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REDISTRIBUTIVE OUTCOMES OF SICKNESS INSURANCE ON INCOME: AN EMPIRICAL STUDY OF SOCIAL INSURANCE INSTITUTIONS

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We analyzed the redistributive outcomes of sickness benefits using a typology of social insurance institutions, including four different systems, after adjusting for sickness risk factors. The aim is to empirically observe if the expected redistributive pattern of the typology could be verified whether or not considering the variations in sickness risk across the countries. Data on household earnings and sickness benefits in ten countries and for different years were taken from the Luxembourg Income Study. We also used data on labor force demography and educational attainment. Gini coefficients were used for measuring earnings inequality. Relative changes in earnings inequality for sickness benefits were predicted by social insurance institutional dummies using multiple regression analyses. Among the four different schemes, the encompassing system is found to be most redistributive, followed by basic security and targeting systems. The corporatist system has shown no significant difference from the encompassing system in redistributive outcomes.

1. Introduction

The distributional effects of government social policies have become important from an equity perspective in developed countries (Gottschalk and Smeeding, 1997). Normative values, reflected in policies, thus play a vital role in basic economic security for individuals and households. Thereby, social insurance payments constitute an important part of household income. However, the regulations for compensation from social insurance systems vary between countries (ISSA, 2002). Though social insurance institutions are heterogeneous, several attempts have been undertaken to find the countries that resemble each other so that institutional solutions can be grasped (Esping-Andersen, 1990; Castles and Mitchell, 1992; Korpi and Palme, 1998). The traditional outcome measures for such institutional categories are reduction in poverty and in economic inequality (Beer *et al.*, 2001).

For better understanding of similarities and variations between countries, a typology of social insurance institutions based on sickness insurance and old age pension regulations has been developed (Korpi and Palme, 1998). It is argued that these two social insurance schemes consider the influence of aging and the risk of illness to a greater extent, and are jointly more comprehensive than unemployment and occupational injury insurances. The typology comprises five system catego-

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TABLE 1

THE SOCIAL SECURITY TYPOLOGY DEVELOPED BY KORPI AND PALME (1998) AND KANGAS (2004)

Social Insurance Category	Base for Entitlement	Benefit Level Principle	Main Sources of Financing	Administration	Arena of Actions
Encompassing	Citizenship + labor force participation	Flat rate + earnings-related	Taxes and contribution	Public	Politics
Corporatist	Occupational category and labor force participation	Earnings-related	Contributions	Bi-/tri-partite	Labor market/ politics
Basic security	Citizenship or contribution	Flat-rate	Taxes	Public	Politics
Voluntary state-subsidized	Membership, contribution	Flat-rate or earnings-related	Membership fees and taxes	Members/public	Funds, politics
Targeted	Proven need	Minimum	Taxes	Public	Politics

ries: encompassing, corporatist, basic security, voluntary state subsidized, and targeted. Sickness insurance and old age pension regulations are used to allocate countries to five social insurance categories (see Table 1).

Eligibility within the encompassing model (Sweden, Finland) is based on citizenship and labor force participation. The programs cover all citizens in principle. In this system, basic security is combined with earnings-related compensations for people at work, and is designed to ensure a specific living standard. In the corporatist model (Austria, France, Belgium), programs are directed at people in work. Eligibility for compensation is based on a combination of contributions and on belonging to a specified occupational branch. Compensations are clearly earnings-related, but entitlements and rules can differ significantly between the programs according to occupational category. Eligibility in the basic security model (Denmark, UK, Ireland) is based on contribution or citizenship (residence). Flat-rate compensations or low ceilings on earnings replacements are representative of this model. The voluntary state-subsidized model supports voluntary organizations by using tax revenue. Since eligibility for compensation is based on the voluntary contributions that offer membership of the schemes, they have been most important for skilled workers and the middle class (compared with unskilled workers and low income earners). In the targeted model (Australia) eligibility is based on a means test, which results in minimum or relatively similar compensations for those who fall below a stipulated poverty line or are in need of support. These variations in regulations between social security systems are expected to have variable capacity of redistribution. In Section 2, we explain the hypothesis about redistributive capacity of these five systems in comparison with each other.

In this study, we rely on the allocation of countries to categories performed by Kangas (2004), who used only sickness insurance regulations. Although most of the countries belonged to a specific category throughout the study period (1981–2000), two countries possibly have changed their system from encompassing to basic security (Denmark in 1990, and Finland in 1994) as Kangas (2004) notified.

The encompassing system is expected to have the largest redistributive effect with regard to capacity to reduce earnings inequality. It is thus of interest to establish whether the other systems are significantly less redistributive than theencompassing social insurance system and if the systems can be ranked according to their expected outcomes.

A reduction in earnings inequality has been observed when incorporating social and occupational sickness insurance rights into the wage concept (Selén and Ståhlberg, 2001). The authors observed differences in the consumption of sickness insurance between gender, socioeconomic and age groups. It can be argued that, given any particular social insurance system, the distribution of sickness risk may redistribute earnings differently. Observed risk factors for sickness absence include working conditions, family structure, lifestyle, demography, and education (Alexanderson and Norlund, 2004). A study using cross-national data from five countries on the proportion of employees with at least one week of sick leave considered age and gender as the determinants of sick leave (Nyman *et al.*, 2002). It was observed that sick leave increases significantly in higher age groups (50–59 years and 60–64 years). A discussion by Mastekaasa and Olsen (1998) shows a clear gender-based pattern in sickness absence in the western industrialized countries. It has there been observed that the females have higher sickness absence than males. Nyman *et al.* (2002) analyzed panel data from six industrialized countries (Denmark, Sweden, France, Great Britain, Germany and the Netherlands). The authors mentioned that all countries except Germany show that the sickness absence is higher for women than men. During period 1987–2001, 3.3 percent of men and 5.5 percent of women were on sickness absence. Since elderly people and females are at greater risk, the higher the proportions of these groups in the labor force, the greater could be the redistributive effect. It is therefore of interest to analyze the outcome of the different systems in the typology in relation to established risk factors for sickness.

2. Aims and Hypotheses

The principle aim is to analyze whether the social insurance systems follow the expected pattern in redistributive outcomes of the typology. We further consider whether the observed pattern remain stable after taking into account the influences of educational attainment and labor force demography.

Our hypotheses concern two types of variables that may influence the redistributive outcomes of sickness benefits. First, the various social insurance institutions are expected to redistribute differently. The encompassing system includes all citizens in the same programs. Assuring basic security for everyone and providing earnings-related benefits to the economically active population, this system places low-income and better-off groups on the same platform. Consequently, the system gives insurance coverage to a large portion of the population. The encompassing system therefore is expected to have the highest redistributive outcome. The corporatist system supports occupational groups through earnings-related benefits. There is scope for both blue-collar and white-collar workers to be included. Since the inclusion of low and middle income groups is not guaranteed by the political system, the redistributive outcome is not fully predictable. However, this system may be

expected to redistribute less than the encompassing system. The basic security system, with flat-rate benefits, provides a safety net for the blue-collar group, leaving the middle class on private insurance. Benefits are paid according to a flat-rate principle or as a (low) proportion of earnings prior to sickness. Expected redistribution should therefore be lower than either the encompassing or the corporatist system. The voluntary state subsidized system uses tax money to support voluntary organizations. Since eligibility is based on voluntary contributions, it is more important for skilled workers and the middle class than for unskilled and low income earners. This system is thus expected to redistribute even less. The targeted system provides support only for low-income earners. It is thus expected that the redistributive outcome will also be low. It is not clear which of the two latter systems—the voluntary state subsidized or the targeted system—redistributes less. In summary, the redistributive outcome of the encompassing system should be highest, followed by the basic security and targeted systems. These three systems are more predictable, since all are operated in the public domain and easy to influence by political decision making. The corporatist and voluntary state subsidized systems are based on occupational engagement and contributions, and their redistributive outcomes may vary considerably between countries.

Our second set of hypotheses concerns the overall sickness risk in the various countries. For any given type of social insurance system, redistributive outcomes can be different due to variations in sickness risk between countries. It can be hypothesized that a country with a higher risk level redistributes more. Comparable cross-national sickness data are not available. Instead, we employ labor force demography and the educational level of people of working age as proxy variables for sickness risk. A higher proportion of females in the labor force may accumulate a higher risk, since women are more frequently on sickness absence. The higher labor force participation rate of people aged 55–64 years of age may be connected with a higher risk, which could lead to greater redistribution. Educational attainment of working age people in a country may reduce sickness risk and consequently the redistributive outcome. We hypothesize that redistributive outcomes are not only influenced by social insurance institutions, but also by demographic structure and educational attainment.

3. Methods

3.1. *Earnings Redistribution through Sickness Benefits*

Gini coefficients of earnings without and with sickness compensations are used for estimating the redistributive effects of sickness compensations on earnings. The Gini coefficient ranges between 0 and 1, with higher values showing greater inequality. Relative changes in Gini coefficients are calculated using the following formula:

$$\text{Relative change in Gini coefficient} = 1 - (\text{GES}/\text{GE}) * 100$$

where GE = Gini coefficient of earnings excluding sickness compensations and GES = Gini coefficient of earnings including sickness benefits. The redistributive

effects of social insurance have been estimated using this formula in other studies (Ferrarini and Nelson, 2002; Bradley *et al.*, 2003; Mahler and Jesuit, 2004).

3.2. *Econometric Issues*

Data

The Luxembourg Income Study (LIS) database contains cross-national data from 25 countries, mainly the OECD countries (www.lisproject.org). The data providers are mostly prime respondents from each registry holder in each country, e.g. the Australian Bureau of Statistics. The LIS group adjusts the data for international comparisons. The LIS database includes data on earnings and sickness compensations at household level. The earnings and compensation data have been weighted according to an equivalence scale (square root of household members), which takes into account the number of members of households when calculating earnings inequality. Households with heads of ages 25–59 are included in the computation. Data on earnings are constituted by adding three variables: gross wages and salaries, farm self-employment income, and non-farm self-employment income. Sickness benefit includes cash compensations that are paid for loss of earnings during sickness absence. Maternal compensations are generally included in sickness benefits. In some countries, sickness benefit includes occupational injury payments. With regard to earnings, gross income from both employment and self-employment are usually included. The LIS databases are presented in detail on the Luxembourg Income Study Project website (www.lisproject.org).

Selection of countries is based on the principle of most comparable cases (Lijphart, 1975). Countries that have a history of uninterrupted political democracy during the post World War II period and with more than one million inhabitants are included in our study.

Our number of observations has been restricted by some practical criteria. Firstly, we took those countries of 18 countries in the analysis which have been placed into any of five social insurance system categories (Korpi and Palme, 1998; Kangas, 2004). Number of countries thus cannot be more than 18 in any condition. Secondly, most of the countries did not separate sickness benefits from work income. We could not naturally include those countries in the analysis as sickness benefits were our main interest. It restricted our sample to a low number of observations, i.e. 31. We exclude Austria from the analysis for several reasons. First, it shows a strange outcome with regard to earnings inequality (Gini coefficient = 0.51) and sickness benefits contribute to greater inequality (unlike in any other country). The most important reason for this is provided by Statistics Austria, which regards the tails of the income distribution as unreliable (www.lisproject.org). Accordingly, we present the data from Austria only in Table 2.

Variables

Relative change in earnings inequality due to sickness compensation is used as the dependent variable in the analysis. The independent variables are dummies for

TABLE 2

REDISTRIBUTIVE EFFECTS OF SICKNESS BENEFITS, EDUCATION AND DEMOGRAPHY IN OECD COUNTRIES,[1] BELONGING TO FIVE SOCIAL INSURANCE CATEGORIES OVER THE PERIOD 1981–2000

			Gini Coefficients			Education and Demography		
Country	Year	Obs[2]	Earnings	Earnings Incl. SB	Relative Change*	Education**	Female***	Age****
Encompassing System								
Sweden	1981	6,907	0.27920	0.26515	5.032	10.2	44.2	67.6
Sweden	1987	6,275	0.28905	0.27050	6.418	10.8	46.5	69.1
Sweden	1992	8,095	0.31726	0.30251	4.649	11.3	47.7	69.3
Sweden	1995	8,680	0.33305	0.32181	3.375	11.5	47.8	67.1
Sweden	2000	8,023	0.33829	0.32297	4.529	11.6	48.0	69.4
Denmark	1987	6,741	0.27451	0.26729	2.630	10.9	45.5	54.6
Finland	1987	8,500	0.28685	0.28417	0.934	10.1	47.0	42.7
Finland	1991	8,373	0.29588	0.29219	1.247	10.5	47.3	43.0
Corporatist System								
Austria	1994	1,786	0.50797	0.50987	–0.374	11.4	40.3	29.5
Austria	1997	1,611	0.43444	0.43427	0.039	11.7	40.3	29.9
Belgium	1985	3,796	0.25365	0.03912	1.226	9.6	36.7	27.3
Belgium	1988	2,171	0.24934	0.24380	2.222	9.7	38.3	22.8
France	1984	8,670	0.36087	0.35907	0.499	9.7	41.4	40.1
France	1994	6,827	0.35700	0.35367	0.933	10.4	44.1	35.9
Basic Security System								
Denmark	1992	6,862	0.29074	0.28259	2.803	11.1	46.2	57.2
Finland	1995	6,540	0.33701	0.33439	0.777	10.9	47.7	43.2

Finland	2000	7,401	0.32390	0.32099	0.898	11.2	48.1	46.6
Ireland	1987	1,814	0.39079	0.38443	1.627	9.1	30.6	44.5
Ireland	1994	1,877	0.37466	0.36928	1.436	9.8	33.1	43.0
Ireland	1995	1,645	0.37182	0.36559	1.676	10.0	32.8	42.5
Ireland	1996	1,524	0.37010	0.36496	1.389	10.1	33.4	43.2
Netherlands	1991	2,574	0.28664	0.28257	1.420	11.3	39.1	29.0
Netherlands	1994	3,157	0.30078	0.29912	0.552	11.5	39.5	30.0
Netherlands	1999	3,191	0.29421	0.29274	0.500	11.9	40.4	36.2
UK	1986	3,601	0.32727	0.32515	0.648	10.6	41.0	50.9
UK	1991	3,638	0.34770	0.34664	0.305	11.0	42.6	53.0
UK	1994	13,136	0.37082	0.37043	0.105	11.6	43.9	52.1
UK	1995	3,454	0.35945	0.35820	0.348	11.6	43.2	51.4
UK	1999	12,813	0.37311	0.37273	0.102	11.9	45.0	52.1
Voluntary State Subsidized System								
Switzerland	1992	3,048	0.28724	0.28664	0.209	12.7	39.4	72.5
Targeted System								
Australia	1981	8,497	0.31295	0.31184	0.355	11.6	37.3	44.2
Australia	1985	4,490	0.31351	0.31260	0.290	11.9	39.1	39.7
Australia	1989	8,837	0.32575	0.32496	0.243	12.1	40.9	42.6
Australia	1994	3,892	0.34022	0.33972	0.147	12.3	42.3	43.7

Notes: [1]Countries are divided according to the social security typology developed by Korpi and Palme (1998) and Kangas (2004).
[2]Number of observations for calculating Gini coefficients.
*Calculated as (1 – Gini coefficient of earnings including sickness benefits/Gini coefficient of earnings excluding sickness benefits) × 100.
**Education = average years of schooling among working age people.
***Female = proportion of females in total labor force.
****Age = labor force participation rate among people aged 55–64.

social insurance systems, proportion of females in the total labor force, the labor force participation rate of people aged 55–64 and average years of schooling among working age people.

Institutional dummy variables are used, with the encompassing system treated as the reference category. We find eight observations for the encompassing system. Seven, twelve, one and four observations are found for the corporatist, basic security, voluntary state-subsidized and targeted systems, respectively. In the analysis, some observations could not be included due to lack of data at the end of the 1990s.

The proportion of females in the labor force ranges between 30.6 percent (Ireland in year 1987) and 48.1 percent (Finland in year 2000). Ireland had 33.4 percent of females in the labor force in 1996. Variation in the female labor force was found to be large between countries. Participation of females in the labor force generally increased during the study period in all countries. In Australia it increased from 37.3 percent to 42.3 percent between 1981 and 1994. Data were obtained from the UN's World Development Indicators (United Nations, 2002).

The labor force participation rate among people aged 55–64 varies strongly between countries. The lowest rate was observed in Belgium (22.8 percent) in 1988, and the highest in Switzerland (72.5 percent) in 1992. In the UK, the rate increased, then decreased, and then increased again during 1986–99. The variations are not large within countries over the years, but we observed large variations between countries within the same kinds of social insurance systems. For example, both Finland and Sweden had an encompassing system in 1987. The labor force participation rates among people at ages 55–64 were 42.7 percent and 69.1 percent, respectively. Data on labor force participation were taken from an OECD database (OECD, 2001).

Average years of schooling range between 9.1 and 12.7 years. Ireland showed the lowest educational attainment in 1987, but it increased to 10.1 in 1996. The highest educational attainment was observed in Switzerland in 1992. Educational attainment increased over the years in all countries. Data on average years of schooling were taken from Bassanini and Scarpetta (2001).

The correlation matrix (Table 3) for the explanatory variables shows that the encompassing system has a significantly positive correlation (correlation coefficient greater than 0.50) with females in the total labor force, and also with the labor force participation rate at ages 55–64. The corporatist system is negatively and significantly correlated with the labor force participation rate among people aged 55–64 (by more than 0.50). Significant correlations were found between other variables, but there is no correlation coefficient above 0.50.

Estimations

Our first regression model estimates the redistributive effects of social insurance categories using unbalanced panel data, which means that some cross-sectional observations are missing for some years. We apply here generalized least square estimation of cross-sectional time-series analysis. This estimation model sets up countries and years as cross-sectional and time units respectively and fits cross-sectional time-series linear models using feasible generalized least squares. It

TABLE 3

CORRELATION MATRIX FOR VARIABLES INCLUDED IN THE ANALYSES

Variables	1	2	3	4	5	6	7	8	9
1. Redistribution*	1.0000								
2. Encompassing	0.6305	1.0000							
	(0.0001)								
3. Corporatist	0.0097	–0.3055	1.0000						
	(0.9578)	(0.0891)							
4. Basic security	–0.1952	–0.4472	–0.4099	1.0000					
	(0.2844)	(0.0103)	(0.0198)						
5. Voluntary state subsidized	–0.2308	–0.1037	–0.0950	–0.1391	1.0000				
	(0.2037)	(0.5722)	(0.6049)	(0.4476)					
6. Targeted	–0.4306	–0.2182	–0.2000	–0.2928	–0.0679	1.0000			
	(0.0139)	(0.2302)	(0.2724)	(0.1039)	(0.7120)				
7. Education**	–0.4922	–0.0594	–0.2208	–0.1861	0.3564	0.4387	1.0000		
	(0.0042)	(0.7466)	(0.2245)	(0.3079)	(0.0453)	(0.0120)			
8. Females in labor force***	0.1422	0.5750	–0.2098	–0.1971	–0.0906	–0.1543	0.3683	1.0000	
	(0.43749)	(0.0006)	(0.2491)	(0.2795)	(0.6217)	(0.3991)	(0.0381)		
9. Aged in labor force****	0.2658	0.5670	–0.6611	0.0364	0.3459	–0.1513	0.3308	0.4742	1.0000
	(0.14159)	(0.0007)	(0.0000)	(0.8432)	(0.0525)	(0.4086)	(0.0645)	(0.0061)	
Mean	1.5475						10.95	41.87	47.70
Minimum	0.1018						9.1	30.55	22.8
Maximum	6.4175						12.7	48.1	72.5
Standard deviation	1.6319						0.89	4.98	13.08
Observation	32						32	32	32

Notes: *Logged relative changes in Gini coefficients, mean redistribution in lower panel is not log transformed.
**Average years of schooling in working age people.
***Proportion of females in the total labor force.
****Labor force participation rate among people aged 55–64 (p-values in parentheses).

allows estimation in the presence of AR(1) autocorrelation within panels and cross-sectional correlation and heteroskedasticity across panels.

The first model is as follows:

$$y_{it} = \alpha + X_{it}\beta + \varepsilon_{it} \tag{1}$$

where y = relative change in Gini coefficients, i and t denote country and year respectively. α is the constant term, and X denotes dummies for the social insurance systems for the corresponding country and year. X is 1 if the country belongs to the corresponding insurance category in the corresponding year; otherwise it is 0. The model treats the encompassing system as the reference category. β's represent the coefficients of the social insurance systems; ε is an error term.

In the extended model, we employed external variables which may influence the relationship between social insurance systems and their redistributive outcomes. The extended model can be expressed as:

$$y_{it} = \alpha + X_{it}\beta + E_{it}\beta' + \varepsilon_{it} \tag{2}$$

where E denotes external variables, such as labor force demography and educational attainment. β's represent the coefficients of adjacent variables. The model is both extended and reduced in order to find a good fit.

The dependent variable, i.e. relative changes in Gini coefficients of earnings without and with sickness benefits, is not normally distributed. We logged the values and found a normal distribution. We test for first-order auto-correlation which appears as a problem in panel data analysis. Generalized least square estimation considering cross-country time-series is employed in this study.

As we use an unbalanced panel data set including 31 observations from ten countries and variable number of years for each, we even estimate the regression coefficients, with the use of a robust-cluster estimator of the standard errors. The robust-cluster variance estimator remains valid in the presence of any pattern of correlations among errors within units (countries), including serial correlation and correlation due to unit-specific components. The robust-cluster standard errors are unaffected by the presence of unmeasured stable country-specific factors causing correlation among errors of observations for the same country. On the basis of the argument above, robust-cluster estimator has previously been employed in similar study (Bradley *et al.*, 2003).

4. Results

4.1. *Redistributive Outcomes*

Redistributive outcomes, i.e. the reductions in earnings inequality as an influence of sickness benefits, are presented in the seventh column of Table 2. Sweden showed the largest redistribution, with the greatest reduction being observed in 1987 (6.4 percent). The outcome was lowest (3.4 percent) in 1995. Denmark redistributed by 2.6 percent. Finland had lower redistributive outcomes (approximately 1 percent). All these countries belong to the encompassing social insurance system category.

Among the countries with corporatist social insurance systems, Belgium showed the greatest redistributive outcome. The highest was 2.2 percent. France had an outcome lower than 1 percent. Austria experienced an increase in inequality in 1994, but inequality fell slightly in 1997 (0.04 percent).

Among the countries in the basic social insurance system category, the largest reduction in inequality was observed in Denmark in 1992. Ireland experienced more than a 1 percent reduction in all years. In 1991, the Netherlands showed a reduction of 1.4 percent. In later years, the redistributive outcome reduced to approximately 0.5 percent. Finland had less than a 1 percent reduction, and the UK much lower than 1 percent.

Switzerland, the only country with a voluntary state-subsidized social insurance system, experienced a reduction in inequality of only 0.21 percent in 1992. Australia, with its targeted system, never experienced more than a 0.35 percent reduction in earnings inequality through sickness benefits. In 1994, earnings inequality fell by only 0.15 percent.

4.2. *Econometric Estimation*

Three types of models, based on which dependent variables are included, have been estimated. Each type of model (1, 2a and 2b in Table 4) is estimated using both generalized least square (GLS) and robust-cluster estimation techniques. The first model (model 1 in Table 4) has been estimated according to equation (1) in Section 4.2. In the second model (model 2a in Table 4), we included demographic structure of the labor force. It represents a reduced model of equation (2). In the third model (model 2b in Table 4), we further included educational attainment of working age population which can be considered as an extended model of equation (2). In the analyses, we found evidence of first-order autocorrelation in our data. We therefore estimated the models considering first-order auto-correlation. Consequently, the social security system category, i.e. voluntary state-subsidized system has been dropped from our analysis as only one country (Switzerland) represents this category.

In the first model (GLS), we find that all three models (corporatist, basic security and targeted) reduce inequality in income significantly less than the encompassing system. It has also been observed that the targeted system has the least redistributive capacity followed by the basic security and corporatist systems. The coefficients are –2.496, –1.484 and –1.190 respectively. The systems that operate in the public arena show the expected pattern. That is, the targeted system redistributes least, followed by the basic security system, in comparison with the encompassing system. The log-likelihood value is –35.72. Akaile's Information Criterion (AIC) and the Bayesian Information Criterion (BIC) show the values of 79.4 and 85.2 respectively.The OLS robust cluster estimation of model 1 (Table 4) shows a similar result.

Inclusion of demographic structure made the model better (model 2a). Log-likelihood value has changed significantly from –35.72 to –32.35. AIC reduced from 79.4 (model 1) to 76.7, while BIC remained almost on the same level. Among the variables of demographic structure, the proportion of females in the labor force shows a significant relationship with redistributive effect, which implies that

TABLE 4

RELATIONSHIPS BETWEEN SOCIAL INSURANCE INSTITUTIONS AND THEIR REDISTRIBUTIVE OUTCOMES THROUGH SICKNESS BENEFITS

	Model 1		Model 2a		Model 2b	
Variables	OLS[1] Robust Cluster	GLS[2]	OLS[1] Robust Cluster	GLS[2]	OLS[1] Robust Cluster	GLS[2]
Constant	1.107**	1.093***	3.922	3.913***	6.023	2.905
Encompassing system	Reference	Reference	Reference	Reference	Reference	Reference
Corporatist system	–1.207**	–1.190***	–1.105	–1.102*	–0.564	–0.875
Basic security system	–1.511**	–1.484***	–1.774	–1.771***	–1.398	–1.491***
Targeted system	–2.509***	–2.496***	–2.694***	–2.691***	–1.643	–2.345***
Females in labor force				–0.093***	–0.046	–0.124***
Aged in labor force				0.026	0.038	0.038**
Education					–0.461	0.127
Observations	31	31	31	31	31	31
R^2	0.5098	–	0.6175	–	0.6638	
Log-likelihood		–35.721		–32.349		–47.033
Akaike's Information Criterion		79.4		76.7		108.1
Bayesian Information Criterion		85.2		85.3		118.1

Notes: [1]Ordinary Least Square, [2]Generalized Least Square.
***, ** and *denote significance at risk levels 1%, 5% and 10% respectively.
All GLS models take first order auto-correlation into consideration.

the inequality reduced with higher participation of females in the labor force. In this model, the corporatist system shows a slightly lower and borderline significant effect (at 10 percent risk level) on redistribution. The coefficients of basic security and targeted systems, on the contrary, show a stronger effect with higher absolute values of their coefficients. The coefficients change from –1.484 to –1.771 for the basic security system and –2.496 to –2.691 for the targeted system.

The OLS robust-cluster analysis of model 2a shows that only the targeted system has significantly less redistributive capacity in comparison with the encompassing system. The corporatist system is not significantly different from the encompassing system. The basic security system is borderline significant with a risk level of 11% ($p = 0.118$). However, the regression coefficients of the social security systems, estimated with OLS robust-cluster analysis, are quite similar to the GLS model.

In model 2b, the observed log-likelihood value is –47.03, which is significantly less than our previous model (model 2a). The AIC and BIC increased to 108.1 and 118.1 respectively. These indicate that this model was worse than model 2a.

The OLS robust-cluster estimator of this model shows no significant difference between encompassing and all other social security systems. However, the magnitudes of the regression coefficients of the social security systems show the similar pattern (lowest in targeted system and highest in corporatist system) as indicated by GLS estimation.

Among our tested models, we found model 2a the best fit in accordance with GLS estimation. The estimation of this model by OLS robust-cluster is also similar. The results can be summarized in connection with our hypotheses. The targeted and basic security systems redistribute significantly less than the encompassing system at 1 percent risk level. The corporatist system also redistributes less, but it does so at a higher risk level. The redistributive pattern of the system, i.e. ranking, remains the same after considering demographic structure. However, the estimated effects of all systems changed to some extent. Female participation in the labor force showed a clear negative effect on redistribution, while age did not show any significant influence.

We tested the recommended model (model 2a), even considering heteroskedasticity. The redistributive pattern of the social security systems and the effect of demographic structure were similar to model 2a.

4.3. *Sensitivity Analysis*

We estimated the models using logged absolute differences in Gini coefficients with regard to earnings without and with sickness benefits. We put Finland and Denmark in the encompassing model for all years and found no difference from our findings.

5. Discussion and Concluding Remarks

We find that, among the social insurance systems that operate in the public arena, the encompassing system has the largest redistributive effect on earnings, followed by the basic security and targeted systems. The corporatist system shows

a borderline significant difference from the encompassing system in its redistributive outcome. When considering the demographic variations in labor force in the countries, the expected redistributive pattern between social insurance systems remained the same. The participation of females in the labor force had an influence on redistributive outcomes.

The redistributive outcome of social sickness insurance has not been studied enough on the basis of cross-national data. Employment of sickness insurance in the context of social insurance systems in this empirical study is prompted by the studies of Korpi and Palme (1998) and Kangas (2004). Since the authors mainly used social sickness insurance regulations for categorizing social insurance systems, we expected that their typology would be reflected in the redistributive outcomes of sickness benefits. The contribution of workers to the sickness insurance fund must have a redistributive outcome, which is not considered in this study. There are two reasons for the exclusion of financing in the analysis. First, we did not have data at household level on the contribution to the sickness insurance fund. Second, the typology was initially established on the basis of population coverage and of the principles of compensation in social sickness insurance systems (Korpi and Palme, 1998). Kangas (2004) later included funding of the systems, but this did not change the placement of the countries into five categories. Accordingly, we expected that our empirical study would confirm the typology.

The redistributive outcome in Sweden is much greater than in other countries. Whereas the current study estimated the reduction in earnings inequality due to sickness benefits, comparable studies have calculated the reduction in inequality due to taxes and transfers (Ferrarini and Nelson, 2002; Bradley *et al.*, 2003). Ferrarini and Nelson (2002) found that Sweden showed a redistributive effect of 47.5 percent around year 1995. Inequality reduction in the UK was only 26.2 percent during the same period. An average redistributive effect of 37.9 percent during the period 1967–95 in Sweden was observed by Bradley *et al.* (2003). Sweden experienced a 47 percent reduction in inequality in 1995, when the corresponding rate was 11.2 percent in Switzerland in 1992. Thus, it is not surprising that Sweden—in the corresponding years—showed a much higher redistributive outcome of sickness benefits. Whether sickness benefits correspond to similar cost components across countries is not obvious from the dataset. Further, it was not possible for us to control for data-reporting and processing errors.

When considering the demographic structure of the labor force, the expected outcomes of the social insurance typology could be verified. It provides us with an indication of robustness of the categorization of the social sickness insurance system.

While the previous studies on sick-leave of female workers generally show that females are more frequently on sickness absence (Mastekaasa and Olsen, 1998; Nyman *et al.*, 2002), we observed the opposite result, i.e. higher female participation in the labor force reduces income inequality through sickness insurance. Further research on this specific issue is thus warranted.

Economic incentives of sickness absence have shown a significant effect on an individual's sickness absence behavior (Johansson and Palme, 1996; Broström *et al.*, 2002; Khan *et al.*, 2004; Askildsen *et al.*, 2005). In economic recessions, workers are more committed to their jobs and less prone to shirking as the supply

of labor is higher than its demand. Both Askildsen *et al.* (2005) and Khan *et al.* (2004) found that sickness absence and sickness benefits reduce during recessions. Broström *et al.* (2002) and Johansson and Palme (1996) observed that sickness absence is attributed to individual costs of sickness absence. Economic incentives that influence the individual behavior of sickness absence can have an effect on redistribution of income through sickness insurance. It can be argued that if sickness absence benefits are terminated, the behavior of workers with respect to sickness absence would be different. The current paper has not put this argument in the econometric model. However, such factors are to some extent incorporated into the social insurance categories.

One important limitation of this study is that redistributive effects are calculated on the basis of household earnings and sickness benefits. Sickness benefits in one country (the UK) are paid in relation to the number of dependants in the household, but most provide economic support to individual earners. Using individual data might be a better alternative. Our study is restricted by the availability of micro data on sickness benefits in the Luxembourg Income Study, which contains such data only at household level. In the regression models, we had to depend on a small number of observations.

The result of this study can be affected to some extent by the variations in sickness benefit concept between countries and between years within countries. First, a part of the sickness benefits which is paid by the employers at the start of sick spells is not included in sickness benefits and can instead be included in income. The magnitude of such a portion of sickness benefits is very low, and may not have much effect on our final redistributive outcomes. Second, maternity benefit is included into sickness benefits in some years and countries, while not in others. It is not possible with the available dataset to determine to what extent the redistributive outcomes could be influenced by exclusion or inclusion of maternity benefits into the sickness benefit concept. The principle of payments due to sickness and maternity leave are generally similar. The consequence of similar payment principles may not vary greatly.

It can further be noted that a direct adjustment of variation in health status of the workers (for instance, quality adjusted life years) rather than just the adjustment by variation in demographic structure of the labor force should be employed for testing the robustness of the social security typology.

The result of this study can be sensitive to the choice of inequality measurement, i.e. the Gini coefficient. However, this frequently used measurement of inequality in health economics and sociological literature captures the experience from the entire population as data from each individual in the society is sensitive to the Gini coefficient (Wagstaff *et al.*, 1991). In the Luxembourg Income Study working papers list, we find this measurement has been used most frequently (www.lisproject.org). A further study can be initiated for analyzing the redistributive outcomes of social sickness insurance systems using different measurements of inequality.

Our results are comparable with those of similar studies (Ferrarini and Nelson, 2002; Nyman *et al.*, 2002; Bradley *et al.*, 2003). However, the disappearance of a systemic social insurance pattern in terms of redistributive outcomes suggests the need for further studies using more appropriate data. Such studies

may give rise to new questions on how to develop a social insurance typology that can have a more robust influence on redistributive outcomes after taking into account the risks of being put on sick leave.

On the basis of our analyses, we conclude that the social security categorization by Korpi and Palme (1998) and Kangas (2004) is robust.

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