than older men. Third, due to the immaturity of contribution-based pension schemes, earlier contributors may lack sufficient entitlements for a full pension. Fourth, partial nonindexation of pension benefits may negatively affect older cohorts more than younger pensioners over the years. Fifth, some working younger elderly are better off than their older counterparts. Sixth, as the lifecycle hypothesis implies, older pensioners have lower savings income than younger ones if they spent their assets. However, older cohorts may be wealthier since aging survivors often possess more financial, housing, and pension assets than those who die young. Thus, the impact of aging on poverty remains to be analyzed thoroughly.

A single household living arrangement impacts elderly income distribution in two ways. A single pensioner often has a higher equivalized income than married couples with one partner lacking a full contribution history. This is particularly the case for most continental European systems that base social security on contributions and earnings (OECD, 2001; Whitehouse, 2002a, 2002b; Hinrichs, 2021). This differs from the flat-rate benefit systems in Denmark, the United Kingdom and the Netherlands. In contrast, assuming that household resources are shared among family members, relative poverty would be lower if fewer elderly people live alone. For example, suppose an elderly man with public and private pension benefits lives with an elderly woman with only a public pension. Their income is redistributed within the family, which results in lower relative poverty than if individuals lived separately. Hence, a lower share of single-person households is expected to reduce the relative poverty rate.

Education is positively associated with earnings (Chevalier et al., 2004; Blundell et al., 2005; Heckman et al., 2018). Therefore, better educated households often have higher retirement incomes. Furthermore, higher education increases the possibility of job retention and self-employment (Robinson and Sexton, 1994). Higher education concentration among the wealthy tends to increase relative poverty over time.

3. Analytical framework and data

3.1. LIS

Our analysis used household level microdata from LIS, a cross-national data center serving a community of researchers and policy makers and providing detailed information on income components, labor market status and demographic information.⁵ Income components include income from labor, property, and transfers and taxes. Labor market status includes activity status, employment intensity, job characteristics and work experience. Demographic information includes household composition, age, gender, marital status, etc. Information about all variables was collected through surveys conducted by the national bureau of statistics or academic institutions and have been “harmonized” by LIS for information

comparability among countries.⁶ This study analyzed data from both private and public pension benefits and focused on 16 European countries approximately from 2005 to 2022.⁷

3.2. Calculation of poverty among the elderly

The elderly is individuals aged 65 and above, including the household head, spouse and other relatives living in the household. The elderly group was categorized by age, not labor force withdrawal, as some elderly people were still self-employed. Furthermore, some early retirees were still middle-aged and thus not included in the elderly group.

Poverty is a relative concept for international comparisons. This study uses 60 % of median equivalized income as the standard poverty line. The European Union uses this poverty line. We applied poverty lines of 50 % and 40 % of median equivalized income in the sensitivity analysis. Equivalized income was obtained by applying the LIS equivalence scale to divide total household income by the square root of the number of household members. The choice of equivalence scales affects international income poverty comparisons. Alternative adjustment methods may affect country rankings, but the overall pattern remains unchanged (Atkinson et al., 1995). According to LIS convention and the work of Caminada et al. (2021), we removed observations with zero or a missing value of disposable income from LIS datasets.

3.3. Decomposition of poverty change among the elderly by pensions and other factors

This analysis examined the relative contributions of public and private pension benefits, labor market and demographic factors to poverty changes among the elderly in 16 European countries. We used two dummy variables to indicate a household's public and private pension participation status. The proportion of household members with labor incomes during the income reference period represented labor market factors. We analyzed how demographic factors affect poverty through three variables: the proportion of household members over 75, whether the elderly lived alone, and the education level of the household head. Education was measured by a binary variable indicating whether the household head has tertiary education or higher.

Inspired by Firpo et al. (2018), we decomposed the poverty change among the elderly based on the reweighting Recentered Influence Function-Oaxaca Blinder (RIF-OB) decomposition approach. The decomposition method proposed by Oaxaca (1973) and Blinder (1973) was applied to various distribution measures (OB decomposition hereafter). The OB decomposition divides income distribution into composition and structural effects. The former reflects changes in the distribution of household characteristics, while the latter captures changes in the return to these characteristics (or the change of relationships between the explained variables and explanatory variable). In the standard OB decomposition, the income of elderly households is written in the following linear functional form:

$$Y_{it} = X'_{it}\beta_t + \varepsilon_{it}, \text{ for } t = 0, 1 \quad (1)$$

The overall mean income change was defined from time 0 to 1 as $\Delta_0 = E(Y|T=1) - E(Y|T=0)$ and the overall mean change was divided into composition and structural effects. Averaging over X , the mean

⁵ See the rules, practices, and definitions applied during the harmonization process at <http://www.lisdatacenter.org/wp-content/uploads/our-lis-documentation-harmonization-guidelines.pdf>.

⁷ Austria (2005, 2021), Belgium (2005, 2021), Denmark (2004, 2022), France (2005, 2020), Germany (2005, 2020), Ireland (2005, 2021), Italy (2006, 2020), Luxembourg (2005, 2021), Netherlands (2005, 2021), Norway (2004, 2021), Poland (2005, 2020), Romania (2006, 2021), Spain (2005, 2019), Sweden (2005, 2021), Switzerland (2006, 2019), and the United Kingdom (2005, 2021).

⁶ See at <http://www.lisdatacenter.org/>.

income difference Δ_O^μ can be written as follows:

$$\Delta_O = E[Y|T=1] - E[Y|T=0] = E[X|T=1](\beta_1 - \beta_0) + (E[X|T=1] - E[X|T=0])'\beta_0 = \bar{X}^1'(\beta_1 - \beta_0) + (\bar{X}^1 - \bar{X}^0)'\beta_0 \quad (2)$$

The first term $\bar{X}^1'(\beta_1 - \beta_0)$ is the structural effect. It refers to the average change in income structure (that is, the change in the return of household characteristics). The second term $(\bar{X}^1 - \bar{X}^0)'\beta_0$ is the change in the mean income due to changes in household characteristics' distribution when the income determination equation is fixed at the $T = 0$ moment.

Eq. (2) suggests that OB method can decompose the overall mean income change but not other income distribution measures. To decompose the elderly relative poverty, we adopted the RIF statistics proposed by [Firpo et al. \(2007, 2009\)](#). RIF statistics estimated the marginal impact of the change of household characteristics on the change in unconditional distribution of income. According to [Essama-Nssah and Lambert \(2012\)](#), we expressed the RIF function of poverty as follows:

$$RIF\{y, FGT_Y(\alpha, Z)\} = \left(\frac{Z-y}{Z}\right)^\alpha \quad (y \leq Z) \quad (3)$$

where y represents the equivalized household disposable income. α is the poverty aversion index, where $\alpha = 0$ stands for the poverty coverage rate while $\alpha = 1$ and $\alpha = 2$ represent the mean relative poverty gap and squared relative poverty gap, respectively. We focused on the case $\alpha = 0$. Z as the poverty line.

Once we had the RIF statistics, we performed a decomposition similar to the standard OB decomposition. In particular, we did this by replacing Y in Eqs. (1)–(3) with the RIF statistics. Then, we estimated $\hat{\beta}_0$ and $\hat{\beta}_1$ and obtained the composition and structural effects of relative poverty.⁸

Another concern was that the core of income distribution decomposition lies in the construction of the counterfactual income distribution v_c . In OB decomposition, v_c is represented as $\bar{X}^1'\hat{\beta}_0$. However, it may misidentify the counterfactual income distribution for improper model specification or ungeneralizable local approximates obtained using RIF statistics ([Rios-Avila, 2020](#)).

To address this concern, we used the reweighted semiparameter identification method proposed by [Firpo et al. \(2018\)](#) for estimating the counterfactual distribution $F_Y^C = \int F_{Y|X,T=0} dF_{X|T=1}$, where $F(\cdot)$ represents the cumulative distribution function. To estimate the counterfactual statistics, we can approximate $dF_{X|T=1}$ at time $T = 1$ by multiplying the observed feature distribution $dF_{X|T=0}$ by the weight $\omega(X)$.

$$\begin{aligned} \omega(X) &= \frac{dF_{X|T=1}}{dF_{X|T=0}} = \frac{dF_{T=1|X} dF_X}{dF_{T=1} dF_{T=0|X} dF_X} = \frac{dF_{T=1|X}}{dF_{T=1}} \frac{dF_{T=0}}{dF_{T=0|X}} \\ &= \frac{1-P}{P} \frac{P(T=1|X)}{1-P(T=1|X)} \end{aligned} \quad (4)$$

P is the population at time $T = 1$ as a share of total population at time $T = 1$ and $T = 0$. $P(T=1|X)$ is the conditional probability that a

household with feature X belonging to group $T = 1$.⁹ Clearly, in Eq. (4) parameter P is observable but $P(T=1|X)$ is unobservable, which can be

assessed by a probit or logit model ([Firpo and Pinto, 2016](#)).

After obtaining the reweighting factor $\omega(X)$, we approximated the counterfactual distribution:

$$F_Y^C = \int F_{Y|X,T=0} dF_{X|T=1} \cong \int F_{Y|X,T=0} dF_{X|T=0} \omega(X) \quad (5)$$

With both the counterfactual distribution of factors $dF_X^C = dF_{X,T=0} \omega(X)$ and household income distribution F_Y^C , we computed the counterfactual statistics $v_c = \bar{X}^c \hat{\beta}^c$, where $\hat{\beta}^c$ was calculated using the reweighted RIF regression. Finally, the overall decomposition results were obtained:

$$\Delta_O = \underbrace{(\bar{X}^c - \bar{X}^0)'\hat{\beta}_0}_{\Delta_X^p} + \underbrace{\bar{X}^c(\hat{\beta}_c - \hat{\beta}_0)}_{\Delta_X^e} + \underbrace{\bar{X}^1'(\hat{\beta}_1 - \hat{\beta}_c)}_{\Delta_S^p} + \underbrace{(\bar{X}^1 - \bar{X}^c)'\hat{\beta}_c}_{\Delta_S^e} \quad (6)$$

Here, $\Delta_X^p + \Delta_X^e$ responds to the composition effect in the OB decomposition while $\Delta_S^p + \Delta_S^e$ is the structural effect. In particular, Δ_X^p is the pure composition effect, Δ_S^p is the pure structural effect. Δ_X^e is the model specification error, which can indicate the degree to which the model deviates from the linear assumption. Δ_S^e is the reweighting error. A large Δ_S^e implies that the counterfactual statistics are not well identified.

The previous procedures allowed us to decompose the change in elderly poverty into the composition and structural effect. However, the overall impact of the household characteristics on changing poverty was more interesting. To this end, we decomposed the composition and structural effects for each factor based on Eqs. (7) and (8). Finally, the sum of the composition and structural effects of each factor represented the total contribution of the factors to the overall change in elderly poverty.

$$\Delta_X^p = \sum_{k=1}^K (\bar{X}_k^c - \bar{X}_k^0)' \cdot \hat{\beta}_{0,k} \quad (7)$$

$$\Delta_S^p = \sum_{k=1}^K \bar{X}_k^c \cdot (\hat{\beta}_{1,k} - \hat{\beta}_{c,k}) \quad (8)$$

Overall, the reweighting RIF-OB decomposition method used in this paper could overcome some limitations in other commonly used decomposition methods. First, traditional decomposition methods such as budget incidence analysis ([Musgrave et al., 1974](#)), growth and redistribution decomposition approach ([Datt and Ravallion, 1992](#)), and the rank-preserving exchange approach ([Chen and Corak, 2008](#)) assume that the factors are not correlated, which may not be true in reality. For example, the working status of the elderly is possibly correlated with his age, leading to biased decomposition results using the traditional decomposition methods. Second, the reweighting method proposed by [DiNardo et al. \(1996\)](#), the improved rank-preserving exchange approach

⁸ For example, the education level of the elderly in 2022 was higher than that in 2005 (showing a shift to the right of education's distribution curve); thus, the contribution of the change in education's distribution to the change in poverty between 2005 and 2022 showed the composition effect $((E[X|T=1] - E[X|T=0])'\beta_0)$, which reduces poverty (provided that higher education helps escape poverty). If the poverty-reducing effect of education in 2022 was higher than that in 2005, the poverty rate in 2022 was also lower, even if the overall level of education remained the same. This shows the structural effect $(E[X|T=1]'\beta_1 - \beta_0)$.

⁹ For instance, let us assume that the share of elderly people living in a single-person household increased from 10 % in 2005 to 20 % in 2022. To adjust the feature distribution from time $T = 0$ to $T = 1$, each observation should have been reweighted according to the percentage change in the share of each group. Therefore, every single-person household elderly individual in 2005 should have been up-weighted and every elderly person in another type of household should have been down-weighted since the increase share of single elderly people.

developed by Larrimore (2014) and Ku et al. (2021) and the aforementioned budget incidence analysis and growth and redistribution decomposition methods face ordering effect issues, that is, the results may vary depending on the sequence in which factors are entered into the decomposition process. Third, the decomposition method proposed by Wan (2004), which is based on Shapley cooperative game theory, can solve the above two defects and calculate the contributions of single factors to the change of income distribution. However, Wan's (2004) method does not reveal what drives the contribution, resulting in a relatively low interpretability of the model.

Instead, the reweighting RIF-OB decomposition method can best overcome all of these limitations, as it is based on unconditional RIF regression, which allows us to calculate the contribution of a single variable controlling other factors unchanged, therefore avoiding the impact of possible correlation between variables. Meanwhile, under the OB decomposition framework, the contribution of each factor can be further divided into the impact of changes in the distribution of household characteristics (composition effect) and changes in the return of the characteristics (structural effect). Moreover, we applied the inverse probability weighting to construct counterfactual groups to address the limitations of the traditional OB decomposition, such as its high sensitivity to model specification errors and the selection of reference group (Sen, 2014) and its tendency to overestimate the contribution of composition effect (Elder et al., 2010). Other studies that have utilized this decomposition method include Churchill et al. (2020), Tufa et al. (2022) and Islam and Amin (2023).

4. Empirical results

4.1. Poverty among the elderly

Table 1 shows the poverty level among the elderly in the studied countries from the mid-2000s to 2022, using 60 % of median equivalized household income as the poverty line. In 2022, Ireland had the highest elderly poverty rate at 31.59 %. Belgium, Germany, the Netherlands, Spain, Sweden, Switzerland, and the United Kingdom had elderly poverty rates over 20 %. France had the lowest poverty rate. Elderly poverty gradually declined over the observed period. The poverty rate in our 16 European countries decreased from 21.72 % to 20.16 %, a decline of 1.56 %. The largest reductions were in Denmark (17.87 %), Spain (13.64 %), and Norway (9.33 %). Several countries, including Germany, the Netherlands,

Table 1
Relative Poverty among the elderly, 2005–2022 (60 % poverty line, %).

	Around 2005	Around 2022	Change 05–22
Own calculations based on LIS data			
AT (Austria, 2005–2021)	20.24	18.00	–2.23
BE (Belgium, 2005–2021)	28.84	26.93	–1.91
DK (Denmark, 2004–2022)	31.13	13.26	–17.87
FR (France, 2005–2020)	12.69	11.43	–1.26
DE (Germany, 2005–2020)	17.13	20.78	3.65
IE (Ireland, 2005–2021)	37.17	31.59	–5.58
IT (Italy, 2006–2020)	21.31	17.54	–3.78
LU (Luxembourg, 2005–2021)	8.58	13.76	5.17
NL (Netherlands, 2005–2021)	7.96	21.97	14.00
NO (Norway, 2004–2021)	23.00	13.67	–9.33
PL (Poland, 2005–2020)	7.76	19.50	11.74
RO (Romania, 2006–2021)	24.10	19.71	–4.39
ES (Spain, 2005–2019)	34.33	20.69	–13.64
SE (Sweden, 2005–2021)	18.87	22.31	3.43
CH (Switzerland, 2006–2019)	29.82	29.17	–0.65
UK (United Kingdom, 2005–2021)	24.66	22.32	–2.34
Mean	21.72	20.16	–1.56

Source: Own calculations based on LIS data.

Table 2
Descriptive statistics of characteristics among elderly people, 2005–2022.

Country	Around 2005					Around 2022					Change 05–22				
	Household working status	University attendance of household head	Single- person household	Share of people above 75 years old	Public Pension	Private Pension	Household working status	University attendance of household head	Single- person household	Share of people above 75 years old	Public Pension	Private Pension	Household working status	University attendance of household head	Single- person household
AT (2005–2021)	0.11	0.14	0.35	0.37	0.98	0.05	0.13	0.13	0.35	0.36	0.98	0.06	0.02	–0.01	–0.01
BE (2005–2021)	0.06	0.19	0.35	0.45	0.97	0.04	0.11	0.34	0.34	0.45	0.97	0.00	0.05	0.00	0.00
DK (2004–2022)	0.18	0.12	0.45	0.39	0.99	0.46	0.51	0.29	0.39	0.48	0.96	0.61	0.33	0.16	–0.05
FR (2005–2020)	0.07	0.07	0.36	0.46	1.00	–	0.10	0.19	0.36	0.42	0.99	–	0.03	0.12	0.00
DE (2005–2020)	0.10	0.24	0.40	0.38	0.97	0.23	0.19	0.30	0.41	0.45	0.95	0.33	0.09	0.06	0.01
IE (2005–2021)	0.16	0.10	0.34	0.41	0.95	0.05	0.24	0.26	0.32	0.40	0.96	0.04	0.08	0.16	–0.01
IT (2006–2020)	0.10	0.05	0.26	0.39	0.98	0.05	0.12	0.07	0.29	0.42	0.96	0.04	0.03	0.01	0.02
LU (2005–2019)	0.08	0.08	0.31	0.36	0.99	0.03	0.12	0.41	0.33	0.29	0.95	0.12	0.03	0.33	0.02
NL (2005–2021)	0.09	0.16	0.35	0.42	1.00	0.02	0.16	0.27	0.32	0.42	0.96	0.93	0.06	0.11	–0.04
NO (2004–2021)	0.23	0.15	0.42	0.49	–	0.77	0.28	0.28	0.34	0.43	–	0.85	0.05	0.13	–0.08
PL (2005–2020)	0.08	0.11	0.33	0.28	1.00	–	0.12	0.21	0.27	0.26	0.98	–	0.04	0.09	–0.06
RO (2006–2021)	0.20	0.07	0.29	0.32	0.97	–	0.14	0.08	0.34	0.33	0.97	0.00	–0.06	0.01	0.05
ES (2005–2019)	0.14	0.09	0.23	0.38	0.96	0.03	0.23	0.21	0.23	0.41	0.95	0.10	0.10	0.12	–0.01
SE (2005–2021)	0.21	0.10	0.43	0.49	1.00	0.88	0.24	0.24	0.41	0.49	0.99	0.93	0.08	0.14	–0.02
CH (2006–2019)	0.19	0.20	0.33	0.38	0.98	0.59	0.20	0.31	0.33	0.45	0.98	0.70	0.01	0.12	–0.01
UK (2005–2021)	0.10	0.07	0.35	0.44	0.99	0.72	0.13	0.26	0.30	0.43	0.95	0.73	0.04	0.20	–0.04
Mean	0.13	0.12	0.35	0.40	0.98	0.30	0.19	0.24	0.33	0.41	0.97	0.39	0.06	0.12	–0.01

Note: Not available (–). Around 2005, the public pension coverage in France, the Netherlands, Poland and Sweden reached around 100 %.

Source: Own calculations using LIS micro-data.

Table 3
Decomposition of changes in relative poverty (60 %) among the elderly, 2005–2022 (%).

	AT	BE	DK	FR	DE	IE	IT	LU	NL	NO	PL	RO	ES	SE	CH	UK	Mean
Changes in relative poverty	-2.23 (1.40)	-1.91 (1.74)	-17.87 (0.65)	-1.26 (0.47)	3.65 (1.40)	-5.58 (2.43)	-3.78 (1.63)	5.17 (2.15)	14.00 (1.83)	-9.33 (7.87)	11.74 (0.46)	-4.39 (1.11)	-13.64 (1.23)	3.43 (1.56)	-0.65 (1.59)	-2.34 (0.94)	-1.56
<i>Contributions of factors</i>																	
Household working status	0.42 (0.59)	-1.37 (0.91)	-3.98 (1.26)	-0.35 (0.21)	-3.84 (0.91)	-1.24 (1.32)	-0.53 (0.62)	-0.17 (1.05)	5.80 (9.48)	-1.40 (6.61)	-2.87 (0.21)	1.00 (0.58)	0.53 (0.91)	-4.52 (1.06)	0.18 (0.79)	-3.04 (0.46)	-0.96
University attendance of household head	1.53 (0.41)	-0.81 (1.11)	-1.43 (0.58)	-0.99 (0.21)	-0.27 (0.82)	-3.35 (1.03)	-0.20 (0.16)	-0.12 (3.39)	5.01 (7.63)	-0.94 (4.77)	-2.09 (0.17)	0.37 (0.19)	-1.71 (0.71)	-1.47 (0.67)	-2.72 (1.06)	-1.15 (0.60)	-0.65
Single-person household	0.94 (1.10)	4.26 (1.31)	1.09 (0.81)	1.13 (0.40)	2.88 (1.17)	-2.35 (1.39)	-1.02 (1.07)	2.87 (1.81)	8.56 (7.37)	-3.05 (7.79)	6.38 (0.33)	-0.58 (0.89)	-2.30 (0.79)	4.61 (1.20)	1.61 (1.07)	0.37 (0.59)	1.59
Share of people above 75 years old	-3.59 (1.11)	1.59 (1.85)	-2.86 (1.10)	-1.81 (0.46)	-5.82 (1.49)	1.89 (1.97)	-2.66 (1.59)	-2.31 (1.79)	16.32 (13.37)	-3.47 (9.48)	0.28 (0.30)	1.31 (0.92)	2.19 (1.34)	-3.55 (1.42)	0.78 (1.65)	0.98 (0.91)	-0.05
Public pensions	-13.28 (11.25)	-2.40 (8.49)	-7.18 (5.50)	-4.03 (7.88)	-7.88 (8.03)	-18.33 (10.06)	-8.91 (7.71)	-6.19 (19.58)	-2.60 (2.52)	-	-16.61 (8.41)	-18.65 (8.65)	-17.70 (4.81)	10.64 (9.09)	-5.54 (13.12)	-2.78 (5.64)	-8.10
Private pensions	-0.10 (0.19)	0.81 (0.17)	5.28 (1.38)	-	-3.53 (0.84)	0.41 (0.27)	0.07 (0.23)	-0.99 (0.59)	-21.20 (15.63)	-1.35 (24.06)	-	-	-1.60 (0.62)	-1.98 (5.70)	-1.55 (2.38)	-4.83 (1.85)	-2.35
<i>Other contributions</i>																	
Constants	11.92 (11.76)	-3.73 (9.47)	-11.15 (5.70)	4.78 (7.98)	21.50 (7.84)	18.10 (11.16)	9.48 (8.64)	14.20 (20.89)	18.80 (43.51)	0.11 (31.38)	26.70 (8.51)	12.21 (9.20)	6.31 (5.71)	-1.54 (10.27)	6.31 (13.33)	7.84 (6.25)	8.87
Specification error	-0.01 (0.16)	0.11 (0.30)	1.70 (0.19)	0.00 (0.10)	0.61 (0.29)	0.40 (0.42)	0.01 (0.26)	-1.94 (3.33)	-9.62 (8.03)	0.31 (0.23)	-0.05 (0.10)	0.00 (0.17)	1.02 (0.33)	0.10 (0.17)	0.17 (0.37)	-0.63 (0.36)	-0.49
Reweighting error	-0.06 (0.50)	-0.37 (0.68)	0.67 (0.29)	0.03 (0.13)	0.01 (0.38)	-1.15 (1.38)	-0.01 (0.50)	-0.21 (0.76)	-7.02 (9.04)	0.44 (0.47)	0.04 (0.11)	-0.03 (0.41)	-0.39 (0.76)	1.15 (0.49)	0.10 (0.78)	0.90 (0.39)	-0.37

Notes: Standard errors (SE) clustered at the household level are given in parentheses. Not available (-).

Luxembourg, Poland, and Sweden, experienced increases in elderly poverty, and the Netherlands experienced the greatest rise at 14.00%¹⁰

The relative poverty rates among the elderly in some countries have experienced substantial changes of over 10 % from 2005 to 2022. For instance, the relative poverty rate among the elderly in Denmark decreased by 17.87 %. Table 3 shows that factors explaining 86 % of the 17.87 % decline include household working status (-3.98 %), university attendance of the household head (-1.43 %), share of those over 75 (-2.86 %) and public pensions (-7.18 %). In Spain, the elderly's relative poverty rate decreased by 13.64 %, mainly due to public pensions (-17.70 %).

Elderly relative poverty rates in the Netherlands and Poland rose over 10 %. The decomposition results show that single-person household drove the rise in relative poverty rates in both countries. Despite a decline in elderly individuals living alone in the Netherlands and Poland (Table 2), their probability of falling into relative poverty has significantly increased. In the Netherlands, the median equivalized income increased from €24,948.34 to €32,376.30, while the income of elderly living alone rose from €19,453.30 in 2005 to €21,409 in 2021. The aging population in the Netherlands, defined by those over 75, contributed to a 16.32 % increase in the relative poverty rate.

In addition, the widening income gap between the elderly and other age groups may explain rising relative poverty rates among the elderly in the Netherlands and Poland. Eurostat data shows that the median income ratio (65+)—defined as the ratio of the median equivalized disposable income of individuals aged above 65 to that of those aged below 65—has significantly declined. In the Netherlands, the ratio decreased from 0.88 in 2005 to 0.74 in 2021, and in Poland, it fell from 1.09 in 2005 to 0.85 in 2020. Since the relative poverty line is set based on the median income of the entire population, an increase in the younger groups' relative income lowers the elderly's relative income, raising their relative poverty incidence.

4.2. Descriptive statistics of characteristics among the elderly

Table 2 shows the mean household characteristics of the elderly in 16 European countries. In 2022, 19 % of elderly household members participated in the labor market, notably in Denmark (51 %), Sweden (29 %), Norway (28 %), and Ireland (24 %). Elderly households in the labor market increased by 6 % from 2005 to 2022. In Romania, elderly households in the labor market fell from 20 % to 14 %. The proportion of elderly household heads with higher education increased over time, except in Austria, which experienced a slight decline. In 2022, the countries with the most educated elderly household heads were Luxembourg (41 %), Belgium (34 %), Switzerland (31 %), and Germany (30 %).

Single-person households (30 %) and individuals over 75 (40 %) showed little variation across countries and time. Public pension coverage in all countries was high (over 95 %) throughout the study. In 2005, 100 % of the elderly in the Netherlands had public pension coverage. Between 2005 and 2022, public pensions coverage declined slightly by 2 %, with the largest drops in the United Kingdom (5 %), the Netherlands (4 %) and Luxembourg (4 %). In contrast, private pension coverage increased by 12 % on average, with 91 % in the Netherlands, 15 % in Denmark and 11 % in Switzerland.

4.3. Decomposition results

Table 3 presents the decomposition results of poverty among the

¹⁰ Considering the potential influence of countries with substantial fluctuations in relative poverty rates on the overall trend, we conducted an analysis excluding countries where the change in the relative poverty rate among the elderly exceeded 10 percentage points (namely Denmark, the Netherlands, Poland, and Spain). The remaining countries still exhibited a trend consistent with the full-sample analysis. In particular, the relative poverty rate among the elderly decreased from 22.20 % in 2005 to 20.60 % in 2022.

Table 4
Decomposition of changes in relative poverty (50 %) among the elderly, 2005–2022 (%).

	AT	BE	DK	FR	DE	IE	IT	LU	NL	NO	PL	RO	ES	SE	CH	UK	Mean
Changes in relative poverty	-0.10 (1.11)	-6.84 (1.31)	-5.18 (0.38)	-0.69 (0.29)	4.96 (1.18)	-2.38 (1.85)	-1.54 (1.28)	4.73 (1.71)	5.32 (1.00)	-4.53 (6.17)	6.98 (0.32)	-2.17 (0.93)	-11.06 (1.03)	2.27 (1.12)	0.85 (1.32)	0.15 (0.72)	-0.58 -
<i>Contributions of factors</i>																	
Household working status	-0.35 (0.46)	-0.68 (0.86)	-0.68 (0.79)	-0.28 (0.14)	-2.12 (0.76)	0.02 (0.90)	-0.98 (0.52)	-0.22 (0.83)	-1.36 (0.22)	-0.60 (3.83)	-1.88 (0.19)	0.98 (0.50)	0.28 (0.74)	-1.71 (0.81)	-0.14 (0.65)	-1.74 (0.32)	-0.72 -
University attendance of household head	1.19 (0.33)	1.76 (0.89)	-0.19 (0.33)	-0.26 (0.16)	-0.57 (0.70)	-1.23 (0.77)	-0.14 (0.12)	1.43 (3.19)	0.48 (0.33)	0.07 (3.08)	-1.16 (0.12)	0.14 (0.16)	-0.99 (0.46)	-0.06 (0.47)	-0.91 (0.76)	-0.01 (0.43)	-0.03 -
Single-person household	-0.91 (0.31)	-0.30 (1.09)	-0.97 (0.50)	-0.17 (0.27)	1.75 (1.02)	1.20 (1.22)	-1.65 (0.87)	3.12 (1.57)	0.89 (0.34)	-2.94 (4.97)	4.03 (0.24)	-0.01 (0.76)	-1.72 (0.58)	0.62 (0.84)	0.02 (0.82)	0.27 (0.48)	0.20 -
Share of people above 75 years old	-2.22 (0.01)	-0.52 (1.54)	-1.53 (0.64)	-0.61 (0.30)	-3.99 (1.31)	2.22 (1.46)	-2.62 (1.19)	-2.50 (1.48)	1.14 (0.45)	-1.45 (5.84)	-0.73 (0.20)	0.33 (0.78)	0.37 (1.05)	-2.55 (1.10)	1.67 (1.22)	0.76 (0.69)	-0.76 -
Public pensions	-16.73 (0.15)	-12.77 (8.32)	-6.03 (4.30)	-0.32 (7.84)	-2.62 (7.69)	-7.78 (7.62)	-9.31 (8.11)	-4.89 (15.82)	-5.78 (2.49)	-	-21.02 (8.59)	-7.48 (8.40)	-21.35 (4.61)	11.25 (7.47)	-9.73 (10.12)	-9.78 (3.85)	-8.29 -
Private pensions	-0.25 (0.15)	0.62 (0.09)	2.62 (0.89)	-	-3.30 (0.69)	0.33 (0.16)	-0.06 (0.20)	-1.01 (0.44)	-31.35 (2.78)	-2.36 (20.51)	-	-	-0.69 (0.32)	-14.71 (6.44)	-5.89 (2.24)	-3.19 (1.52)	-4.56 -
<i>Other contributions</i>																	
Constants	19.24 (11.88)	5.26 (9.22)	1.85 (4.26)	0.96 (7.90)	15.61 (7.38)	3.48 (8.33)	13.21 (8.82)	10.51 (16.50)	41.33 (3.14)	2.42 (24.06)	27.82 (8.68)	3.95 (8.88)	12.52 (5.29)	9.16 (8.62)	15.65 (10.47)	14.25 (4.60)	12.33 -
Specification error	-0.01 (0.93)	-0.03 (0.25)	-0.30 (0.11)	-0.02 (0.07)	0.30 (0.25)	0.10 (0.32)	-0.02 (0.21)	-1.65 (1.22)	-0.01 (0.28)	0.15 (0.16)	-0.09 (0.07)	-0.01 (0.14)	0.79 (0.23)	-0.04 (0.11)	0.11 (0.27)	-0.98 (0.26)	-0.11 -
Reweighting error	-0.04 (0.91)	-0.19 (0.37)	0.04 (0.13)	0.01 (0.07)	-0.10 (0.27)	-0.74 (0.96)	0.03 (0.35)	-0.08 (0.59)	-0.01 (0.06)	0.17 (0.24)	0.02 (0.09)	-0.05 (0.33)	-0.27 (0.51)	0.30 (0.20)	0.07 (0.54)	0.56 (0.26)	-0.02 -

Notes: SE clustered at the household level are given in parentheses. Not available (-).

Table 5
Decomposition of changes in relative poverty (40 %) among the elderly, 2005–2022 (%).

	AT	BE	DK	FR	DE	IE	IT	LU	NL	NO	PL	RO	ES	SE	CH	UK	Mean
Changes in relative poverty	2.76 (0.71)	-0.61 (0.69)	0.01 (0.15)	-0.12 (0.16)	4.01 (0.85)	-0.76 (1.01)	-0.48 (0.89)	1.48 (1.05)	1.61 (0.62)	-0.07 (2.19)	2.88 (0.20)	-1.59 (0.68)	-4.87 (0.72)	1.40 (0.71)	1.36 (1.00)	1.04 (0.47)	0.50 -
<i>Contributions of factors</i>																	
Household working status	-0.68 (0.36)	-0.00 (0.26)	-0.71 (0.31)	-0.03 (0.10)	-1.72 (0.48)	0.21 (0.52)	-0.92 (0.43)	-0.41 (0.46)	-0.37 (0.12)	-0.23 (1.62)	-1.06 (0.15)	0.51 (0.39)	-0.09 (0.52)	0.45 (0.66)	-0.80 (0.46)	-0.79 (0.21)	-0.42 -
University attendance of household head	0.50 (0.22)	0.61 (0.43)	-0.00 (0.19)	-0.12 (0.12)	0.08 (0.49)	-0.28 (0.32)	-0.07 (0.08)	-0.36 (2.24)	0.28 (0.22)	0.12 (1.22)	-0.35 (0.08)	0.05 (0.12)	-0.46 (0.27)	0.16 (0.35)	-0.34 (0.51)	0.55 (0.28)	0.02 -
Single-person household	0.63 (0.54)	0.28 (0.57)	0.01 (0.29)	-0.27 (0.16)	0.78 (0.68)	0.50 (0.65)	-0.70 (0.55)	1.83 (1.07)	0.93 (0.23)	0.18 (1.89)	1.35 (0.15)	-0.64 (0.57)	0.91 (0.42)	0.07 (0.46)	-0.61 (0.62)	-0.26 (0.33)	0.31 -
Share of people above 75 years old	-0.69 (0.54)	0.89 (0.79)	0.16 (0.27)	0.06 (0.17)	-1.91 (0.86)	1.28 (0.84)	-1.67 (0.80)	-1.52 (0.70)	0.05 (0.30)	-0.18 (2.53)	-0.48 (0.12)	-0.21 (0.56)	0.42 (0.77)	-0.01 (0.70)	1.21 (0.88)	1.04 (0.48)	-0.10 -
Public pensions	-26.36 (11.08)	8.44 (7.09)	-5.41 (3.16)	2.81 (7.35)	-14.78 (5.79)	-1.20 (6.89)	-17.78 (6.66)	-9.06 (4.00)	-1.60 (1.86)	-	-37.25 (7.10)	-12.54 (7.67)	-19.81 (4.34)	4.70 (6.73)	-8.04 (9.06)	-6.42 (3.39)	-9.62 -
Private pensions	-0.16 (0.12)	0.15 (0.03)	0.00 (0.41)	-	-1.50 (0.44)	0.14 (0.08)	0.14 (0.11)	-0.31 (0.27)	-11.94 (2.60)	-0.73 (9.40)	-	-	-0.26 (0.14)	-6.62 (4.76)	-7.80 (1.82)	-1.86 (1.03)	-2.37 -
<i>Other contributions</i>																	
Constants	29.55 (11.43)	-10.89 (7.48)	6.11 (3.09)	-2.56 (7.38)	23.15 (6.06)	-1.31 (7.37)	20.52 (7.45)	11.38 (4.31)	14.24 (2.13)	0.78 (10.55)	40.71 (7.19)	11.33 (8.07)	14.18 (4.87)	2.70 (7.60)	17.57 (9.22)	9.60 (4.02)	11.69 -
Specification error	-0.01 (0.07)	0.00 (0.12)	-0.10 (0.06)	-0.01 (0.05)	-0.06 (0.07)	0.08 (0.16)	0.01 (0.16)	-0.17 (0.33)	0.02 (0.11)	-0.03 (0.05)	-0.05 (0.04)	-0.01 (0.11)	0.43 (0.16)	-0.07 (0.08)	0.12 (0.19)	-0.91 (0.23)	-0.05 -
Reweighting error	-0.02 (0.12)	-0.09 (0.14)	-0.05 (0.07)	0.00 (0.04)	-0.03 (0.11)	-0.17 (0.18)	0.00 (0.12)	0.08 (0.22)	-0.01 (0.03)	0.01 (0.05)	0.01 (0.05)	-0.06 (0.19)	-0.18 (0.23)	0.03 (0.07)	0.04 (0.29)	0.09 (0.15)	-0.02 -

Notes: SE clustered at the household level in parentheses. Not available (-).

elderly in terms of public/private pension income, labor market factors and demographic characteristics across 16 European countries approximately from 2005 to 2022, showing an average decrease of 1.56 %, mainly due to public/private pension benefits (−10.45 %), particularly public pensions (−8.10 %) with lesser contributions from labor market changes (−0.96 %), university attendance (−0.65 %) and the share of people over 75 (−0.05 %). However, this increase was partly offset by single-person households (+1.59 %).

Unobservable characteristics contribute to an 8.87 % increase in elderly poverty. This may be due to factors such as ethnicity, health status, urban residency, and variability in terms of access to public services. These factors cannot be explicitly included in the model due to the absence of consistent and comparable indicators in LIS. Consequently, their aggregate effects are captured in the constant term. In addition, the extent of constant contribution is similar to other studies using the same decomposition method (Attanasio et al., 2020; Islam and Amin, 2023; Bonaccolto-Töpfer and Satlukal, 2024).

Finally, the specification and reweighting error caused less than 1 % change in elderly poverty, indicating that our model was valid and decomposition results were not influenced by specification or reweighting errors.

However, large variation was observed among countries. Public pensions reduced poverty in all countries except Sweden, considering other labor market and demographic factors. Private pensions reduced poverty, especially in the Netherlands.¹¹ Yet, in four out of the 16 countries, including Belgium, Denmark, Ireland and Italy, private pensions contributed to the rise of poverty among the elderly.

Labor market changes reduced elderly poverty in all countries except Austria, the Netherlands, Romania, Spain and Switzerland. University attendance of household heads contributed to poverty reduction in elderly households, except in Austria, the Netherlands, and Romania. Single-person households were associated with increased poverty among the elderly in most countries, except those in Ireland, Italy, Norway, Romania, and Spain. The contribution of changes in the share of those over 75 was subtle, with larger differences across countries.¹²

4.4. Sensitivity tests

The exercise repeated with poverty lines of 50 % and 40 % of median equivalized income explored results' sensitivity. Tables 4 and 5 show decomposition results based on 50 % and 40 % poverty lines.¹³ A higher poverty line was observed to yield higher poverty rates. The trends remained the same using the 50 % or 40 % poverty lines as with the 60 % line, with exceptions of Austria and Denmark, which showed increased poverty rates at the 40 % line, and Switzerland, which showed increased rates at both the 50 % and 40 % poverty lines.

Overall, the results remained robust at the 50 % and 40 % poverty lines. Austria showed that household working status positively affects elderly poverty under the 60 % line but negatively under the 50 % line, because the structure effect of household working status in Austria shifts from 0.76 at the 60 % poverty line to −0.19 at the 50 % (see Table A3). In Austria, employment discrimination against the elderly decreased only by 50 %–60 % income range from 2005 to 2022. Low-income elderly

Table 6
Detailed decomposition of changes in relative poverty (60 %) among the elderly, 2005–2022 (%).

	AT	BE	DK	FR	DE	IE	IT	LU	NL	NO	PL	RO	ES	SE	CH	UK	Mean
Changes in relative poverty	−2.23	−1.91	−17.87	−1.26	3.65	−5.58	−3.78	5.17	14.00	−9.33	11.74	−4.39	−13.64	3.43	−0.65	−2.34	−1.56
Contributions of factors																	
Household working status	0.42	−1.37	−3.98	−0.35	−3.84	−1.24	−0.53	−0.17	5.80	−1.40	−2.87	1.00	0.53	−4.52	0.18	−3.04	−0.96
Composition effect	−0.35	−1.47	−4.92	−0.08	−1.56	−3.38	−0.89	−0.61	−0.44	−0.70	−0.53	0.92	−4.97	−0.57	−0.34	−2.22	−1.38
Structural effect	0.76	0.11	0.94	−0.27	−2.28	2.15	0.37	0.44	6.24	−0.70	−2.34	0.09	5.50	−3.95	0.53	−0.82	0.42
University attendance of household head	1.53	−0.81	−1.43	−0.99	−0.27	−3.35	−0.20	0.12	5.01	−0.94	−2.09	0.37	−1.71	−1.47	−2.72	−1.15	−0.65
Composition effect	0.17	−3.90	−1.39	−1.16	−0.87	−4.15	−0.20	0.72	−0.60	−0.68	−0.63	−0.23	−3.33	−0.77	−0.53	−2.47	−1.25
Structural effect	1.36	3.09	−0.04	0.17	0.60	0.80	−0.01	−0.84	5.61	−0.26	−1.46	0.60	1.62	−0.70	−2.19	1.31	0.60
Single-person household	0.94	4.26	1.09	1.13	2.88	−2.35	−1.02	2.87	8.56	−3.05	6.38	−0.58	−2.30	4.61	1.61	0.37	1.59
Composition effect	−0.11	0.07	−0.15	0.00	0.12	−0.43	0.23	0.22	−0.22	−2.79	−0.34	1.05	−0.06	−0.81	−0.01	−0.67	−0.24
Structural effect	1.05	4.20	1.24	1.13	2.76	−1.92	−1.25	2.65	8.78	−0.26	6.72	−1.63	−2.23	5.42	1.61	1.05	1.83
Share of people above 75 years old	−3.59	1.59	−2.86	−1.81	−5.82	1.89	−2.66	−2.31	16.32	−3.47	0.28	1.31	2.19	−3.55	0.78	0.98	−0.05
Composition effect	−0.05	0.04	0.05	−0.10	−0.23	0.10	0.10	0.10	−0.12	−0.58	0.15	0.04	0.10	−0.41	−0.03	−0.02	−0.05
Structural effect	−3.55	1.55	−2.91	−1.71	−5.59	1.78	−2.75	−2.41	16.43	−2.89	0.14	1.27	2.09	−3.14	0.82	1.00	0.01
Public pensions	−13.28	−2.40	−7.18	−4.03	−7.88	−18.33	−8.91	−6.19	−2.60	−	−16.61	−18.65	−17.70	10.64	−5.54	−2.78	−8.10
Composition effect	0.18	0.01	−0.09	0.10	0.21	−0.11	0.29	2.47	−	−	0.47	0.17	0.58	−0.14	−0.04	1.77	0.42
Structural effect	−13.46	−2.42	−7.09	−4.14	−8.09	−18.21	−9.20	−8.65	−2.60	−	−17.10	−18.81	−18.27	10.78	−5.51	−4.55	−8.49
Private pensions	−0.10	0.81	5.28	−	−3.53	0.41	0.07	−0.99	−21.20	−1.35	−	−	−1.60	−1.98	−1.55	−4.83	−2.35
Composition effect	−0.08	0.83	−6.26	−	−1.37	0.27	0.12	−0.69	22.60	−2.81	−	−	−1.16	−2.01	−5.17	0.00	0.33
Structural effect	−0.02	−0.03	11.54	−	−2.16	0.14	−0.05	−0.30	−43.80	1.47	−	−	−0.44	0.03	3.62	−4.84	−2.68

Notes: Not available (−).

¹¹ One reason is that in the Netherlands in 2005, 30.93 % of elderly households covered by private pensions were poor while this ratio largely decreased to 18.07 % in 2022.

¹² The RIF regression results based on equation Eq. (3) is presented in Table A1 in the appendix. The results are in line with the theoretical assumption that household working status, university attendance of household head, public pensions and private pensions show are poverty-reducing effect while single-person households are show poverty-increasing effect.

¹³ Detailed decomposition results using different poverty line are reported in Table A3 and A4.

households still faced intensified employment discrimination. A similar explanation applied to inconsistent results with different poverty lines.

4.5. Detailed decomposition for composition effect and structural effect

Each factor's contribution can be further decomposed into the changes in factor distribution (composition effect) and return (structural effect). Table 6 presents the decomposition results.¹⁴

Overall, the household working status reduced poverty over time, because of the increased participation of the elderly in the labor market, caused by composition effect. The positive structural effect of household working status indicated a decline in factor return, increasing poverty over time and partially offsetting the poverty reduction from its composition effect. University attendance reduces poverty primarily by increasing the share of highly educated household heads with high education (composition effect), which was partially offset by decreasing education returns (structural effect).

Single-person households increase poverty, with a positive structural effect that outweighs the negative composition effect, indicating that the share of single-person households decreased from 2005 to 2022; however, being single increased the likelihood of poverty in 2022. The share of people over 75 varies across countries, resulting in a small average value.¹⁵

Finally, in almost all countries, the changing distribution of public pensions slightly increased elderly poverty with increments in the marginal returns to poverty, leading to a net poverty-reducing effect of public pensions. The composition effect of private pensions was negative, implying increased coverage of private pensions. Private pensions' returns increased, enhancing the net poverty-reducing effect.

This paper's findings relate to pension reforms in European countries since the 21st century. Despite reforms reducing public pension generosity, the overall pension system still significantly alleviates poverty. The results align with those of Kuitto et al. (2023), who analyzed data from 17 OECD countries between 1980 and 2010 and found that while pension reforms reduced public pension generosity, minimum pension schemes significantly reduce poverty.

This can first be explained by the late retirement policy. Many European countries have extended the statutory retirement age during pension reform. Between 2005 and 2022, increased labor market participation reduced poverty risk (see Table A1). Consequently, the rise in elderly workers reduced overall relative poverty, reflecting the household working status effect (−1.38 %), as given in Table 6.

Second, the result can be explained by minimum pension benefits. We found that, structural effect of public pensions plays a dominant role in poverty reduction (−8.49 %). This negative structural effect of public pensions reduced the probability of poverty for the elderly from 2005 to 2022. The marginal poverty-reduction effect of public pensions has increased. Many European countries introduced or strengthened minimum income pensions during this period. For instance, France introduced the "Allocation de Solidarité aux Personnes Âgées" (ASPA) in 2006, and Germany implemented the pension credit reform in 2021, both targeting low-income elderly individuals.

Third, increasing private pensions compensate for decreasing public pensions, with a shift from public to private pensions between 2005 and 2022 in European countries. On average, the coverage rate of private pensions increased by 12 %. Table 6 shows that private pensions reduced elderly relative poverty by −2.35 %. Therefore, private pensions can be

¹⁴ The standard errors for each estimate are not reported in Table 6 due to limited space. Detailed decomposition results with standard errors are reported in Table A2 in the appendix.

¹⁵ The structural effect of private pensions in the Netherlands reached 43 %. The reason is that the impact of private pensions on elderly poverty in 2005 was positive but turned into negative in 2022. That is, the change in contribution direction of private pensions led to positive impact of the structural effect (see Table A1 in the appendix).

considered as a complement to public pensions, providing additional income sources for low-income elderly groups and reducing their risk of poverty.

5. Conclusion

Poverty in Europe has decreased in recent decades. This is largely due to changes in income composition, labor market and demographic factors. Research on decreasing poverty and its drivers has primarily focused on the total or prime-age population. This study examined the factors affecting the elderly poverty and the extent to which they do so in 16 European countries from 2005 to 2022.

Using the reweighting RIF-OB decomposition, this study found that on average the majority of the decrease was due to public and private pension benefits, especially public ones, and to a lesser extent, changes in labor market factors and university attendance of the household head. Single-person households positively influenced changes, with mixed contributions from those over 75 in the studied period and countries.

We further decomposed the contributions of single factors into their composition and structural effects. The results indicated that increases in the proportion of elderly households participating in the labor market and the proportion of elderly household heads with higher education dominated the poverty-reducing effect, outweighing the poverty-increasing effect of reduced employment and education returns. The poverty reduction was mainly due to increased public and private pension returns, not coverage. Although the proportion of elderly households living alone decreased, their probability to fall into poverty increased, resulting in a positive contribution to elderly poverty. Finally, the impact of the share of people aged more than 75 years was small and varied across countries.

Our findings have several implications. First, the decline in elderly poverty in Europe, mainly due to public pensions, warns governments against reducing these pensions. Second, it shows that education and job opportunities are key to alleviating elderly poverty, which is in line with studies by Heckman et al. (2018) and Nakamura and Avner (2021). Hence, increasing elderly participation in the labor market and improving their level of education can help alleviate elderly poverty. However, it should be noted that the poverty-reducing effects of education and job opportunities have weakened from 2005 to 2022. Therefore, governments should strengthen the "age-job" matching mechanism in the labor market to improve resource allocation efficiency. The government may consider the elderly's experience and guide the development of more "age-friendly" positions. Finally, we suggest targeted policies for vulnerable groups, such as single-person households, to enhance social inclusion by providing special financial assistance, easy access to medical care and sound social support.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

Financial support from the Natural Science Foundation of China (grant numbers 72203238 and 72073091), National Social Science Fund of China (grant number 2023&ZD067) and Natural Science Foundation of Hunan Province (grant number 2024JJ6541) is acknowledged.

Appendix

Table A1

Effects of household characteristics on poverty among elderly (RIF-OLS) (%).

	AT		BE		DK		FR		DE		IE		IT		LU	
	T =	T =	T =	T =	T =	T =	T =	T =	T =	T =	T =	T =	T =	T =	T =	T =
	2005	2022	2005	2022	2005	2022	2005	2022	2005	2022	2005	2022	2005	2022	2005	2022
Household working status	−24.19 (3.43)	−18.06 (3.02)	−32.96 (5.58)	−23.58 (2.99)	−15.30 (0.86)	−6.19 (0.25)	−2.79 (1.61)	−5.28 (1.16)	−15.31 (2.58)	−21.64 (2.90)	−52.05 (3.43)	−35.43 (3.77)	−37.65 (3.89)	−32.97 (3.35)	−15.29 (3.86)	−8.69 (5.79)
University attendance of household head	−13.56 (1.99)	−2.14 (2.52)	−26.02 (2.03)	−17.14 (1.90)	−7.21 (0.60)	−7.75 (0.18)	−9.88 (0.72)	−9.04 (0.52)	−12.01 (1.35)	−7.96 (2.04)	−28.66 (2.73)	−23.10 (2.51)	−15.13 (1.70)	−14.67 (1.59)	2.07 (5.60)	−2.91 (3.42)
Single-person household	15.07 (2.36)	18.55 (2.05)	8.76 (2.76)	20.89 (2.24)	7.58 (0.67)	11.46 (0.25)	13.08 (0.81)	14.92 (0.67)	10.99 (1.71)	16.73 (2.16)	44.23 (2.34)	34.76 (3.22)	11.66 (2.58)	8.17 (2.66)	3.14 (3.19)	10.55 (3.88)
Share of people above 75 years old	4.98 (2.28)	−4.82 (2.04)	5.95 (2.92)	10.56 (2.44)	10.61 (0.70)	4.01 (0.25)	3.39 (0.81)	−1.00 (0.69)	−3.72 (1.81)	−12.52 (2.34)	−5.16 (2.61)	1.32 (3.87)	2.98 (2.63)	−3.33 (2.69)	−2.28 (3.27)	−5.51 (3.68)
Public Pension	−36.58 (8.50)	−48.62 (7.95)	−25.44 (6.51)	−24.37 (5.83)	2.41 (2.18)	−0.98 (0.57)	−15.50 (6.01)	−17.04 (3.99)	−5.05 (4.20)	−16.58 (5.80)	−14.41 (4.58)	−29.97 (8.42)	−18.47 (7.46)	−25.97 (5.45)	−43.03 (19.27)	−17.68 (10.79)
Private Pension	−15.54 (2.44)	−15.81 (1.65)	−20.73 (3.72)	−21.80 (6.54)	−36.51 (0.62)	−12.60 (0.26)	− (−)	− (−)	−13.47 (1.43)	−17.73 (1.86)	−18.19 (4.40)	−6.65 (4.89)	−11.29 (3.68)	−10.27 (3.80)	−7.60 (1.73)	−9.37 (3.56)
Constants	54.43 (8.74)	64.43 (8.01)	55.74 (6.77)	47.34 (6.23)	40.93 (2.25)	20.87 (0.61)	22.80 (6.05)	25.54 (4.06)	26.51 (4.29)	47.70 (5.75)	50.35 (5.08)	63.38 (8.95)	40.21 (7.74)	47.06 (5.96)	52.51 (19.36)	32.06 (10.90)
Number of observations	1788	2055	1521	2460	20727	89667	10404	14616	3382	2942	2259	1799	3175	3062	733	1108
Adjusted R-squared	0.11	0.11	0.11	0.16	0.24	0.12	0.05	0.07	0.08	0.14	0.35	0.30	0.08	0.07	0.03	0.04

	NL		NO		PL		RO		ES		SE		CH		UK	
	T =	T =	T =	T =	T =	T =	T =	T =	T =	T =	T =	T =	T =	T =	T =	T =
	2005	2022	2005	2022	2005	2022	2005	2022	2005	2022	2005	2022	2005	2022	2005	2022
Household working status	−7.52 (2.76)	−22.60 (2.17)	−12.78 (1.97)	−11.90 (0.27)	−11.42 (0.94)	−29.57 (1.06)	−14.90 (2.73)	−14.87 (2.76)	−59.62 (2.97)	−22.96 (2.14)	−5.22 (1.43)	−18.00 (2.52)	−45.37 (3.04)	−33.91 (2.46)	−32.07 (1.52)	−32.16 (1.96)
University attendance of household head	−5.51 (1.74)	−7.99 (1.61)	−4.98 (1.38)	−6.16 (0.18)	−6.67 (0.45)	−13.78 (0.59)	−22.61 (1.43)	−16.92 (1.37)	−24.72 (1.99)	−12.23 (1.94)	−5.25 (1.21)	−7.82 (1.94)	−4.35 (2.28)	−10.62 (1.79)	−11.09 (1.24)	−7.80 (1.24)
Single-person household	2.00 (2.18)	6.30 (1.75)	32.26 (1.69)	27.52 (0.26)	5.82 (0.75)	30.89 (0.86)	22.01 (1.80)	17.14 (1.63)	20.11 (2.24)	12.16 (1.98)	24.26 (1.19)	33.70 (2.02)	5.46 (2.20)	9.86 (1.85)	8.41 (1.13)	12.50 (1.44)
Share of people above 75 years old	0.71 (2.34)	7.24 (1.80)	8.52 (1.79)	1.36 (0.25)	−6.83 (0.79)	−5.37 (0.92)	3.66 (2.02)	7.58 (1.74)	4.24 (2.34)	8.89 (1.97)	6.58 (1.34)	1.48 (2.02)	−0.47 (2.49)	1.83 (2.07)	0.24 (1.25)	2.86 (1.53)
Public Pension	− (3.79)	−2.70 (3.79)	− (−)	− (−)	−41.77 (7.16)	−48.57 (3.41)	−21.11 (6.67)	−37.75 (5.59)	−22.89 (4.25)	−35.01 (3.50)	8.30 (7.45)	20.03 (6.13)	7.13 (6.46)	−1.22 (9.97)	−22.31 (5.42)	−15.74 (3.16)
Private Pension	24.71 (17.44)	−52.37 (2.69)	−31.49 (2.02)	−28.38 (0.39)	− (−)	− (−)	− (−)	−17.65 (4.46)	−14.37 (4.51)	−14.84 (1.29)	−37.76 (2.15)	−36.54 (4.27)	−45.7 (2.18)	−39.06 (2.07)	−20.33 (1.24)	−25.31 (1.77)
Constants	8.10 (1.46)	73.67 (4.09)	33.16 (2.27)	33.01 (0.43)	51.00 (7.17)	66.88 (3.45)	41.64 (6.84)	51.39 (5.82)	60.79 (4.54)	56.77 (3.73)	31.78 (7.77)	28.98 (6.68)	57.25 (6.66)	63.44 (10.10)	62.24 (5.50)	57.13 (3.59)
Number of observations	1721	6207	2662	72795	8965	12714	3119	3841	4292	5499	4779	2745	1646	2696	8072	6583
Adjusted R-squared	0.02	0.18	0.38	0.33	0.04	0.21	0.11	0.11	0.18	0.14	0.28	0.29	0.32	0.25	0.11	0.16

Notes: Standard errors (SE) clustered at the household level in parentheses. Not available (−).

Table A2

Detailed decomposition of changes in relative poverty (60 %) among the elderly with standard errors, 2005–2022 (%).

	AT	BE	DK	FR	DE	IE	IT	LU	NL	NO	PL	RO	ES	SE	CH	UK	Mean
Changes in relative poverty:	–2.23 (1.40)	–1.91 (1.74)	–17.87 (0.65)	–1.26 (0.47)	3.65 (1.40)	–5.58 (2.43)	–3.78 (1.63)	5.17 (2.15)	14.00 (1.83)	–9.33 (7.87)	11.74 (0.46)	–4.39 (1.11)	–13.64 (1.23)	3.43 (1.56)	–0.65 (1.59)	–2.34 (0.94)	–1.56 –
<i>Contributions of factors:</i>																	
<i>Household working status:</i>	0.42 (0.59)	–1.37 (0.91)	–3.98 (1.26)	–0.35 (0.21)	–3.84 (0.91)	–1.24 (1.32)	–0.53 (0.62)	–0.17 (1.05)	5.80 (9.48)	–1.40 (6.61)	–2.87 (0.21)	1.00 (0.58)	0.53 (0.91)	–4.52 (1.06)	0.18 (0.79)	–3.04 (0.46)	–0.96 –
Composition effect	–0.35 (0.05)	–1.47 (0.29)	–4.92 (0.23)	–0.08 (0.04)	–1.56 (0.26)	–3.38 (0.36)	–0.89 (0.11)	–0.61 (0.41)	–0.44 (0.43)	–0.70 (0.10)	–0.53 (0.04)	0.92 (0.15)	–4.97 (0.39)	–0.57 (0.13)	–0.34 (0.16)	–2.22 (0.27)	–1.38 –
Structural effect	0.76 (0.59)	0.11 (0.86)	0.94 (1.24)	–0.27 (0.21)	–2.28 (0.87)	2.15 (1.27)	0.37 (0.61)	0.44 (0.96)	6.24 (9.47)	–0.70 (6.61)	–2.34 (0.21)	0.09 (0.56)	5.50 (0.82)	–3.95 (1.05)	0.53 (0.78)	–0.82 (0.37)	0.42 –
<i>University attendance of household head:</i>	1.53 (0.41)	–0.81 (1.11)	–1.43 (0.58)	–0.99 (0.21)	–0.27 (0.82)	–3.35 (1.03)	–0.20 (0.16)	–0.12 (3.39)	5.01 (7.63)	–0.94 (4.77)	–2.09 (0.17)	0.37 (0.19)	–1.71 (0.71)	–1.47 (0.67)	–2.72 (1.06)	–1.15 (0.60)	–0.65 –
Composition effect	0.17 (0.03)	–3.90 (0.32)	–1.39 (0.10)	–1.16 (0.08)	–0.87 (0.12)	–4.15 (0.43)	–0.20 (0.03)	0.72 (1.58)	–0.60 (0.58)	–0.68 (0.15)	–0.63 (0.04)	–0.23 (0.03)	–3.33 (0.34)	–0.77 (0.15)	–0.53 (0.23)	–2.47 (0.26)	–1.25 –
Structural effect	1.36 (0.40)	3.09 (1.06)	–0.04 (0.57)	0.17 (0.19)	0.60 (0.81)	0.80 (0.94)	–0.01 (0.15)	–0.84 (3.00)	5.61 (7.61)	–0.26 (4.77)	–1.46 (0.16)	0.60 (0.18)	1.62 (0.62)	–0.70 (0.66)	–2.19 (1.03)	1.31 (0.54)	0.60 –
<i>Single-person household</i>	0.94 (1.10)	4.26 (1.31)	1.09 (0.81)	1.13 (0.40)	2.88 (1.17)	–2.35 (1.39)	–1.02 (1.07)	2.87 (1.81)	8.56 (7.37)	–3.05 (7.79)	6.38 (0.33)	–0.58 (0.89)	–2.30 (0.79)	4.61 (1.20)	1.61 (1.07)	0.37 (0.59)	1.59 –
Composition effect	–0.11 (0.02)	0.07 (0.06)	–0.15 (0.04)	–0.00 (0.03)	0.12 (0.07)	–0.43 (0.30)	0.23 (0.05)	0.22 (0.21)	–0.22 (0.30)	–2.79 (0.17)	–0.34 (0.04)	1.05 (0.09)	–0.06 (0.13)	–0.81 (0.12)	–0.01 (0.03)	–0.67 (0.09)	–0.24 –
Structural effect	1.05 (1.10)	4.20 (1.31)	1.24 (0.81)	1.13 (0.39)	2.76 (1.17)	–1.92 (1.35)	–1.25 (1.07)	2.65 (1.80)	8.78 (7.36)	–0.26 (7.78)	6.72 (0.33)	–1.63 (0.88)	–2.23 (0.78)	5.42 (1.19)	1.61 (1.07)	1.05 (0.59)	1.83 –
<i>Share of people above 75 years old:</i>	–3.59 (1.11)	1.59 (1.85)	–2.86 (1.10)	–1.81 (0.46)	–5.82 (1.49)	1.89 (1.97)	–2.66 (1.59)	–2.31 (1.79)	16.32 (13.37)	–3.47 (9.48)	0.28 (0.30)	1.31 (0.92)	2.19 (1.34)	–3.55 (1.42)	0.78 (1.65)	0.98 (0.91)	–0.05 –
Composition effect	–0.05 (0.02)	0.04 (0.04)	0.05 (0.05)	–0.10 (0.02)	–0.23 (0.10)	0.10 (0.05)	0.10 (0.07)	0.10 (0.13)	–0.12 (0.34)	–0.58 (0.10)	0.15 (0.02)	0.04 (0.02)	0.10 (0.06)	–0.41 (0.07)	–0.03 (0.15)	–0.02 (0.08)	–0.05 –
Structural effect	–3.55 (1.11)	1.55 (1.85)	–2.91 (1.10)	–1.71 (0.46)	–5.59 (1.49)	1.78 (1.97)	–2.75 (1.59)	–2.41 (1.79)	16.43 (13.36)	–2.89 (9.48)	0.14 (0.30)	1.27 (0.92)	2.09 (1.34)	–3.14 (1.42)	0.82 (1.65)	1.00 (0.91)	0.01 –
<i>Public pensions</i>	–13.28 (11.25)	–2.40 (8.49)	–7.18 (5.50)	–4.03 (7.88)	–7.88 (8.03)	–18.33 (10.06)	–8.91 (7.71)	–6.19 (19.58)	–2.60 (2.52)	–	–16.61 (8.41)	–18.65 (8.65)	–17.70 (4.81)	10.64 (9.09)	–5.54 (13.12)	–2.78 (5.64)	–8.10 –
Composition effect	0.18 (0.05)	0.01 (0.08)	–0.09 (0.06)	0.10 (0.04)	0.21 (0.16)	–0.11 (0.05)	0.29 (0.11)	2.47 (1.75)	–	–	0.47 (0.11)	0.17 (0.06)	0.58 (0.14)	–0.14 (0.11)	–0.04 (0.03)	1.77 (0.46)	0.42 –
Structural effect	–13.46 (11.25)	–2.42 (8.49)	–7.09 (5.50)	–4.14 (7.88)	–8.09 (8.02)	–18.21 (10.06)	–9.20 (7.71)	–8.65 (19.50)	–2.60 (2.52)	–	–17.10 (8.41)	–18.81 (8.65)	–18.27 (4.81)	10.78 (9.09)	–5.51 (13.12)	–4.55 (5.62)	–8.49 –
<i>Private pensions</i>	–0.10 (0.19)	0.81 (0.17)	5.28 (1.38)	–	–3.53 (0.84)	0.41 (0.27)	0.07 (0.23)	–0.99 (0.59)	–21.20 (15.63)	–1.35 (24.06)	–	–	–1.60 (0.62)	–1.98 (5.70)	–1.55 (2.38)	–4.83 (1.85)	–2.35 –
Composition effect	–0.08 (0.02)	0.83 (0.17)	–6.26 (0.17)	–	–1.37 (0.16)	0.27 (0.08)	0.12 (0.04)	–0.69 (0.26)	22.60 (13.86)	–2.81 (0.18)	–	–	–1.16 (0.35)	–2.01 (0.14)	–5.17 (0.28)	0.00 (0.19)	0.33 –
Structural effect	–0.02 (0.19)	–0.03 (0.03)	11.54 (1.37)	–	–2.16 (0.82)	0.14 (0.26)	–0.05 (0.23)	–0.30 (0.53)	–43.80 (7.22)	1.47 (24.05)	–	–	–0.44 (0.51)	0.03 (5.70)	3.62 (2.36)	–4.84 (1.84)	–2.68 –

Notes: Standard errors (SE) clustered at the household level in parentheses. Not available (–).

Table A3

Detailed decomposition of changes in relative poverty (50 %) among the elderly with standard errors, 2005–2022 (%).

	AT	BE	DK	FR	DE	IE	IT	LU	NL	NO	PL	RO	ES	SE	CH	UK	Mean
Changes in relative poverty:	−0.10 (1.11)	−6.84 (1.31)	−5.18 (0.38)	−0.69 (0.29)	4.96 (1.18)	−2.38 (1.85)	−1.54 (1.28)	4.73 (1.71)	5.32 (1.00)	−4.53 (6.17)	6.98 (0.32)	−2.17 (0.93)	−11.06 (1.03)	2.27 (1.12)	0.85 (1.32)	0.15 (0.72)	−0.58 −
<i>Contributions of factors:</i>																	
<i>Household working status:</i>	−0.35 (0.46)	−0.68 (0.86)	−0.68 (0.79)	−0.28 (0.14)	−2.12 (0.76)	0.02 (0.90)	−0.98 (0.52)	−0.22 (0.83)	−1.36 (0.22)	−0.60 (3.83)	−1.88 (0.19)	0.98 (0.50)	0.28 (0.74)	−1.71 (0.81)	−0.14 (0.65)	−1.74 (0.32)	−0.72 −
Composition effect	−0.17 (0.03)	−0.66 (0.21)	−0.26 (0.14)	−0.00 (0.03)	−0.87 (0.17)	−1.78 (0.21)	−0.45 (0.07)	−0.28 (0.20)	−0.11 (0.11)	−0.19 (0.06)	−0.27 (0.03)	0.46 (0.13)	−3.76 (0.31)	0.12 (0.10)	−0.22 (0.10)	−1.23 (0.15)	−0.60 −
Structural effect	−0.19 (0.45)	−0.02 (0.84)	−0.42 (0.78)	−0.28 (0.14)	−1.24 (0.74)	1.80 (0.87)	−0.53 (0.51)	0.07 (0.80)	−1.25 (0.19)	−0.40 (3.83)	−1.61 (0.19)	0.52 (0.48)	4.04 (0.67)	−1.83 (0.81)	0.08 (0.64)	−0.51 (0.28)	−0.08 −
<i>University attendance of household head:</i>	1.19 (0.33)	1.76 (0.89)	−0.19 (0.33)	−0.26 (0.16)	−0.57 (0.70)	−1.23 (0.77)	−0.14 (0.12)	1.43 (3.19)	0.48 (0.33)	0.07 (3.08)	−1.16 (0.12)	0.14 (0.16)	−0.99 (0.46)	−0.06 (0.47)	−0.91 (0.76)	−0.01 (0.43)	−0.03 −
Composition effect	0.10 (0.02)	−1.94 (0.24)	−0.11 (0.05)	−0.34 (0.06)	−0.41 (0.07)	−2.12 (0.27)	−0.11 (0.02)	1.60 (1.49)	−0.19 (0.19)	−0.01 (0.10)	−0.26 (0.02)	−0.13 (0.02)	−2.17 (0.25)	−0.38 (0.08)	−0.41 (0.18)	−0.59 (0.18)	−0.46 −
Structural effect	1.09 (0.33)	3.70 (0.86)	−0.08 (0.33)	0.08 (0.15)	−0.16 (0.72)	0.89 (0.77)	−0.03 (0.12)	−0.17 (2.82)	0.67 (0.28)	0.08 (3.08)	−0.89 (0.12)	0.27 (0.16)	1.18 (0.39)	0.32 (0.47)	−0.50 (0.74)	0.58 (0.39)	0.43 −
<i>Single-person household</i>	−0.91 (0.31)	−0.30 (1.09)	−0.97 (0.50)	−0.17 (0.27)	1.75 (1.02)	1.20 (1.22)	−1.65 (0.87)	3.12 (1.57)	0.89 (0.34)	−2.94 (4.97)	4.03 (0.24)	−0.01 (0.76)	−1.72 (0.58)	0.62 (0.84)	0.02 (0.82)	0.27 (0.48)	0.20 −
Composition effect	−0.10 (0.02)	0.03 (0.03)	−0.18 (0.04)	−0.00 (0.02)	0.10 (0.06)	−0.40 (0.28)	0.24 (0.04)	0.02 (0.12)	−0.14 (0.19)	−1.17 (0.09)	−0.01 (0.02)	0.92 (0.08)	−0.02 (0.04)	−0.25 (0.04)	−0.01 (0.02)	−0.50 (0.07)	−0.09 −
Structural effect	−0.82 (0.89)	−0.32 (1.09)	−0.79 (0.50)	−0.17 (0.27)	1.65 (1.02)	1.60 (1.19)	−1.89 (0.87)	3.11 (1.57)	1.03 (0.29)	−1.78 (4.97)	4.04 (0.24)	−0.93 (0.76)	−1.70 (0.58)	0.87 (0.84)	0.02 (0.82)	0.77 (0.47)	0.29 −
<i>Share of people above 75 years old:</i>	−2.22 (0.01)	−0.52 (1.54)	−1.53 (0.64)	−0.61 (0.30)	−3.99 (1.31)	2.22 (1.46)	−2.62 (1.19)	−2.50 (1.48)	1.14 (0.45)	−1.45 (5.84)	−0.73 (0.20)	0.33 (0.78)	0.37 (1.05)	−2.55 (1.10)	1.67 (1.22)	0.76 (0.69)	−0.76 −
Composition Effect	−0.03 (0.02)	0.04 (0.04)	0.02 (0.02)	−0.04 (0.01)	−0.07 (0.08)	0.14 (0.05)	0.04 (0.05)	0.01 (0.06)	0.06 (0.18)	−0.23 (0.07)	0.07 (0.01)	0.03 (0.02)	0.07 (0.05)	−0.09 (0.04)	−0.17 (0.13)	−0.09 (0.06)	−0.02 −
Structural Effect	−2.19 (0.89)	−0.56 (1.54)	−1.54 (0.64)	−0.57 (0.30)	−3.93 (1.31)	2.08 (1.46)	−2.66 (1.19)	−2.51 (1.48)	1.07 (0.41)	−1.22 (5.84)	−0.80 (0.20)	0.30 (0.78)	0.30 (1.05)	−2.46 (1.10)	1.84 (1.22)	0.85 (0.69)	−0.75 −
<i>Public Pension</i>	−16.73 (0.15)	−12.77 (8.32)	−6.03 (4.30)	−0.32 (7.84)	−2.62 (7.69)	−7.78 (7.62)	−9.31 (8.11)	−4.89 (15.82)	−5.78 (2.49)	−	−21.02 (8.59)	−7.48 (8.40)	−21.35 (4.61)	11.25 (7.47)	−9.73 (10.12)	−9.78 (3.85)	−8.29 −
Composition Effect	0.16 (0.05)	0.01 (0.06)	0.28 (0.06)	0.12 (0.04)	0.41 (0.17)	−0.12 (0.05)	0.29 (0.12)	1.96 (1.51)	−	−	0.45 (0.11)	0.20 (0.06)	0.51 (0.13)	0.02 (0.11)	−0.03 (0.03)	1.32 (0.37)	0.40 −
Structural Effect	−16.89 (11.47)	−12.79 (8.32)	−6.31 (4.30)	−0.44 (7.84)	−3.03 (7.69)	−7.65 (7.62)	−9.60 (8.11)	−6.86 (15.75)	−5.78 (2.49)	−	−21.47 (8.59)	−7.68 (8.40)	−21.90 (4.61)	11.20 (7.47)	−9.70 (10.12)	−11.10 (3.83)	−8.67 −
<i>Private Pension</i>	−0.25 (0.15)	0.62 (0.09)	2.62 (0.89)	−	−3.30 (0.69)	0.33 (0.16)	−0.06 (0.20)	−1.01 (0.44)	−31.35 (2.78)	−2.36 (20.51)	−	−	−0.69 (0.32)	−14.71 (6.44)	−5.89 (2.24)	−3.19 (1.52)	−4.56 −
Composition Effect	−0.03 (0.01)	0.60 (0.09)	−1.86 (0.06)	−	−0.68 (0.10)	0.19 (0.05)	0.07 (0.03)	−0.33 (0.14)	−1.44 (0.44)	−1.48 (0.14)	−	−	−1.15 (0.22)	−1.11 (0.10)	−3.72 (0.24)	0.00 (0.16)	−0.84 −
Structural Effect	−0.22 (0.17)	0.02 (0.01)	4.48 (0.88)	−	−2.62 (0.68)	0.14 (0.15)	−0.13 (0.20)	−0.68 (0.41)	−29.91 (2.75)	−0.88 (20.51)	−	−	0.46 (0.23)	−13.60 (6.44)	−2.17 (2.23)	−3.19 (1.51)	−3.72 −

Notes: Standard errors (SE) clustered at the household level in parentheses. Not available (−).

Table A4

Detailed decomposition of changes in relative poverty (40 %) among the elderly with standard errors, 2005–2022 (%).

	AT	BE	DK	FR	DE	IE	IT	LU	NL	NO	PL	RO	ES	SE	CH	UK	Mean
Changes in relative poverty:	2.76 (0.71)	−0.61 (0.69)	0.01 (0.15)	−0.12 (0.16)	4.01 (0.85)	−0.76 (1.01)	−0.48 (0.89)	1.48 (1.05)	1.61 (0.62)	−0.07 (2.19)	2.88 (0.20)	−1.59 (0.68)	−4.87 (0.72)	1.40 (0.71)	1.36 (1.00)	1.04 (0.47)	0.50 –
<i>Contributions of factors:</i>																	
<i>Household working status:</i>	−0.68 (0.36)	−0.00 (0.26)	−0.71 (0.31)	−0.03 (0.10)	−1.72 (0.48)	0.21 (0.52)	−0.92 (0.43)	−0.41 (0.46)	−0.37 (0.12)	−0.23 (1.62)	−1.06 (0.15)	0.51 (0.39)	−0.09 (0.52)	0.45 (0.66)	−0.80 (0.46)	−0.79 (0.21)	−0.42 –
Composition Effect	−0.03 (0.03)	−0.37 (0.08)	0.01 (0.07)	0.01 (0.02)	−0.31 (0.12)	−0.49 (0.10)	−0.23 (0.05)	−0.17 (0.13)	−0.01 (0.04)	−0.01 (0.02)	−0.13 (0.02)	0.26 (0.10)	−1.89 (0.19)	−0.06 (0.05)	−0.10 (0.05)	−0.43 (0.06)	−0.25 –
Structural Effect	−0.66 (0.36)	0.37 (0.24)	−0.72 (0.30)	−0.04 (0.10)	−1.41 (0.47)	0.70 (0.51)	−0.69 (0.43)	−0.24 (0.44)	−0.36 (0.11)	−0.23 (1.62)	−0.93 (0.15)	0.25 (0.38)	1.80 (0.48)	0.51 (0.66)	−0.70 (0.46)	−0.36 (0.20)	−0.17 –
<i>University attendance of household head:</i>	0.50 (0.22)	0.61 (0.43)	−0.00 (0.19)	−0.12 (0.12)	0.08 (0.49)	−0.28 (0.32)	−0.07 (0.08)	−0.36 (2.24)	0.28 (0.22)	0.12 (1.22)	−0.35 (0.08)	0.05 (0.12)	−0.46 (0.27)	0.16 (0.35)	−0.34 (0.51)	0.55 (0.28)	0.02 –
Composition Effect	0.02 (0.01)	−0.48 (0.11)	−0.07 (0.03)	−0.04 (0.04)	−0.10 (0.04)	−0.43 (0.10)	−0.04 (0.01)	0.90 (1.18)	−0.06 (0.07)	−0.00 (0.05)	−0.10 (0.01)	−0.06 (0.01)	−1.02 (0.15)	−0.11 (0.03)	−0.40 (0.11)	−0.22 (0.10)	−0.14 –
Structural Effect	0.47 (0.22)	1.10 (0.42)	0.06 (0.18)	−0.07 (0.11)	0.18 (0.49)	0.14 (0.31)	−0.03 (0.08)	−1.26 (1.91)	0.34 (0.21)	0.13 (1.22)	−0.25 (0.08)	0.12 (0.12)	0.55 (0.23)	0.27 (0.35)	0.06 (0.50)	0.77 (0.27)	0.16 –
<i>Single-person household</i>	0.63 (0.54)	0.28 (0.57)	0.01 (0.29)	−0.27 (0.16)	0.78 (0.68)	0.50 (0.65)	−0.70 (0.55)	1.83 (1.07)	0.93 (0.23)	0.18 (1.89)	1.35 (0.15)	−0.64 (0.57)	0.91 (0.42)	0.07 (0.46)	−0.61 (0.62)	−0.26 (0.33)	0.31 –
Composition Effect	−0.02 (0.01)	0.01 (0.01)	−0.00 (0.00)	−0.00 (0.01)	0.05 (0.03)	−0.03 (0.02)	0.05 (0.02)	−0.02 (0.10)	−0.02 (0.07)	−0.01 (0.03)	0.07 (0.01)	0.46 (0.05)	0.00 (0.01)	−0.05 (0.01)	−0.01 (0.02)	−0.30 (0.04)	0.01 –
Structural Effect	0.65 (0.54)	0.26 (0.57)	0.01 (0.29)	−0.27 (0.16)	0.73 (0.68)	0.53 (0.65)	−0.75 (0.55)	1.85 (1.07)	0.95 (0.22)	0.19 (1.89)	1.29 (0.15)	−1.11 (0.57)	0.90 (0.42)	0.12 (0.46)	−0.60 (0.62)	0.04 (0.33)	0.30 –
<i>Share of people above 75 years old:</i>	−0.69 (0.54)	0.89 (0.79)	0.16 (0.27)	0.06 (0.17)	−1.91 (0.86)	1.28 (0.84)	−1.67 (0.80)	−1.52 (0.70)	0.05 (0.30)	−0.18 (2.53)	−0.48 (0.12)	−0.21 (0.56)	0.42 (0.77)	−0.01 (0.70)	1.21 (0.88)	1.04 (0.48)	−0.10 –
Composition Effect	−0.00 (0.01)	−0.00 (0.01)	−0.00 (0.00)	−0.00 (0.01)	−0.06 (0.05)	0.05 (0.03)	−0.03 (0.03)	−0.00 (0.04)	0.00 (0.09)	0.04 (0.03)	0.02 (0.00)	0.02 (0.01)	−0.01 (0.03)	0.03 (0.02)	−0.01 (0.10)	−0.04 (0.04)	0.00 –
Structural Effect	−0.69 (0.54)	0.89 (0.79)	0.16 (0.27)	0.06 (0.17)	−1.84 (0.86)	1.22 (0.84)	−1.64 (0.80)	−1.52 (0.69)	0.04 (0.29)	−0.22 (2.53)	−0.50 (0.12)	−0.23 (0.56)	0.43 (0.77)	−0.04 (0.70)	1.23 (0.88)	1.08 (0.48)	−0.10 –
<i>Public Pension</i>	−26.36 (11.08)	8.44 (7.09)	−5.41 (3.16)	2.81 (7.35)	−14.78 (5.79)	−1.20 (6.89)	−17.78 (6.66)	−9.06 (4.00)	−1.60 (1.86)	–	−37.25 (7.10)	−12.54 (7.67)	−19.81 (4.34)	4.70 (6.73)	−8.04 (9.06)	−6.42 (3.39)	−9.62 –
Composition Effect	0.12 (0.05)	0.01 (0.07)	0.30 (0.05)	0.10 (0.04)	0.26 (0.12)	−0.15 (0.06)	0.08 (0.04)	−0.12 (0.10)	–	–	0.25 (0.07)	0.17 (0.05)	0.44 (0.12)	0.15 (0.12)	−0.01 (0.02)	1.41 (0.38)	0.22 –
Structural Effect	−26.47 (11.08)	8.42 (7.09)	−5.71 (3.16)	2.70 (7.35)	−15.04 (5.79)	−1.05 (6.89)	−17.90 (6.66)	−8.94 (4.00)	−1.60 (1.86)	–	−37.50 (7.10)	−12.70 (7.67)	−20.25 (4.34)	4.55 (6.73)	−8.03 (9.06)	−7.83 (3.37)	−9.82 –
<i>Private Pension</i>	−0.16 (0.12)	0.15 (0.03)	0.00 (0.41)	–	−1.50 (0.44)	0.14 (0.08)	0.14 (0.11)	−0.31 (0.27)	−11.94 (2.60)	−0.73 (9.40)	–	–	−0.26 (0.14)	−6.62 (4.76)	−7.80 (1.82)	−1.86 (1.03)	−2.37 –
Composition Effect	−0.01 (0.01)	0.15 (0.03)	−0.16 (0.02)	–	−0.35 (0.04)	0.06 (0.02)	0.05 (0.01)	−0.19 (0.10)	−0.69 (0.28)	−0.22 (0.05)	–	–	−0.61 (0.10)	−0.44 (0.06)	−2.01 (0.17)	0.00 (0.08)	−0.34 –
Structural Effect	−0.15 (0.12)	0.00 (0.00)	0.15 (0.41)	–	−1.15 (0.43)	0.07 (0.07)	0.08 (0.11)	−0.12 (0.25)	−11.20 (2.58)	−0.52 (9.39)	–	–	0.35 (0.10)	−6.18 (4.76)	−5.78 (1.81)	−1.86 (1.02)	−1.88 –

Notes: Standard errors (SE) clustered at the household level in parentheses. Not available (–).

Data availability

The microdata supporting this study can be accessed through the Remote Execution System (LISSY) of LIS at <https://webui.lisdatacenter.org/userinterface/>. All the Stata code and instructions can be found on Mendeley at the following DOI address: <https://doi.org/10.17632/s92h3b9n75.1>.

References

- Atkinson, A.B., Rainwater, L., Smeeding, T.M., 1995. Income Distribution in OECD Countries: Evidence from the Luxembourg Income Study.
- Attanasio, O., Blundell, R., Conti, G., Mason, G., 2020. Inequality in socio-emotional skills: a cross-cohort comparison. *J. Publ. Econ.* 191, 104171. <https://doi.org/10.1016/j.jpubeco.2020.104171>.
- Becker, C.M., Urzhumova, D.S., 1998. Pension burdens and labor force participation in Kazakhstan. *World Dev.* 26 (11), 2087–2103. [https://doi.org/10.1016/S0305-750X\(98\)00107-7](https://doi.org/10.1016/S0305-750X(98)00107-7).
- Been, J., Caminada, K., Goudswaard, K., Van Vliet, O., 2016. Public/private pension mix, income inequality, and poverty among the elderly in Europe: an empirical analysis using new and revised OECD data. *Soc. Pol. Adm.* 51, 1079–1100. <https://doi.org/10.1111/spol.12282>.
- Blinder, A.S., 1973. Wage discrimination: reduced form and structural estimates. *J. Hum. Resour.* 8, 436–455. <https://doi.org/10.2307/144855>.
- Blundell, R., Britton, J., Dias, M.C., French, E., 2023. The impact of health on labor supply near retirement. *J. Hum. Resour.* 58, 282–334. <https://doi.org/10.3368/jhr.58.3.1217-9240R4>.
- Blundell, R., Dearden, L., Sianesi, B., 2005. Evaluating the impact of education on earnings in the UK: models, methods and results from the NCDS. *J. Roy. Stat. Soc.* 168, 473–512. <https://doi.org/10.1111/j.1467-985X.2004.00360.x>.
- Bonaccolto-Töpfer, M., Satlukal, S., 2024. Gender differences in reservation wages: new evidence for Germany. *Labour Econ.* 91, 102649. <https://doi.org/10.1016/j.labeco.2024.102649>.
- Burkhauser, R.V., Corinth, K., Elwell, J., Larrimore, J., 2024. Evaluating the success of the war on poverty since 1963 using an absolute full-income poverty measure. *J. Polit. Econ.* 132, 1–47. <https://doi.org/10.1086/725705>.
- Burtless, G.T., Quinn, J.F., 2002. *Is Working Longer the Answer for an Aging Workforce?* Center for Retirement Research at Boston College, Boston, 11.
- Cahill, K.E., Giandrea, M.D., Quinn, J.F., 2016. Chapter 13—evolving patterns of work and retirement. *Handbook of Aging & the Social Sciences* 271–291. <https://doi.org/10.1016/B978-0-12-417235-7.00013-5>.
- Calvi, R., 2020. Why are older women missing in India? The age profile of bargaining power and poverty. *J. Polit. Econ.* 128, 2453–2501. <https://doi.org/10.1086/706983>.
- Caminada, K., Goudswaard, K., Wang, C., Wang, J., 2021. Antipoverty effects of various social transfers and income taxes across countries. *Soc. Indic. Res.* 154, 1055–1076. <https://doi.org/10.1007/s11205-020-02572-9>.
- Casey, B., Yamada, A., 2002. Getting Older, Getting Poorer? A Study of the Earnings, Pensions, Assets and Living Arrangements of Older People in Nine Countries. LIS Cross-National Data Center in Luxembourg. <https://doi.org/10.1787/345816633534>.
- Chan, L.S., Chou, K.L., 2018. Poverty in old age: evidence from Hong Kong. *Ageing Soc.* 38, 37–55. <https://doi.org/10.1017/S0146686X16000817>.
- Chen, W., Corak, M., 2008. Child poverty and changes in child poverty. *Demography* 45, 537–553. <https://doi.org/10.1353/dem.0.0024>.
- Chevalier, A., Harmon, C., Walker, I., Zhu, Y., 2004. Does education raise productivity, or just reflect it? *Econ. J.* 114 (499), F499–F517. <https://doi.org/10.1111/j.1468-0297.2004.00256.x>.
- Churchill, S.A., Munyanyi, M.E., Prakash, K., Smyth, R., 2020. Locus of control and the gender gap in mental health. *J. Econ. Behav. Organ.* 178, 740–758. <https://doi.org/10.1016/j.jebo.2020.08.013>.
- Datt, G., Ravallion, M., 1992. Growth and redistribution components of changes in poverty measures: a decomposition with applications to Brazil and India in the 1980s. *J. Dev. Econ.* 38, 275–295. [https://doi.org/10.1016/0304-3878\(92\)90001-P](https://doi.org/10.1016/0304-3878(92)90001-P).
- Delfani, N., De Deken, J., Dewilde, C., 2015. Poor because of low pensions or expensive housing? The combined impact of pension and housing systems on poverty among the elderly. *Int J Housing Pol.* 15, 260–284. <https://doi.org/10.1080/14616718.2015.1004880>.
- DiNardo, J., Fortin, N.M., Lemieux, T., 1996. Labor market institutions and the distribution of wages, 1973–1992: a semiparametric approach. *Econometrica* 64, 1001–1044. <https://doi.org/10.2307/2171954>.
- Disney, R., Whitehouse, E., 2002. The economic well-being of older people in international perspective: a critical review. *Annu. Rev. Gerontol. Geriatr.* 22, 59–94.
- Ebbinghaus, B., 2021. Inequalities and poverty risks in old age across Europe: the double-edged income effect of pension systems. *Soc. Pol. Adm.* 55, 440–455. <https://doi.org/10.1111/spol.12683>.
- Elder, T.E., Goddeeris, J.H., Haider, S.J., 2010. Unexplained gaps and Oaxaca–Blinder decompositions. *Labour Econ.* 17, 284–290. <https://doi.org/10.1016/j.labeco.2009.11.002>.
- Engelhardt, G.V., Gruber, J., 2004. Social Security and the Evolution of Elderly Poverty. NBER Working Paper no., 10466 <https://doi.org/10.3386/w10466>.
- Essama-Nssah, B., Lambert, P.J., 2012. Influence functions for policy impact analysis. In: Bishop, J.A., Salas, R. (Eds.), *Inequality, Mobility and Segregation: Essays in* Honor of Jacques Silber. Emerald, Bingley, UK, pp. 135–159. [https://doi.org/10.1108/S1049-2585\(2012\)0000020009](https://doi.org/10.1108/S1049-2585(2012)0000020009).
- Fahle, S., McGarry, K.M., 2017. Caregiving and work: the relationship between labor market attachment and parental caregiving. Michigan Retirement Research Center Research Paper 2017–2356. <https://doi.org/10.2139/ssrn.2934442>.
- Firpo, S.P., Fortin, N.M., Lemieux, T., 2018. Decomposing wage distributions using recentered influence function regressions. *Econometrica* 6, 28. <https://doi.org/10.3390/econometrics6020028>.
- Firpo, S., Pinto, C., 2016. Identification and estimation of distributional impacts of interventions using changes in inequality measures. *J. Appl. Econ.* 31, 457–486. <https://doi.org/10.1002/jae.2448>.
- Firpo, S., Fortin, N.M., Lemieux, T., 2007. Decomposing wage distributions using recentered influence functions regressions. *Econometrica* 6, 28. <https://doi.org/10.3390/econometrics6020028>.
- Firpo, S., Fortin, N.M., Lemieux, T., 2009. Unconditional quantile regressions. *Econometrica* 77, 953–973. <https://doi.org/10.3982/ECTA6822>.
- Haider, S.J., Loughran, D., 2001. *Elderly. Labor Supply: Work or Play?* CRR working paper 2001–04, Boston.
- Heckman, J.J., Humphries, J.E., Veramendi, G., 2018. Returns to education: the causal effects of education on earnings, health, and smoking. *J. Polit. Econ.* 126 (S1), S197–S246. <https://doi.org/10.1086/698760>.
- Hinrichs, K., 2021. Recent pension reforms in Europe: more challenges, new directions. An overview. *Soc. Pol. Adm.* 55, 409–422. <https://doi.org/10.1111/spol.12712>.
- Houthakker, H.S., 1959. Education and income. *Rev. Econ. Stat.* 41, 24–28. <https://doi.org/10.2307/1925454>.
- Hungerford, T., Rasette, M., Iams, H., Koenig, M., 2001. Trends in the economic status of the elderly, 1976–2000. *Soc. Secur. Bull.* 64, 12–22.
- Islam, A.M., Amin, M., 2023. The gender labor productivity gap across informal firms. *World Dev.* 167, 106229. <https://doi.org/10.1016/j.worlddev.2023.106229>.
- Jacques, P., Leroux, M.L., Stevanovic, D., 2021. Poverty among the elderly: the role of public pension systems. *Int. Tax Publ. Finance* 28, 24–67. <https://doi.org/10.1007/s10797-020-09617-2>.
- Kaushal, N., 2014. How public pension affects elderly labor supply and well-being: evidence from India. *World Dev.* 56, 214–225. <https://doi.org/10.1016/j.worlddev.2013.10.029>.
- Ku, I., Lee, W., Lee, S., 2021. Declining family support, changing income sources, and older people poverty: lessons from South Korea. *Popul. Dev. Rev.* 47, 965–996. <https://doi.org/10.1111/padr.12442>.
- Kuitto, K., Helmdag, J., 2021. Extending working lives: how policies shape retirement and labour market participation of older workers. *Soc. Pol. Adm.* 55, 423–439. <https://doi.org/10.1111/spol.12717>.
- Kuitto, K., Madia, J.E., Podesta, F., 2023. Public pension generosity and old-age poverty in OECD countries. *J. Soc. Pol.* 52, 256–275. <https://doi.org/10.1017/S0047279421000544>.
- Larrimore, J., 2014. Accounting for United States household income inequality trends: the changing importance of household structure and male and female labor earnings inequality. *Rev. Income Wealth* 60, 683–701. <https://doi.org/10.1111/roiw.12043>.
- Larsen, M., Pedersen, P.J., 2012. Paid work after retirement: recent trends in Denmark. <https://doi.org/10.2139/ssrn.2056727>.
- Laun, L., 2017. The effect of age-targeted tax credits on labor force participation of older workers. *J. Publ. Econ.* 152, 102–118. <https://doi.org/10.1016/j.jpubeco.2017.06.005>.
- Lee, S.Y., Chou, K.L., 2019. Assessing the relative contribution of social exclusion, income-poverty, and financial strain on depressive symptoms among older people in Hong Kong. *Ageing Ment. Health* 23 (11), 1487–1495. <https://doi.org/10.1080/13607863.2018.1506740>.
- Lefebvre, M., Pestieau, P., Ponthiere, G., 2018. FGT old-age poverty measures and the mortality paradox: theory and evidence. *Rev. Income Wealth* 64, 428–458. <https://doi.org/10.1111/roiw.12277>.
- Li, Y., Chen, T., Li, Q., Jiang, L., 2023. The impact of subjective poverty on the mental health of the elderly in China: the mediating role of social capital. *Int. J. Environ. Res. Publ. Health* 20 (17), 6672. <https://doi.org/10.3390/ijerph20176672>.
- LIS, 2024. Luxembourg income study database. <http://www.lisdatacenter.org> (multiple countries; microdata runs completed on 10th August 2024). Luxembourg: LIS.
- Maes, M., 2013. Poverty persistence among the elderly in the transition from work to retirement. *J. Econ. Inequal.* 11, 35–56. <https://doi.org/10.1007/s10888-011-9200-5>.
- Maestas, N., Mullen, K.J., Powell, D., 2023. The effect of population aging on economic growth, the labor force, and productivity. *Am. Econ. J. Macroecon.* 15, 306–332. <https://doi.org/10.1257/mac.20190196>.
- Martey, E., 2022. Blessing or burden: the elderly and household welfare in Ghana. *Soc. Indic. Res.* 162, 803–827. <https://doi.org/10.1007/s11205-021-02871-9>.
- Moller, S., Huber, E., Stephens, J.D., Bradley, D., Nielsen, F., 2003. Determinants of relative poverty in advanced capitalist democracies. *Am. Sociol. Rev.* 68, 22–51. <https://doi.org/10.1177/000312240306800102>.
- Morgan, J., David, M., 1963. Education and income. *Q. J. Econ.* 77, 423–437. <https://doi.org/10.2307/1925454>.
- Musgrave, R.A., Case, K.E., Leonard, H., 1974. The distribution of fiscal burdens and benefits. *Public Finance Quarterly* 2, 259–311. <https://doi.org/10.1177/109114217400200301>.
- Nakamura, S., Avner, P., 2021. Spatial distributions of job accessibility, housing rents, and poverty: the case of Nairobi. *J. Hous. Econ.* 51, 101743. <https://doi.org/10.1016/j.jhe.2020.101743>.
- Oaxaca, R., 1973. Male-female wage differentials in urban labor markets. *Int. Econ. Rev.* 14, 693–709. <https://doi.org/10.2307/2525981>.

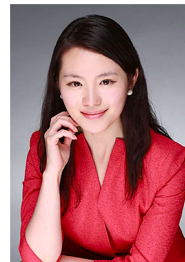
- OECD, 2001. *Aging and Income: Financial Resources and Retirement in Nine OECD Countries*. OECD, Paris.
- OECD, 2008. *Growing Unequal? Income Distribution and Poverty in OECD Countries*. OECD, Paris.
- Pal, S., Palacios, R., 2011. Understanding poverty among the elderly in India: implications for social pension policy. *J. Dev. Stud.* 47, 1017–1037. <https://doi.org/10.1080/00220388.2010.509783>.
- Ravallion, M., Chen, S., 2011. Weakly relative poverty. *Rev. Econ. Stat.* 93, 1251–1261. https://doi.org/10.1162/REST_a_00127.
- Rios-Avila, F., 2020. Recentered influence functions (RIFs) in stata: RIF regression and RIF decomposition. *STATA J.* 20, 51–94. <https://doi.org/10.1177/1536867X20909690>.
- Riphahn, R.T., Schrader, R., 2020. Institutional reforms of 2006 and the dramatic rise in old-age employment in Germany. *ILR Review* 73, 1185–1225. <https://doi.org/10.1177/0019793919863378>.
- Robinson, P.B., Sexton, E.A., 1994. The effect of education and experience on self-employment success. *J. Bus. Ventur.* 9, 141–156. [https://doi.org/10.1016/0883-9026\(94\)90006-X](https://doi.org/10.1016/0883-9026(94)90006-X).
- Sen, B., 2014. Using the Oaxaca–Blinder decomposition as an empirical tool to analyze racial disparities in obesity. *Obesity* (Silver Spring, Md.) 22, 1750–1755. <https://doi.org/10.1002/oby.20755>.
- Skira, M.M., 2015. Dynamic wage and employment effects of elder parent care. *Int. Econ. Rev.* 56, 63–93. <https://doi.org/10.1111/iere.12095>.
- Smeeding, T.M., Gao, Q., Saunders, P., Wing, C., 2008. *Elder poverty in an ageing world: conditions of social vulnerability and low income for women in rich and middle-income nations*. LIS Working Paper Series no. 497.
- Staubli, S., Zweimüller, J., 2013. Does raising the early retirement age increase employment of older workers? *J. Publ. Econ.* 108, 17–32. <https://doi.org/10.1016/j.jpubeco.2013.09.003>.
- Stolz, E., Mayerl, H., Waxenegger, A., Freidl, W., 2017. Explaining the impact of poverty on old-age frailty in Europe: material, psychosocial and behavioural factors. *Eur. J. Publ. Health* 27, 1003–1009. <https://doi.org/10.1093/eurpub/ckx079>.
- Suryahadi, A., Suryadarma, D., Sumarto, S., 2009. The effects of location and sectoral components of economic growth on poverty: evidence from Indonesia. *J. Dev. Econ.* 89, 109–117. <https://doi.org/10.1016/j.jdeveco.2008.08.003>.
- Tufa, A.H., Alene, A.D., Cole, S.M., Manda, J., Feleke, S., Abdoulaye, T., Chikoye, D., Manyong, V., 2022. Gender differences in technology adoption and agricultural productivity: evidence from Malawi. *World Dev.* 159, 106027. <https://doi.org/10.1016/j.worlddev.2022.106027>.
- United Nations, Department of Economic and Social Affairs, Population Division, 2022. *World population prospects 2022: summary of results*. UN DESA/POP/2022/TR/NO. 3.
- Van Houtven, C.H., Coe, N.B., Skira, M.M., 2013. The effect of informal care on work and wages. *J. Health Econ.* 32, 240–252. <https://doi.org/10.1016/j.jhealeco.2012.10.006>.
- Van Vliet, O., Been, J., Caminada, K., Goudswaard, K., 2012. Pension reform and income inequality among older people in 15 European countries. *Int. J. Soc. Welfare* 21 (s1), S8–S29. <https://doi.org/10.1111/j.1468-2397.2012.00873.x>.
- Walker, A., 1990. The economic 'burden' of ageing and the prospect of intergenerational conflict. *Ageing Soc.* 10, 377–396. <https://doi.org/10.1017/s0144686x00007376>.
- Wan, G., 2004. Accounting for income inequality in rural China: a regression-based approach. *J. Comp. Econ.* 32, 348–363. <https://doi.org/10.1017/S0144686X00007376>.
- Wang, J., Jamison, D.T., Bos, E., ThiVu, M., 1997. Poverty and mortality among the elderly: measurement of performance in 33 countries 1960–92. *Trop. Med. Int. Health* 2 (10), 1001–1010. <https://doi.org/10.1046/j.1365-3156.1997.d01-161.x>.
- Wang, J., Wang, C., Li, S., Luo, Z., 2021. Measurement of relative welfare poverty and its impact on happiness in China: evidence from CGSS. *China Econ. Rev.* 69, 101687. <https://doi.org/10.1016/j.chieco.2021.101687>.
- Whitehouse, E.R., 2002a. The value of pension entitlements: a model of nine OECD countries. In: *OECD Labor Market and Social Policy Occasional Papers*, vol. 9. OECD, Paris. <https://doi.org/10.1787/232728581604>.
- Whitehouse, E.R., 2002b. *Pension Systems in 15 Countries Compared: the Value of Entitlements*. Central for Pension and Superannuation University of New South Wales Discussion, Sydney. Paper 02/04.
- Zhang, A., Imai, K.S., 2024. Do public pension programmes reduce elderly poverty in China? *Rev. Dev. Econ.* 28, 3–33. <https://doi.org/10.1111/rode.13016>.
- Zhao, L., Burge, G., 2017. Housing wealth, property taxes, and labor supply among the elderly. *J. Labor Econ.* 35, 227–263. <https://doi.org/10.1086/687534>.



Koen Caminada is Professor of Empirical Analysis of Tax and Social Policy at Leiden University. He is the Dean of the Faculty of Governance and Global Affairs. His research interests include Empirical Analysis of Tax Law and Social Policy, Social Security, Fiscal and Tax Policy, Income Distribution and Poverty (EU and OECD). He has published papers in journals as the *International Journal of Social Welfare*, *Journal of Common Market Studies*, *International Social Security Review*, *International Advances in Economic Research*, *International Tax and Public Finance*, *Cambridge Journal of Economics* and so on.



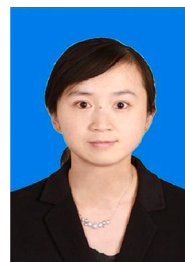
Kees Goudswaard is Professor of Economics and Professor of Social Security at the Law School, Leiden University. His research areas include Social Policy, Pensions and Public Finance. He has been the director of several research programs on Social Security, for which he received grants of approximately 4 million euros. In recent years, he has done much research on Pensions. He has been one of the main advisors of the Dutch government on pension policies and is now member of the supervisory board of two large pension funds.



Chen Wang is Professor at the School of Public Administration and Policy, Shanghai University of Finance and Economics, and Research Fellow at Leiden University. Her current research focuses on Regional Economics, Income Inequality and Poverty Alleviation. Her research has been published in journals such as *World Development*, *Journal of Economic Surveys*, *The World Economy*, *Cambridge Journal of Economics*, *China Economic Review*, *Review of Development Economics*, *Journal of Social Policy* and so on.



Jingqi Liu is a Ph.D. Candidate at the School of Public Administration and Policy, Shanghai University of Finance and Economics. His current research focuses on Income Inequality and Poverty. His research has been published in *Review of Development Economics*.



Jinxian Wang is Associate Professor at Business School, Central South University and Research Fellow at Leiden University (wangjinxian@csu.edu.cn). Her research interests include Income Distribution and Residents' Well-being. She has published papers in journals of *Annals of Tourism Research*, *Social Science & Medicine*, *Ecological Economics*, *China Economic Review* and so on.