DISENTANGLING ANNUITIES AND TRANSFERS: REDISTRIBUTION IN GREEK RETIREMENT BENEFITS

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Abstract

The objective of this paper is to identify the relative importance of annuities and transfers in Greek retirement benefits and draw conclusions as to their impact on intergenerational and intragenerational equity. As one of the core objectives of a pension system is to redistribute income over the life span of individuals, their equity effects are examined by adopting a longitudinal approach. This approach compares the balance between the net present value of total contributions paid and pensions received by individuals throughout the course of their lives. The difference between the two is the implicit transfer that can be either positive (a transfer received by the rest of society) or negative (a transfer paid to the rest of society). The methodological line of inquiry involves the analysis of a representative sample of retirees from the biggest social insurance fund of the country in 2008. Annuities and transfers were calculated according to the rules that were in place both before and after the major pension reform that took place in Greece in 2010. The impact of the 2010-2013 austerity measures on lifetime pension benefits were also taken into account. Our findings suggest that the vast majority of retirees are receiving positive -and quite substantial, in absolute terms- net transfers from the system. This outcome implies that the underlying pension rules seriously deviate from actuarial fairness and are thus violating the principle of intergenerational equity.

Key words: public pensions, lifetime contributions, lifetime benefits, redistribution, progressivity.

JEL classification: D31, H55, J26

1. Introduction

Pensions represent the backbone of the Greek social protection system, providing households with a far from negligible 36.1% of their total equivalised disposable income in 2011. Not much remains for other social benefits (such as unemployment, family, sickness, housing and social assistance benefits), accounting for a mere 4.4% of household disposable income (El.Stat., 2013).

Expenditure on pensions is the second highest in the EU; from 12.3% of GDP in 2007 it reached 14.9% of GDP in 2011, two percentage points above the EU-28 average (Eurostat, 2014). At the same time, although monetary poverty in old age has fallen significantly between the late 1990s and 2011, it still remains well above the EU-28 average (17.2% versus 14.5% in 2011), especially if poverty is measured by using a fixed poverty line (25.7% versus 13.5% in 2011, with the poverty line being anchored in 2005 and adjusted for inflation).[1] It appears that the country's pension system is failing to deploy the large resources it commands to meet fundamental distributional objectives.

On top of its limited anti-poverty effectiveness, the Greek retirement pension system also seems to be performing poorly with respect to intragenerational equity, i.e., with respect to the way it treats different groups of retirees within the same generation (EC, 2010). In a context of large institutional fragmentation, pension entitlements vary widely between different occupational groups; as a result of that, workers with identical contributory records can be eligible for very different pension benefits, depending on occupation, cohort or gender.

Since one of the main objectives of a pension system is to redistribute income over the life span of individuals, their equity effects can be best examined by adopting a longitudinal approach. This approach compares the balance between total contributions paid and total benefits received by individuals throughout the course of their lives. If the present value of lifetime benefits is equal to the present value of lifetime contributions, then retirement benefits can be said to be equivalent to annuities, such as those offered by private insurers. The difference between the two is the (implicit) transfer that can be either positive (i.e. a transfer received by the rest of society) or negative (i.e. a transfer paid to the rest of society).

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[1] While both poverty indicators reveal different parts of the same picture, the use of an anchored poverty line is arguably better suited to periods of rapid change in living standards, as is the case in Greece since 2009.

intragenerational equity. Annuities and transfers are calculated according to the rules that were in place both before and after the major pension reform that took place in Greece in 2010. The impact of the 2010-13 austerity measures on lifetime pension benefits is also taken into account. The research focuses on main old-age pensions, leaving aside survivors', invalidity and supplementary pensions. The methodological line of inquiry involves the analysis of a representative sample of 2008 retirees from IKA, the country's largest social insurance fund for private sector workers.

The importance of identifying the relative weight of annuities and transfers in Greek retirement benefits is twofold. Establishing that current pension system rules severely violate inter-generational equity would strengthen the case for pension reforms. On the contrary, finding that the relevant transfers are not significantly higher than zero would inevitably call into question the legitimacy of reforms, as the latter would mean that pensioners have "earned" their pensions through their and their employers' contributions during their working life, and therefore attempts by governments to cut back their entitlements would amount to a breach of the implicit social contract.

Moreover, even if net transfers are zero on aggregate, they may still be taking place between different categories of pensioners. These may be entirely consistent with stated public policy goals: this is the case when low earning workers are awarded pension benefits that are above their lifetime contributions, since without the implicit transfer the level of pension benefit corresponding to a pure annuity would fail to provide adequate pension income. Alternatively, transfers between different categories may be perverse, as when workers with identical contributory histories end up receiving pension benefits that differ significantly in value (which constitutes a violation of *horizontal equity*), or when redistribution is from low to high earners (which is a violation of *vertical equity*). Hence, determining the pattern of annuities versus transfers and clarifying the nature of intra-generational redistribution between groups is of relevance and interest.

The main findings of this paper can be summarised as follows. The present value of IKA main old-age pensions is estimated to exceed the present value of lifetime contributions by wide margins. The 2010-2013 austerity measures have led to an increase in the progressivity of transfers received, significantly reducing the non-contributory part of pensions paid to retirees with the highest amounts of lifetime contributions. Finally, it is estimated that, on average, the new pension system established by the 2010 reform will further reduce (but not fully eliminate) the non-contributory part of old-age pensions provided by IKA.

The structure of the paper is the following. Section 2 presents the main features of the Greek pension system before and after the 2010 reform; section 3 offers a literature review of the subject; section 4 explains the methodology of the study; section 5 reports the results and discusses the main findings of the research; section 6 reflects on the policy implications of the findings, on the limitations of the approach and on issues for further research.

2. Overview of the Greek pensions system

Retirement pensions in Greece are public and have a compulsory character. They work at a pay-as-you-go basis: the contributions of current workers (and their employers) are financing current pension recipients. The state is the ultimate responsible for covering any shortages between contributions and pension expenditure. Contributions/pensions are collected/provided by a large number of social security organisations, called funds. This plethora of funds stems from historical reasons, as they were gradually created to insure people working in different economic sectors. Workers can be insured to one or more primary funds. They can also be insured in supplementary funds. Most of the latter were created in the early 1980s in order to enhance pensioners' incomes. In addition, some workers such as public sector workers, some groups of professionals and private sector employees also contribute towards a lump-sum separation payment which is received at the time of retirement. Hence, the Greek pension system is segmented both in a horizontal (i.e. across economic sectors) and in a vertical way (i.e. by levels of pension receipt, i.e. main, supplementary and separation pension payments).

Pension reform has been high on the political agenda since the early 1990s (see Featherstone, 2005; Tinios, 2005; Sakellaropoulos and Angelaki, 2007; Vlachantoni, 2007; Matsaganis, 2010; Tinios, 2010). The pension reform of 1992 created a new, more uniform -and also significantly less generous- system for those entering the labour market from 1993 onwards: the age limit was set to 65 for both men and women, the minimum contribution period was set to 15 years, the calculation of pensionable earnings was fixed to the average of the five final employment years, replacement rates (i.e. the pension benefit as a percentage of income upon retirement) were reduced, contributions rates were increased and a tripartite financing mechanism was introduced. According to this mechanism, employees, employers and the state had to provide 2/9, 4/9 and 3/9 of total social insurance contributions respectively. While this reform reduced some of the inequities of the previous situation, especially those arising from the unequal treatment of private and public sector employees, it also created a new important segmentation: between pre and post-1993 entrants to the labour market.

A few years later, with the pension reform of 2002 replacement rates for *all* workers were set equal to 70% of pensionable income. The calculation of pensionable earnings became somewhat more favourable for those first-insured before 1993, by being calculated as the average of the best five years of the decade before retirement. Finally, the yearly state contribution to the financing of retirement benefits of workers belonging to the post-1993 regime was changed and set equal to 1% of GDP.

In 2008 another piece of legislation tried to tackle the horizontal fragmentation of the Greek social insurance system by consolidating the 155 existing social insurance funds into 13; five responsible for the provision of main pensions, eight for supplementary and two for separation payments. This consolidation was criticised as being mostly on paper, since in reality many of the merged funds were allowed to keep their autonomy and their special contribution and pension benefit regulations. The five funds that are responsible for the delivery of primary pensions are: i) ΙΚΑ - for most private sector employees; ii) ΟΓΑ - for farmers; iii) ΟΑΕΕ - for most self-employed workers; iv) ΕΤΑΑ - for doctors, pharmacists, lawyers and engineers; and v) ΕΤΑΠ-ΜΜΕ - for employees working in the media sector. Civil servants' pensions are paid directly from the state budget.

In December 2013 the largest of these five funds was IKA, providing 984,525 primary pensions. It was followed by ΟΓΑ and ΟΑΕΕ, which provided 714,829 and 355,039 primary pensions respectively. ΕΤΑΑ and ΕΤΑΠ-ΜΜΕ are much smaller, providing primary pensions to 80,315 and 8,115 individuals respectively. Finally, primary pensions were paid by the state budget to 453,407 retired civil servants (Ministry of Labour, Social Security and Welfare, 2013). Descriptive statistics on the distribution of pensions by type and fund are provided in the Appendix (Tables A1-A3).

Primary pensions are subject to a guaranteed minimum threshold, intended to ensure that no pension falls below this specified level. The thresholds applicable in IKA in 2004-2014 are shown in Table 1.

Table 1. IKA minimum monthly primary old-age pension amounts (2004-2014)

year	single	with spouse	with spouse + 1 child	with spouse + 2 children	with spouse + 3 children
2004	411.77	442.06	461.73	481.15	500.64
2005	428.24	459.74	480.20	500.40	520.40
2006	445.37	478.13	499.41	520.42	541.50
2007	463.39	498.16	521.37	544.44	567.59
Jan 2008 – Sept 2008	477.29	513.10	537.01	560.77	584.61
Oct 2008 – 2014	486.84	523.37	547.76	571.99	596.31

Source: IKA.

2.1 The 2010 pension reform

In 2010, pension reform returned to the top of the political agenda in the context of the country's economic crisis: the Memorandum of Economic and Financial Policies that was signed in return for the €110 billion loan agreed on with the European Commission, the European Central Bank and the International Monetary Fund (known as 'Troika') contained the blueprint of a drastic pension reform. The reform (Law 3865/10 for public sector workers and 3863/10 for all other workers) established a new pension structure starting in 2015. The retirement age was set to 65 for all workers with a contributory record of at least 15 years and 62 for workers with a contribution record of at least 40 years. The new structure combines a tax-funded basic pension with a contributory proportional pension.

With respect to the proportional pension, accrual rates vary by length of insurance period. The return on contributions ranges from 0.8% per year for a contributor with less than 15 insurance years, to 1.5% per year for one with 40 or more insurance years. As noted in Matsaganis and Leventi (2011), although this gradual progression was meant to serve as a motivation for workers to stay longer in employment, it might also increase the risk that low-paid workers with uncertain career prospects see little incentive to pay pension contributions at all. The calculation of pensionable earnings was extended from the average of the best five years of the decade before retirement to the average of lifetime earnings. In cases of early retirement, the basic pension is reduced by 1/200 for each month short of age 65.

The basic pension, fixed at €360 per month in 2010 prices and paid 12 times a year, is available with no means test to all recipients of a proportional pension with a contributory record of at least 15 years. The full rate is payable at age 65, reduced pro rata for those who were resident in the country for fewer than 35 years between the ages of 15 and 65. In cases of early retirement the basic pension is reduced by 6% each year short of age 65.

The total pension amount (basic plus proportional) is subject to a guaranteed minimum threshold. This is equal to the equivalent of 15 minimum daily wages per month, as defined in the National Collective Labour Agreement for 2015. Since February 2012 the minimum wage is statutory, i.e. set unilaterally by the government rather than by the social partners in the context of collective bargaining. The daily minimum wage was reduced from €33.57 to €26.18 (hence €392.70 per month) for employees over 25 and hasn't changed since. An indexation system was also introduced: since January 2014 pensions are supposed to be indexed by the average of the previous year's inflation and GDP growth, with inflation being used as an upper threshold.[2] The new pension laws allow pension spending to grow faster than GDP but set a ceiling at 2.5 percentage points relative to 2009 (exceeding that will trigger corrective action).

Finally, according to the 2010 pension reform persons aged 65 and over with a contributory record shorter than 15 years are also eligible for the basic pension, but only if they pass a means test: personal/family income must be below €5,400/€10,800 per year (in 2010 prices). Same as the non means-tested version of the basic pension, it is also reduced by 1/35 for each year short of 35 that people have spent abroad between the ages of 15 and 65.

In 2013 the retirement age was raised by two more years, to 67 for workers with a contributory record of 15-39 years (and for the recipients of the means-tested basic pension) and to 62 for workers with a contribution record of 40 years or more. Special regulations apply for people working in hard and arduous occupations[3] and for women with dependent children.

2.2 Austerity measures related to pensions

Under the terms of the 2010 Memorandum and its regular revisions pensions have been subject to various forms of cuts.

Pension cuts

Christmas, Easter and summer bonuses, amounting to two months' pay, were abolished in 2010.[4] They were replaced by flat-rate vacation allowances totalling €800 a year, payable to pensioners aged over 60. If average pensions plus bonuses exceeded €2,500 per month,

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[2] At the time of writing (December 2014) this indexation rule has not been applied. The freezing of pensions until 2017 was being discussed between the Greek government and the Troika.

[3] Special category of contributors who are eligible for early retirement in exchange for somewhat higher contributions.

[4] Invalidity pensions, farmers' basic pensions, social pension and pensions below €400 were not subject to this change.

bonuses were provided up to the approach of that threshold. In January 2013 these allowances were also abolished.[5]

Pensioners' solidarity contributions

The first special levy on pension incomes (labelled 'Pensioners' solidarity contribution') was introduced in August 2010. Since then, a large number of such levies were legislated. These are presented in Table 2.

Table 2. Pensioners' solidarity contributions (2010-2013)

year	description
2010	Introduction of pensioners' solidarity contribution, i.e. a special levy on main pensions, with rates between 3% for pensions above €1,400 per month to 14% for pensions above €3,500 per month.
2011	a. Increase in pensioners' solidarity contribution's rates (varying from 3% to 14%)
	b. Introduction of additional pensioners' solidarity contribution for pensioners below 60 with main pensions exceeding €1,700 per month, with rates between 6% and 10%.
	c. Pensioners below (above) 55 with main old-age pensions exceeding €1,000 (€1,200) were subject to an extra solidarity contribution equal to 40% (20%).
2012	Main old-age pensions exceeding €1,300 were subject to an extra 12% contribution.
2013	If the sum of main and supplementary pensions exceeds €1,000 they are subject to an additional levy varying from 5% to 20%.

3. Literature review

Although the importance of   disentangling the annuity from the transfer component of public pensions has been discussed in theoretical terms both in the economics literature (Feldstein and Siebert, 2002) and in policy documents (Queisser and Whitehouse, 2006; World Bank, 1994), the empirical research on the issue remains relatively limited. The most important problem that these studies face is the lack of adequate data. Only in very few countries (such as U.S.A. and Germany) there exist income data covering a sufficiently large sample over a long period. For this reason, simulation techniques have often been used in order to generate data (i.e. lifetime flows of labour income of hypothetical workers) that are then used to compute the net present value of lifetime contributions and benefits.

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[5] The 13th and 14th monthly installments of invalidity pensions, social pensions and farmers' basic pensions were also abolished.

A comprehensive review of the existing empirical studies in several European countries and the U.S. can be found in Grammenos et al. (2006). Keeping in mind that the estimates of these studies rely on different sets of assumptions and make use of various methodological strategies, the literature on the lifetime redistributive impact of pension systems seem to be offering the following key insights: (a) with respect to intragenerational redistribution, most pension systems appear to favour low-income groups (with the exception of some studies for Italy and Spain), female over men, married over single persons and employees over self-employed; (b) with respect to intergenerational redistribution, average transfers rates are found to be positive in all pension systems studied (c) recent pension reforms seem to have weakened the progressive redistributive pattern of most pension systems and to have reduced the transfer component of pensions.

Moving to the case of Greece, to the best of our knowledge, the only relevant available research is the study of Mylonas and de la Maisonneuve (1999). The authors calculate the ratio of the present value of lifetime pension benefits to contributions and the annual rate of return of contributions under various hypothetical work and retirement scenarios. Their baseline scenario involves male workers in five economic sectors[6], starting their employment career at age 25 and retiring after 35 years, having equivalent salary paths (indexed to 100 at the start of their career and growing annually by 2% in real terms) and making pension contributions according to the contribution rates in place in each sector both before and after a major reform that took place in 1992. Pensions are indexed to inflation, remain constant in real terms and are received for a period of 15 years.

The main conclusion of this work is that the pre-reform contribution and replacement rates differ widely across sectors, but both of them are very high in all five sectors studied; in each occupational sector, the present value of main pension payments exceeds the present value of contributions by wide margins, often higher than 2:1. In the baseline scenario, civil servants seem to have by far the most generous main pension scheme, with a rate of return equal to 4.6. They are followed by employees in public enterprises, farmers, own account and self-employed workers and, finally, private sector employees with a rate of return equal to 0.9. Though the post-reform system is considerably less generous than any of the pre-reform regimes, the present value of lifetime main pension benefits continues to exceed the present value of lifetime contributions; its internal rate of return (i.e. the discount rate at which the present value of

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[6] The authors study the following occupational sectors: (i) private sector employees; (ii) own account and self-employed workers; (iii) farmers; (iv) civil servants and (v) employees in public enterprises.

lifetime pension benefits is equal to the present value of lifetime pension contributions) is estimated to be equal to 0.2.

It becomes obvious that workers that are identical in all respects apart from membership in a social insurance fund are treated very differently, and in ways that severely violate the rules of inter-generational equity. Are these results still valid two decades later full with (less, or more successful) pension reform attempts? How representative is the type of employee/pensioner described in the baseline scenario of Mylonas and de la Maisonneuve? The following sections attempt to shed light on these highly contested issues.

4. Data and methodology

In general, disentangling annuities and transfers in retirement benefits amounts to estimating the present value of lifetime contributions and comparing it to the present value of lifetime pension benefits usually at the time of retirement. In order to do that, a representative sample of 2008 retirees was used. The sample was provided by IKA, the country's largest social insurance fund, and covered 5,430 old age pensioners, i.e. 15.7% of all IKA contributors who retired on an old-age pension in 2008. More specifically, it contained information on the following variables:

- Gender
- Age at retirement
- Length of contribution record
- Type of occupation ('hard and arduous' or not)
- Insurance class[7] at the time of retirement
- Total pension amount
- Legal basis for retirement[8]
- Total pension amount

After omitting observations with missing information regarding their insurance class, age, number of contribution days, as well as people with acquired pension rights from countries other than Greece and individuals previously contributing to funds that were administratively merged with IKA in 2008, the final sample was reduced to 4,795 observations (i.e. 14.7% of all

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[7] In IKA social insurance contributions are related to workers' "reference earnings". Reference earnings reflect the notional earnings for every one of IKA's 28 insurance classes where private sector employees are placed according to their actual earnings.

[8] The law that was used for the pension entitlement to be claimed.

IKA old-age retirees in 2008). The distribution of the sample's pensioners by retirement age and gender is presented in Figure 1. The average retirement age is 60.8 for men and 58.4 for women. The distribution has three local maxima for men at the ages of 61, 59 and 66 and three for women at the ages of 56, 61 and 51. Individuals retiring below 60 (65) represent 45.9% (87.5%) of the total sample.

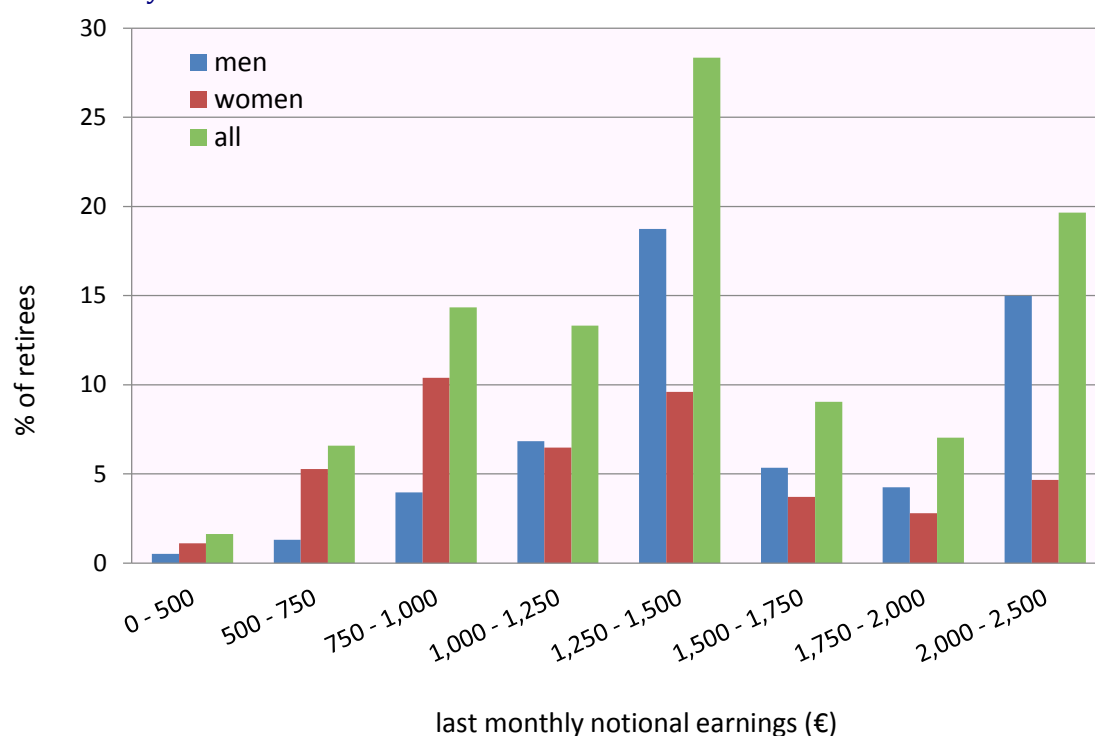Figure 1. Distribution of IKA old-age retirees by retirement age
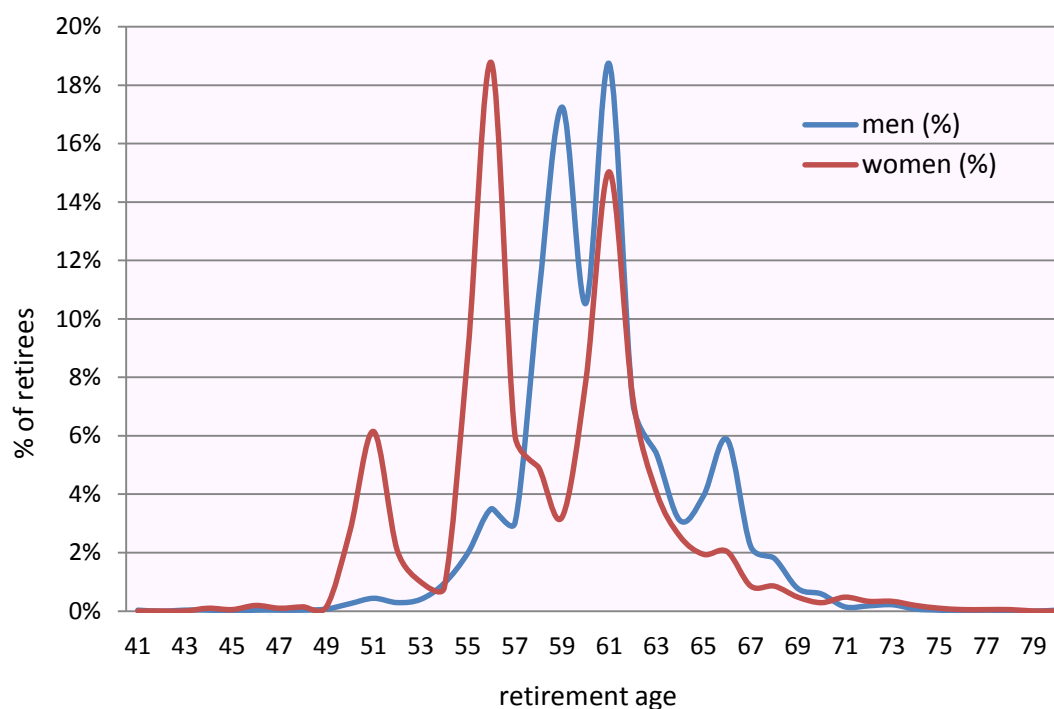
Source: Own estimations based on the sample of old-age pension retirees of year 2008, provided by IKA.

Although it has not been possible to gain access to workers' full record of contributions paid as such information is not available, we have been able to calculate their last notional monthly earnings (and hence contributions paid) by using the information on their insurance class at the time of retirement (see Figure 2).[9] The distribution of IKA old-age retirees according to the length of their contributory record is shown in Table 3. The backward induction of earnings throughout the whole contributory period was made by assuming that the workers' earnings rose in line with minimum wages. The evolution of the minimum wage in 1973-2007 and IKA's social insurance contributions formulae for main pensions are presented in the Appendix (Tables A4-A5).

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[9] By using employees' insurance class in order to reconstruct their last notional daily earnings, we have also been able to take into account IKA's upper earnings threshold, which is applicable to both employers' and employees' social insurance contributions. Note that employees' last (notional) earnings refer to year 2007.

Figure 2. Distribution of IKA old-age retirees according to their last monthly notional earnings by sex

Note: Employees' last notional earnings refer to year 2007. The average last salary was €1,595 for men and €1,276 for women.

Source: Own estimations based on the sample of old-age pension retirees of year 2008, provided by IKA.

Table 3. Distribution of IKA old-age retirees according to their contributory record

contribution years	men (as % of all)	women (as % of all)	all (%)
<=15	5.8	9.7	15.5
16-20	9.1	13.0	22.1
21-25	7.9	8.9	16.8
25-20	7.8	6.0	13.9
31-35	13.5	4.4	17.9
>=36	11.9	2.0	13.9

Notes: Average contribution years: 28 for men and 22 for women.
Minimum contribution years: 11. Maximum contribution years: 51

Source: Own estimations based on the sample of old-age pension retirees of year 2008, provided by IKA.

Actuarial fairness requires lifetime contributions to be equal to lifetime benefits, as if contributions were paid not into a defined-benefit pay-as-you-go scheme, but into a defined-contribution funded one. This begs two questions: first, what a reasonable return on contributions, had they been invested in a funded pension scheme, might have been. Second, what rate might be applied at the time of retirement in order to convert the stock of

accumulated contributions into a flow of periodic payments ('annuities'). As regards the first question, we work with two assumptions: (a) return equal to 2% in real terms, i.e. providing full protection against inflation risk plus a premium, or (b) return equal to that of yearly government bonds, i.e. assumed to be providing considerable protection against investment risk. The first assumption is part of the ***baseline scenario***, whereas the second one is used as a sensitivity check. For example, under assumption (a) an investment of €100 in 1961 would yield €18,209 in 2007; the same investment would yield €9,802 under assumption (b). On the other hand, an investment of €100 in 1985 would yield €1,010 in 2007 under assumption (a) and €1,205 and under assumption (b).

Note that in reality pension funds tend to invest in safer assets, such as bonds,[10] and impose investment restrictions in certain asset categories, such as equities or property.[11] Inflation and yearly Greek government bond returns in 1961-2007 are presented in Figure 3.

Figure 3. Inflation and yearly government bond returns (1961-2007)
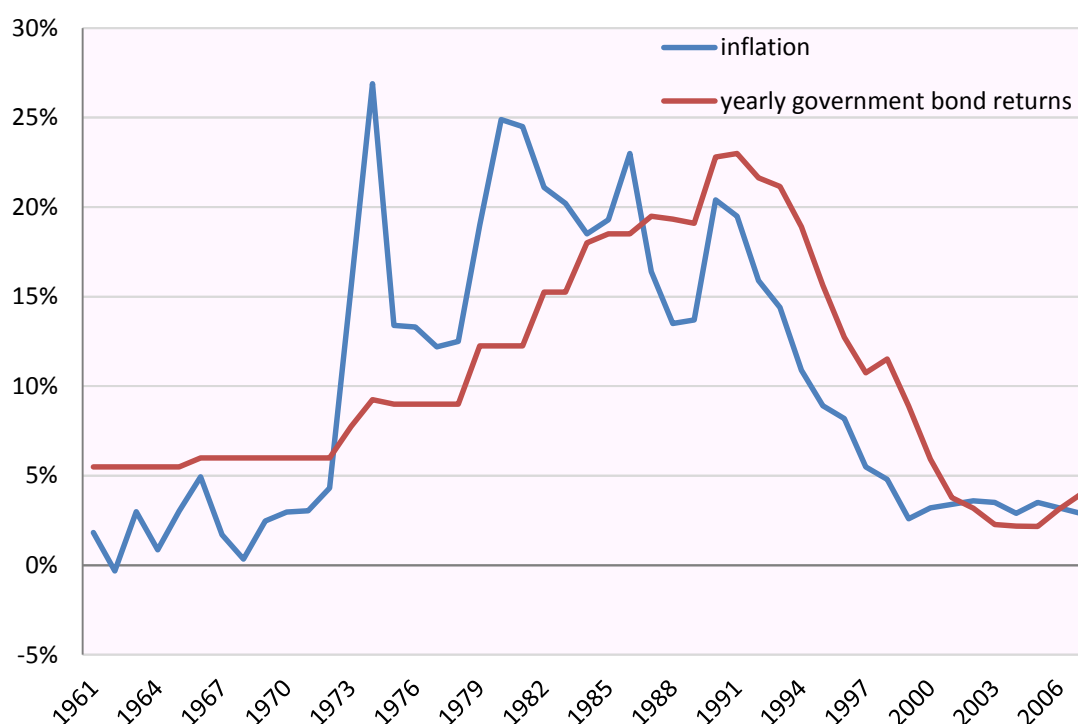
Sources: El.Stat. (annual average rate of change of Harmonized Index of Consumer Prices- HICP), Bank of Greece (annual average rate of return of 52-week government bonds).

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[10] Even though bonds are usually considered as a safe option for an investment portfolio, in Greece pension funds were subject to significant losses in 2011 due to the 53% 'haircut' of Greek bonds in the context of the PSI ('Private Sector Involvement') programme.

[11] The vast majority of OECD countries set quantitative limits on the investment decisions of pension funds. Investments in equities are capped in 21 out of the 34 OECD countries (OECD, 2014).

Valuing this income stream in the year in which retirement takes place (2008), the total social insurance contributions amount would be the cumulated sum of employees' and employers' contributions revalued at these implicit interest rates.

As regards the second question, the present value of lifetime pension benefits was computed on the basis of the following assumptions:[12]

- The period for which benefits are received is equal to the life expectancy at the age of retirement. Information on life expectancy at selected ages for both men and women can be found in the Appendix (Table A7).[13]
- In line with the relevant literature, the discount rate applied to express the future stream of pensions in terms of present values (i.e. 2008) in the baseline scenario is set equal to 2%.[14] By way of sensitivity analysis, the rate of return of 15 and 32-year government bonds in 2008 (i.e. 4.76% and 4.95% respectively) were linearly expanded in order to construct a series of returns that corresponds to the life expectancy of each retiree, ranging from 4.68% (for retirees with life expectancy equal to 8 years) to 5.04% (for retirees with life expectancy equal to 40 years).

So far we have discussed how we estimate actuarial fairness of pension benefits as of 2008. However, as has been seen in the previous sections, the 2010-2013 austerity measures have significantly affected the amounts of main pensions. The 2010 pension reform also provides for a completely different calculation of pensions. In our attempt to account for these developments, three different scenarios have been constructed:

1. **Pre-austerity scenario**: in this scenario we assume that pension amounts are paid 14 times per year. In 2009-2013 they are uprated in line with the harmonised consumer prices index and from 2014 onwards they are assumed to remain constant in their 2013 levels.

2. **Post-austerity scenario**: in the scenario we simulate in a gradual way (i.e. year by year, taking into account the exact month that each measure was introduced) the austerity measures related to main pensions that were legislated in the period 2010-2013, as

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[12] The detailed process that has been followed for the calculation of the present value of lifetime contributions and benefits of IKA retirees is available upon request (VBA code).

[13] Note that in the sample of IKA retirees average life expectancy is 20.7 years for men and 25.5 years for women.

[14] This rate is also close to the one actually used in countries that have adopted notional defined contribution pension systems such as Sweden and Italy (1.6% and 1.5% respectively).

described in Section 2.3.2. From 2014 onwards pension amounts are assumed to remain constant in their 2013 levels and to be paid 12 times per year.[15]

3. **2010 pension reform scenario**: in this scenario we re-calculate pensions received in 2008 according to the rules that were established by the 2010 pension reform (as described in Section 2.3.1). In other words, we estimate the pension amounts that retirees would have received if the rules established by Law 3863/10 had been applicable in 2008. In order to - partially- take into consideration the high disincentives for retirement that this reform has introduced for people with short contribution histories, retirees with less than 4,500 days of contributions are excluded from the sample (196 cases). These pension amounts are assumed to remain constant throughout the lives of retirees and to be payable 12 times per year.

Table 4 presents the 2014 yearly[16] average pension amounts of the three scenarios per decile, as well as their percentage changes. The sample's observations have been ranked in deciles according to the present value of lifetime contributions; as lifetime contributions are the same in all three scenarios, this ranking guarantees that the estimated changes are not due to re-ranking effects. We estimate that the average decrease in main old-age IKA pensions due to the 2010-2013 austerity measures has been 28.8%. Interestingly, average reductions are uniform for deciles 1-6; this finding suggests that these deciles have only been affected by the austerity measures related to the provision of the 13th and 14th monthly pension instalments. As we move on to higher contribution deciles, the estimated average reductions become much larger, exceeding 38% for decile 10. Assuming that the pension system introduced by Law 3863/10 had been in place throughout the lives of the 2008 retirees (column 3), we estimate that average pensions would have been 9.3% lower compared to the post-austerity scenario.[17] Changes in average pensions paid to deciles 1-6 are found to be rather limited - and positive for deciles 2-4. Again, as we move to higher contribution deciles, reductions in the average pension amounts are estimated to exceed 10%, and to reach a maximum of 17.5% for decile 9. This seems to be the combined effect of the introduction of the basic pension amount (which is common for all retirees, irrespective of contributions paid) and the new benefit computation formula that takes

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[15] By remaining constant in their 2013 levels, pensions are allowed to decrease in real terms. In principle, this is in accordance with the rules established by the 2010 pension reform. It is also an indirect way of taking into account the possibility of further pension cuts in the near future, followed by pension increases in the longer term.

[16] Pensions are presented in yearly terms in order to take into account the austerity measures related to the provision of the 13th and 14th monthly pension instalments.

[17] Comparisons are made with the post-austerity (rather than the pre-austerity) scenario, as this is the one actually in place in 2014.

into account the earnings of the whole working life of individuals rather than those of the last few years.

Table 4. Average pension amounts per decile (2014, yearly amounts)

deciles	pre-austerity (1)	post-austerity (2)	2010 pension reform (3)	% change (1) vs (2)	% change (2) vs (3)
1	6,855.6	5,368.9	5,212.9	-21.8	-2.9
2	7,178.6	5,621.9	5,743.8	-21.6	2.2
3	7,703.4	6,032.9	6,159.3	-21.7	2.1
4	8,331.1	6,524.5	6,531.6	-21.7	0.1
5	9,211.6	7,214.0	7,156.9	-21.7	-0.8
6	10,836.0	8,482.6	8,116.0	-21.7	-4.3
7	13,576.9	10,504.8	9,332.6	-22.6	-11.2
8	17,111.4	12,769.7	10,801.4	-25.4	-15.4
9	23,111.4	15,806.0	13,041.9	-31.6	-17.5
10	28,201.5	17,442.6	15,013.7	-38.2	-13.9
all	13,456.2	9,735.7	8,831.1	-28.8	-9.3

Notes: Deciles are constructed on the basis of the present value of lifetime contributions. The rate of return on contributions is equal to 2% in real terms. Pensions are in € per year. For comparative reasons, retirees with less than 4,500 days of contributions have been excluded from the sample in all three scenarios (n = 4,599).

Source: Own calculations, based on the IKA sample of 2008 retirees.

The main objective of this research is to quantify the **transfer component** of IKA main pensions, as described in the three above-mentioned scenarios. Let NPV_C denote the net present value of lifetime social insurance contributions and NPV_B denote the discounted value of lifetime pension benefits. Both income streams are valued in year 2008. The transfer component of pensions is defined as:

Transfer component (%) = (NPV_B – NPV_c) / NPV_B

If positive, the transfer component represents the implicit subsidy paid to pensioners by taxpayers, as a proportion of the lifetime pensions received. If negative, it represents the implicit subsidy paid from pensioners to taxpayers. In this context, a pension system can be defined as *progressive* if the transfer component is higher for those situated in the lower contribution deciles of Table 5 and decreases as we move to higher deciles. A pension systems that attempts to combine the (conflicting) objectives of actuarial fairness with progressive redistributive would feature a close-to-zero average transfer component; this would be the joint effect of positive transfers to those on low lifetime contributions, smoothly declining as contributions rise. The transfers would have to be reasonably small, so that they do not create incentives for early retirement or contribution evasion.

Since lifetime contributions were assumed to be treated as an investment, the internal rate of return (IRR) of this 'investment' was also calculated. The IRR is defined as the discount rate at which the present value of lifetime pension benefits NPV_b is equal to the present value of lifetime pension contributions NPV_c. If the IRR is greater than the discount rate used to express the future stream of pensions in terms of present values then the system is considered to have an implicit rate of return that is higher than the actuarially fair rate of return.

5. Results and discussion

Have IKA old-age pensioners who retired before the current crisis 'earned' their pensions through their (and their employers') contributions? Or was their retirement subsidised by current and, especially, future generations of taxpayers? More formally, what proportion of their pension benefits was 'annuities' (i.e. corresponded to the pension contributions they and their employers had paid over their working life), and what was 'transfers' (i.e. amounted to a subsidy paid for by society at large)? How did the 2010-2013 austerity cuts affect the relative shares of annuities vs. transfers? How would these shares change if pensions in 2008 were calculated according to the rules established by the 2010 pension reform? In this section we attempt to provide some tentative answers to these questions.

5.1 Transfer component of IKA main old-age pensions

Table 5 presents the share of lifetime contributions of each decile for both men and women. It is estimated that individuals in the first five deciles have accumulated a relatively low amount of contributions: their share is almost 25% of total contributions. On the other hand, the share of decile 10 alone (i.e. the 10% of the sample with the highest lifetime contributions) is estimated to be as high as 22% of total contributions. Women's lifetime contributions are found to be significantly lower than men's. This can be explained by women's shorter employment careers (22 years on average versus 28 for men – also see Table 3) as well as their lower earnings at the time of retirement: 38.1% of women received less than €1,000 as a final monthly -notional- salary, whereas the respective percentage for men was 10.4% (also see Figure 2). Table 6 also shows that the share of men (women) rises (falls) steeply as we move from lower to higher deciles. In fact, in decile 10 only 12% of observations are women.

Table 5. Relative frequency distribution of lifetime contributions

deciles	share of contributions (%)			as % of observations	
	men	women	all	*men*	*women*
1	0.4	2.0	2.4	*17.9*	*82.1*
2	1.2	2.6	3.8	*31.9*	*68.1*
3	1.9	3.1	5.0	*38.1*	*61.9*
4	3.0	3.1	6.1	*49.1*	*50.9*
5	4.3	3.2	7.5	*56.9*	*43.1*
6	6.1	3.2	9.3	*64.9*	*35.1*
7	7.9	3.6	11.5	*68.8*	*31.3*
8	9.6	4.7	14.3	*67.2*	*32.8*
9	14.0	4.2	18.2	*77.1*	*22.9*
10	19.2	2.5	21.7	*87.9*	*12.1*
all	67.7	32.3	100.0	*56.0*	*44.0*

Notes: Deciles are constructed on the basis of the present value of lifetime contributions. The rate of return on contributions is equal to 2% in real terms.

Source: Own calculations, based on the IKA sample of 2008 retirees.

The share of lifetime benefits of each contribution decile is presented in Table 6. We can see that the shares increase as we move to higher contribution deciles in all estimated scenarios. The share of benefits held by the 30% of the sample with the highest lifetime contributions decreases from 52% in the pre-austerity scenario to 49% in the post-austerity scenario and to 46% in the 2010 pension reform scenario. As seen in Section 2, under the regime established by Law 3863/10 pension benefits have a basic and a proportional part. We estimate that the basic part of total lifetime pensions declines monotonically from 82.7% for decile 1 to 28.8% for decile 10. Note that, in total, the basic part of lifetime pension benefits is found to be almost equal to the proportional one.

Table 6. Relative frequency distribution of lifetime benefits (ranked by lifetime contributions)

deciles	pre-austerity	post-austerity	2010 pension reform		
			total benefits	*...of which, basic part (%)*	*...proportional part (%)*
1	5.1	5.4	5.4	*82.7*	*17.3*
2	5.6	5.9	6.1	*75.2*	*24.8*
3	5.9	6.3	6.2	*70.1*	*29.9*
4	6.5	6.9	7.6	*66.1*	*33.9*
5	7.0	7.4	8.5	*60.3*	*39.7*
6	8.1	8.6	9.5	*53.3*	*46.7*
7	10.1	10.7	10.9	*46.4*	*53.6*
8	13.1	13.3	12.8	*40.0*	*60.0*
.09	17.5	16.7	15.4	*33.2*	*66.8*
10	21.2	18.7	17.5	*28.8*	*71.2*
all	100.0	100.0	100.0	*49.0*	*51.0*

Notes: Deciles are constructed on the basis of the present value of lifetime contributions.

Source: Own calculations, based on the IKA sample of 2008 retirees.

Tables 7-9 present the average transfer components of IKA main old-age pensions that were estimated in the pre-austerity, post-austerity and 2010 pension reform scenarios, by contribution decile. Separate estimates are provided for both men and women. Figure 4 compiles the overall estimates into a single graph. Average lifetime transfer amounts (in 2008 euros) per contribution decile are also presented in the tables and assembled together in Figure 5.

We observe that in all three scenarios the average transfer component of pensions is well above zero; this finding suggests that the vast majority of transfers correspond to implicit subsidies paid by current and future tax payers to the 2008 IKA retirees. In the pre-austerity scenario the estimated average transfer reaches 49.3% of lifetime pension benefits. In absolute terms, average lifetime transfers are estimated to be a bit more than €114 thousand. The 2010-2013 austerity measures seem to have reduced the transfer component by almost 14 percentage points (to 35.8%) and the average transfer amount by approximately 55 thousand euros (to €59.4 thousand) but still, 98.6% of retirees continue to receive positive transfers (versus 99.5% of retirees in the pre-crisis scenario). In the 2010 reform scenario, the estimated transfer component of pensions is reduced even further to 27.1% on average. In absolute terms, average lifetime transfers slightly exceed €35 thousand, whereas the percentage of retirees receiving positive transfers falls to 87.6%.

Focusing on gender differences, the non-contributory part of women's pensions is estimated to be significantly larger than that of men: by 14 percentage points on average in the pre-austerity, 19 percentage points in the post-austerity and more than 29 percentage points in the 2010 reform scenario. A reason that explains part of the difference in all three scenarios is biological: women live longer than men. The existence of favourable legislation for women retiring in 2008 (i.e. allowing for earlier exit from work, special conditions for mothers of dependent children etc.) exacerbates the disparities. The increase in the difference between the pre and post-austerity scenarios implies that women were relatively less affected by the recent pension cuts than men. This is because, as was previously shown, the austerity measures affected much more severely deciles 9 and 10, and in these deciles men feature prominently. An equivalent reasoning holds for the estimated increase in the difference between the post-austerity and the 2010 reform scenarios; the pension system introduced by Law 3863/10 mostly made a difference to individuals with long contributory records and, as can been seen in Table 3, these are typically men.

As can be seen in Figure 4, the estimated transfer paid to retirees belonging to the first decile exceeds two-thirds of lifetime benefits in all three scenarios. This result is mostly due to the

existence of minimum pensions, which are intended to ensure that all pensions reach at least a specified minimum threshold.[18]

The estimated transfer component in the pre-austerity scenario declines monotonically from 73.6% for bottom decile 1 to 39.1 for decile 7, then rises again to 46.1% for top decile 10. This increase is mostly due to people with a contributory record of 37 years or more.[19] This suggests a somehow perverse distributive pattern, where taxpayers not only subsidise pensioners situated on low contribution deciles, but also those with lengthy careers and high lifetime contributions (with the latter being much more heavily subsidised than the former, in absolute terms). This pattern is broadly reversed when the 2010-2013 austerity measures are taken into account: the transfer component is estimated to decrease as we move from decile 1 to decile 6, remain constant (at around 25%) until decile 9 and further decrease as we move to decile 10. Remarkably, compared to the pre-austerity scenario, the decrease in the transfer component of pensions received by the 10% of the sample with the highest lifetime contributions is estimated to be as high as 25 percentage points (from 46.1% to 21.3%).

The system established by the 2010 pension reform seems to be the least generous but also the most linear of all. Compared to the post-austerity scenario, the biggest decreases in the transfer component seem to be taking place in deciles 7-10 (by 17 percentage points on average). The progressivity of the system is also more pronounced; as in the previous scenarios, it pays much more to those who have contributed less. Contrary to the two previous cases, male retirees located in decile 9 receive lifetime pensions that are very close to actuarial fairness, whereas those located in decile 10 are now becoming net contributors to the retirement pension system (as their estimated average transfer component becomes negative).

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[18] Pensions might as well be lower than this minimum threshold in case of early retirement. The thresholds in the pre and post-austerity scenarios are depicted in Table 1. In the 2010 reform scenario, where the threshold is equal to the equivalent of 15 minimum daily wages per month, pensions are not allowed to fall below €392.70 per month.

[19] In 2008 people having contributed for 37 years (or more) were allowed to retire irrespective of age. 95% of these people are located in deciles 7-10 (51% in decile 10).

Table 7. Average transfer component of pensions (%): pre-austerity scenario

deciles	men	women	all	*average lifetime transfer (€)*
1	71.1	74.1	73.6	*90,251*
2	55.8	64.8	62.0	*84,778*
3	49.2	57.4	54.3	*77,534*
4	46.0	54.2	50.1	*78,909*
5	39.1	48.9	43.3	*73,455*
6	35.7	45.7	39.2	*78,812*
7	35.9	46.1	39.1	*99,315*
8	38.2	46.1	40.8	*134,264*
9	44.0	48.2	45.0	*191,959*
10	45.6	50.4	46.1	*236,242*
all	43.2	57.2	49.3	*114,543*

Notes: Deciles are constructed on the basis of the present value of lifetime contributions. The rate of return on contributions is equal to 2% in real terms.

Lifetime transfer = NPV_B - NPV_C (both income streams are valued in year 2008).

Source: Own calculations, based on the IKA sample of 2008 retirees.

Table 8. Average transfer component of pensions (%): post-austerity scenario

deciles	men	women	all	*average lifetime transfer (€)*
1	65.3	68.4	67.9	*68,636*
2	46.8	56.7	53.6	*60,499*
3	38.6	47.7	44.2	*52,076*
4	34.4	43.4	39.0	*50,579*
5	25.9	36.9	30.6	*43,158*
6	21.5	32.9	25.5	*43,163*
7	21.1	33.0	24.8	*53,013*
8	22.0	31.5	25.1	*66,969*
9	24.0	30.5	25.5	*81,045*
10	20.4	27.7	21.3	*75,074*
all	27.3	46.5	35.8	*59,421*

Notes: Deciles are constructed on the basis of the present value of lifetime contributions. The rate of return on contributions is equal to 2% in real terms.

Lifetime transfer = NPV_B - NPV_C (both income streams are valued in year 2008).

Source: Own calculations, based on the IKA sample of 2008 retirees.

Table 9. Average transfer component of pensions (%) – 2010 pension reform scenario

deciles	men	women	all	*average lifetime transfer (€)*
1	61.6	68.7	67.3	*62,145*
2	44.9	59.3	54.8	*59,860*
3	34.4	49.0	44.0	*51,504*
4	30.0	44.5	37.5	*47,522*
5	21.3	37.3	28.2	*38,667*
6	14.9	30.9	20.5	*32,433*
7	9.6	24.3	14.2	*26,542*
8	3.8	20.5	9.3	*22,430*
9	1.1	16.2	4.5	*14,918*
10	-0.6	12.3	0.9	*5,095*
all	14.4	43.8	27.1	*35,278*

Notes: Deciles are constructed on the basis of the present value of lifetime contributions. The rate of return on contributions is equal to 2% in real terms.

Lifetime transfer = NPV_B - NPV_C (both income streams are valued in year 2008).

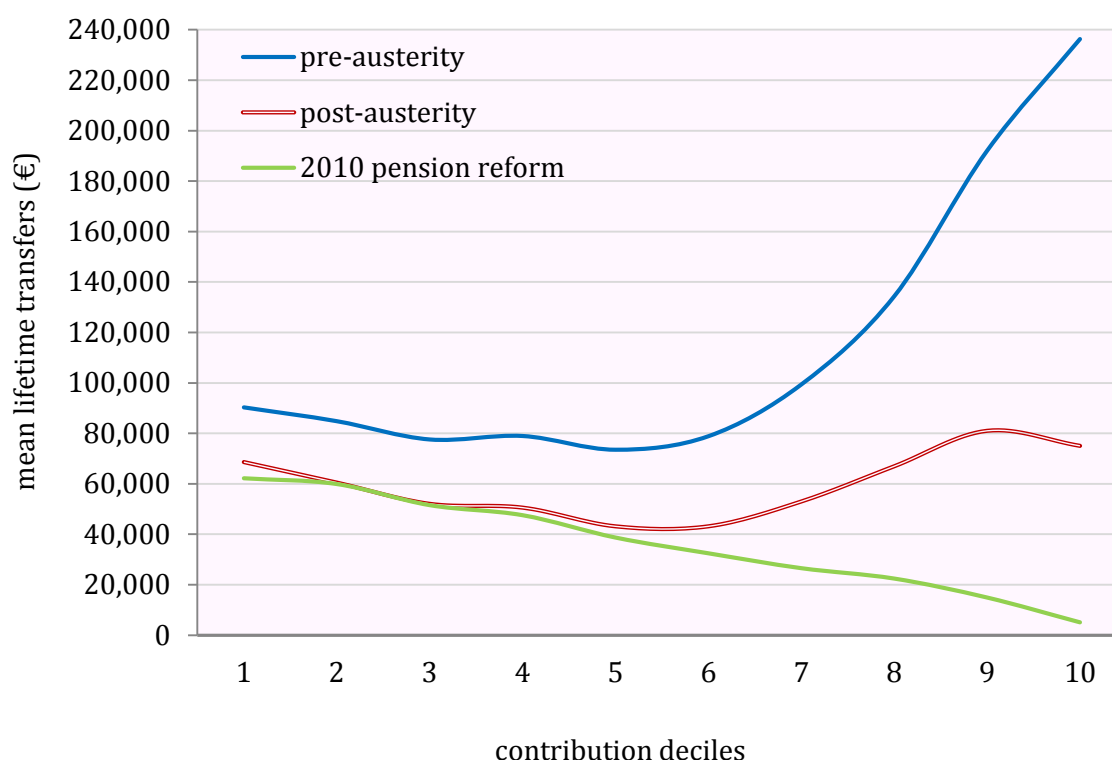Source: Own calculations, based on the IKA sample of 2008 retirees.

Figure 4. Average transfer component of pensions by contribution decile (%)
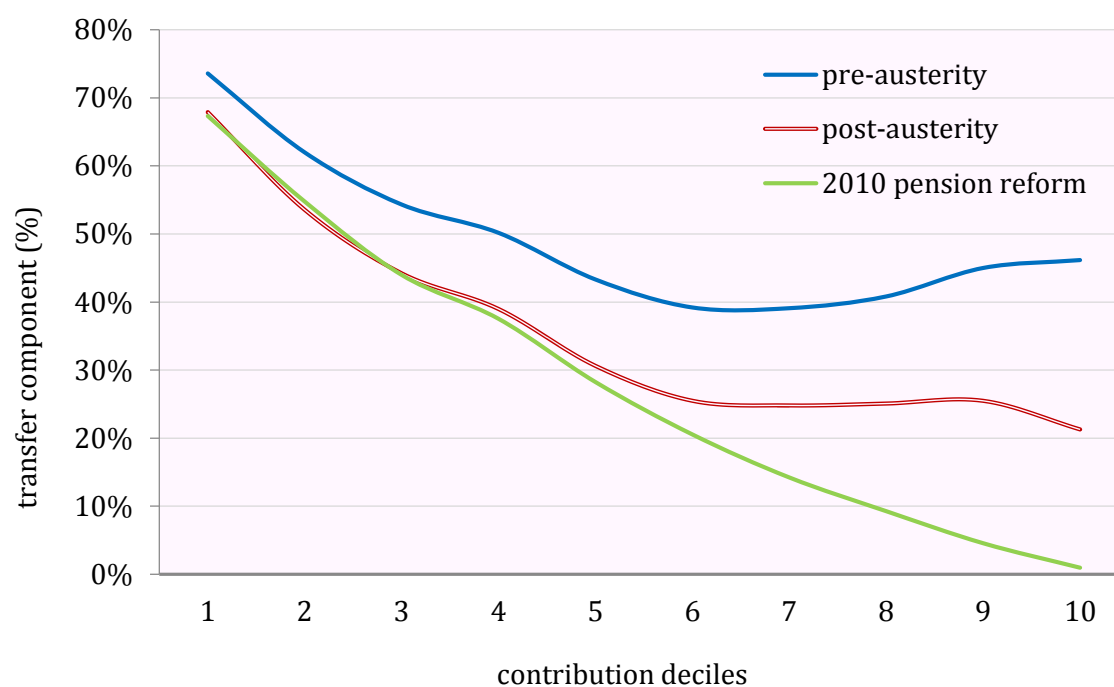
Notes: Deciles are constructed on the basis of the present value of lifetime contributions. The rate of return on contributions is equal to 2% in real terms.

Source: Own calculations, based on the IKA sample of 2008 retirees.

Figure 5. Average lifetime transfers by contribution decile (€)

Notes: Lifetime transfer = NPV$_B$ - NPV$_C$ (both income streams are valued in year 2008).
          Deciles are constructed on the basis of the present value of lifetime contributions. The rate of return on contributions is equal to 2% in real terms.
Source: Own calculations, based on the IKA sample of 2008 retirees.

Figures 6 – 8 offer a visual representation of the relationship between lifetime contributions and lifetime transfers under the three considered scenarios, as well as the fitted OLS regression lines. The black solid line shows the scenario of actuarial fairness, where lifetime contributions equal lifetime benefits. We can see that in all scenarios our explanatory variable (i.e. lifetime contributions) explains around 85% of the variability of lifetime transfers around their mean. The return on contributions, proxied by the slope of the fitted lines, is positive and decreases as we move from the pre-crisis to the 2010 pension reform scenario (from 1.66 to 0.76). In the latter, the fitted line is much closer to the line of actuarial fairness and goes below it when lifetime contributions exceed €270 thousand.
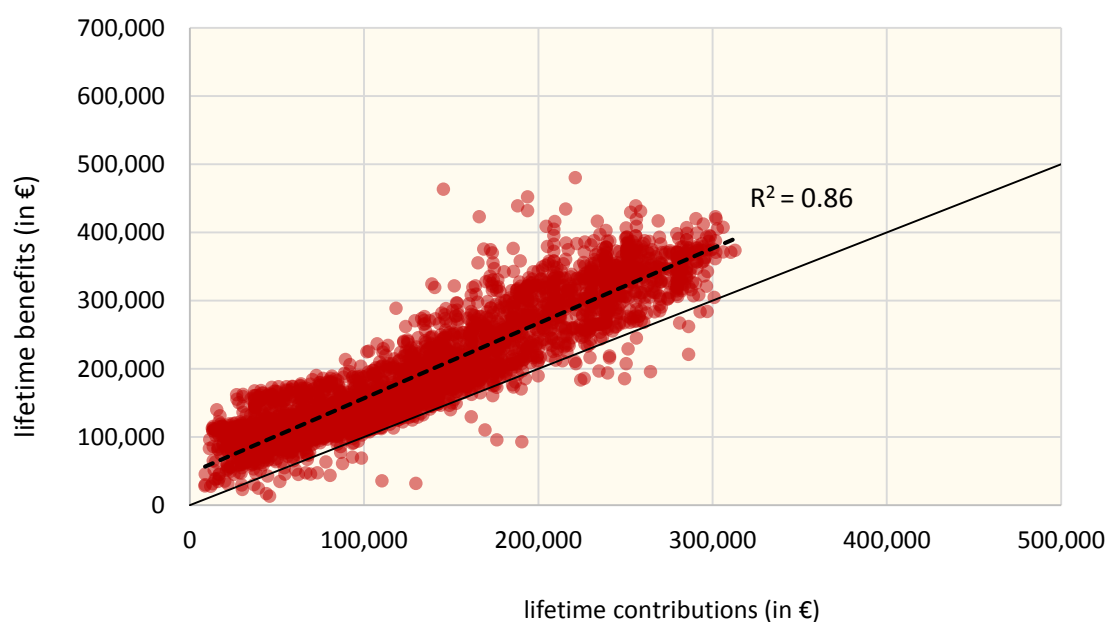
Figure 6. Scatter plot and fitted OLS regresion line: pre-crisis scenario
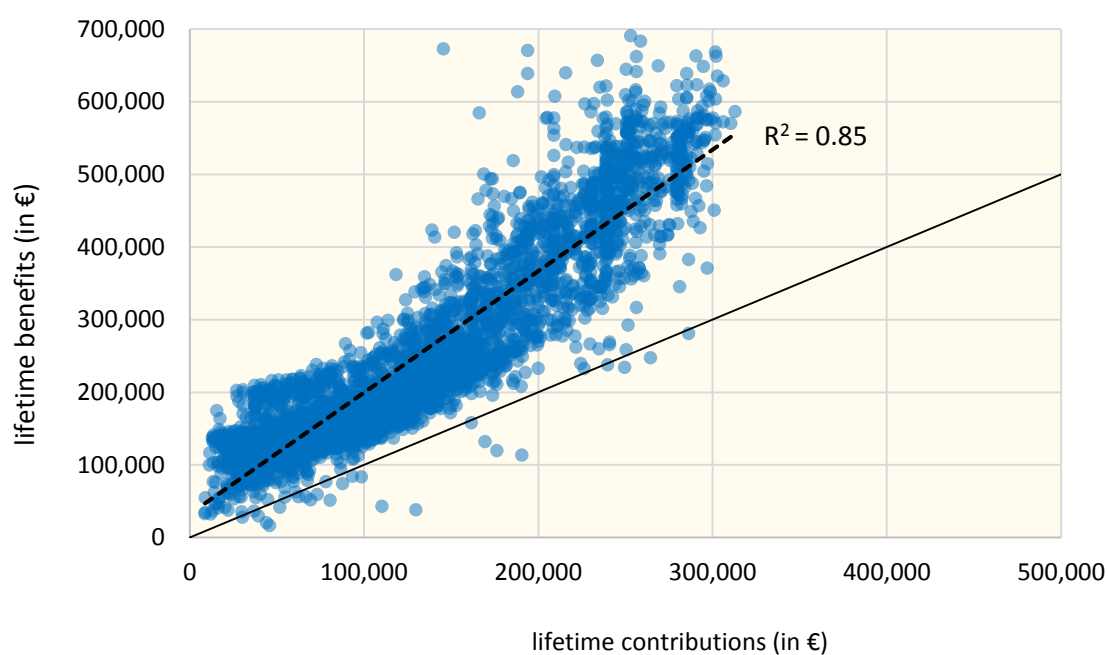
Notes: Both income streams are valued in year 2008.

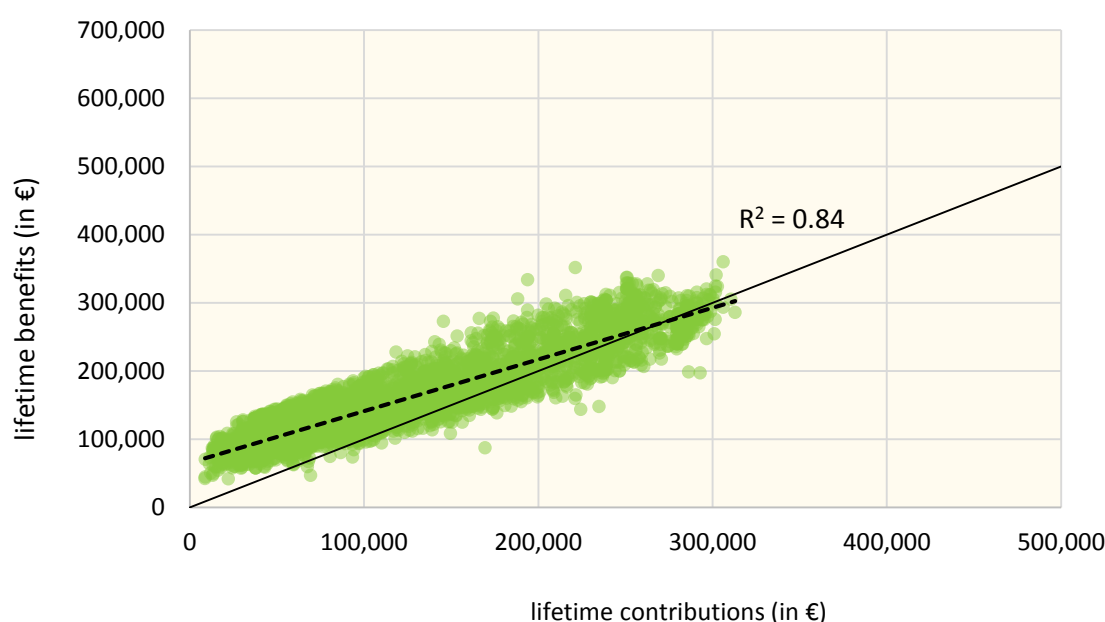Source: Own calculations, based on the IKA sample of 2008 retirees.

Figure 7. Scatter plot and fitted OLS regresion line: post-crisis scenario

Notes: Both income streams are valued in year 2008.

Source: Own calculations, based on the IKA sample of 2008 retirees.

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Figure 8. Scatter plot and fitted OLS regresion line: 2010 pension reform scenario

Notes: Both income streams are valued in year 2008.

Source: Own calculations, based on the IKA sample of 2008 retirees.

The high variability of transfers between different population sub-categories is clearly depicted in Table 10. In all three scenarios the transfer part of pensions increases when retirement age goes down. Even though the average transfer components are falling for all age clusters as we move from the pre-austerity to the pension reform scenario, the difference in the transfer parts between those retiring at the age of 55 or earlier and those retiring after they reach the age of 65 remains relatively stable (around 20 percentage points).

The pre-austerity system seems to be benefiting both those with the least contribution years as well as those with the most. This picture seems to change drastically when pensions are calculated according to the rules established by Law 3863/10; the non-contributory part of pensions for those with the longest contribution histories (i.e. more than 31 years) decreases substantially to less than 10 percent, i.e. almost 18 percentage points below the estimated average of this scenario. The transfer component of retirees previously employed in hard and arduous occupations is 6 percentage points below the average in the pre-austerity scenario, 7 in the post-austerity and almost 12 in the 2010 pension reform scenario. On the other hand, the respective transfer for mothers of dependent children seems to remain well above the average (by more than 15 percentage points) in all three scenarios.

Table 10. Average transfer component of pensions by sub-categories (%)

	scenarios			nr of cases (as % of total)
	pre-austerity	post-austerity	2010 pension reform	
retirement age				
<=54	62.3	51.2	44.1	7.4
55-59	51.0	36.7	28.6	38.5
60-64	47.3	33.7	24.0	41.6
>=65	43.4	30.5	22.8	12.5
contribution years				
<=15	62.6	54.7	53.4	15.5
16-20	56.5	46.8	44.7	22.1
21-25	45.4	32.9	29.2	16.8
25-20	39.4	24.8	16.7	13.9
31-35	42.5	24.6	8.6	17.9
>=36	46.7	26.0	9.6	13.9
hard and arduous				
no	52.4	39.6	33.0	64.2
yes	43.8	28.8	16.4	35.8
mothers of dependent children	60.4	53.9	49.4	6.3
all	49.3	35.8	27.1	100.0

Source: Own calculations, based on the IKA sample of 2008 retirees.

The results obtained so far have been based on the hypothesis that lifetime contributions are converted to present values by using a rate of return equal to 2% in real terms. The use of a rate of return equal to yearly government bonds does not seem to significantly affect the calculated transfers or their distributional patterns; the average transfer components of pension benefits are estimated to go slightly up in all three scenarios (from 49.3% to 50.3%, from 35.8% to 37% and from 27.1% to 28.5% in the pre-austerity, post-austerity and 2010 pension reform scenarios respectively).

5.2 Internal rates of return of main old-age IKA pensions

As can be seen in Figure 9, the estimated internal rates of return (IRRs) of lifetime contributions mirror the patterns of transfers described above. The average IRR was estimated to be 10.7% in the pre-austerity scenario, to fall to 7.9% when the 2010-2013 austerity measures are taken into account and to be further reduced to 6.3% in the pension reform scenario.[20] We observe that in all cases the IRRs remain well above the discount rate of 2% applied in our baseline

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[20] Note that, in the pre-austerity and 2010 pension reform scenarios future cash flows are assumed to remain constant in their 2008 nominal levels. In the post-austerity scenario, pension amounts up to 2013 were recalculated on a year-by-year basis, taking into account (i.e. simulating) all the implemented austerity measures; from 2014 onwards pensions are assumed to remain constant in their 2013 nominal levels.

analysis. They are also higher than the returns offered by alternative investment options, such as fixed-term deposits, government bonds, shares etc.

Figure 9. Internal rates of return of IKA reitrees (%)
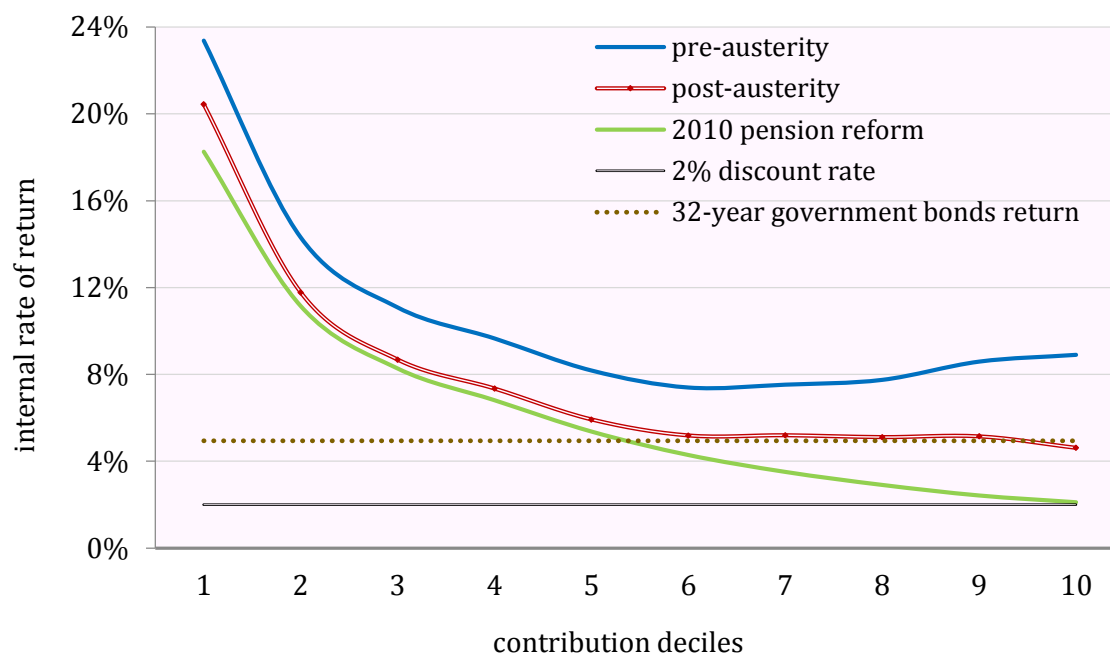
Notes: Deciles are constructed on the basis of the present value of lifetime contributions. The rate of return of contributions is equal to 2% in real terms.

Source: Own calculations, based on the IKA sample of 2008 retirees.

For retirees located in the first and second contribution deciles the calculated IRRs are much higher than the average whereas for those located in the highest contribution deciles the IRRs are moving closer to a situation of actuarial fairness, especially in the 2010 pension reform scenario. This means that the implicit retirement pension contract becomes less profitable for the biggest contributors of the system.

As a way of sensitivity analysis lifetime contributions are converted to present values by using an alternative rate of return, equal to yearly government bonds. In that case average IRRs are found to be slightly higher (11.1%, 8.3% and 6.6% in the pre-austerity, post-austerity and 2010 pension reform scenarios respectively) and follow the same distributive patterns.

Finally, if the estimated IRRs (i.e. 10.7%, 7.9% and 6.3% on average for each of the scenarios) are evaluated against a discount rate of future pension benefits equal to the rate of return of 32-year government bonds (i.e. 4.95% in 2008), IKA old-age pensions would still be above the actuarially fair threshold. However, since the threshold would now be higher (and, hence, the present value of future pensions flows would be significantly lower), retirees located in decile 5

and above can be considered as receiving lifetime pensions that are very close to actuarial fairness in the post-austerity scenario and less than actuarially fair in the 2010 pensions reform scenario.

5.3 Reasons for caution

A certain amount of caution is called for when interpreting the above results. The main limitations to do with the assumptions used are discussed below.

In the absence of data on workers' lifetime contributory record (only their last notional daily earnings are available in the data), we attempt to reconstruct their earnings profile on the basis of a backward induction, assuming that they followed the evolution of minimum wages.[21] To some extent, this is a reasonable assumption, since the course of minimum wages usually reflects, in broad terms, the course of the overall economy (and also considering the fact that the last earnings of almost ¼ of retirees in the sample are very close to this level). However, other earning profiles such as steeper or more erratic, more stable or with periods of inactivity or unemployment spells, rising faster or slower than the minimum wage, are bound to exist. To some extent they are also bound to cancel each other out. As most of the labour market literature suggests that that job displacements cause workers' future earnings to drop, including such events when reconstructing individuals' contributory records would decrease the present value of lifetime contributions and hence further increase the estimated transfer component of pensions. The same would be true if the evolution of average earnings was used instead of that of minimum wages (at least for the period for which data on the former are available). Figure 10 shows the evolution of both indicators from 1991 onwards. We observe that, if the evolution of average earnings had been chosen, lifetime contributions of individuals with a contributory record of up to 17 years (21% of the sample) would have been lower than those calculated using the evolution of minimum wages, and hence the non-contributory part of pensions would have been even bigger.

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[21] The assumption that the income distribution of this pseudo-panel is stable over time is commonly used in the relevant literature (see Klazar and Slintáková, 2012).

Figure 10. Evolution of average and minimum wages in 1991 – 2007
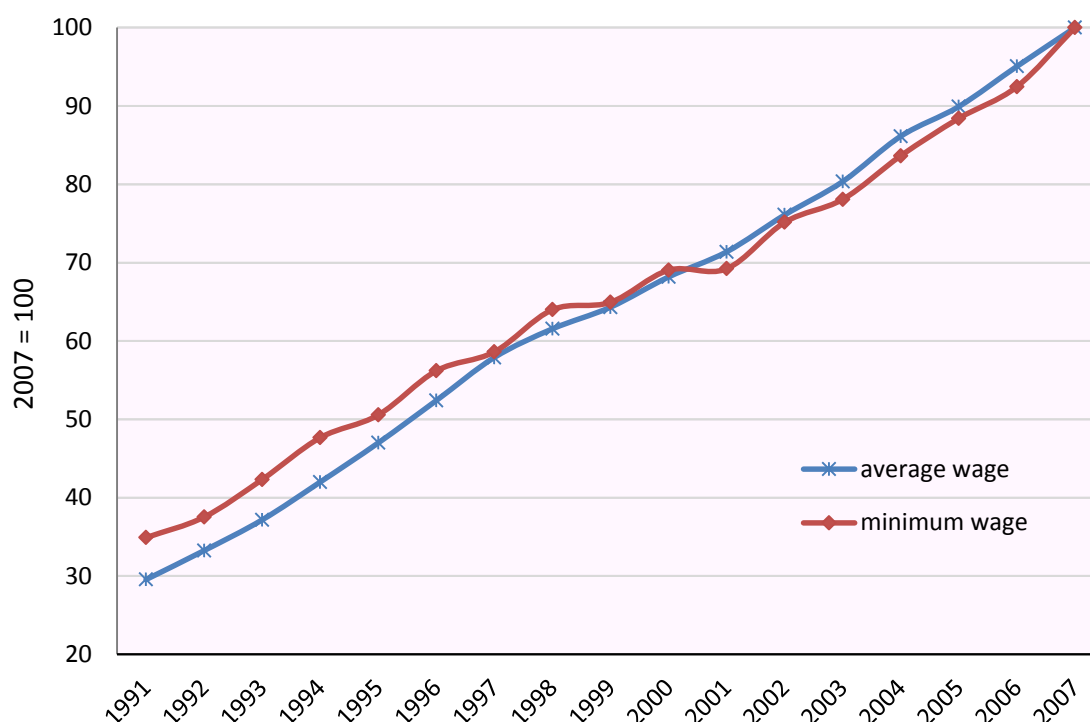
Notes: Both streams are in gross, nominal terms.
Source: Bank of Greece (yearly Governor's Reports), ΓΣΕΕ (National general collective agreements).

Furthermore, the results of the baseline scenario of this research are based on the hypothesis that social insurance contributions are compounded at a yearly rate of return equal to inflation plus 2% and that the discount rate of future pension benefits is equal to 2%.[22] This is only one of numerous possible combinations of rates that could have been used instead. The sensitivity analysis performed by applying a rate of return equal to yearly government bonds showed that our main results are robust to the change of this parameter. The calculation of the internal rates of return of the system allows us to refrain from the use of specific discount rates, and invites policy makers to reflect upon what an acceptable rate should be.

Moving to the way lifetime benefits have been calculated, we have to note that there is some evidence that high income earners and better educated people enjoy lower mortality rates and higher life expectancy. One would expect that the opposite might be the case for retirees previously employed in hard and arduous occupations. However, since official life expectancy

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[22] In accordance with the relevant literature that suggests using the same rate of return for calculating accumulations of notional pension wealth and in converting the account balance at retirement into an annuity stream (Auerbach & Lee, 2006).

data for different earnings, educational or occupational profiles are not available, the general life expectancy tables (different for men and women) have been used throughout the analysis. Accounting for life expectancy differentials would have a flattening effect on the curves depicted in Figures 4, 5 and 9.

On a different note, the estimation of the transfer component of pensions in the pension reform scenario was performed assuming away the behavioural responses of retirees to this new piece of legislation. Excluding retirees with less than 4,500 contribution days from the analysis takes only partially into account the high disincentives for early retirement that the 2010 reform has introduced. For this reason, the results of this scenario for the lowest distribution deciles should be treated with caution and be considered as upper bound estimates. The increase in retirement age from 65 to 67 that was introduced in 2013 is also expected to cause the transfer component of future retirees' pensions to fall (and to disproportionately affect women, as they are the ones with the shortest contributory records and lower age at retirement).

Finally, due to the lack of data from other social insurance funds, this analysis has only focused on IKA main old-age pensions. The acquisition of data from more social insurance funds would certainly improve our understanding of the relative importance of annuities and transfers in Greek retirement benefits as a whole, and would allow for a more comprehensive examination of their impact on intragenerational equity. However, we can safely infer that the addition of the two biggest funds after IKA (i.e. ΟΓΑ and civil servants')[23] would further reinforce the imbalance between lifetime benefits and lifetime contributions as (a) in the case of ΟΓΑ, famers were not required to pay any social insurance contributions until 1987, whereas contributions for main old-age pension only became compulsory in 1998, and (b) in the case of civil servants, until 2007 the conditions for individuals who have entered the labour market before 1993 were much more favourable than private sector workers (in terms of retirement age, replacement rates, pensionable earnings etc.). Adding survivor and invalidity pensions in the frame of analysis would also increase the relative importance of transfers, as the annuity component of these pensions is by definition small.

6. Summary and conclusions

The purpose of this paper has been to investigate the relative importance of annuities and transfers in Greek retirement benefits and attempt to draw conclusions as to the impact of transfers on intra- and intergenerational equity by using a longitudinal approach. This approach

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[23] Note that these three funds together provided 49% of pensions and accounted for 61% of total pension spending in 2013 (Ministry of Labour, Social Security and Welfare, 2013).

compares the balance between lifetime contributions paid and lifetime benefits received by individuals: the difference between the two is the implicit transfer that can be either positive (i.e. a transfer received by the rest of society) or negative (i.e. a transfer paid to the rest of society).

Based on a representative sample of IKA retirees in the year 2008, the transfer component and internal rates of return of main old-age IKA pensions were calculated according to the rules that were in place both before and after the implementation of the 2010-13 austerity measures related to pensions. The research also tried to provide some early estimates of the impact of the 2010 pension reform (to be gradually implemented after 2015) on lifetime pension benefits. As discussed in the previous section, this analysis performed is by necessity static: 2008 retirees are responding to the incentives inherent to 2008 pension rules. Austerity cuts and the 2010 reform have changed those rules, and hence the incentives faced by retirees. Analysing the structure of incentives of current pension rules lies beyond the scope of this research.[24]

In accordance with Mylonas and de la Maisonneuve (1999), our results showed that the vast majority of IKA retirees are receiving positive -and quite substantial, in absolute terms- net transfers from the system. In other words, the present value of lifetime pension benefits seems to largely outweigh the present value of lifetime social insurance contributions. This finding implies that the underlying pension rules seriously deviate from the principle of actuarial fairness and are thus violating intergenerational equity. The perception that pensioners have fully earned their retirement benefits is not supported by the evidence.

Our analysis has shown that the recent changes in the pension system have improved intergenerational equity by reducing (but not fully eliminating) transfers. Compared to the pre-austerity scenario, the average transfer component of pensions was estimated to fall from 49.3% to 35.8% when the 2010-2013 austerity measures are taken into account. In the case where lifetime pensions are calculated according to the rules established by the 2010 pension reform, the estimated transfers are further reduced, reaching 27.1% of lifetime pension benefits on average.[25] Interestingly, our findings suggest that male retirees located in contribution decile 9 are now becoming recipients of lifetime pensions that are very close to actuarial fairness, whereas those located in the highest decile are becoming net contributors of the retirement

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[24] An analysis of the incentives introduced by the 2010 pension reform can be found in Matsaganis & Leventi (2011).

[25] Note that this is less than 3/9 of total social insurance contributions, which is the rate that Law 2084/92 assigned to the state (as one of the three parties responsible for the financing of pensions – together with employers and employees).

pension system; in the pre-crisis world, they would be receiving transfers as high as 41% of lifetime benefits.

With respect to intragenerational equity, the pre-reform system treated more favourably those who retire earlier, with fewer contributions, on a lower (or minimum) pension. Austerity cuts and the 2010 reform have only slightly mitigated these features; in all three scenarios retirees located in the first contribution decile are the recipients of intragenerational transfers that correspond to more than two-thirds of their lifetime pension benefits.

Within the current generation of pensioners, women also seem to be benefiting considerably more than men. The reason is twofold. On the one hand, the annuity part of their pensions is smaller both because of lower employment incomes and shorter professional careers. On the other hand, their longer life expectancy combined with the favourable rules that apply for minimum pension recipients -where women appear prominently- and mothers of under-age children renders the transfer component of their lifetime pension benefits significantly higher than the one of men. Austerity cuts and the 2010 reform seem to have exacerbated this difference, as both of them affected much more severely contribution deciles 9 and 10 – and in these deciles men feature prominently.

Differences in occupational sector are also found to be playing a role in the level of transfers, as workers in hard and arduous occupations (typically workers in construction, heavy industry etc.) seem to be less favoured than workers in non-arduous employments in terms of transfers received by the system. Although differences in the transfer component of pensions reflecting different need for assistance (as in the cases of minimum pensions) can arguably be justified as serving anti-poverty objectives, differences related to characteristics such as gender or occupational sector can be considered as a violation of the principles of intragenerational equity.

The internal rates of return that have been estimated revealed very similar patterns for all the above-mentioned scenarios. The results also seem to be robust to different choices of rates of return used for the calculation of the present value of lifetime contributions.

Overall, this research has shown that the link between pension payments and their supporting contributions in IKA main old-age pensions remains relatively loose. Designing a pension system that is fair to current as well as future generations, ensures that pensions do not fall below a minimum threshold and at the same time enhances incentives to work and pay contributions is not an easy task. Trade-offs are present, e.g. between the wish to protect low pensions (by deviating from the principle of actuarial fairness, but enhancing the progressivity

of the system) and the concern to guarantee a decent return on contributions for all, including those who have contributed the most. Even though our estimates suggest that the 2010-2013 austerity measures and the 2010 reform have been successful in strengthening this relation, it seems that there is still scope -and need- for improvement.

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Appendix

Table A1. Distribution of **pensioners** by pension type (Dec. 2013)

pension brackets (€)	old-age		survivors		invalidity	
	number of pensioners	% of total	number of pensioners	% of total	number of pensioners	% of total
0-500	451,897	22.7	101,491	24.9	95,616	40.9
500-1,000	756,710	37.9	243,056	59.6	108,658	46.5
1,000-1,500	460,028	23.1	55,173	13.5	26,273	11.2
1,500-2,000	283,278	14.2	7,062	1.7	2,534	1.1
2,000-2,500	33,141	1.7	852	0.2	358	0.2
>2,500	9,786	0.5	142	0.0	177	0.1
all	1,994,840	100.0	407,776	100.0	233,616	100.0

Notes: Pension amounts are gross. Note that pensioners usually receive more than one pension (e.g. both main and supplementary).

Source: Own elaboration of data from the Ministry of Labour, Social Security and Welfare (December 2013 Helios Report).

Table A2. Distribution of main old-age **pensions** (Dec. 2013)

pension brackets (€)	number of pensions	% of total	average pension amount (€)
0-500	647,871	32.0	370.1
500-1,000	770,755	38.0	677.4
1,000-1,500	528,018	26.1	1,234.2
1,500-2,000	77,377	3.8	1,641.7
2,000-2,500	1,452	0.1	2,198.8
>2,500	748	0.0	2,678.5
all	2,026,221	100.0	

Notes: Pension amounts are gross.

Source: Own elaboration of data from the Ministry of Labour, Social Security and Welfare (December 2013 Helios Report).

Table A3. Average main pension by fund (Dec. 2013)

	average pension
ΙΚΑ	641.7
ΟΓΑ	435.2
Civil servants'	1,010.3
ΟΑΕΕ	736.3
ΕΤΑΑ	841.2
ΕΤΑΠ-ΜΜΕ	889.9

Notes: Pension amounts (€) are gross. All types of pensions are included (i.e. old-age, survivors' and invalidity pensions).

Source: Own elaboration of data from the Ministry of Labour, Social Security and Welfare (December 2013 Helios Report).

Table A4. Monthly minimum wage (1973-2007)

year	min. wage (€)
1973	10.04
1974	11.04
1975	13.25
1976	14.69
1977	17.18
1978	21.42
1979	25.31
1980	30.05
1981	36.03
1982	54.53
1983	62.31
1984	79.27
1985	93.71
1986	106.58
1987	117.68
1988	136.30
1989	160.90
1990	191.06
1991	217.52
1992	244.05
1993	267.66
1994	303.73
1995	336.42
1996	362.49
1997	393.14
1998	416.89
1999	432.91
2000	450.90
2001	465.90
2002	490.04
2003	519.87
2004	540.66
2005	572.30
2006	608.32
2007	657.89

Notes: Monthly minimum wage in nominal terms.

Source: ΓΣΕΕ (national general collective agreements).

Table A5. IKA contribution formulae for pensions (1973-2007)

year	pension SIC: employees (%)		pension SIC: employers (%)	
	normal	hard and arduous	normal	hard and arduous
1973 – 1975	4.75	4.25	9.50	10.00
1976 – 1990	5.25	7.45	10.50	11.90
1991 – 1992	5.75	7.95	11.50	12.90
1993 – 2007	6.67	8.87	13.33	14.73

Notes: Monthly minimum wage in nominal terms.
Source: IKA.

Table A6. Life expectancy at selected ages in 2007

age	men	women
50	29.68	33.33
51	28.81	32.39
52	27.94	31.45
53	27.08	30.52
54	26.22	29.59
55	25.38	28.66
56	24.54	27.73
57	23.71	26.81
58	22.90	25.89
59	22.09	24.98
60	21.29	24.07
61	20.50	23.17
62	19.72	22.27
63	18.95	21.38
64	18.18	20.49
65	17.42	19.60
66	16.67	18.72
67	15.94	17.85
68	15.22	16.99
69	14.51	16.14
70	13.82	15.30
71	13.15	14.48
72	12.50	13.67
73	11.85	12.88
74	11.23	12.10
75	10.62	11.35
76	10.03	10.63
77	9.46	9.93
78	8.92	9.26
79	8.41	8.63
80	7.93	8.03
81	7.47	7.47
82	7.04	6.95
83	6.63	6.48
84	6.25	6.06
85	5.90	5.68
86	5.59	5.33
87	5.29	5.02
88	5.00	4.73
89	4.73	4.45
90	4.46	4.18

Notes: As life tables for 2008 are not available, 2007 life tables were used as a proxy.

Source: El.Stat. (Life tables 2007: Life expectancy at selected ages).