The Bismarckian Factor: A Measure of Intra-generational Redistribution in International Pension Systems

Social systems, and especially pension systems, are commonly divided into two broad classes: they are organized according to the principles of either the *Beveridgean* or the *Bismarckian* tradition. Conceptionally, a Bismarckian pension system is characterized by a close link between previous earnings (and contributions when we assume that the latter are collected as payroll taxes) and today's benefits. A Beveridgean pension system, on the other hand, provides a basic or minimum pension. This binary characterization along the lines of the welfare state tradition ignores, however, that real-world pension systems typically contain elements of both. On the one hand, Bismarckian pension systems often provide benefits related not to previous contributions, but to personal characteristics (like motherhood, years at school) or earnings histories (like last or best contribution years). These exemptions tend to loosen the link between earnings and benefits, thereby inducing intra-generational redistribution. On the other hand, some countries with a strong degree of intra-generational redistribution have recently begun to introduce pension reforms that reduce this type of redistribution in their pension formulae. In order to evaluate how redistributive a pension system is, a more detailed measure of intra-generational redistribution is needed. The present data set aims to provide this information.

In order to determine the level of intra-generational redistribution in the public pension system ("first pillar"), we use micro data from the Luxembourg Income Study (LIS). The resulting measure of intra-generational redistribution may be referred to as the *Bismarckian factor*, following a convention in the theoretical contributions of, among others, Cremer and Pestieau (1998). Specifically, the index compares the inequality of pension benefits with the inequality of household net income, assuming that the principle of participation equivalence holds (see below). In a "pure" Beveridgean pension system, every pensioner receives the same pension benefit, independent of his/her (previous) household income. Here, the Bismarckian factor assumes a value of zero. Under a "pure" Bismarckian pension system, benefits are proportional to previous earnings/contributions, i.e., pension benefits exhibit the same level of inequality as earnings. Accordingly, the Bismarckian factor equals one.

Let Y^i and $P^i, i \in \{B(ottom),2,3,4,T(op)\}$, denote the mean income and the mean pension benefit, respectively, of the ith quintile of the income distribution. A purely Bismarckian pension system implies $\frac{P^B}{Y^B} = \frac{P^T}{Y^T}$, and a purely Beveridgean pension system implies $P^B = P^T$. The pension benefit of a representative member of quintile i, P^i, is defined as a convex combination of a flat payment (proportional to the mean income) and an earnings-related component (proportional to Y^i):

$$P^i \equiv \tau \cdot \left[\alpha Y^i + (1-\alpha)\mu\right], \qquad (1)$$

where $\alpha \in [0,1]$ is the Bismarckian factor, $\mu = \sum_i Y^i/5$ is the mean income of a society, and $\tau \equiv \sum_i P^i / \sum_i Y^i \in [0,1]$ the "generosity index", a measure of the level of redistribution between generations.

We are interested in a comparison of different income distributions at retirement age. Plugging equation (1) into the ratio of the pension benefits of the bottom and the top quintile, P^B/P^T, and solving for α gives:

$$\alpha = \frac{\mu(P^T - P^B)}{\mu(P^T - P^B) - P^T Y^B + P^B Y^T} \in [0,1]\,. \qquad (2)$$

A purely Beveridgean pension system yields $\alpha^{Bev} = 0$, while a purely Bismarckian pension system gives $\alpha^{Bis} = 1$. Hence, the Bismarckian factor is normalized on the closed interval [0,1]. Let us note that τ drops out of the formula, that is, the Bismarckian factor is independent of the generosity of the pension system. Accordingly, α is not only a pure measure of intra-generational redistribution but also allows for cross-country comparisons of public pension systems of different size. It is also worth noting that negative values of α can arise if pension benefits follow a progressive scheme due to, for example, means testing (formally, we then have: $P^B > P^T$).

All LIS data employed in computing the Bismarckian factor (Table 1)[1] and the generosity

[1] The tables can also be downloaded in the DICE Database under Social Policy / Pensions / System Characteristics.

Table 1

The Bismarckian factor

Country	LIS wave (years)							
	0 (-1978)	1 (1979-1983)	2 (1983-1987)	3 (1988-1992)	4 (1993-1997)	5 (1998-2002)	6 (2003-2004)	7 (2006-2008)
Australia	---	0.014	-0.086	0.046	0.113	0.010	0.029	---
Austria	---	---	---	---	0.501	0.525	---	---
Belgium	---	---	0.417	0.463	0.488	0.430	---	---
Canada	-0.002	0.035	0.046	0.066	0.270	0.307	0.289	0.265
Czech Republic	---	---	---	0.148	0.156	---	0.146	---
Denmark	---	---	---	---	0.056	0.024	-0.004	---
Finland	---	---	-0.044	0.019	0.594	0.416	0.364	---
France	---	0.710	0.701	0.711	0.730	0.737	0.715	---
Germany	0.573	0.579	0.583	0.539	0.564	0.589	0.549	0.575
Greece	---	---	---	---	---	---	---	0.638
Hungary	---	---	---	0.307	0.148	0.348	0.387	---
Ireland	---	---	0.121	---	0.347	0.327	0.348	---
Israel	---	-0.017	0.021	0.093	0.037	0.148	0.120	0.071
Italy	---	---	0.379	0.375	0.540	0.549	0.546	0.643
Luxembourg	---	---	0.445	0.367	0.315	0.351	---	---
Mexico	---	---	0.506	0.506	---	---	---	---
Netherlands	---	---	0.253	0.353	0.289	0.278	---	---
Norway	---	---	---	0.226	0.434	---	---	---
Poland	---	---	0.142	0.256	0.489	0.405	0.518	---
Slovenia	---	---	---	---	0.502	0.506	0.489	
Spain	---	---	---	0.528	0.432	0.470	---	0.554
Sweden	0.569	0.422	---	0.571	0.421	---	---	---
Switzerland	---	0.190	---	0.147	---	0.099	0.052	---
Taiwan	---	0.240	0.353	0.522	-0.068	-0.171	-0.152	---
United Kingdom	0.038	0.198	0.157	0.141	0.168	0.088	0.095	0.144
United States	0.340	0.342	0.532	0.533	0.545	0.462	0.445	0.461
Average	0.304	0.271	0.283	0.329	0.351	0.328	0.290	0.419

Note: A dash means that no data set (or first-pillar pension data) is available for the respective LIS wave.
LIS = Luxembourg Income Study.
Source: The authors.

index (Table 2) refer to the household level. We use "raw" household net income. Hence, α and τ measure the *legal status* of the pension system as it is reflected in the respective income distribution. This means that the numbers reported in the tables do not account for differences in needs due to household composition. Let us also note that we use the household weights provided by LIS in order to weight cases, if available. LIS reports household net income in an aggregate variable (DPI). The first-pillar of the pension system (i.e., the public part) is captured by three variables: HMITSILEP contains employment-related old-age, disability, and survivors' public pensions; HMITSUP and HMITSAP contain the respective figures for non-employment-related public pensions (universal pensions and social assistance, respectively).

LIS data is organized in "waves", that is, a data set is assigned to a certain wave if its base year falls into the respective time period, which usually comprises five years. Sometimes, and for some countries, several data sets are available referring to the same wave. In such cases, we selected one data set according to two criteria: firstly, only data sets for which the relevant pension variables were available were considered and, secondly, among those data sets we chose the eldest. As shown in the tables, there are many waves for which data sets and/or the respective variables are not available for some countries. Since LIS data rely on different samples for each wave (cross section), we cannot directly compare a single individual's pension benefit with his/her previous earnings, but have to resort to income distributions instead. This implies that our estimates of the

Table 2

The generosity index

Country	LIS wave (years)							
	0 (-1978)	1 (1979-1983)	2 (1983-1987)	3 (1988-1992)	4 (1993-1997)	5 (1998-2002)	6 (2003-2004)	7 (2006-2008)
Australia	---	0.065	0.080	0.054	0.071	0.068	0.067	---
Austria	---	---	---	---	0.209	0.224	---	---
Belgium	---	---	0.172	0.180	0.217	0.198	---	---
Canada	0.042	0.051	0.066	0.076	0.041	0.044	0.045	0.044
Czech Republic	---	---	---	0.206	0.182	---	0.214	---
Denmark	---	---	---	---	0.185	0.174	0.175	---
Finland	---	---	0.066	0.058	0.262	0.224	0.224	---
France	---	0.171	0.198	0.209	0.240	0.233	0.213	---
Germany	0.199	0.193	0.188	0.207	0.202	0.209	0.210	0.204
Greece	---	---	---	---	---	---	---	0.254
Hungary	---	---	---	0.220	0.040	0.280	0.280	---
Ireland	---	---	0.057	---	0.119	0.115	0.118	---
Israel	---	0.054	0.075	0.059	0.062	0.077	0.079	0.073
Italy	---	---	0.209	0.216	0.251	0.265	0.267	0.296
Luxembourg	---	---	0.223	0.210	0.216	0.206	---	---
Mexico	---	---	0.022	0.024	---	---	---	---
Netherlands	---	---	0.165	0.166	0.175	0.155	---	---
Norway	---	---	---	0.163	0.132	---	---	---
Poland	---	---	0.139	0.169	0.305	0.330	0.345	---
Slovenia	---	---	---	---	0.246	0.249	0.253	---
Spain	---	---	---	0.200	0.204	0.201	---	0.185
Sweden	0.107	0.252	0.272	0.256	0.215	---	---	---
Switzerland	---	0.084	---	0.112	---	0.160	0.122	---
Taiwan	---	0.001	0.001	0.005	0.004	0.007	0.011	---
United Kingdom	0.087	0.119	0.111	0.100	0.110	0.091	0.091	0.085
United States	0.076	0.054	0.101	0.102	0.113	0.098	0.104	0.104
Average	0.102	0.104	0.126	0.142	0.165	0.172	0.166	0.156

Note: A dash means that no data set (or first-pillar pension data) is available for the respective LIS wave.
LIS = Luxembourg Income Study.
Source: The authors.

Bismarckian factor should be interpreted according to the principle of participation equivalence. This principle assumes that intra-generational redistribution takes place if the individual replacement ratio (defined within the same wave) of a pensioner decreases with her individual benefit. This requires the (weak) assumption that a complete re-ranking of income and benefit positions will not take place between any two consecutive generations. Based on this assumption, it is justified that our data set rests on a comparison of today's earnings and today's pension benefits. This makes our data set especially useful for the analysis of distributional conflict since the participation of a pensioner in today's societal activities depends mainly on his/her personal position in terms of income distribution and the relative income position of pensioners compared to income earners.

Further information on the Bismarckian factor and an empirical application can be found in Krieger and Traub (2011). Please note, however, that the figures reported there do not accord with Tables 1 and 2 due to major data and variable revisions recently carried out by LIS.

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References

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