Pensions, retirement, and the financial position of the elderly

Been, J.

2 Pension reform and income inequality among the elderly in 15 European countries

Abstract

The ageing of populations and hampering economic growth increase pressure on public finances in many advanced capitalist societies. Consequently, governments have adopted pension reforms in order to relieve pressure on public finances. These reforms have contributed to a relative shift from public to private pension schemes. Since private social security plans are generally less redistributive than public social security, it can be hypothesized that the privatization of pension plans has led to higher levels of income inequality among the elderly. This study contributes to the income inequality and pension literature by empirically analysing the distributional effects of shifts from public to private pension provision in 15 European countries for the period 1995-2007. We do not find evidence that shifts from public to private pension provision lead to higher levels of income inequality or poverty among elderly people. The results appear to be robust for a wide range of econometric specifications.

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2.1 Introduction

The ageing of populations has triggered pension reform in many industrialized countries over the past decades. Plans to alleviate the pressure of ageing on public finances have resulted in a trend towards more private pension provision (OECD 2009b, Orenstein 2011). In the pension literature, remarkably little attention has been paid to the distributive effects of these reforms for the elderly. Since private social security arrangements generally entail less income redistribution than public social security (Goudswaard and Caminada 2010), it could be expected that shifts from public to private in the pension provision lead to higher levels of income inequality and poverty among elderly people (Arza 2008). This would imply a trade-off between alleviating the pressure on public finances on the one hand and income inequality among the elderly on the other. The empirical literature in this field exists mainly of either cross-national studies at one moment in time (for example Smeeding and Williamson 2001) or descriptive analyses for a single country (for example Milligan 2008). As a consequence, relatively little insight has been gained about how pension reforms have influenced income inequality and poverty among the elderly in advanced capitalist countries over the past decades.

The aim of the present study was to examine the relationship between the developments in pension systems and the variation in income inequality and poverty among the elderly across countries and over time. First, we analysed to what extent reforms have resulted in a trend towards relatively more private pension provision across advanced capitalist countries. To that end, we used the most recent release of the OECD Social Expenditure database (OECD 2010b). Indeed, in the pension systems of many countries, there have been shifts from public to private in the period 1995-2007, but there is substantial variation across countries. Subsequently, we examined to what extent these shifts have influenced income inequality levels and poverty rates among the elderly, based on a number of pooled time series cross-section regression analyses. Our focus on annual macro data for a relatively short period implies that this article does not contain an integral income redistribution analysis based on the discounted values of lifetime income, contributions paid and benefits received. The main result of our

analysis is that a relatively higher private share of pension provision in a country is not associated with higher levels of income inequality or poverty in that country. With respect to inequality and poverty, the analysis has relied mainly on EU ECHP/SILC data (Eurostat 2011b), but the results appear to be robust for other data and for a wide range of econometric specifications.

The article is structured as follows. In section 2.2, the relationship between pension reform and income inequality among elderly people is introduced. Section 2.3 describes the data, measures and method used in the study. Descriptive statistics, the results of the regression analyses and the sensitivity analyses are presented in section 2.4. In the fifth section, some explanations for our findings are discussed and the article closes with the conclusions in the sixth and last section.

Pension reforms 2.2

Public and private pensions 2.2.1

In an era of ageing populations, relieving public finances is one of the most important drivers of pension reform. An increase in the number of pensioners relative to the labour force leads to increasing budgetary pressure. Budgetary problems as a consequence of cyclical shocks, such as the recession of 2008-2009, may increase the pressure to reform (public) pension systems even further. However, even though the pressure to reform pensions is high, pension reforms are in reality often unruly. Since pensions are based on long-term contracts, reforms are complicated by institutional path dependency (Myles and Pierson 2001). Changes as higher statutory pension ages or reductions of pension benefits are often controversial from a political viewpoint and therefore difficult to realize. Hence, many countries have chosen for a different approach to pension reform. This approach, which is often labelled pension privatization, entails shifts from public pension provision to a mix of public and private pension provisions and a change from the defined benefit to the defined

contribution system (OECD 2009b, Orenstein 2011).[1] In Germany, for instance, the 2001 pension reform consisted of a reduction of the public pension levels and the introduction of state-subsidised, voluntary private pension schemes (Natali and Rhodes 2008). Based on a comparative case study, Arza (2008) showed that this is the type of pension reform that has also been opted for in Italy, Sweden, Poland and the United Kingdom.

The relevant question here is how relative shifts in the pension provision affect the income distribution among elderly people. Public pension plans are generally based on income-related funding and flat rate benefits, which relatively strongly benefit lower income groups. Therefore, public pensions are expected to generate a more equal income distribution and less poverty among the elderly. In a number of OECD countries, the level of public pension benefits is such that a relatively small percentage of pensioners has fallen below the poverty line. Private pension plans, in contrast, are based on a link between contributions paid and benefits received and therefore are not expected to contain elements of (ex ante) income redistribution. A private pension insurance is actuarially fair as a rule. This means that each individual is provided with benefits whose actuarial value is equal to his contributions, given the chance of the insured event occurring. This is the case for individual private pension insurances that have a defined contribution character. However, private earnings-related pension schemes (in the second pillar) may not be actuarially fair and may contain elements of redistribution. This is often the case when (supplementary) private schemes are negotiated by social partners in collective labour contracts. These schemes are mandatory for (a group of) workers. Defined benefit pension schemes, for example, generally redistribute resources both within generations (for instance through redistributive elements such as thresholds or ceilings) and across generations (risk sharing, back service). Also, tax advantages (to households or to employers) can be used to stimulate the provision of private pensions. This is often the case in supplementary pension programs, where contributions are tax

[1] A shift from public to private pension provision alleviates the pressure on public finances, but it does not solve financing problems of the pension system. If a deficit of the pension system is considered as unsustainable, the only solution to make it sustainable is reducing benefits, increasing contributions, or both, either publicly or privately (Barr and Diamond 2009).

exempt (Yoo and De Serres 2004). The fiscal advantages related to, for example, supplementary private pension plans are positively related to income levels in most countries and thus favour the rich (Goudswaard and Caminada 2010). In general, as Ferrarini and Nelson (2003) showed, social insurance is less equalising after taxation in all countries.

In summary, it seems plausible that private pension schemes will generate less income redistribution from rich to poor than public programs, although at this stage their distributional impact in a cross-country analysis is not fully clear. In other words, there are good reasons to expect that relative shifts from public to private pensions lead to higher income inequality among the elderly.

Earlier findings 2.2.2

Much literature analyses the relationship between social security and income inequality in general. Based on a cross-national study at the macro level Smeeding and Williamson (2001) concluded that high levels of public social spending are associated with low levels of income inequality and poverty. Caminada and Goudswaard (2005) and Goudswaard and Caminada (2010) compared the redistributive effects of public and private social security. Taking a broad definition of social security and based on an international comparative analysis, they concluded that the redistributive effect of private social security is smaller than that of public social security. However, Caminada et al. (2012) found no significant effects of private social expenditure on poverty rates.

Interestingly, the findings for pensions seem to be less ambiguous than for social security in general. A number of cross-sectional studies indicate that income inequality among elderly people is lower as larger shares of the income of the elderly consist of public pension benefits (Brown and Prus 2004, Fukawa 2006, Weller 2004). The number of studies on the income effects of private pensions is considerably smaller, but Schirle (2009) found for Canada that a larger private share in the pension provision is associated with an increasing income inequality among elderly people. Combining the results of the studies on public and private pensions, it

seems plausible that a shift from public to private leads to more income inequality among the elderly.

Comparable effects of shifts in the public/private-mix of pensions were found for poverty among elderly people. Based on country-specific analyses over time, Oshio and Shimizutani (2005) and Milligan (2008) concluded that a larger public share in the pension provision is related to less poverty among elderly people. Hughes and Stewart (2004) found that increases in the private share are associated with an increase in the poverty rate among elderly people.

From a methodological perspective, the empirical literature on pension reform and income inequality can be divided into two types of studies. The first type consists of cross-sectional studies, comparing a number of countries in a certain year (Brown and Prus 2004, Fukawa 2006, Weller 2004). In these studies, the effects of pension reform cannot be analysed over time. The second type of studies is mainly focused on developments over a longer period but, for a single country (Milligan 2008, Myles 2000, Oshio and Shimizutani 2005, Schirle 2009). In these studies, it is quite difficult to examine whether the findings also hold for other comparable pension reforms in other countries. Therefore, in this study the dimension time will be incorporated into a cross-sectional analysis.

2.3 Data, measures and method

2.3.1 Public and private pension expenditure

Most comparative studies on welfare states rely on social expenditures as indicator to analyse welfare state reforms across different countries. To examine changes in the public/private-mix of pension provision, we used data from the most recent OECD Social Expenditure Database (OECD 2010b). This database contains social expenditure data on both public and private pension schemes. In this database, programmes are classified as social when two conditions are simultaneously satisfied (Adema 2010, Adema and Ladaique 2009). First, they have to be intended to serve a social purpose, such as old-age. Other policy areas with a social purpose are:

survivors, incapacity related benefits, health, family, active labour market policies, unemployment, housing and a category of other social security areas. Second, they have to involve either interpersonal redistribution or compulsory participation. Hence, purely private old-age plans which are the result of direct market transactions by individual people are not included. The distinction between public and private social security is based on the institution that controls the financial flows, namely public agencies or private bodies.

Our study analysed public and private social pension expenditure, both expressed as percentage of GDP and as millions of U.S. dollars (constant (2000) prices, ppp) per pensioner. A relevant measure is the share of private social pension expenditure as percentage of total social pension expenditure. This measure provides a good indication of shifts in the public/private-mix. The measure for private social pension expenditure indicates the total of expenditures on mandatory and voluntary pension schemes.[2] Furthermore, the indicators include expenditures on incomes of people who retired at the statutory retirement age and of early retirees.[3] Expenditures on survivor pensions are not included in the indicators.

In a cross-national analysis at the macro-level, expenditure indicators have some limitations (Van Vliet 2010). First, differences in expenditure patterns may be driven by differences in demographic trends across countries. When increases in pension expenditure fall short of increases in the number of retirees, this may have negative consequences for the incomes of elderly people and for the income inequality among the elderly. To control for the ageing of populations, we included a control variable measuring the percentage of population aged 65 and above. For this measure,we used data from Eurostat (2011a). Second, expenditures do not indicate institutional differences in pension systems, such as a pay-as-you-go ver-

[2]The OECD Social Expenditure Database also provides the possibility to present expenditures on mandatory and voluntary private pension separately. However, since the classification of private pension spending into mandatory and voluntary pension schemes is not unequivocal, we mainly use the total of these two categories. As a robustness check, we also analysed the income effects of mandatory and voluntary pension schemes separately, which did not alter the results (reported below). Note that the classification into public, mandatory private and voluntary private pensions coincides with the classification into first, second and third pillar pensions respectively.

[3]Expenditures on public pensions also include spending on some other services for the elderly (see Vandenbroucke and Vleminckx 2011).

sus a funded system, or a defined benefit versus a defined contribution system. Third, the variation in the tax treatment of contributions and benefits across countries was not taken into account. Ideally, we would use net expenditure on pensions, after tax, but international standardised data for such an indicator are unfortunately not available for a longer period. Despite these limitations, pension expenditures can give an indication of shifts from public to private pensions.

2.3.2 Income inequality and poverty among the elderly

For income inequality and poverty among the elderly, the study relied on two indicators provided by Eurostat (2011b). Income inequality among the elderly was measured by the S80/S20 ratio of people aged 65 and over. This indicator is constructed by dividing the total disposable income of the top 20 percent incomes of elderly by the total equivalized disposable income of the bottom 20 percent incomes of people aged 65 and over. A higher value of this indicator implies a higher inequality among the elderly. Although this indicator gives a good indication of income inequality at the extremes of the distribution, it neglects shifts between other quintiles. Therefore, the *Gini-coefficient* and the *Atkinson index* may be preferred measures of income inequality. However, data on income inequality among elderly measured by either the Gini coefficient or the Atkinson index are not available for a reasonable number of years.

Poverty among the elderly is measured by the percentage of people aged 65 and over who live below the poverty line of 60 percent of median equivalized (disposable) income of the total population. This poverty line of 60 percent is also officially used as poverty measure by the European Union. A higher value of this indicator implies a higher rate of poverty among elderly. Note that this indicator is a relative poverty line and can therefore be seen as a detailed representation of income inequality for the lower part of the income distribution.

Method 2.3.3

To examine the relationship between pension reform and income inequality among the elderly, we run a number of pooled time series cross-section regression analyses. Our estimations take the following form:

$$Q_{it} = \alpha + \beta X_{it} + \delta Z_{it} + \mu_i + \lambda_t + \epsilon_{it} \quad (2.1)$$

In equation (2.1), Q represents the dependent variables of income inequality (S80/S20) or poverty (PL 60) among the elderly. Variables describing the pension system, public pension expenditures, private pension expenditures and total pension expenditures (all as a percentage of GDP) and the private share of pension expenditures (private pension expenditures as percentage of total pension expenditures), are represented in vector X. The control variables ageing (share of people aged 65 and over relative to total population) and real GDP per capita (constant (2000) prices ppp) are represented in vector Z. For the latter variable, we used data from the OECD (OECD 2011a). Recognising that the variation in income inequality and poverty among the elderly may be related to unobserved country- and year-specific effects, country (i) and year (t) dummies are modelled by μ and λ, respectively. The error-term ϵ follows an *AR(1)*-process to correct for autocorrelation. In addition, we used panel-corrected standard errors to correct for panel-heteroskedasticity and simultaneous spatial correlation (Beck and Katz 1995).

Constrained by data availability, the study covered 15 European countries (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Sweden and the United Kingdom) for the years 1995 up till 2007. In the dataset, a number of observations were missing. This is in particular the case for the income inequality and poverty data and especially for Scandinavian countries. However, all countries were included in the regression analyses. Several sensitivity tests, which are discussed below, indicate that results did not suffer from the missing data.

2.4 Empirical analysis

2.4.1 Descriptive statistics

Table 2.1 illustrates the developments in pension expenditures for the included countries from 1995 up till 2007. On average, social expenditures as a percentage of GDP on both public and private pensions have been increased. Hence, total pension expenditure as a percentage of GDP has increased too. Furthermore, the data show an increase in the private share of total pension expenditure, albeit to a limited extent. Private spending as a share of total pension expenditure rose on average from 14.3 percent in 1995 to 14.9 percent in 2007. This indicates a relative shift from public to private in the pension provision. More interestingly, there is substantial variation in the developments of private pension expenditure as a share of total pension expenditure across countries. In Belgium for instance, social expenditures on private pensions increased more than expenditures on public pensions. This has resulted in a shift from public to private in the total pension expenditure. This trend fits well with the trend that is reported in Peeters et al. (2003), which is based on data from national sources. In other countries, such as Denmark, Ireland, Italy, the Netherlands, Sweden and the UK, shifts in the public/private-mix are the result of opposing trends in public and private pension expenditure. Indeed, there is a negative correlation between yearly changes in private and public pension expenditure of -0.22 which is significant at the 1 percent level.

Table 2.2 shows a general trend towards less income inequality and less poverty among the elderly in the period 1995-2007.[4] In 2007, the average income inequality among elderly (mean 12 countries) has decreased by

[4]These results should be interpreted with caution, because there is a disruption in the time series of inequality and poverty indicators presented in table 2.2. Until 2001, data were provided by the European Community Household Panel survey (ECHP). Since 2005 all EU-15 countries provide data from the new European Union Statistics on Income and Living Conditions (EU-SILC). During the transitional period poverty indicators were provided by national sources which were harmonized ex-post as closely as possible with EU-SILC definitions by Eurostat. Despite the fact that most EU-SILC variables are defined in the same way as the corresponding ECHP variables, some differences arise. The transition from ECHP to EU-SILC possibly explains the large number of missing observations in this period. See for more details Eurostat (2005).

almost 18 percent compared to 1995. A decreasing trend over time is also shown by the poverty rate among the elderly which has decreased by almost 9 percent on average. There is some variation in trends between countries still. Greece and Portugal, for example, have shown a huge decline in poverty rates among elderly over time. However, Finland and Ireland have faced a relatively large increase in poverty among elderly in the same period. These trends are robust with respect to the poverty lines applied (50, 60 or 70% of median equivalized income). Nevertheless, different patterns of poverty can be seen within countries. Germany and the Netherlands, for example, have shown a decrease in poverty rates among elderly when using poverty line of 50 percent, while both countries have shown an increase in poverty rates in the same period when using a poverty line of 60 and 70 percent. These observations imply that relatively more elderly live at risk of poverty in 2007 compared with 1995, but less elderly find themselves at the absolute bottom of the income distribution.

Table 2.1: Pension expenditures in European countries, 1995-2007

	Public pension expenditure (%GDP)			Private pension expenditure (%GDP)			Total pension expenditure (%GDP)			Private pension expenditure (%total)		
	1995	2007	Change 95-07	1995	2007	Change 95-07	1995	2007	Change 95-07	1995	2007	Change 95-07
Austria	10	10.7	0.7	0.4	0.5	0.1	10.4	11.3	0.8	3.7	4.7	0.9
Belgium	7	7.1	0.1	1.3	2.8	1.5	8.3	9.9	1.6	15.5	28.4	12.8
Denmark	8.4	7.3	-1.1	1.8	2.2	0.3	10.2	9.5	-0.7	18	23	5
Finland	8.5	8.4	-0.1	0.3	0.2	-0.1	8.8	8.6	-0.2	3.4	2.2	-1.1
France	10.6	11.1	0.5	0.1	0.2	0.1	10.7	11.2	0.5	1	1.5	0.5
Germany	8	8.7	0.7	0.7	0.7	0.1	8.6	9.4	0.8	7.6	7.9	0.3
Greece	9.2	10	0.9	0.4	0.4	0	9.5	10.4	0.9	3.8	3.5	-0.3
Ireland	2.9	3.1	0.2	1.1	0.9	-0.2	3.9	4	0.1	26.8	22.4	-4.4
Italy	9.3	11.7	2.4	2.8	1.3	-1.5	12.2	13.1	0.9	23.4	10.1	-13.3
Luxembourg	8.2	4.8	-3.4	0.6	0.3	-0.3	8.8	5.2	-3.7	6.8	6.6	-0.2
Netherlands	5.5	5.3	-0.3	2.6	3.5	0.9	8.1	8.8	0.7	31.9	40.2	8.4
Norway	7.1	6.2	-0.8	0.6	0.6	-0.1	7.7	6.8	-0.9	8.2	8.5	0.3
Portugal	6	9.2	3.2	0.2	0.2	0	6.2	9.4	3.2	2.7	1.8	-0.8
Sweden	9.8	9	-0.8	1.9	2.1	0.2	11.7	11.1	-0.7	16.3	19	2.7
United Kingdom	5.5	5.8	0.3	4.7	4.5	-0.2	10.2	10.3	0	46.2	43.8	-2.5
Mean	7.7	7.9	0.2	1.3	1.4	0.1	9	9.3	0.2	14.3	14.9	0.6

Note: Figures for Luxembourg (1995) are based on linear extrapolation. Source: OECD Social Expenditure Database (OECD, 2010) and own calculations.

Regression results 2.4.2

The social outcomes presented above suggest that there is no evidence that an increasing share of private pensions leads to higher income inequality and poverty among elderly. In Belgium, for instance, the country with the largest relative shift from public to private, income inequality and poverty among the elderly decreased. In Italy, the country with the largest relative shift from private to public, an increase in income inequality and poverty rates among the elderly can be observed. In order to take our analysis beyond the descriptive statistics, we continue with regression analyses on the 15 European countries over the years 1995-2007.

The results of the regression analyses are presented in table 2.3 and table 2.4. The effects of public pension expenditure as percentage of GDP on income inequality among the elderly are negative, but not significant. Model 7 indicates that public pension expenditure as percentage of GDP is negatively and significantly related to poverty among the elderly. Consistent with our expectations based on the literature, this suggests that higher social spending on public pensions is associated with lower poverty rates among the elderly. However, the results in Models 9 and 11 indicate that there is only weak evidence for this relationship.

With respect to private pension expenditure as percentage of GDP, the results do not indicate a positive effect of private pension expenditure on income inequality. In contrast, the negative coefficients suggest that private pension expenditure as a percentage of GDP is negatively related to income inequality among the elderly. Model 2 indicates also a negative coefficient for private pension expenditure as percentage of total pension expenditure, but the Models 3 and 5 show a positive effect for the private share of the pension provision, albeit not significant. However, when pension expenditure is expressed in dollars per pensioner, to exclude any denominator effect of GDP, the results indicate a negative effect for the private pension expenditure as a share of total pension expenditure again. This implies that higher spending on private pensions in general, and a shift from public to private pensions in particular, are not associated with higher income inequality among the elderly. Turning to poverty, all

Table 2.2: Trends in social outcomes among elderly people, 1995-2007

	Income inequality among the elderly (S80/S20)			Poverty among the elderly (PL 60)		
	1995	2007	Change 95-07	1995	2007	Change 95-07
Austria	4.0	3.2	-0.8	20.0	14.0	-6.0
Belgium	4.9	3.4	-1.5	25.0	23.0	-2.0
Denmark	-	2.7	-	-	17.7	-
Finland	3.0	2.9	-0.1	12.0	21.6	9.6
France	4.8	4.0	-0.8	19.0	13.1	-5.9
Germany	4.9	4.2	-0.7	15.0	16.2	1.2
Greece	7.6	4.8	-2.8	35.0	22.9	-12.1
Ireland	3.9	3.4	-0.5	19.0	28.3	9.3
Italy	4.6	4.7	0.1	18.0	21.9	3.9
Luxembourg	4.1	3.2	-0.9	12.0	7.2	-4.8
Netherlands	4.2	3.2	-1.0	8.0	9.5	1.5
Norway	-	2.8	-	-	14.1	-
Portugal	6.6	6.0	-0.6	38.0	25.5	-12.5
Sweden	-	2.8	-	-	9.9	-
United Kingdom	4.9	4.4	-0.5	32.0	27.6	-4.4
Mean (all countries)	4.8	3.7	-1.1	21.1	18.2	-2.9
Mean (12 countries)	5.2	4.3	-0.9	23.0	21.0	-2.0

Note: Mean 12 countries excluding Denmark, Norway and Sweden. Eurostat SILC-database (Eurostat, 2011a) and own calculations.

measures for private pension provision are not significantly related to poverty among the elderly.

The results for total pension expenditure are comparable to the case of public pension expenditures. Total pension expenditure as a percentage of GDP, which consists of the sum of public and private pension expenditure, is negatively and significantly correlated with poverty among the elderly, while no significant correlation can be observed between total pension expenditures and income inequality among the elderly.

As to graying populations, the results indicate that the effect of graying on income inequality and poverty among the elderly is limited. It seems that the percentage of the population aged 65 and over is slightly negatively correlated with income inequality among the elderly, while no correlation can be observed between this variable and poverty among the elderly. The results suggest that there is no clear linkage between GDP per capita and income inequality among the elderly. However, GDP per capita is positively and significantly associated with poverty rates among the elderly.

In summary, the results of the regression analyses suggest that higher private expenditure for pensions as a percentage of GDP, per pensioner and as a share of total pension expenditure are not associated with higher levels of income inequality among the population aged 65 and above. Furthermore, the regression analyses indicate a poor linkage between private provisions of pension schemes and poverty rates among the elderly. Taken together, these results do not provide evidence for the expectation that shifts from public to private pension provision are associated with higher levels of income inequality.

Table 2.3: Panel data regressions of pension expenditures and income inequality (s80/s20) among the elderly (65+)

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
Public pension exp. (%GDP)	-0.13	0.12			-0.07	0.12			-0.19	0.13		
Private pension exp. (%GDP)	-0.45***	0.17			-1.22**	0.52			-0.87**	0.42		
Private share (%total)			-3.41**	1.52	9.2	5.85			3.58	4.77	-6.82***	2.52
Total pension exp. (%GDP)							-0.2	0.13				
Public pension exp. p.p (/100)											-0.01*	0.01
Private pension exp. p.p. (/100)											-0.01	0.01
Population aged 65 and over (%total)	-0.22**	0.11	-0.22*	0.12	-0.26**	0.11	-0.18	0.11	-0.34***	0.13		
GDP per capita (/1000)									-0.09***	0.03	0.00	0.03
Constant	8.96***	2.14	7.62***	1.78	8.99***	2.02	9.03***	2.23	13.74***	2.92	7.12***	1.12
Observations	135		135		135		135		135		135	
Adj. R-squared	0.84		0.84		0.84		0.84		0.85		0.83	
Rho	0.41		0.42		0.35		0.48		0.36		0.39	

OLS regressions; unstandardized coefficients; panel-corrected standard errors; Prais-Winsten transformation (AR (1) disturbances). * Significant at the .10 level; ** at the .05 level; *** at the .01 level. Exp. p.p. is expenditures per pensioner. Each regression also includes country and year dummies (not shown here). Countries included: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Sweden, and the United Kingdom. Data sources: Income inequality (Eurostat, 2011); Pension expenditure: OECD Social Expenditure Database (2010).

Table 2.4: Panel data regressions of pension expenditures and poverty (PL 60) among the elderly (65+)

	Model 7		**Model 8**		**Model 9**		**Model 10**		**Model 11**		**Model 12**	
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
Public pension exp. (%GDP)	-1.50*	0.83			-1.13	0.91			-0.29	1.14		
Private pension exp. (%GDP)					-4.04	3.31			-5.23	3.84		
Private share (%total)			2.61	11.96	40.38	48.43			65.32	56.73	-0.95	39.82
Total pension exp. (%GDP)							-1.34*	0.70				
Public pension exp. p.p (/100)											-0.11	0.07
Private pension exp. p.p. (/100)											-0.01	0.15
Population aged 65 and over (%total)	-0.54	0.80	-0.78	0.76	-0.70	0.80	0.61	0.78	-0.02	0.64		
GDP per capita (/1000)									0.81**	0.34	1.08***	0.30
Constant	42.75***	11.58	30.42***	11.49	41.05***	11.46	42.37***	11.67	1.38	16.85	12.50	15.06
Observations	154		154		154		154		154		154	
Adj. R-squared	0.79		0.78		0.79		0.79		0.80		0.80	
Rho	0.63		0.66		0.63		0.64		0.63		0.59	

OLS regressions; unstandardized coefficients; panel-corrected standard errors; Prais-Winsten transformation (AR (1) disturbances). * Significant at the .10 level; ** at the .05 level; *** at the .01 level. Exp. p.p. is expenditures per pensioner. Each regression also includes country and year dummies (not shown here). Countries included: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Sweden, and the United Kingdom. Data sources: Income inequality (Eurostat, 2011); Pension expenditure: OECD Social Expenditure Database (2010).

2.4.3 Sensitivity analyses

Since the results are not in line with our expectations based on both theoretical and empirical literature on pension reform and income inequality, we perform a variety of robustness checks. First, we examine the dependence of the results on different specifications of the empirical model. Estimations without correction for autocorrelation or panel-corrected standard errors do not alter the result that shifts towards more private pensions are not correlated with higher income inequality or poverty levels among the elderly. With respect to the most important independent variable, the share of private pension expenditure as percentage of total pension expenditure, it should be noted that the variation within countries over time is rather small. In combination with country fixed-effects, this reduces in itself the chance to find any significant effects for this variable. Therefore, we ran the analyses also without country fixed-effects, which did not alter the results. Other specifications that we applied, such as first differences, log-transformations, lagged variables or the exclusion of year fixed-effects did not change the results. Neither do the results change if an independent variable as graying is excluded or if a measure for a country's wealth such as GDP per capita is included.

To further probe the robustness of our results, we took into account that our analyses were based on unbalanced panels owing to a number of missing observations. This is especially the case for Scandinavian countries with regard to the inequality and poverty indicators. This could lead to biased results, since Denmark, Finland, Norway and Sweden have below average poverty and inequality levels. Therefore, we also ran regressions in which the number of observations is extended. We employed regression analyses in which both the dependent and the independent variables are linearly inter- and extrapolated and analyses in which only the dependent variables are inter- and extrapolated. Since extrapolation is associated with more uncertainty than interpolation, we also ran regressions for only interpolated dependent variables. In addition, we used more sophisticated techniques such as cubic- and cubic-spline interpolation.[5] All analyses

[5]We use several inter- and extrapolation techniques such as linear inter- and extrapolation, cubic interpolation and cubic spline interpolation. For applications of linear interpolation, see for example L'horty and Rault (2003), Clarke et al. (2008), Stern (2005)

indicate that our results are not biased by the missing observations. This is also confirmed by the results of regression analyses in which the group of Scandinavian countries is omitted. These results are in line with the findings of Gustafsson and Johansson (1999), who found that the group of Scandinavian countries do not influence the results of regression analyses on income inequality and social expenditure very strongly. Moreover, the results are neither affected by excluding the countries one by one in the regression analyses. We also tested to what extent the results are driven by the countries with the largest shifts in the public/private-mix, namely Belgium, Italy and the Netherlands. Regressions without these three countries yielded similar results.

Finally, we examined the sensitivity of the results for the use of alternative indicators and data sources. With regard to poverty, the results of estimation of poverty lines among the elderly of 50 and 70 percent are comparable to the results of the poverty line of 60 percent. Subsequently, we ran our main empirical specification for four different indicators for income inequality among the elderly based on data from the OECD (OECD 2008).[6] Our results with respect to the linkage between the share of private pension expenditure and income inequality among the elderly appear to be robust for Gini coefficients before and after taxes and transfers, the standard coefficient of variation and the mean log deviation. Additionally, the replication of the results presented in table 2.3 and 2.4 with Gini coefficients and poverty lines[7] among the elderly from the Luxembourg Income Study (LIS 2011) confirm our empirical results based on Eurostat data. As to the independent variable, the measures for private pension expenditure can be disaggregated into mandatory and voluntary private pension expenditure. The results of the regression analyses with the dis-

and Toroj (2008). An example of cubic-spline interpolation in economics, which is based on polynomial instead of linear methods, can be found in Nanda and Ross (2008).

[6]The main advantage of these OECD data is the availability of more sophisticated income inequality indicators. However, the most important disadvantage of these data is that at most 6 data points per country are available in the waves from mid 1970s till mid 2000s. Another advantage is that these data are available for a longer period and a larger group of countries than the Eurostat data (Eurostat 2011b). Our results also hold for this larger country group and longer period.

[7]The Gini coefficient among the elderly is provided by Wang and Caminada (2011) who constructed this indicator from the micro data. The 40, 50 and 60 percent poverty lines among the elderly are taken from the LIS Key Data (LIS 2011).

aggregated measure do not differ from the results with the aggregated measures. In summary, the combined evidence of these robustness checks suggest that our results are robust with respect to different specifications, variables and data sources.

2.5 Discussion

A number of tentative explanations is conceivable for our main finding that shifts towards relatively more private pensions are not related to higher levels of income inequality among the elderly. The level of supplementary pension benefits is often strongly related to the income level during working life. A more private pension provision therefore leads to a higher supplementary pension for higher incomes than for lower incomes. But it could be possible that even though the absolute increase in private pension benefits is smaller for lower incomes than for higher incomes, the relative increase for lower incomes is much larger than for higher incomes. This is illustrated by Myles and Pierson (2001) in a study on pension reform in Canada in the beginning of the 1990s. Burtless (2006) also stated that the effects of changes in the public/private-mix of pensions on replacement rates, the income from pensions relative to income from work in the past, vary along the income distribution. A possible scenario is that the coverage of private pensions has increased and that this is mainly the case for lower income groups. This could be an explanation for the fact that we did not find a relationship between shifts in the public/private-mix of pensions and income inequality and poverty among the elderly. Hence, further research at the macro-level could be focused on specifying the effects of pension reform for different quintiles of the income distribution.

In addition, it should be noted that the analyses in this study do not account for determinants of income at the individual level. On the one hand, this concerns general personal characteristics which determine income such as education. On the other hand, current individual pension benefits are determined by long-term effects such as previous wages, contributions paid and macro-economic conditions in the past. It is hardly

possible to capture this time dimension in a macro-level analysis. Another factor that might influence pension benefits and incomes of elderly people is the prevalence of deficiencies in contributions paid in the past (Esping-Anderson and Myles 2006). Future empirical research based on micro-data, in which it is possible to control for individual characteristics, may provide more insight into the relationship between pension reform and income inequality.

Finally, the use of pension expenditure data at the macro-level implies some restrictions. Much information can be lost in classifying pension programmes into pillars (Whitehouse 2002). Moreover, as mentioned above, shifts in pension expenditure can only give a rough indication of changes in institutional characteristics of pension systems.

Conclusion 2.6

In many industrialized countries, public pension systems have been reformed in order to alleviate the pressure on public finances resulting from ageing populations. This has often led to shifts in the pension provision from public to private. The average magnitude of these shifts remains limited, but in a number of countries there have been substantial changes. Since private pensions are probably less redistributive than public pensions, these shifts could be hypothesized to lead to more income inequality among retirees. This study contributes to the income inequality and pension literature by empirically analyzing the income effects of shifts in the public/private-mix of pensions in 15 European countries for the period 1995-2007, using pooled time series cross-section regression analyses. The most important finding is that shifts in the pension provision from public to private do not (yet) seem to entail higher levels of income inequality or poverty among people aged 65 and older. Intriguingly, this finding is not in line with expectations in the literature on pension reform and income inequality (Arza 2008, Fukawa 2006, Hughes and Stewart 2004, Milligan 2008, Oshio and Shimizutani 2005, Weller 2004) and with literature on the redistributive effects of public and private social security in general (Caminada and Goudswaard 2005, Goudswaard and Caminada

2010). A tentative explanation for this finding is that more people in lower income deciles have been covered by private pension plans. As a result, the increases in the pension benefits of people with lower incomes were relatively larger than for people with higher incomes.

The policy implication of our findings seems to be that the pressure of the pension expenditures on public finances can be alleviated without serious consequences for income inequality or poverty among elderly people. However, this policy implication should be taken with much caution, even though the results are robust for other data sources and a broad range of alternative econometric specifications. As suggested before, our results could be explained by increases in the coverage of private supplementary pension schemes rather than policy reforms. A higher coverage of private programs also causes a shift from public to private, but will probably have a rather different distributional impact compared to cutting public pension benefits. In addition, empirical research at the macro-level goes along with a number of limitations with respect to institutional characteristics of pension systems and individual characteristics of pensioners.

Finally, it should be noted that our analysis does not include the years after 2007. This implies that we have no prospect of the income effects of the pension reforms which are triggered by the credit crisis at the beginning of the 21st century. The results of this study provide no reason to expect that recent reforms in many European countries will lead to more income inequality and higher poverty rates among the elderly. Future research should provide more insight into the answer to this question.

2.A Sensitivity analyses

Tables 2.3 and 2.4 of the main text present the results of panel data regressions of pension expenditures and social outcomes among the elderly (65+). Tables 2.5 to 2.15 below present the result of several robustness checks:

Table 2.5: Panel data regressions of pension expenditures and social outcomes among the elderly (65+) **excluding graying** (population aged 65 and over, % total)

Table 2.6: Panel data regressions of pension expenditures and social outcomes among the elderly (65+) **including GDP per capita**
Table 2.7: Panel data regressions of pension expenditures and social outcomes among the elderly (65+) **with linearly inter- and extrapolated dependent and independent variables**
Table 2.8: Panel data regressions of pension expenditures and social outcomes among the elderly (65+) **with linearly inter- and extrapolated independent variables**
Table 2.9: Panel data regressions of pension expenditures and social outcomes among the elderly (65+) **with linearly interpolated independent variables**
Table 2.10: Panel data regressions of pension expenditures and social outcomes among the elderly (65+) **with cubically interpolated independent variables**
Table 2.11: Panel data regressions of pension expenditures and social outcomes among the elderly (65+) **with cubically spline interpolated independent variables**
Table 2.12: Panel data regressions of pension expenditures and social outcomes among the elderly (65+) **excluding Scandinavian countries**
Table 2.13: Panel data regressions of pension expenditures and **different poverty lines (PL 50, PL 70)** among the elderly (65+)
Table 2.14: Panel data regressions of pension expenditures and income inequality among the elderly (65+) **using income distribution variables of OECD (2010) instead of Eurostat (2011)**
Table 2.15: Panel data regressions of pension expenditures and social outcomes among the elderly (65+) **using a decomposition of private pension expenditures into mandatory and voluntary expenditures**

Table 2.5: Panel data regressions of pension expenditures and social outcomes among the elderly (65+) **excluding graying**

	Income inequality (s80/s20) among the elderly (65+)						Poverty (PL 60) among the elderly (65+)					
	Model 1		**Model 2**		**Model 3**		**Model 4**		**Model 5**		**Model 6**	
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
Public pension exp. (%GDP)	-0.18	0.14					-1.63**	0.79				
Private pension exp. (%GDP)	-0.41**	0.18					-1.02	0.84				
Private share (%total)			-2.99**	1.25					3.93	11.05		
Total pension exp. (%GDP)					-0.23	0.14					-1.43**	-0.70
Population aged 65 and over (%total)												
Constant	6.25***	1.48	4.37***	0.11	34.23***	7.50	36.13***	8.24	18.86***	1.46	34.23***	-7.50
Country dummies	Yes		Yes		Yes		Yes		Yes		Yes	
Time dummies	Yes		Yes		Yes		Yes		Yes		Yes	
AR(1) disturbances	Yes		Yes		Yes		Yes		Yes		Yes	
Observations	135		135		135		154		154		154	
Adj. R-squared	0.84		0.83		0.84		0.79		0.78		0.79	
Rho	0.42		0.42		0.47		0.62		0.65		0.64	

OLS regressions; unstandardized coefficients; panel-corrected standard errors; Prais-Winsten transformation (AR (1) disturbances). * Significant at the .10 level; ** at the .05 level; *** at the .01 level.

Table 2.6: Panel data regressions of pension expenditures and social outcomes among the elderly (65+) **including GDP per capita**

	Income inequality (s80/s20) among the elderly (65+)						Poverty (PL 60) among the elderly (65+)					
	Model 1		**Model 2**		**Model 3**		**Model 4**		**Model 5**		**Model 6**	
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
Public pension exp. (%GDP)	-0.22*	0.12					-0.94	1.01				
Private pension exp. (%GDP)	-0.58***	0.18					-0.50	0.79				
Private share (%total)			-4.39***	1.51					7.98	14.05		
Total pension exp. (%GDP)					-0.28**	0.14					-0.78	0.87
Population aged 65 and over (%total)	-0.33***	0.12	-0.32***	0.13	-0.27**	0.12	0.13	0.65	0.11	0.61	0.04	0.67
GDP per capita (/1000)	-0.10***	0.03	-0.08**	0.03	-0.08***	0.03	0.71***	0.36	0.81***	0.29	0.70**	0.36
Constant	14.03***	2.95	11.05***	2.35	13.32***	3.06	9.03	16.89	-3.42***	9.30	8.98	16.52
Country dummies	Yes		Yes		Yes		Yes		Yes		Yes	
Time dummies	Yes		Yes		Yes		Yes		Yes		Yes	
AR(1) disturbances	Yes		Yes		Yes		Yes		Yes		Yes	
Observations	135		135		135		154		154		154	
Adj. R-squared	0.85		0.84		0.85		0.79		0.79		0.79	
Rho	0.36		0.34		0.46		0.64		0.65		0.65	

OLS regressions; unstandardized coefficients; panel-corrected standard errors; Prais-Winsten transformation (AR (1) disturbances). * Significant at the .10 level; ** at the .05 level; *** at the .01 level.

Table 2.7: Panel data regressions of pension expenditures and social outcomes among the elderly (65+) **with linearly inter- and extrapolated dependent and independent variables**

	Income inequality (s80/s20) among the elderly (65+)						Poverty (PL 60) among the elderly (65+)					
	Model 1		**Model 2**		**Model 3**		**Model 4**		**Model 5**		**Model 6**	
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
Public pension exp. (%GDP)	0.08	0.07					-0.06	0.48				
Private pension exp. (%GDP)	-0.34***	0.12					-0.03	0.77				
Private share (%total)			-5.31***	1.64					1.42	12.04		
Total pension exp. (%GDP)					0.07	0.09					0.03	0.55
Population aged 65 and over (%total)	0.00	0.10	0.03	0.10	0.03	0.09	1.64***	0.55	1.58***	0.48	1.57***	0.51
Constant	3.77***	1.46	4.14***	1.52	3.16*	1.83	-3.69	6.74	-3.53	7.54	-3.69	7.64
Country dummies	Yes		Yes		Yes		Yes		Yes		Yes	
Time dummies	Yes		Yes		Yes		Yes		Yes		Yes	
AR(1) disturbances	Yes		Yes		Yes		Yes		Yes		Yes	
Observations	195		195		195		195		195		195	
Adj. R-squared	0.75		0.76		0.75		0.72		0.71		0.71	
Rho	0.55		0.58		0.61		0.70		0.74		0.73	

OLS regressions; unstandardized coefficients; panel-corrected standard errors; Prais-Winsten transformation (AR (1) disturbances). * Significant at the .10 level; ** at the .05 level; *** at the .01 level.

Table 2.8: Panel data regressions of pension expenditures and social outcomes among the elderly (65+) **with linearly inter- and extrapolated independent variables**

	Income inequality (s80/s20) among the elderly (65+)						Poverty (PL 60) among the elderly (65+)					
	Model 1		**Model 2**		**Model 3**		**Model 4**		**Model 5**		**Model 6**	
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
Public pension exp. (%GDP)	0.18	0.10					-0.02	0.58				
Private pension exp. (%GDP)	-0.25***	0.13					0.03	0.72				
Private share (%total)			-5.20***	1.57					-1.70	9.47		
Total pension exp. (%GDP)					0.07	0.09					0.00	0.52
Population aged 65 and over (%total)	-0.01	0.12	0.04	0.12	0.05	0.11	1.68***	0.44	1.67***	0.36	1.66***	0.43
Constant	2.76	2.06	3.97**	0.76	2.9	2.03	-4.75	5.85	-4.82	5.61	-4.66	5.90
Country dummies	Yes		Yes		Yes		Yes		Yes		Yes	
Time dummies	Yes		Yes		Yes		Yes		Yes		Yes	
AR(1) disturbances	Yes		Yes		Yes		Yes		Yes		Yes	
Observations	189		189		189		189		189		189	
Adj. R-squared	0.76		0.76		0.75		0.72		0.71		0.71	
Rho	0.60		0.60		0.61		0.71		0.72		0.71	

OLS regressions; unstandardized coefficients; panel-corrected standard errors; Prais-Winsten transformation (AR (1) disturbances). * Significant at the .10 level; ** at the .05 level; *** at the .01 level.

Table 2.9: Panel data regressions of pension expenditures and social outcomes among the elderly (65+) **with linearly interpolated independent variables**

	Income inequality (s80/s20) among the elderly (65+)						Poverty (PL 60) among the elderly (65+)					
	Model 1		**Model 2**		**Model 3**		**Model 4**		**Model 5**		**Model 6**	
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
Public pension exp. (%GDP)	0.09	0.11					-1.38	0.64				
Private pension exp. (%GDP)	-0.35***	0.13					-1.05	0.79				
Private share (%total)			-2.90**	1.44					-1.33	10.64		
Total pension exp. (%GDP)					-0.16	0.11					-1.22**	0.57
Population aged 65 and over (%total)	-0.21**	0.10	-0.21*	0.11	-0.18*	0.10	-0.45	0.57	-0.63	0.54	-0.50	0.56
Constant	8.43***	1.91	7.47***	1.63	8.50***	1.94	40.28***	0.55	28.4***	8.35	39.54***	8.64
Country dummies	Yes		Yes		Yes		Yes		Yes		Yes	
Time dummies	Yes		Yes		Yes		Yes		Yes		Yes	
AR(1) disturbances	Yes		Yes		Yes		Yes		Yes		Yes	
Observations	164		164		164		169		169		169	
Adj. R-squared	0.83		0.83		0.83		0.75		0.73		0.74	
Rho	0.43		0.45		0.49		0.62		0.66		0.64	

OLS regressions; unstandardized coefficients; panel-corrected standard errors; Prais-Winsten transformation (AR (1) disturbances). * Significant at the .10 level; ** at the .05 level; *** at the .01 level.

Table 2.10: Panel data regressions of pension expenditures and social outcomes among the elderly (65+) **with cubically interpolated independent variables**

	Income inequality (s80/s20) among the elderly (65+)						Poverty (PL 60) among the elderly (65+)					
	Model 1		**Model 2**		**Model 3**		**Model 4**		**Model 5**		**Model 6**	
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
Public pension exp. (%GDP)	-0.09	0.11					-1.39*	0.64				
Private pension exp. (%GDP)	-0.33**	0.14					-1.02	0.78				
Private share (%total)			-2.73**	1.47					1.58	10.51		
Total pension exp. (%GDP)					-0.15	0.11					-1.23**	0.56
Population aged 65 and over (%total)	-0.20**	0.10	-0.21*	0.11	-0.18*	0.10	-0.45	0.52	-0.64	0.50	-0.51	0.52
Constant	8.37***	1.97	7.43***	1.67	8.46***	2.00	40.41***	8.02	28.58***	7.70	39.73***	8.09
Country dummies	Yes		Yes		Yes		Yes		Yes		Yes	
Time dummies	Yes		Yes		Yes		Yes		Yes		Yes	
AR(1) disturbances	Yes		Yes		Yes		Yes		Yes		Yes	
Observations	164		164		164		168		168		168	
Adj. R-squared	0.83		0.82		0.82		0.75		0.74		0.75	
Rho	0.48		0.48		0.53		0.62		0.65		0.63	

OLS regressions; unstandardized coefficients; panel-corrected standard errors; Prais-Winsten transformation (AR (1) disturbances). * Significant at the .10 level; ** at the .05 level; *** at the .01 level.

Table 2.11: Panel data regressions of pension expenditures and social outcomes among the elderly (65+) **with cubically spline interpolated independent variables**

	Income inequality (s80/s20) among the elderly (65+)						Poverty (PL 60) among the elderly (65+)					
	Model 1		**Model 2**		**Model 3**		**Model 4**		**Model 5**		**Model 6**	
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
Public pension exp. (%GDP)	-0.09	0.11					-1.40*	0.73				
Private pension exp. (%GDP)	-0.32**	0.14					-1.02	0.85				
Private share (%total)			-2.67*	1.48					2.83	12.21		
Total pension exp. (%GDP)					-0.15	0.11					-1.26*	0.65
Population aged 65 and over (%total)	-0.21*	0.11	-0.21*	0.11	-0.18*	0.11	-0.47	0.66	-0.69	0.64	-0.55	0.63
Constant	8.39***	2.00	7.47***	1.71	8.51***	2.07	40.95***	9.8	29.09***	9.80	40.45***	9.88
Country dummies	Yes		Yes		Yes		Yes		Yes		Yes	
Time dummies	Yes		Yes		Yes		Yes		Yes		Yes	
AR(1) disturbances	Yes		Yes		Yes		Yes		Yes		Yes	
Observations	160		160		160		162		162		162	
Adj. R-squared	0.83		0.83		0.83		0.77		0.76		0.77	
Rho	0.43		0.43		0.54		0.64		0.67		0.65	

OLS regressions; unstandardized coefficients; panel-corrected standard errors; Prais-Winsten transformation (AR (1) disturbances). * Significant at the .10 level; ** at the .05 level; *** at the .01 level.

Table 2.12: Panel data regressions of pension expenditures and social outcomes among the elderly (65+) **excluding Scandinavian countries**

	Income inequality (s80/s20) among the elderly (65+)						Poverty (PL 60) among the elderly (65+)					
	Model 1		**Model 2**		**Model 3**		**Model 4**		**Model 5**		**Model 6**	
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
Public pension exp. (%GDP)	0.00	0.11					-1.58*	0.84				
Private pension exp. (%GDP)	-0.31**	0.16					-0.90	0.81				
Private share (%total)			-2.77*	1.56					7.10	12.12		
Total pension exp. (%GDP)					-0.06	0.11					-1.30*	0.69
Population aged 65 and over (%total)	-0.24*	0.11	-0.22**	0.11	-0.21*	0.11	-0.94	0.75	-1.18	0.73	-1.06	0.74
Constant	7.96***	1.81	7.7***	1.67	8.00**	1.85	49.86***	11.40	36.79***	10.92	49.06***	11.46
Country dummies	Yes		Yes		Yes		Yes		Yes		Yes	
Time dummies	Yes		Yes		Yes		Yes		Yes		Yes	
AR(1) disturbances	Yes		Yes		Yes		Yes		Yes		Yes	
Observations	112		112		112		123		123		123	
Adj. R-squared	0.85		0.86		0.86		0.79		0.78		0.79	
Rho	0.45		0.48		0.54		0.61		0.65		0.63	

OLS regressions; unstandardized coefficients; panel-corrected standard errors; Prais-Winsten transformation (AR (1) disturbances). * Significant at the .10 level; ** at the .05 level; *** at the .01 level.

Table 2.13: Panel data regressions of pension expenditures and **different poverty lines (PL 50, PL 70)** among the elderly (65+)

	Poverty (PL 50) among the elderly (65+)						*Poverty (PL 70)* among the elderly (65+)					
	Model 1		**Model 2**		**Model 3**		**Model 4**		**Model 5**		**Model 6**	
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
Public pension exp. (%GDP)	-1.98***	0.59					-1.77**	0.86				
Private pension exp. (%GDP)	-1.88**	0.92					-1.40	1.19				
Private share (%total)			-6.62	11.39					-5.35	12.93		
Total pension exp. (%GDP)					-1.91***	0.53					-1.66**	0.68
Population aged 65 and over (%total)	-0.87*	0.51	-1.16**	0.47	-0.90*	0.49	0.18	0.53	-0.11	0.51	-0.12	0.49
Constant	43.26***	6.22	26.92***	7.16	42.99***	6.38	44.08***	8.88	30.05***	7.93	43.9***	9.03
Country dummies	Yes		Yes		Yes		Yes		Yes		Yes	
Time dummies	Yes		Yes		Yes		Yes		Yes		Yes	
AR(1) disturbances	Yes		Yes		Yes		Yes		Yes		Yes	
Observations	128		128		128		128		128		128	
Adj. R-squared	0.79		0.78		0.79		0.88		0.88		0.88	
Rho	0.42		0.38		0.43		0.60		0.59		0.60	

OLS regressions; unstandardized coefficients; panel-corrected standard errors; Prais-Winsten transformation (AR (1) disturbances). * Significant at the .10 level; ** at the .05 level; *** at the .01 level.

Table 2.14: Panel data regressions of pension expenditures and social outcomes among the elderly (65+) **using income distribution variables of OECD (2010) instead of Eurostat (2011)**

	Gini before taxes and transfers		Gini after taxes and transfers		Standard coefficient of variation		Mean log deviation		Gini before taxes and transfers		Gini after taxes and transfers		Standard coefficient of variation		Mean log deviation	
	Model 1		**Model 2**		**Model 3**		**Model 4**		**Model 5**		**Model 6**		**Model 7**		**Model 8**	
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
Private share (%total)	-0.09	0.20	-0.07***	0.02	-0.03	0.04	-0.13***	0.04	-0.10	0.24	-0.13***	0.04	-0.01***	0.00	-0.22***	0.07
Constant	0.76***	0.08	0.32***	0.01	1.83***	1.40	0.2***	0.02	0.81***	0.01	0.31***	0.00	1.02***	0.20	0.23***	0.03
Country dummies	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
Time dummies	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
AR(1) disturbances	No		No		No		No		No		No		No		No	
Year restriction	No		No		No		No		Yes		Yes		Yes		Yes	
Country restriction	No		No		No		No		Yes		Yes		Yes		Yes	
Observations	85		108		96		96		37		45		42		42	
Adj. R-squared	0.72		0.95		0.45		0.97		0.88		0.93		0.79		0.89	

OLS regressions; unstandardized coefficients; panel-corrected standard errors; Prais-Winsten transformation (AR (1) disturbances). * Significant at the .10 level; ** at the .05 level; *** at the .01 level. The coefficients and standard errors are multiplied by a factor of 100 in the columns (1), (2), (4), (5), (6) and (8). The full time span covers the years 1985-2005. The restricted period covers the years 1995-2005 to make the time span comparable to our main analyses based on the data from Eurostat (2011a). The full country group includes the 15 European countries and Australia, Canada, Czech Republic, Hungary, Iceland, Japan, Korea, Mexico, New Zealand, Poland, Slovak Republic, Switzerland, Turkey and the United States. The countries are restricted to the 15 European countries from the Eurostat (2011a) data set to make the analyses comparable.

Table 2.15: Panel data regressions of pension expenditures and social outcomes among the elderly (65+) **using a decomposition of private pension expenditures into mandatory and voluntary expenditures**

	Income inequality (s80/s20) among the elderly (65+)						Poverty (PL 60) among the elderly (65+)					
	Model 1		**Model 2**		**Model 3**		**Model 4**		**Model 5**		**Model 6**	
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
Public pension exp. (%GDP)	-0.43*	0.23					-1.66	2.08				
Mandatory pension exp. (%GDP)	-0.37	0.30					-1.40	2.50				
Voluntary pension expenditures (%GDP)	-0.76***	0.13					-0.66	0.84				
Voluntary share (% total pension exp.)			-3.31**	1.39	-7.55*	1.14			12.61	11.95	-1.83	10.23
Mandatory share (% total pension exp.)					1.57	1.90					1.71	17.89
Population aged 65 and over (%total)	0.17**	0.08	-0.19*	0.11	0.18**	0.09	1.65	1.13	-0.84	0.75	1.45	1.13
Constant	omitted		4.39***	0.11	1.30	1.70	10.02	29.26	30.99***	11.25	-6.74	21.34
Country dummies	Yes		Yes		Yes		Yes		Yes		Yes	
Time dummies	Yes		Yes		Yes		Yes		Yes		Yes	
AR(1) disturbances	Yes		Yes		Yes		Yes		Yes		Yes	
Observations	49		135		49		60		154		60	
Adj. R-squared	0.67		0.84		0.67		0.82		0.78		0.82	
Rho	-0.02		0.41		-0.04		0.44		0.65		0.46	

OLS regressions; unstandardized coefficients; panel-corrected standard errors; Prais-Winsten transformation (AR (1) disturbances). * Significant at the .10 level; ** at the .05 level; *** at the .01 level.