Luxembourg Income Study Working Paper Series

Working Paper No. 485

Back to Bismarck? Shifting Preferences for Intragenerational Redistribution in OECD Pension Systems

Tim Krieger and Stefan Traub

June 2008

Luxembourg Income Study (LIS), asbl

Back to Bismarck?

Shifting Preferences for Intragenerational Redistribution in OECD Pension Systems

Tim Krieger[a,*], Stefan Traub[b]

[a]*Department of Economics, University of Paderborn, Germany*

[b]*Department of Economics, University of Bremen, Germany*

June, 2008

Abstract Using a sample of 20 OECD countries it is shown that the majority of countries decreased the level of intragenerational redistribution in the first pillar of their pension systems, though the evidence is weak in statistical terms. We find strong correlations between changes of the so-called Bismarckian factor and changes of the generosity of the pension system, the shape of the income distribution in terms of its first three central moments and life expectancy. An economic laboratory experiment confirms that these variables could have been causal for the observed change.

JEL classification: H55, D71, J18, D63, C92

Keywords: earnings-related and flat-rate benefits, Beveridge vs. Bismarck, pension reform, relative deprivation, OECD countries, experiments

[*]Corresponding author. Department of Economics, University of Paderborn, Warburger Str. 100, 33098 Paderborn, Germany, phone +49-5251-602117, fax +49-5251-605005, email tim.krieger@notes.upb.de.

1 Introduction

Recent studies suggested that the degree of *intra*generational redistribution in the first pillar of many OECD countries' pension systems has been decreasing over the last two decades (see, e.g., Fenge et al., 2003; Lindbeck and Persson, 2003; Queisser, 2000; and Werding, 2003). Our study empirically tests this hypothesis using microdata taken from the Luxembourg Income Study (LIS). In order to estimate the level of intragenerational redistribution in the public pension system, we employ the Bismarckian factor (see, e.g., Hassler and Lindbeck, 1997; and Cremer and Pestieau, 1998). Conceptionally, the Bismarckian factor divides the pension benefit into a flat component (such as a basic or minimum pension) and into an earnings-related component: the higher the Bismarckian factor, the more important is the earnings-related part and, thus, the smaller is the degree of intragenerational redistribution (under the proviso that contributions are collected as payroll taxes). A pension system that emphasizes the earnings-related component (such as in France or Germany) is called a Bismarckian pension system. If the pension system accentuates the flat benefit part (such as in the UK), it is called Beveridgean.

Our study considers pension systems in 20 OECD countries. Depending on data availability, we used data for the time period from 1985 to 2000. In line with the studies mentioned above, we empirically observe for most countries an increase of the Bismarckian factor that was accompanied by an increase of the "generosity" of the pension system (the share of pension benefits in total household income).[1] In 14 countries, the Bismarckian fac-

[1] The negative correlation between the level of intragenerational redistribution and the

tor increased; in 11 cases both the level of intragenerational redistribution decreased and the generosity increased. It should be noted, however, that the increases of the Bismarckian factor as well as the generosity index are statistically insignificant at conventional terms. Hence, though we approve our initial question that OECD pension systems actually tend to move "back to Bismarck", the empirical evidence is relatively weak.

The core of our analysis, however, is formed by the identification of economic factors that through political processes could exert influence on the level of intragenerational redistribution in a country's pension system. In our paper, we mainly focus on two aspects that are likely to be important. First, during the observation period, the income distributions of the 20 OECD countries considered have changed dramatically. Not only real per capita GDP has risen, but also the variance and the skewness of the income distribution have increased. It does not seem to be too farfetched to assume that these developments have somehow influenced the perceived level of inequality in the society and shaped redistribution policy (though the causality may be mutual). Conde-Ruiz and Profeta (2007) recently emphasized the decisive role of inequality for the level of intragenerational redistribution in the pension system. With substantial inequality, a winning coalition of the rich and the poor could implement a Beveridgean pension system, while a low degree of inequality would allow the middle-class to introduce a Bismarckian system.[2] Second, the average life expectancy of a male person at the age of

size of the pension system also was investigated by, for example, Cremer and Pestieau, 1998; Casamatta et al., 2000a, 2000b; Köthenbürger et al., 2008; and Rossignol and Taugourdeau, 2006).

[2]This outcome resembles to some degree the "paradox of redistribution" by Korpi and

65 has increased by about one and a half months per year. However, the gain in life years was probably not uniformly distributed. Evidence for a positive effect of wealth on life expectancy has been provided, for example, by Attanasio and Emerson (2003) or Deaton and Paxson (2001). So, the relative importance of retirement arrangements has increased, and the increase has been more intense for the rich. A positive effect of income on life expectancy is known to make a pension system regressive (see Coronado et al., 2000; Gil and Lopez-Casanovas, 1998; and Reil-Held, 2000). These findings also are consistent with Borck (2007) and Gorski et al. (2007) who showed formally that a positive correlation between income and longevity dampens redistribution from rich to poor in pension systems.

We choose a twofold approach to investigate these questions. In the first part of the analysis, we present empirical facts based on LIS data as to the change of OECD pension systems, income distributions, and life expectancy. Results are reported in terms of descriptive statistics and a correlation analysis. Due to data limitations and unclear causal relationships of the empirical analysis, the second part of the paper presents an economic laboratory experiment where subjects had to chose the Bismarckian factor representing a hypothetical social security system. The experiment involved 18 treatments mimicking exogenous changes in the generosity of the pension system, in the shape of the income distribution and both symmetric and asymmetric increases of life expectancy.

In our experiment, we basically followed the so-called individual choice

Palme (1998), which has been supported empirically in the context of pension systems by Lefèbvre (2007).

approach to social welfare which was developed by Friedman (1953) and Harsanyi (1953, 1955).[3] Our subjects were induced by the experimental design to act as involved social planners. They evaluated income distributions from under a veil of ignorance, that is, they became a member of the respective society after having done their choices, but they did not know their own future income positions in advance. Note that the experiment involved considerable monetary payoffs of up to €1,050. The individual choice approach was also employed by Bernasconi (2002), Bosmans and Schokkaert (2004), and Traub et al. (2005, 2008) in order to test various hypotheses concerning perceptions of justice and the consistency of choice behavior in income distribution contexts. In terms of the individual choice approach, income distributions resemble lotteries. The principle of insufficient reason implies that the social planner imagines that the chance of being any person in the society is equally likely. Equal consideration is given to every member of the society, thereby guaranteeing impartiality of the social planner. Accordingly, the social planner is assumed to choose that income distribution that maximizes the expected utility.

Apart from theoretical concerns (see, for example, Mongin, 2001), the literature suggests that the relationship between a social planner's distributional preferences and income distributions is more complex than stated by

[3] The large existing body of experimental literature concerned with redistribution problems comprises, for example, Amiel and Cowell, 1992, 2000; Ballano and Ruiz-Castillo, 1993; Frohlich and Oppenheimer, 1994; Harrison and Seidl, 1994a, 1994b; Bernasconi, 2002; Bosmans and Schokkaert, 2004; Traub et al., 2005, 2008. However, to our best knowledge this is the first study to contrast empirical findings concerning the change of institutions such as the pension system with experimental micro data.

the impartial observer theorem. Recent research has shown that inequality and risk preferences are not the same (on this issue, see Cowell and Schokkaert, 2001). Bernasconi (2002) questioned both the utilitarian approach to social welfare and the non-utilitarian approach like Rawls' (1971) maximin criterion to be a meaningful description of distributional preferences. Instead, he found some evidence of randomization preferences, that is, a procedural fairness motive (Diamond, 1967) which violates the betweeness axiom of expected utility theory. Likewise, in an experimental "beauty contest" of social welfare functions Traub et al. (2005) demonstrated that a quadratic social welfare function (Epstein and Segal, 1992) which expresses randomization preferences performed remarkably well. As a consequence of such procedural fairness motives entering the self-interested social planner's preference, she is likely to avoid extreme outcomes in terms of insufficiently low or excessively high incomes (see Traub et al., 2008).

A hypothesis that goes remarkably well with these observations is Boulding's (1962, p. 83) proposition that "society lays a modest table at which all can sup and a high table at which the deserving can feast". Boulding's hypothesis translates into a lexicographic social welfare function. First, the social planner takes care that everyone in the society (including himself) obtains enough to make ends meet. The income threshold associated with it may be called living wage, subsistence level, or poverty line. Then, for incomes above that threshold, the social planner's preferences are best expressed by maximizing the average or expected utility of the society (as assumed by Friedman-Harsanyi). In the ignorance scenario (no probability information was given) of the Traub et al. (2005) "beauty contest" of social welfare functions, the Boulding social welfare function was the best performing standard of behavior among all subjects; it was among the four top performers in the risk scenario.

Further complications seem to arise from the fact that the evaluation of incomes is context dependent. Whether an income is perceived as barely sufficient or excellent does not only depend on its absolute value but also on the background context in terms of the overall shape of the income distribution. The concept of relative deprivation, tracing back to Stouffer et al. (1949) and advanced by Runciman (1966) and others, provides the missing link between income evaluation and societal context.[4] Generically, relative deprivation describes a subjectively perceived lack of something in relation to a societal reference value (for example, a hot breakfast). The link between relative deprivation and a society's degree of inequality aversion was highlighted by the philosopher Temkin (1986, 1993) who argued that inequality aversion was driven by the complaints of the poor about their situation in relation to that of the rich. Devooght (2003) found experimental support for Temkin's model. Seidl et al. (2006) used Parducci's (1965, 1968, 1974, 1982) range-frequency theory in order to experimentally investigate the context dependence of the assessment of income distributions. They showed that positively skewed income distributions (which happen to be the normal case in OECD countries) generate more relative deprivation at the societal level than negatively skewed income distributions. Our empirical observation that the skewness of the OECD countries' income distributions annually increased

[4]The literature on the economics of happiness (see, e.g., Oswald, 1997; and Easterlin, 2001) heavily relies on the concept of relative deprivation.

by more than 3% since 1985 leaves us anticipating an upswell of complaint.

The rest of the paper is structured as follows. In Section 2, we formally discuss the Bismarckian factor and present the empirical analysis based on LIS microdata for 20 OECD countries. The experiment is presented in Section 3. Section 4 provides an extensive discussion of our results. Section 5 concludes.

2 Empirical Facts

2.1 Defining the Bismarckian factor

In order to derive a workable and intuitive representation of the level of intragenerational redistribution in a pension system, we define the Bismarckian factor along the lines of the "index of non-contributiveness" (INC) (Lefbvre and Pestieau, 2006; Lefbvre 2007). INC, denoted by β, is defined as the ratio of the income share of public pensions in the bottom quintile, B, to the same share in the top quintile, T:

$$\beta \equiv \frac{P_B/Y_B}{P_T/Y_T} = \frac{P_B}{P_T} \cdot \frac{Y_T}{Y_B}, \tag{1}$$

where Y_i and P_i, $i \in \{B, 2, 3, 4, T\}$, are the mean income and the mean pension benefit, respectively, of the ith quintile of the income distribution. A purely Beveridgean pension system which pays equal benefits to every citizen implies $P_B = P_T$, such that $\beta^{bev} = Y_T/Y_B$ (≥ 1). If benefits are solely earnings-related, the respective purely Bismarckian pension system yields $P_B/Y_B = P_T/Y_T$ and, therefore, $\beta^{bis} = 1$. Note that due to $\beta \in [1, Y_T/Y_B]$ INC is not normalized which is a bit unfavorable for cross-country comparisons.

We use the definition of the pension benefit of a representative member of quintile i in order to derive the Bismarckian factor. P_i is defined as a convex combination of a flat payment (proportional to the mean income) and an earnings-related component (see Casamatta et al., 2000a):

$$P_i = \tau \left[\alpha Y_i + (1-\alpha)\mu \right], \tag{2}$$

where $\alpha \in [0,1]$ is the Bismarckian factor and $\mu \equiv \sum_i Y_i/5$ is the mean of the society's income distribution. A measurement of the generosity of the pension system $\tau \in [0,1]$ reflecting the replacement ratio[5] is given by

$$\tau \equiv \frac{\sum_i P_i}{\sum_i Y_i}. \tag{3}$$

Henceforth, we will refer to τ as the "generosity index".

We plug equation (2) into the ratio of the pension benefits of the bottom and the top quintile P_B/P_T (the left fraction in the definition of INC). Since τ drops out, solving this expression for α gives the Bismarckian factor

$$\alpha \equiv \frac{(P_T - P_B) \cdot \mu}{(P_T - P_B) \cdot \mu - P_T Y_B + P_B Y_T}. \tag{4}$$

A purely Beveridgean pension system ($P_B = P_T$) yields $\alpha^{bev} = 0$ and a purely Bismarckian pension system ($P_B/Y_B = P_T/Y_T$) gives $\alpha^{bis} = 1$. Hence, as desired the Bismarckian factor is normalized[6] on the closed interval $[0,1]$ and

[5]Note that this parameter could be interpreted as the pension system's replacment ratio, thereby also capturing *inter*generational redistributive elements in the pension formula, which are, however, not explicitly build into our approach.

[6]Alternatively, we can write $\alpha \equiv [(P_T - P_B) \cdot \mu]/[(P_T - P_B) \cdot \mu + P_T Y_B \cdot (\beta - 1)]$, highlighting that the Bismarckian factor is in fact a normalization of the INC.

is also independent of the generosity τ of the pension system. Accordingly, α is not only a pure measure of intragenerational redistribution but also allows for cross-country comparisons of public pension systems of different size.

2.2 The Data

For the empirical analysis, we used microdata taken from the Luxembourg Income Study (LIS, 2008). It provides internationally comparable and reliable data on income distributions (see Atkinson, 2004). The LIS data were employed for computing the values of the Bismarckian factor α and the generosity index τ. Furthermore, LIS data were used in order to compute the first three central moments of the income distribution (mean, variance, skewness).

The following countries were included in our data set: Austria (first year: 1985, last year: 2003), Australia (1987, 2000), Belgium (1985, 2000), Canada (1987, 2000), Denmark (1987, 2004), Finland (1987, 2000), France (1984, 2000), Germany (1984, 2000), Greece (1995, 2000), Ireland (1987, 2000), Italy (1986, 2000), Luxembourg (1985, 2000), Mexico (1984, 2002), the Netherlands (1983, 1999), Norway (1986, 2002), Spain (1990, 2000), Sweden (1987, 2000), Switzerland (1982, 2002), the United Kingdom (1986, 1999) and the United States (1986, 2000). Apart from rare exemptions in terms of radical system changes, large aggregates such as pension systems transform themselves only gradually. Hence, we looked at the longest available time period for each country. In most cases, the earliest wave providing us with the necessary data was Wave II (around 1985), the latest wave available at the time this research was conducted was Wave V and Wave VI in some cases (around

2000).

All LIS data employed in our analysis refer to the household level. The household is the most natural economic unit to focus on as its members jointly plan on earning and spending income. At the household level, we have to distinguish between "raw" and equivalized household net income. In order to compute the Bismarckian factor as well as the generosity of the pension system, we used "raw" household net income. That is, α and τ measure the legal status of the pension system as it was reflected in the respective income distribution. In the subsequent empirical analysis, we shall explore correlations between changes in the income distribution and the pension system. Therefore, when computing the moments of the income distribution, we employed equivalized household net income. By adjusting the income distribution for the different needs of different household types, we based this part of our analysis on household welfare. Note that we used the household weights provided by LIS in order to weight cases. Furthermore, if necessary, income data was adjusted for inflation using the consumer price index with the last LIS year of the respective country as the base year (data source: OECD Main Indicators).

LIS reports household net income in an aggregate variable (LIS variable: DPI). For computing the moments of the income distribution, it was adjusted for differing needs by using the square root of household size (D4) as weights. As recommended by LIS, the equivalized income data were bottom- and top-coded.[7] The variable "state old-age and survivors benefits" (V19)

[7] Equivalized household net incomes smaller than 1% of the mean equivalized income were recoded as 1% of the mean equivalized income. Household net incomes larger than 10

provided us with the data required for computing the (unequivalized) mean pension benefits of the income quintiles.[8] Note that V19 provides a broad measure of intragenerational redistribution, including — in addition to minimum pensions — different non-insurance benefits such as benefits due to education, unemployment, maternity etc. (see, for example, Börsch-Supan and Reil-Held, 2001).[9]

2.3 Changes of α and τ

Figure 1 displays the changes of the Bismarckian factor and the generosity index. Each of the 20 countries considered has two markers referring to the first and the last year of analysis (country codes are listed in Table 1). The horizontal axis refers to the generosity index, while the vertical axis states the Bismarckian factor. Sweden kept the most generous pension system: in 1987 the share of pensions in total household net income was about 27.9%. As compared to this, Mexico's 1984 pension system was virtually negligible (2.9%). In the year 2000 France maintained the pension system with the lowest degree of intragenerational redistribution ($\alpha = 0.764$). In some cases, the Bismarckian factor turned out to be outside the theoretical $[0, 1]$

times the median unequivalized incomes were recoded as ten times the median household net income weighted by the square root of household size.

[8]Note that the disaggregated variables V19S1a ("universal old-age pensions") and V19S1b ("employment-related old-age pensions") would have been more suitable but were available only from Wave IV on.

[9]Some of these benefits, such as benefits due to education times, may be regressive. Therefore, there may be a slight downward bias in the Bismarckian factor as compared to a scenario where only minimum pensions are considered.

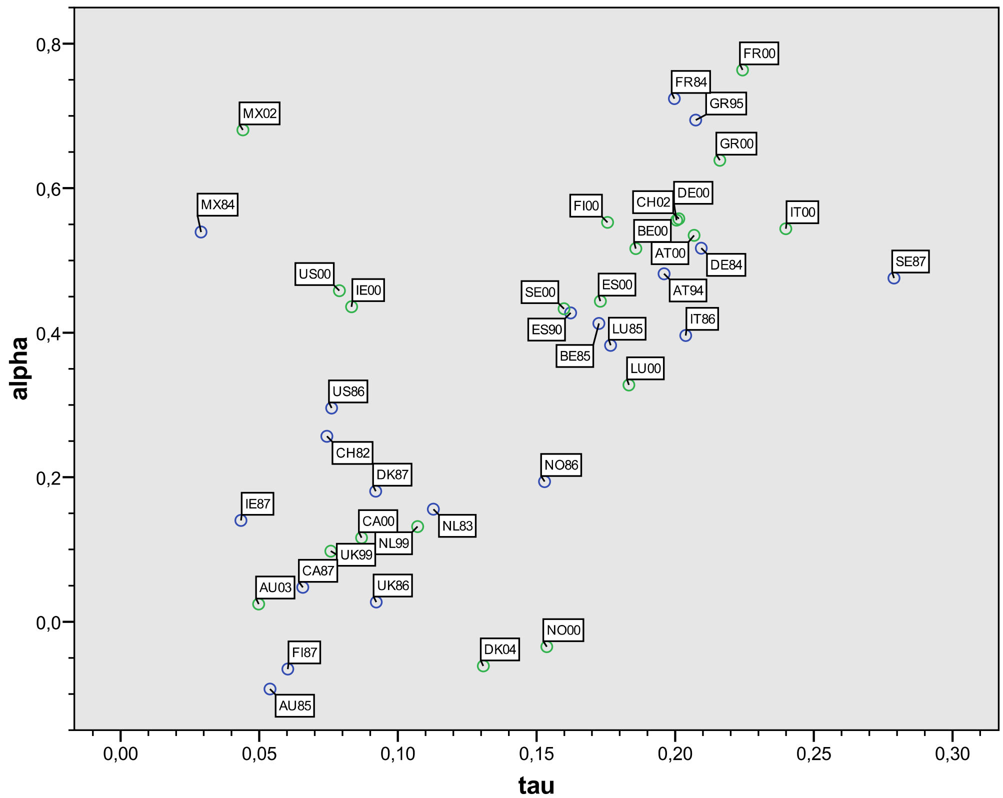

Figure 1: Changes of Bismarckian factor and generosity index

interval: for Australia and Finland in the past and for Denmark and Norway in the present, we recorded slightly negative values for the Bismarckian factor. These countries had or still have an almost purely Beveridgean pension system, where additionally high-income earners do not receive the (full) minimum pension.

Table 1 classifies the countries according to their changes in the Bismarckian factor and the generosity index. The generosity of most pension systems seems to have increased. Likewise, for six countries only (Denmark, Greece,

Table 1: Classification of countries

Generosity index	Bismarckian factor increased	Bismarckian factor decreased
increased	Austria (AU)	Denmark (DK)
	Belgium (BE)	Greece (GR)
	Canada (CA)	Luxembourg (LU)
	Finland (FI)	Norway (NO)
	France (FR)	
	Ireland (IE)	
	Italy (IT)	
	Mexico (MX)	
	Spain (ES)	
	Switzerland (CH)	
	United States (US)	
decreased	Australia (AT)	Netherlands (NL)
	Germany (DE)	Sweden (SE)
	United Kingdom (UK)	

Table 2: Changes of Bismarckian factor and generosity index

Variable	Mean	Level of significance
Bismarckian factor (α)	0.524	0.106
Generosity index (τ)	0.109	0.165

Table notes. $n = 20$. Annual changes in percentage points.

Luxembourg, the Netherlands, Norway and Sweden), we had to record a decreasing Bismarckian factor.[10]

One might wonder whether the observed changes of α and τ are significant. In order to test this, we computed the annual changes of both variables in percentage points (this proceeding allows for country-specific time spans). Table 2 shows that neither the change in α (about 0.5 percentage points per year) nor the change in τ (about 0.1 percentage points per year) are significant at conventional terms. Another interesting result, which can be taken from Table 3, is that both, the absolute levels and the changes of Bismarckian factor and generosity of the pension system were highly correlated. As discussed in the literature, less redistributive pension systems are usually larger (though this relationship seems to have diminished a bit). Furthermore, most

[10]Note that in Lindbeck and Persson (2003) and Werding (2003), Denmark, Greece and Sweden are considered as countries that reduced intragenerational redistribution in their pension systems. At least in Denmark and Sweden the relevant major pension reforms were enacted at the time of collecting the data for Wave V. Hence, these reforms are not covered by our data.

Table 3: Correlation between Bismarckian factor and generosity of the pension system

Variables	Coefficient	Level of significance
α_{past}, τ_{past}	0.673	0.001
$\alpha_{present}$, $\tau_{present}$	0.499	0.025
$\Delta\alpha$, $\Delta\tau$	0.578	0.008

Table notes. Pearson correlations. $n = 20$.

pension reforms have taken place on the main diagonal of Figure 1 (or Table 1), that is, increases of α came along with increases of τ.

Technically, the reduction of the level of intragenerational redistribution came about in very different forms in the latest pension reforms (see, for example, Casey et al., 2003). The most fundamental change certainly being the switch from a defined-benefit to a defined-contribution system as in Italy and Sweden, which is the "most Bismarckian" specification among the different types of pay-as-you-go systems. Other reforms included altering the reference earnings with respect to which pensions are calculated, for example, by moving from "best years" to a "period average", by increasing the number of contribution years required to obtain a full pension, or by changing the method of calculating the reference earnings. All these reforms tightened the link between individual earnings and future pension benefits.

Summarizing this part of the analyis, we are inclined to answer the question: "Back to Bismarck?" in the affirmative as most countries have undertaken pension reforms that reduced intragenerational redistribution. It should be kept in mind, however, that as far as the average trend is concerned the result is rather weak in statistical terms.

2.4 Changes in the Shape of the Income Distribution and Life Expectancy

In this subsection, we consider changes of the mean, the coefficient of variation[11] and the skewness (the standardized third central moment) of the income distribution. Furthermore, we consider changes in life expectancy. These are captured by the residual life expectancy of a male aged 65. The respective data is taken from the 2005 OECD Health Data set. Table 4 presents the changes in the shape of the income distribution and life expectancy over time. Additionally, we report the changes in household size and the Gini coefficient (the Gini coefficient is listed in the LIS "keyfigures"). Figures are stated in terms of annual changes in percent (income, household size), percentage points (Gini coefficient[12]) or expected life years, allowing for the different time spans that we had available for the 20 OECD countries.

Mean equivalized household net income on average increased by 1.6% per year. Note that the average household size shrunk significantly by more than 0.5% per year and thus contributed to the increase of equivalized household income. Without this demographic effect, the annual increase in mean in-

[11]We employ the coefficient of variation (standard deviation divided by mean) instead of the variance because it is scale invariant.

[12]Since the Gini coefficient is normalized on the $[0, 1]$ interval, we consider absolute instead of relative changes.

come would have been only 1.23% which still is significant at the 1% level. The coefficient of variation annually rose a bit more than 0.6% (significant at the 10% level). Much more pronounced was the change of the income distribution is terms of its skewness. On average, OECD countries' income distributions have become significantly more positively skewed, as the annual increase of the skewness coefficient indicates (3.1%). Both coefficient of variance and skewness reflect a strong and significant increase in income inequality. As can be taken from the table, the additionally reported Gini coefficient increased by a bit less than 0.1 percentage points per year. The relatively modest increase in the Gini coefficient as compared to coefficient of variation and the skewness is easily explained. Due to the transfer principle, a rise in the variance of the income distribution unambiguously makes the Gini coefficient larger. This increase, however, may be counteracted by a left shift of the median income: if the skewness of the income distribution increases, a measurement of lower inequality at the bottom of the income distribution is implied.

Table 4 also reports the annual change in life expectancy in terms of expected life years of a person at the age of 65 is given. The coefficient of 0.127 corresponds to a strong increase in life expectancy of about 1.5 months per year.

2.5 Correlation Analysis

Table 5 gives the correlations between the variables listed in Table 4 and Bismarckian factor α and generosity index τ, respectively. The Bismarckian factor exhibits positive correlations with mean income, coefficient of variation,

Table 4: Change of income distribution and life expectancy over time

Variable	Mean	Level of Significance
Mean income[a]	1.609	0.001
Coefficient of variation[a]	0.641	0.063
Skewness[a]	3.104	0.008
Life expectancy[c]	0.127	0.000
Household size[a]	-0.547	0.000
Gini coefficient[b]	0.092	0.052

Table notes. $n = 20$. Annual changes. [a]Percent. [b]Percentage points. [c]Expected life years.

and life expectancy. We observe negative correlations between Bismarckian factor and skewness as well as household size. However, only life expectancy is significant at the 5% level. Interestingly, mean, coefficient of variation, and skewness exhibit positive bivariate correlations, where the correlation between the coefficient of variation and skewness is particularly strong and significant at the 1% level. Hence, although coefficient of variation and skewness both increased and were highly correlated, their bivariate relationship with the Bismarckian factor was oppositional.

In contrast to the Bismarckian factor, the generosity of the pension system shows a negative but insignificant correlation with mean, coefficient of variation, and skewness. Only life expectancy shows a slightly positive correlation. Life expectancy exhibits positive correlations with mean income and

Table 5: Bivariate correlations

	τ	Mean	Coefficient of variation	Skewness	Life Expectancy	HH Size
α	0.578**	0.021	0.179	−0.266	0.472*	−0.184
τ	—	−0.175	−0.150	−0.199	0.076	−0.159
Mean		—	0.326	0.243	0.186	−0.352
C. of Var.			—	0.745**	0.089	−0.285
Skewness				—	−0.131	−0.046
Life Exp.					—	−0.007

Table notes. $n = 20$. Pearson correlations. Annual changes of the variables in percentage points (α, τ), percent (mean, coefficient of variance, skewness, household size) or expected life years. $^{**}p \leq .01$, $^{*}p \leq .05$.

coefficient of variance and a negative correlation with skewness. As expected, (the change in) household size is negatively correlated with (the change in) mean income which is, to some extent, an effect of using equivalized household income.

Of course, bivariate correlations can only give a first impression of the complex empirical relationships between these variables. In order to learn more about the change of the pension system in OECD countries, we performed OLS estimations with the Bismarckian factor and the generosity of the pension system as the left-hand variables and the income variables as well as life expectancy as the right-hand variables.[13] We avoid the terms endogenous and exogenous variables since we do not claim at this point of the analysis that there is any clear causal relationship among them. Note that we used regression through the origin because zero changes in the right-hand variables should be associated with zero changes in the pension systems.[14]

Table 6 presents the results of the OLS regressions. In this section, we only give a brief account of the figures stated in the table. We will discuss them in detail together with the results of the experiment in the Section 4. First, we comment on the change of the Bismarckian factor. The overall fit of the regression is satisfactorily high for a cross-section of only 20 countries. The coefficient for the annual change in mean income is close to zero and insignificant. As it seems there was no direct relationship between the significant rise of household welfare in terms of equivalized household income

[13]Since this is a case of seemingly unrelated regression with identical regressors, we estimated both equations separately.

[14]As a robustness check, we also performed regressions including an intercept. In none of the regressions, the intercept was significant.

and the level of intragenerational distribution in the pension system. Likewise, the change of household size did not have an impact on changes of α. A change of the coefficient of variation by 1 percent came along with an increase of the Bismarckian factor by about 0.7 percentage points, while a rise in the skewness of the income distribution by 1 percent was associated with a decrease of the Bismarckian factor of almost 0.25 percentage points. Both variables are highly significant. The relationship between increased life expectancy and change of the Bismarckian factor is particularly strong, exhibiting a coefficient of 7.61 percentage points per additional expected life year. Unfortunately, no data was available as to the correlation between life expectancy and income. This relationship will be explored in the experiment.

The regression for the generosity index is insignificant. None of the variables entering the regression exhibits a significant correlation with τ. Hence, the main channel through which changes in the income distribution and life expectancy may have exerted an influence on the design of the pension system is the level of intragenerational redistribution rather than its generosity. This finding contrasts with Conde-Ruiz and Profeta (2007) who in their model used both channels contemporaneously (yet, issue-by-issue) in order to determine the design of the pension system.

The correlation analysis presented in this section has a number of drawbacks. First, as already mentioned, it remains unclear whether the change in intragenerational redistribution is actually caused by changes in the shape of the income distribution and life expectancy or vice versa. Second, the number of observations is too low in order to run more sophisticated regressions, taking into account the countries' heterogeneity and other factors of influ-

Table 6: Results of OLS regression

	Bismarckian factor		Generosity index	
Variable	Coeff.	p	Coeff.	p
Mean	−0.075	0.654	−0.045	0.387
Coefficient of Variation	0.733	0.016	−0.027	0.761
Skewness	−0.248	0.009	−0.004	0.877
Life Expectancy	7.610	0.024	1.063	0.278
Household Size	0.009	0.984	0.145	0.314
	$F = 3.399$, $p = 0.030$		$F = 0.803$, $p = 0.565$	
	$R^2 = 0.531$		$R^2 = 0.211$	

Table notes. Variables entered the regression in terms of annual changes in percentage points (Bismarckian factor and generosity of the pension system), percent (mean, coefficient of variation, skewness), or life years (life expectancy). $n = 20$. Regression through the origin.

ence. Hence, in the next section, we shall present a laboratory experiment that avoids both problems.

3 The Experiment

3.1 Experimental design

The experiment was fully computerized. It consisted of two parts. In the first part, the subjects were presented the decision task. In the second part, we

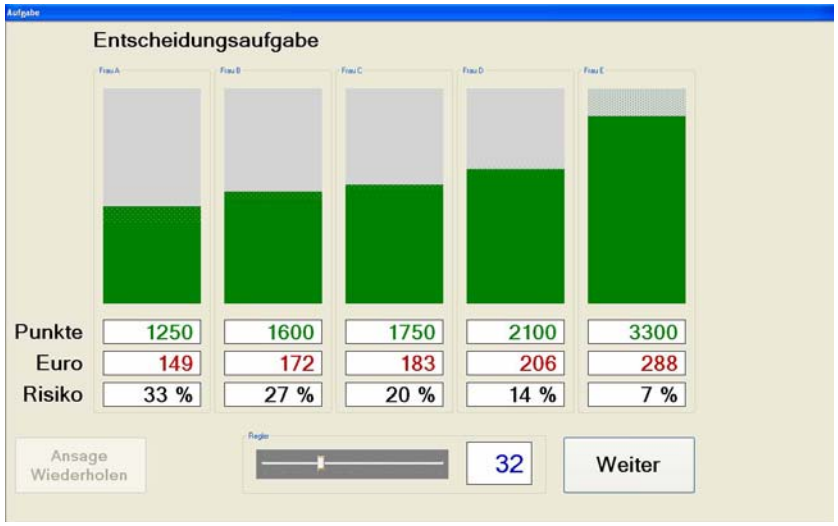

Figure 2: Sample screen of the decision task

collected their sociodemographics and attitudes. Each subject had only one decision problem to solve. Figure 2 presents a sample screen of the decision problem. There were five columns on the screen. Under each column the number of "winning points" (labelled "Punkte") was displayed, corresponding to the height of the column. The subjects were told that the points resemble "Mr./Mrs. A to E's" claims against some (non-specified) social insurance system. Below the winning points, the row labeled "Euro" gave the information how the winning points would be exchanged for money at the end of the experiment. This payoff should be interpreted as the actual pension benefit after redistribution.

By using the control on the lower part of the screen, the participants could choose the degree of redistribution of (pension) claims of five hypothetical persons, ranging from zero to 100 percent. Initially, the control was set at zero; this is equivalent to a Bismarckian factor of one, that is, there is a perfectly proportional relation between winning points and payoffs. By turning the control to the right, the share of winning points which are redistributed among individuals increases to up to 100 percent, implying a Bismarckian factor of zero, that is, a pure Beveridgean pension system. The redistribution of winning points was highlighted by spotted areas within the columns.

The participants were asked to choose the distribution of payoffs they "liked best" by setting the control appropriately. Thereby the following payoff rules had to be taken into account: at the end of the experiment two groups, each including five subjects, were randomly picked. Each of the selected subjects was randomly assigned to an income position in its group (denoted by "Mr./Mrs. A to E") and given the respective cash payment. The payment resulted from the income position and the median α of the group. That is, the Bismarckian factor of each small society was determined by majority vote from the five individual values set by the control. This simple incentive structure is preference-revealing. Strategic considerations, such as coalition building, could not play a role for the subjects' decisions due to anonymous data collection and randomized sampling of groups.

Remember that the index of generosity, the coefficient of variation, the skewness of the income distribution, and life expectancy were significantly correlated with the Bismarckian factor (in terms of changes of the respective variables). The mean of the income distribution was not correlated with the Bismarckian factor and will therefore be neglected in the following. Hence, the experiment involved 18 treatments. We varied

– the factor, τ, at which winning points were exchanged into cash payments in order to test for the effects of increasing the generosity of the pension system; {*low generosity, high generosity*}

– the inequality of the distribution of winning points with respect to variance, σ, and skewness, λ, in order to test the effect of increasing income inequality; {*low variance and symmetric income distribution, high variance and symmetric income distribution, low variance and positively skewed income distribution*}

- the risk of not receiving a payment (benefit), π, in order to test for the life-expectancy effect. {*no risk, symmetric risk, risk negatively correlated with number of winning points*}

The "no-risk" scenario was conducted according to the previously described rules. In the risk scenario, we use the fact that dying after a certain fraction π of the (fixed) retirement period is equivalent in terms of the expected value of pension benefits to not receiving the maximum retirement income with the same probability (see, for example, Diamond, 2003). Hence, in the case of symmetric risk one out of five subjects did not receive a payment, implying a lower average life expectancy of the entire group.[15]

When risk was negatively correlated with income, the probability of not receiving a benefit was – as before – on average 20 percent; however, the individual probability was calculated according to the formula $\pi_i = i/\left(\sum_{j=1}^{5} j\right)$, where i is the rank in a descending ordering of the distribution of winning points. In Figure 2, this scenario is indicated by the "Risiko" (risk) row.[16] A

[15] Since the focus of our analysis is on intragenerational redistribution rather than the intertemporal aspects of the pensions system, this approach appeared us to be a reasonable short-cut. It also avoids problems as to the experimental design linked to intertemporal choice such as discounting.

[16] Note that probabilities are rounded.

complete list of all treatments and the chosen parameters is given in Table 7.

After the decision task, a standardized questionnaire had to be answered by the subjects. In the questionnaire, we asked for the field of study (ordered by schools) as well as some knowledge and attitude questions, which will be explained in detail in Section 3.3. Furthermore, at the beginning of the experiment subjects had to indicate their sex.

3.2 Procedure

The experiment took place in the cafeteria of the University of Bremen on July 2nd and 3rd, 2007. Interested students were informed about a scientific study on social insurances. Furthermore, they were told that a show-up fee of €5 was to be paid, that participation would take about 10 minutes, and that there was a chance of winning up to €1,050. The subjects drew a lot with a five-digit number. The first three digits determined the treatment according to Table 7, the fourth and fifth digit gave the group number within a treatment and the individual income position within the group, respectively. However, the subjects were not given any information about the meaning of the number, which was – together with the sex – the initial input necessary to start the experiment.

At the end of the experiment, that is, after answering the questionnaire, a lottery started. The ten lot numbers of the winning groups were selected by an umpire (our secretary) before the experiment and saved on the computers. Whenever the lot number of the subject coincided with a predetermined number, the subject was informed that he or she is a winner. In case of a

Table 7: Parametrization of treatments

Distribution	Generosity	Risk of dying None ($\pi = 0$)	 Symmetric ($\pi = 0.2$)	 Correlated ($\pi_i = i/\sum_{j=1}^{5} j$)
Low variance,	low	111	121	131
symmetric	($\tau = 0.1$)			
distribution	high	211	221	231
($\upsilon_Y = 0.35$, $\lambda = 0$)	($\tau = 0.3$)			
High variance,	low	112	122	132
symmetric	($\tau = 0.1$)			
distribution	high	212	222	232
($\upsilon_Y = 0.53$, $\lambda = 0$)	($\tau = 0.3$)			
Low variance,	low	113	123	133
positively skewed	($\tau = 0.1$)			
distribution	high	213	223	233
($\upsilon_Y = 0.35$, $\lambda = 0.97$)	($\tau = 0.3$)			

Table note. The figures in the table refer to the treatment number. $\upsilon \doteq$coefficient of variation of income distribution, $\lambda \doteq$skewness.

risk scenario the winning subjects were reminded that due to a second lottery there may not be a payment despite being a winner. After collecting all data, the median of the control values (or individual preferences for redistribution, respectively) of all five group members was determined. Based on this median value, the individual payments were calculated. All subjects participating in the experiment received, independent of whether being a winner or not, the show-up fee. Per treatment two groups of five subjects each took part. Hence, in total 180 students participated in the experiment. Show-up fees summed up to 900 Euros. The ten winners received a total of €3,379, although one subject in a risk-treatment did not receive a payment.

3.3 Results

On average, the individually preferred Bismarckian factor α of all subjects was 0.61.[17] There was no significant difference (t-test: $p = 0.334$) between men (61 percent of the sample, $\alpha = 0.60$) and women (39%, $\alpha = 0.63$). There was a strong correlation between the average individual Bismarckian factor chosen by the subjects and the expected average α of the other subjects, which also had a value of 0.61 (Pearson correlation: $\rho = 0.441$, $p < 0.01$). The correlation with the level of general basic income support, considered as necessary for Germany by the subjects (mean: 643 Euros, standard deviation: 247 Euros), and α was as expected negative but insignificant ($\rho = -0.028$, $p = 0.711$). Between schools there were no significant differences (F-test: $p = 0.303$) although some schools had a tendency for a below-average α (social sciences: 0.53, education: 0.50) or above-average α (production engineering:

[17] Germany's present Bismarckian factor is 0.56 according to our microdata analysis.

0.69).

Because in the beginning of the experiment, subjects were only told that it deals with some non-specified social insurance system, we asked what subjects believed to be "the social insurance". The results were mixed: 29% thought of the pension insurance (mean Bismarckian factor: 0.60) followed by health insurance (26%, 0.62), unemployment insurance (18%, 0.61), long-term care insurance (6%, 0.66) and accident insurance (4%, 0.54). Only few subjects chose systems which – in a narrow sense – are not related to social insurance, such as social aid (11%, 0.65) or "others" (6%, 0.48). There were no significant differences between answer groups with respect to the Bismarckian factor (F-test, $p = 0.301$). Neither was there a significant difference (F-test, $p = 0.921$) between the answers on the question whether responsibility for old-age provision should be private (8%, 0.62), public (14%, 0.62) or jointly (78%, 0.60). The same insignificance (F-test, $p = 0.437$) could be found for the self-assessment regarding risk attitude with the categories risk-averse (50%, 0.62), risk-neutral (32%, 0.58) and risk-loving (18%, 0.62). On average, the subjects estimated the employees' share in social insurance contributions in Germany to be 24 percent.[18] Again, there was no significant correlation with the Bismarckian factor ($\rho = -0.106$, $p = 0.158$), although there was a slight tendency that subjects who estimated a high share preferred more redistribution.

The descriptive results presented so far are neither representative for the entire population nor is it permissible to refer to the absolute level of the Bismarckian factor. In fact, homogeneity of the random sample allows com-

[18]The actual employee's share was about 21% in Germany in 2007.

paring the different treatments. Any differences in the preferred level of redistribution result exclusively from the exogenous variation of the stimuli. Whenever individuals respond to monetary incentives, these treatment effects in the laboratory turn out to be evidence for analogous effects of changes of the income distribution and life expectancy in the real-world.

Because the public pension system and thus the level of intragenerational redistribution within the pension system are based on democratic majority votes, we do not use the individual α's but – in line with the incentive structure of the experiment – the median α's of different groups. As noted in the Introduction, the individual decisions regarding the Bismarckian factor were made from behind a Rawlsian "veil of ignorance". This implies that subjects were assigned their positions in the society only at the end of the experiment. This should guarantee that subjects take on a neutral position and choose only societally beneficial levels of economic inequality. Furthermore, in reality there exists a substantial degree of uncertainty about one's own future economic situation. Another advantage of the "veil of ignorance" is that subjects had no information about their fellow group members. This anonymity allows to construct by permutation from the ten group members of each of the 18 treatments a total of 252 group observations. Accordingly, we had 4,536 independent observations of homogenous groups in our regression analysis.

Table 8 shows the results of an OLS regression in which the Bismarckian factor (in percent) is the endogenous variable. Exogenous were the treatment dummies high generosity, high variance, positively skewed income distribution, high life expectancy, and life expectancy positively correlated

Table 8: Treatment effects (OLS regression)

Variable	Coefficient	Level of significance
Constant	57.997	0.000
High generosity	3.610	0.000
High variance	1.980	0.000
Positively skewed distribution	-5.286	0.000
High life expectancy	-0.583	0.218
Life expectancy positively correlated with income	2.099	0.000
Dependent variable: Bismarckian factor in percent. $n = 4,536$		
$F = 75.052,\ p(F) = 0.000,\ R^2 = 0.075$		

with income. The benchmark case is a treatment with low generosity, low variance and symmetric income distribution, and low life expectancy uncorrelated with income. While the regression explains only a small part of total variance in the data (in experiments the noise is usually quite large), it is nevertheless highly significant.

The average Bismarckian factor (in percent) was about 58% in the benchmark case. Increasing the exchange rate of payments for winning points (that is, moving to a "high generosity" scenario) raised the Bismarckian factor significantly by approximately 3.6 percentage points. Increasing the variance of the income distribution, increased the Bismarckian factor significantly by approximately two percentage points. In the treatments with a more positively skewed income distribution, α was significantly smaller (by about 5.3 percentage points). In contrast to the empirical analysis, our experiment allows to differentiate between symmetric and asymmetric changes of life expectancy. While the symmetric increase of life expectancy had no significant effect on the Bismarckian factor, an asymmetric change had a significant positive effect on the Bismarckian factor (2.1 percentage points).

4 Discussion

In this section we compare and interpret the results gained from the analysis of the LIS data and the experiment. Table 9 provides a stylized overview.

The analysis of the LIS data showed a strong positive correlation between the size of the pension system in terms of the generosity index and the Bismarckian factor. A more generous pension system came along with

Table 9: Summary of results

Factor	LIS	Experiment
Generosity	$\uparrow$	$\uparrow$
Mean	$\leftrightarrow$	—
Variance	$\uparrow$	$\uparrow$
Skewness	$\downarrow$	$\downarrow$
Life expectancy	$\uparrow$	symmetric: $\leftrightarrow$
		correlated with income: $\uparrow$

Table note. Impact of changes in the left-hand variables on α.

less intragenerational redistribution. Such a negative correlation between the level of intragenerational redistribution and the size of the pension system also has been investigated by, for example, Cremer and Pestieau (1998), Casamatta et al. (2000a, 2000b), Köthenbürger et al. (2008), and Rossignol and Taugourdeau (2006). Our empirical result is clearly confirmed by the experiment, where the change of the generosity index was a pure treatment effect, that is, fully exogenous. How does this result relate to Boulding's (1962) hypothesis of a "modest table" and a "high table"?

According to the LIS data the pension benefit of the bottom quintile increased by 1.935% (std. error: 0.577) per year – that is less than the mean pension benefit of all pensioners (2.624%, s.e.: 0.972) but a bit more then the mean of (equivalized) household net income (1.609%, s.e.: 0.405; see Table 4). This highlights – with the caveat that the mean differences are not statistically significant (the former mean difference is 0.689 with $p = 0.230$;

the latter one is 0.327 with $p = 0.594$)[19] – that Boulding's "modest table" grows with increasing wealth of the society rather than being absolutely fixed. It points to the fact that in OECD countries poverty is more a relative than an absolute concept. In other words: income support is given in order to allow people to participate in a society's usual activities (although at a lower level), and less as a means of avoiding poverty in the sense of famine, malnutrition, and homelessness. On the other hand, the minimum pension seems to have grown less than the mean pension such that the relative distance between minimum pension and mean pension benefit has significantly increased by 4.3% (p=0.084).

> **Result 1**: The minimum pension (Boulding's "modest" table) is
> a weakly superior good.

Both parts of the analysis brought about a negative relationship between intragenerational redistribution and changes in the variance of the income distribution. It straightforward to show that the degree of inequality in the pension system (in terms of the coefficient of variation) is related to the degree of inequality in the income distribution as follows:

$$v_P = \alpha v_Y \ . \tag{5}$$

Accordingly, v_P is linear homogenous in v_Y, and an increase in α that is caused by an increase in v_Y unambiguously leads to an increase in inequality of the pension system. For example, consider the experiment's benchmark

[19] One should keep in mind that the LIS analysis considers intragenerational redistribution in a broader sense than just minimum pensions, some of the transfers even being regressive, such that the pure minimum pension change may be stronger.

case with $Y = (1,000; 1,500; 2,000; 2,500; 3,000)$ and $v_Y = 0.3536$. The high-variance scenario with $Y' = (500; 1,250; 2,000; 2,250; 3,500)$ increased the variation coefficient by 50% ($v_{Y'} = 0.5303$) and induced our subjects to state α's about 1.980 percentage points higher. As a consequence of this, inequality in the pension system rose from $v_P = 0.2051$ to $v_{P'} = 0.3181$, that is, by about 55%.

However, this observation seems to contradict the literature. Conde-Ruiz and Profeta (2007) recently argued that a winning coalition of the rich and the poor (high inequality condition) could implement a Beveridgean pension system, while a low degree of inequality would allow the middle-class to introduce a Bismarckian system. Also from the perspective of the impartial observer model, this result comes as a surprise. An isolated increase in the variance is equivalent with a regressive transfer. Consequently, with a concave welfare function one would expect to see lower instead of higher Bismarckian factors.

Although we neglect the usual equity-efficiency trade-off in our experiment, social planners and real world politicians will have to take this trade off into account, naturally limiting the level of intragenerational redistribution in a society. In an experiment with considerable financial incentives, Traub et al. (2008) showed that subjects put relatively high weight on efficiency consideration (in terms of Pareto dominance) as compared to equity consideration (in terms of transfer and Lorenz dominance) when faced with an equity-efficiency trade-off. Note also that from an empirical point of view the transfer principle is highly controversial. Using questionnaire-based experiments, Amiel and Cowell (1999) showed that between 53 to 74 percent of their subjects rejected the transfer principle in the different contexts of inequality measurement, poverty, and social welfare.

Amiel and Cowell (1999) concluded that people tend to judge inequality in terms of income difference (rather than income levels directly) and the overall shape of the income distributions (rather than only the incomes involved in the transfer). We explain the violation of the transfer principle by randomization preferences (for experimental evidence see Bernasconi, 2002; and Traub et al., 2008): self-interested social planners might perceive a trade-off between "fairness" in terms of inequality and the chance of excelling the others. Randomization preferences imply that a probability mixture of two original (very promising but unequal) income distributions between which the social planner is indifferent from under the veil of ignorance is preferred over the two original income distributions. Such preferences violate the betweeness axiom of expected utility theory (see Chew, 1989) but may be opportune if the social planner looks for a "fair" procedure (for example, tossing a coin) to justify "unfair" outcomes. Our empirical and experimental results suggests, that the weight that is given to the chance of being among the top recipients of pension benefits increases disproportionately high with increasing background inequality of the income distribution.

> **Result 2**: Increasing inequality of the income distribution induces the social planner to put less weight on outcome fairness and more weight on procedural fairness. Hence the level of intragenerational redistribution in the pension system is decreased and, thus, the Bismarckian factor increased.

Table 9 shows that an increase of the skewness of the income distribution unambiguously decreased the Bismarckian factor. We believe that this results can be traced back to an increase of relative deprivation. Seidl et al. (2006) experimentally estimated Parducci's (1965, 1968, 1974, 1982) so-called judgement equation which forms part of his range-frequency theory. Their estimate was given by

$$J_i = -0.028 + 0.855 \times R_i + 0.187 \times F_i, \tag{6}$$

where J_i is the judgement of stimulus i, $R_i = (S_i - \min_j\{S_j\}/(\max_j\{S_j\} - \min_j\{S_j\})$ is the range component, $F_i = (r_i - 1)/(N - 1)$ is the frequency component, r_i is the rank of stimulus i, and N is the total number of stimuli. Using equation (6), we can easily illustrate how the evaluation of income distributions changes if they become more skewed. We consider the benchmark case with $S = (1,000; 1,500; 2,000; 2,500; 3,000)$, first. Here, we obtain an average judgement of 0.493. For the income distribution that is positively skewed (but has the same mean income and variance), $S'' = (1,250; 1,600; 1,750; 2,100; 3,300)$, we compute only 0.378.[20] Temkin's work (1986, 1993) suggests that the latter society is less happy. Inequality aversion that is driven by the complaints of the poor about their situation in relation to that of the rich should therefore be higher in the treatment with a positively skewed income distribution. Note that Devooght (2003) found experimental support for Temkin's model, too.

If inequality aversion – an thus the size of the Bismarckian factor – is

[20] In principle, the judgement should be constrained to the $[0, 1]$-interval and the weighs should add up to one. However, the empirical estimate brought about slight deviations from the theoretical model. For more details on range-frequency theory, we refer to the article by Seidl et al. (2006).

driven by relative deprivation, this creates a paradox: though we actually observe lower α's, the amount of relative deprivation that is felt by the social planner does not decrease. It is straightforward to show, that the judgement given in equation (6) is independent of α. An intuitive explanation for that is, that a change of the Bismarckian factor does only influence the dispersion of pension benefits but not the skewness of their distribution (the skewness of the positively skewed distribution is 0.97 as stated in Table 7). In other words: though relative deprivation might induce redistribution policy, changing the level of intragenerational distribution is an insufficient measure to decrease relative deprivation in the society.

> **Result 3**: Increasing the skewness of the income distribution deepens relative deprivation in the society, augments the social planner's preference for intragenerational redistribution and, thus, decreases the Bismarckian factor. However, increasing the level of intragenerational redistribution does not change the skewness of the distribution of pension benefits.

Finally, we comment on the relationship between life expectancy and Bismarckian factor. The LIS data did not let us differentiate between symmetric and asymmetric increases of life expectancy. However, there is sufficient evidence in the literature for a positive effect of income on life expectancy (see, for example, Deaton and Paxson, 2001; and Attanasio and Emerson, 2003) to assume that the LIS data, too, reflect this asymmetry. Hence, concerning the effect of an asymmetric increase of life expectancy on the Bismarckian factor, empirical and experimental results again are perfectly in line with each other.

From an economic perspective, increasing life expectancy at a given retirement age implies a higher risk of being poor and having to rely on state transfers during retirement. The pension system covers the income risks involved with unknown life expectancy. If life expectancy increases across the board, that is, symmetrically, one would expect the generosity of the pension system τ to increase in order to guarantee the same replacement income as before. However, though the respective coefficients were positive, the correlation analysis in Section 2.5 showed no significant relationship between generosity index and life expectancy. In case of an increase of life expectancy which favors the rich, there is an obvious, rational explanation for lowering the degree of intragenerational redistribution. To work out our argument, let us assume that life expectancy of the average citizen remains unchanged and that life expectancy of the rich (poor) increases (decreases). On the one hand, this implies an increase of the pension system's generosity because the rich receive higher benefits than the poor. On the other hand, this effect is counteracted by a Harsanyi-Friedman type social planner who realizes that the expected value of pension benefits of the rich (poor) has increased (fallen). From the social planner's perspective, it is relatively more profitable to share "the cake" among the rich pensioners. The flat component of the pension system will be reduced in favor of the earnings-related component such that we observe an increase of the Bismarckian factor and a corresponding reduction of intragenerational redistribution. Although viewed from a different angle, this is similar to the life expectancy effect described by Borck (2007) and Gorski et al. (2007).

Result 4: Asymmetric changes in life expectancy in favor of the rich diminish the expected utility of pensions at the lower end of the income distribution, reduce the social planner's preference for intragenerational redistribution and, thus, increase the Bismarckian factor.

This result is nicely reflected in the experimental results reported in Table 8. Comparing the benchmark group with the group that was treated with a symmetric increase in life expectancy shows that the treatment effect was insignificant (a slightly negative value of -0.583 percentage points is recorded). There is obviously no reason to change α as the expected utility of the pension system is independent of it. We do not know the subjects' utility functions, but we can directly compare the expected value of the pension benefit under both treatments. When introducing risk, it dropped from €200 to €160. The generosity of the pension system was given, so the social planner could not go against it by increasing "the cake". Under the asymmetric treatment, the expected value of the pension system was dependent on the Bismarckian factor: €$6.67 \times \alpha +$€160. Hence, the subjects had to balance the efficiency gain of a higher α with its side effect of higher inequality. In the experiment, this yielded a Bismarckian factor more than 2 percentage points higher than in the symmetric scenario.

5 Conclusions

In this paper, we presented an analysis of the long-term change in OECD countries' pension systems. In a first step, using microdata drawn from the Luxembourg Income Study (LIS), we showed that there is some empirical evidence for a reduction of intragenerational redistribution in public pension systems, as suggested (but not yet empirically confirmed) in the recent literature. As a measurement for the level of intragenerational redistribution in the pension system, we employed the Bismarckian factor. Though the majority of countries decreased intragenerational redistribution, accompanied by a rise in the generosity of the pension system, the change proved to be insignificant at conventional statistical terms. We would answer the question: "Back to Bismarck?" in the affirmative. It should be kept in mind, however, that the empirical evidence is only weak.

The main focus of our analysis was on the factors determining societal preferences for intragenerational redistribution in public social insurance systems, the first pillar of the public pension system in particular. Our proceeding comprised two different analytical steps: a cross-country study based on LIS data and an economic laboratory experiment. While the empirical analysis brought about interesting correlations between the Bismarckian factor and some variables of interest, it had some limitations due to low sample size and unclear causal relationships. The laboratory experiment had the clear advantage of enabling us to model changes in potential explanatory variables as exogenous treatment variables. While it is hardly possible to translate the subjects' absolute distributional preferences from the experiment into the real world, this approach allowed to study causal relations. Furthermore, while the empirical analysis was naturally limited to 20 observations, the experiment was conducted with a sample of 180 student subjects from which we generated by permutation more than 4,500 independent observations.

Our results can be summarized as follows: Empirical analysis and laboratory experiment produced identical marginal effects. Factors that increased the Bismarckian factor (decreased intragenerational redistribution) were increases in the generosity of the pension system and the variance of the income distribution as well as asymmetric increases of life expectancy in favor of the rich. Higher skewness of the income distributions decreased the Bismarckian factor.

We explain our results in the following ways. In OECD countries poverty is more a relative than an absolute concept, that is, income support is given in order to allow people to participate in society's usual activities rather than just as a means of providing for subsistence. The minimum pension (or Boulding's "modest table") therefore increases with society's wealth, however, at a less than proportional rate. The relative importance of intragenerational redistribution falls and the Bismarckian factor increases (Result 1).

Falling intragenerational redistribution following increasing variance of the income distribution is somewhat unexpected and can be explained by a violation of the transfer principle in people's preferences. Because of randomization preferences the social planner in cases of increasing inequality puts less weight on outcome fairness and more weight on procedural fairness which causes the Bismarckian factor to increase (Result 2). Increasing skewness, on the other hand, increases the level of intragenerational redistribution because relative deprivation in the society becomes more pronounced which then augments the social planner's preference for redistribution. Notwithstanding changing the Bismarckian factor is an inappropriate means of alleviating relative deprivation because it reduces only the dispersion of benefits but not the skewness of their distribution (Result 3).

Increasing life expectancy implies a higher risk of drifting into old-age poverty and having to rely on state transfers. However, a symmetric increase of life expectancy for all (income) groups in society would rather increase generosity than change the level of intragenerational redistribution. Hence, only an asymmetric change of life expectancy in favor of the rich had a significant impact on the Bismarckian factor. Under these circumstances, the social planner realizes that the expected value of the pension benefits of the rich has increased and therefore finds it more profitable to direct transfers towards them by strengthening the earnings-related element of the pension system (Result 4).

Taking fundamental societal developments – in particular globalization and demographic change – into consideration our results yield the following important insights. Both developments tend to strengthen the earnings-related component of the public pension systems' first pillar, unless they induce a substantial change of the skewness of the distribution of retirement incomes. In the process of globalization barriers to trade and factor mobility are removed. Factor price equalization generates welfare gains for the countries involved, although the gains may not be shared equally within a country. In terms of our analysis we expect mean income and (possibly) the variance of the income distribution to rise which – according to Results 1 and 2 – decreases the preferred level of intragenerational redistribution. The ageing of societies may move the pension system into the same direction, depending on whether life expectancy increases asymmetrically or in favor of the rich, as Result 3 points out. Evidence from past decades shows that life expectancy increased the Bismarckian factor as if life expectancy changed asymmetrically.

However, there is one major counterforce to the reduction of intragenerational redistribution which comes from an increase in the skewness of income distributions. Past data indicates that skewness increased substantially in OECD countries, and there are few signs that this development will not continue in the future. Globalization, for example, tends to reduce the labor share in national income. Upcoming old-age poverty is a major concern in many countries' political debate nowadays.

Globalization and ageing may even interact in some respects. The LIS analysis showed that while changes of the income distribution were insignificant with respect to changes of the level of redistribution, changes of generosity had a significant impact. Globalization leads – in the first place – to an increase of mean income, but not necessarily generosity (although Result 1 indicates that preferences change accordingly). In an ageing society, however, we expect the power of the old generation to increase which allows them to vote in favor of a more generous pension system, as argued in Browning's (1975) seminal paper. When times of globalization and ageing coincide (as projected for the next decades), mean income and generosity increase, leading to a higher Bismarckian factor. It should be noted that the voting power (or gerontocracy) argument introduces an element of *inter*generational redistribution into our reasoning.

Under these circumstances the design of future pension systems remains an unresolved question. Whether pension system will move even further "back to Bismarck" depends on the strength of the skewness effect relative to the other impact factors shown to be relevant in our analysis. But even if pension systems take a turn – induced by society's concern about relative deprivation – to becoming more Beveridgean in the future, this will not solve the problem of relative deprivation due to the inability of the Bismarckian factor to change the skewness of the distribution of pension benefits.

Acknowledgments

Financial support by the German Federal Pension Insurance's *Research Network on Pensions* (FNA) is gratefully acknowledged. Earlier versions of the paper were presented at the IIPF conference in Warwick, at the FNA workshop "Wohlstandsverteilung und gesetzliche Rentenversicherung" in Berlin, at the EPCS conference in Jena, at the IEF workshop "Modelling the effects of pensions and other welfare state transfers in an ageing world" in Madrid, at the Journées d'Economie Publique Louis-André Gérard-Varet in Marseille and at the research seminar in Paderborn. The authors would like to thank Jürgen Faik, Christophe Hachon, Stefan Hupfeld, Tim Köhler-Rama, Sven Stöwhase, Christian Traxler, Björn Tyrefors and Andreas Wagener as well as conference and seminar participants for helpful comments and discussions.

References

Amiel, Y.; Cowell, F.A. (1992): Measurement of income inequality: Experimental test by questionnaire. *Journal of Public Economics* 47, 3–26.

Amiel, Y.; Cowell, F.A. (1999): Thinking about inequality. Cambridge: Cambridge University Press.

Amiel, Y.; Cowell, F.A. (2000): Attitudes to risk and inequality: A new twist on the transfer principle. Distributional Analysis Discussion Paper No. 56, STICERD, London School of Economics, London.

Atkinson, A.B. (2004): The Luxembourg Income Study (LIS): Past, present and future. *Socio-Economic Review* 2, 165–190.

Attanasio, O.; Emmerson, C. (2003): Differential mortality in the UK. *Journal of the European Economic Association* 1, 821–850.

Ballano, C.; Ruiz-Castillo, J. (1993): Searching by questionnaire for the meaning of income inequality. *Revista Espaola de Economa* 10, 233–259.

Bernasconi, M. (2002): How should income be divided? Questionnaire evidence from the theory of 'impartial preferences'. In: Moyes, P.; Seidl, C.; Shorrocks, A. (Eds.): Inequalities: Theory, experiments and applications. *Journal of Economics/Zeitschrift für Nationalökonomie*, Supplement 9, Vienna-New York: Springer, 163–195.

Borck, R. (2007): On the choice of public pensions when income and life expectancy are correlated. *Journal of Public Economic Theory* 9, 711–725.

Börsch-Supan, A.; Reil-Held, A. (2001): How much is transfer and how much is insurance in a pay-as-you-go system? The German case. *Scandinavian Journal of Economics* 103, 505–524.

Boulding, K. (1962): Social justice in social dynamics. In: Brandt, R. (ed.): Social justice, Englewood Cliffs: Prentice-Hall, 73–92.

Bosmans, K.; Schokkaert, E. (2004): Social welfare, the veil of ignorance and purely individual risk: An empirical examination. *Research on Inequality* 11, 85–114.

Browning, E.K. (1975): Why the social insurance budget is too large in a democracy. *Economic Inquiry* 13, 373–388.

Casamatta, G.; Cremer, H.; Pestieau, P. (2000a): The political economy of social security. *Scandinavian Journal of Economics* 102, 503–522.

Casamatta, G.; Cremer, H.; Pestieau, P. (2000b): Political sustainability and the design of social insurance. *Journal of Public Economics* 75, 341–364.

Casey, B.; Oxley, H.; Whitehouse, E.; Antolin, P.; Duval, R.; Leibfritz, W. (2003): Policies for an ageing society: Recent measures and areas for further reform. OECD Economics Department Working Paper No. 369, OECD Publishing, Paris.

Chew, S.H. (1989): Axiomatic utility theories with the betweeness property. *Annals of Operations Research* 19, 273–298.

Conde-Ruiz, I.; Profeta, P. (2007): The redistributive design of social security systems. *Economic Journal* 117, 686–712.

Coronado, J.L.; Fullerton, D.; Glass, T. (2000): The progressivity of social security. NBER Working Paper No. 7520.

Cowell, F.A.; Schokkaert, E. (2001): Risk perceptions and distributional judgments. *European Economic Review* 45, 941–952.

Cremer, H.; Pestieau, P. (2003): Social insurance competition between Bismarck and Beveridge. *Journal of Urban Economics* 54, 181–196.

Deaton, A.; Paxson, C. (2001): Mortality, education, income and inequality among American cohorts. In: Wise, D. (ed.): Themes in the economics of aging. Chicago: Chicago University Press for NBER, 129–70.

Diamond, P.A. (1967): Cardinal welfare, individual ethics, and interpersonal comparison of utility: Comment, *Journal of Political Economy* 75, 765–766.

Diamond, P.A. (2003): Taxation, Incomplete Markets, and Social Security. Cambridge: MIT Press.

Devooght, K. (2003): Measuring inequality by counting “complaints”: Theory and empirics. *Economics and Philosophy* 19, 241–263.

Epstein, L.G.; Segal, U. (1992): Quadratic social welfare functions. *Journal of Political Economy* 100, 691–712.

Easterlin, R.A. (2001): Income and happiness: Towards a unified theory. *Economic Journal* 111, 465–484.

Fenge, R.; Gebauer, A.; Holzner, C.; Meier, V.; Werding, M. (2003): Alterssicherungssysteme im internationalen Vergleich: Finanzierung, Leistungen, Besteuerung. ifo Beitrge zur Wirtschaftsforschung, Band 10, Ifo Institute Munich.

Frohlich, N.; Oppenheimer, J. A. (1994): Preferences for income distribution and distributive justice: A window on the problems of using experimental data in economics and ethics. *Eastern Economic Journal* 20, 147–155.

Friedman, M. (1953): Choice, chance, and the personal distribution of income. *Journal of Political Economy* 61, 277–290.

Gil, J.; Lopez-Casasnovas, G. (1998): Life-time redistribution effects of the Spanish public pension system. Economics Working Paper No. 242, Universitat Pompeu Fabra.

Gorski, M.; Krieger, T.; Lange, T. (2007): Pensions, education and life expectancy. Discussion paper No. 07/04 of the DFG Research Group "Heterogeneous Labor: Positive and Normative Aspects of the Skill Structure of Labor", University of Konstanz.

Harrison, E.; Seidl, C. (1994a): Acceptance of distributional axioms: Experimental findings. In: Eichhorn, W. (Ed.), Models and measurement of welfare and inequality. Heidelberg: Springer, 67–99.

Harrison, E.; Seidl, C. (1994b): Perceptual inequality and preferential judgments: An empirical examination of distributional judgments. *Public Choice* 19, 61–81.

Harsanyi, J.C. (1953): Cardinal utility and the ethics of welfare. *Journal of Political Economy* 61, 434–435.

Harsanyi, J.C. (1955): Cardinal welfare, individualistic ethics, and interpersonal comparisons of utility. *Journal of Political Economy* 63, 309–321.

Hassler, J.; Lindbeck, A. (1997): Optimal actuarial fairness in pension systems: A note. *Economics Letters* 55, 251–255.

Korpi, W.; Palme, J. (1998): The paradox of redistribution and strategies of equality: Welfare states institutions, inequality, and poverty in Western countries. *American Sociological Review* 63, 661–687.

Köthenbürger, M.; Poutvaara, P.; Profeta, P. (2008): Why are redistributive social security systems smaller? A median voter approach. *Oxford Economic Papers* 60, 275–292.

Lefèbvre, M.; Pestieau, P. (2006): The generosity of the welfare state towards the elderly. *Empirica* 33, 351–360.

Lefèbvre, M. (2007): The redistributive effects of pension systems in Europe: A survey of evidence. Luxembourg Income Study Working Paper Series No. 457.

Lindbeck, A.; Persson, M. (2003): The gains from pension reform. *Journal of Economic Literature* 41, 74–112.

Luxembourg Income Study (LIS) Micro database, (2008); harmonization of original surveys conducted by the Luxembourg Income Study asbl. Luxembourg, periodic updating.

Mongin, P. (2001): The impartial observer theorem of social ethics. *Economics and Philosophy* 71, 147–179.

Oswald, A.J. (1997): Happiness and economic performance. *Economic Journal* 107, 1815–1831.

Parducci, A. (1965): Category judgement: A range-frequency model. *Psychological Review* 72, 407–18.

Parducci, A. (1968): The relativism of absolute judgements. *Scientific American* 219/6, 84–90.

Parducci, A. (1974): Contextual effects: A range-frequency analysis. In: Carterette, E.C.; Friedman, P. (eds.): Handbook of perception, Vol. II: Psychological judgement and measurement. New York/San Francisco/London: Academic Press, 127-41.

Parducci, A. (1982): Category ratings: Still more contextual effects! In: Wegener, B. (ed.): Social attitudes and psychophysical measurement. Hillsdale, NY: Lawrence Erlbaum Associates, 88–105.

Queisser, M. (2000): Pension reform and international organizations: From conflict to convergence. *International Social Security Review* 53, 31–45.

Rawls, J. (1971): A theory of justice. Oxford: Oxford University Press.

Reil-Held, A. (2000): Einkommen und Sterblichkeit in Deutschland: Leben Reiche länger? SFB 504 Discussion Paper No. 00-14, University of Mannheim.

Rossignol, S., Taugourdeau, E. (2006): Asymmetric social protection systems with migration. *Journal of Population Economics* 19, 481-505.

Runciman, W.G. (1966): Relative deprivation and social justice. Henley: Routledge & Kegan Paul.

Seidl, C.; Traub, S.; Morone, A. (2006): Relative deprivation, personal income satisfaction, and average well-being under different income distributions. In: McGillivray, M. (ed.): Inequality, poverty and well-being. Basingstoke: Palgrave Macmillan, 66-90.

Stouffer, S.A.; Suckman, E.A.; Devinney, L.C.; Star, S.A.; Williams, R.M. (1949): The American soldier: Adjustment during army life. Princeton: Princeton University Press.

Temkin, L.S. (1986): Inequality. *Philosophy and Public Affairs* 15, 99-121.

Temkin, L.S. (1993): Inequality. Oxford University Press, Oxford.

Traub, S.; Seidl, C.; Schmidt, U.; Levati, V. (2005): Friedman, Harsanyi, Rawls, Boulding - or somebody else? An experimental investigation of distributive justice. *Social Choice and Welfare* 24, 283-309.

Traub, S.; Seidl, C.; Schmidt, U. (2008): An experimental study on individual choice, social welfare, and social preferences. *European Economic Review* (forthcoming).

Werding, M. (2003): After another decade of reform: Do pension systems in Europe converge? *DICE Report: Journal of Institutional Comparisons* 1, 11–16.