

**A multi-national comparison  
of income inequality over the later-life course**

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## **Abstract**

This paper examines income inequality over stages of the later-life course and systems that can be used to mitigate this inequality. Two hypotheses are tested:

- Levels of income inequality decline as cohorts cross from the later part of traditional working ages to retirement ages because public benefits are more equally distributed than work income;
- Because of the progressive nature of government benefits, countries with stronger public income security programs are better able to smooth income inequalities over the later life course.

The analysis is performed for seven OECD countries using Luxembourg Income Study data. Both hypotheses are supported. Several conclusions are drawn from the findings.

## Introduction

In a 2004 paper, Brown and Prus use the Luxembourg Income Study (LIS) to look at income inequality in ten developed countries juxtaposed with the level of retirement income security provided by government-sponsored systems. That paper shows, as demonstrated in Figure 1, that there is a strong negative correlation between the level of government sponsored income (ratio of government transfers to total income) and income inequality (Gini ratio, where the higher the Gini ratio the more inequality there is in income distribution) in old age.

*(Figure 1 about here)*

From this data, one can conclude that Canada, Denmark and Sweden are reaching what could be viewed as optimal outcomes. What varies is the mix of government sponsorship (and control) of retirement income security and income inequality. If Swedes are politically happy with a system in which the government provides 70 percent of post-retirement income, then that system also provides a very high level of income security as evidenced by the Gini ratio (0.194). On the other hand, Canada provides only 46 percent of their seniors' income which results in a higher Gini ratio (0.256). However, it may well be that Canadians are happy with that mix.

What can be said, however, is that the other seven nations analyzed could be doing a “better” job with their total retirement income security systems. For example, the Netherlands could clearly achieve more income equality (a lower Gini ratio) without increasing government control of the retirement income security system. Similar comments can be made about the other nations who are not on the “optimal” frontier.

Other research has arrived at similar conclusions (e.g., Regie des rentes du Quebec, 2004; OECD, 2000; 2001). The 2001 OECD study bases its conclusions on two criteria which are referred to as fundamental objectives of retirement income policies: preventing unacceptable declines in income when people retire and guarding against very low incomes among older people (*ibid*, p21). A partial explanation for the data in Figure 1 above is found in Table 1 derived from this OECD study.

*(Table 1 about here)*

Some conclusions can be drawn from this table. First, general replacements rates are very high which seems to indicate that most systems are preventing unacceptable declines in income when people retire. Many authors have indicated that the types of replacement ratios cited above mean no dislocation in one's standard of living at retirement (e.g., Palmer, 2001). As to guarding against very low incomes among the elderly, countries like Canada clearly have government systems that are highly focused on poverty control. Such targeting of benefits is not so clear in countries like Japan and the U.K..

Income distribution studies most often focus on a given age group or the entire

population. This study presents a unique perspective to this literature by examining income inequality over stages of the later-life course, which then provides us with ideas on how to mitigate this inequality. Two hypotheses are derived, and tested here, from the discussion above.

The first hypothesis states that levels of income inequality decline as cohorts cross from the later part of traditional working ages to traditional retirement ages. This is because public benefits are more equally distributed than income generated from the labor market. A progressive public pension system, which becomes a key source of income for people as they enter old age, reduces the overall level of income inequality in old ages relative to middle ages. The second, and related, hypothesis states that because of the progressive nature of government benefits, countries with stronger public retirement income security programs are better able to smooth income inequalities within cohorts as their members move out of the workforce and into retirement.

## **Methods**

*Data* The aim of this paper is to describe and explain changes in levels of income inequality as cohorts move from the later part of traditional working ages (defined here as 45-64) to traditional retirement ages (65+) within a multi-national perspective. Data from the LIS are used for this analysis. Since these data do not allow for proper cohort analysis, the analysis is cross-sectional; that is, it compares age groups within each country using the most recent wave of LIS data (data from around 2000).

LIS data are a compilation of income survey data files from 30 countries that have been made comparable by rearranging data into internationally consistent income categories such as occupational pension benefits and government transfer benefits (Smeeding, 1991). To make this study more comparable with the findings described above, our analysis focuses on OECD nations. While the LIS has been designed to make cross-national comparisons possible, some differences between LIS datasets make it difficult to compare all OECD countries. For example, gross income data in the Belgium dataset are not available, and Finland includes government-funded pension data in the occupational pension category. Only those OECD countries that have complete and thus comparable income data are used in this analysis. These countries are: Canada, Germany, Netherlands, Norway, Sweden, United Kingdom, and United States.

*Measuring Income* This study uses total annual money income of older-headed (45+) households as the income measure. Annual money income is total income received from all household members from all sources, both private sources -- earnings, investments (namely interest on bank accounts and bonds, dividend income, capital gains, rent income), and occupational pensions/annuities -- and public sources (what we call government transfers, namely social security retirement benefits and means-tested old-age benefits).

Total household income is divided by a household “factor” using an equivalence elasticity of 0.5 (i.e., household size raised to the power of 0.5) to adjust for household size.

This approach offers an intermediate statistic between using no adjustment and using per capita income, and is commonly used in OECD and LIS income distribution studies. We also assign the household's equivalent income to each member of the household to get back to the individual level of analysis. Hence, weighted adjusted household income is the income measure, which we simply refer to as "household income."

*Measuring Income Inequality* Income is measured here at the relative level (a household's share of total income), which permits direct international comparisons of within-country income distributions. Relative income inequality therefore refers to the share of the income pie allocated to different households at different points in the income distribution.

Income quintiles and the Gini ratio are used to measure the level of relative income inequality within this distribution. In an income quintile distribution, the first quintile (Q1) is comprised of households with the lowest 20% of weighted adjusted household incomes, the second quintile (Q2) is made-up of households with the next lowest 20% of weighted adjusted household incomes..... and the fifth quintile (Q5) represents those with the highest 20% of weighted adjusted household incomes. The Gini ratio provides a more summary (single number) measure of relative inequality within a distribution, and ranges from zero (perfect equality) to one (perfect inequality). The mathematical expression for the weighted (i.e., assigning the household's adjusted income to each member of the household to get back to the individual level of analysis) Gini ratio (G) is:

$$G = 1 + \left( \frac{1}{\sum_{i=1}^r w_i} \right) - \left[ \frac{2 \sum_{i=1}^r \left( \frac{n_i(n_i + 1)}{2} - \frac{n_{i-1}(n_{i-1} + 1)}{2} \right) y_i}{\left( \sum_{i=1}^r w_i \right) \sum_{i=1}^r (w_i y_i)} \right]$$

where  $i$  is the individual observation,  $y$  is the adjusted income of the  $i$ th observation,  $r$  is the rank of the  $i$ th observation (beginning with the lowest income observation and ending with the highest income observation),  $w$  is the weight of the  $i$ th observation, and  $n$  is  $\sum_{j=1}^i w_j$ ,  $n_0 = 0$ .

## Results

*Income Inequality and the Later-life Course* Our first hypothesis states that levels of income inequality decline as cohorts move from traditional working to retirement ages. Table 2 shows inequality rates in the distribution of disposable (after tax) household income by age to test this hypothesis.

Norway and Sweden generally have the most equal and the U.S. the most unequal distributions of income at any stage of the later life course. Looking at patterns in the

trajectory of income inequality rates across the later life course, one of the most significant changes is observed in Sweden -- the Gini coefficient increases by over 20 percent between ages 45-54 and 55-64, then decreases by about 15 and 13 percent from ages 55-64 and 65-74 and from ages 65-74 and 75+ respectively. Along with Sweden, Norway, Canada, and the U.K., are best able to smooth income inequalities during old age. Norway and Canada's old age welfare systems produce the largest decline (about 20 percent) in income inequality levels from ages 55-64 to 65-74, followed by the U.K. (15.7 percent). These patterns generally continue from ages 65-74 to 75+. By contrast, income inequality levels change only slightly as households enter old age in the U.S.

*(Table 2 about here)*

Table 3 sheds light on these findings by showing the percentage of total disposable household income owned by each income quintile. Sweden and Norway's decline in income inequality from ages 55-64 to 65-74 is the result of greater transference of income from the top quintile (Q5) to all other quintiles (Q1 to Q4) -- they acquire a greater share of total income at the expense of the top quintile between these ages. By contrast, in Canada and the U.K., the decline in income inequality from ages 55-64 to 65-74 stems from the change in income shares from primarily the top quintile to only the lowest quintiles, namely the bottom quintile -- Q1's share of income increases by over 50 percent in both countries.

*(Table 3 about here)*

In the end, Norway and Sweden smooth income inequalities in old age with a great dispersion of income from the top quintile to all other quintiles, yet in Canada and the U.K. this reflects targeted measures at increasing the income position of the poorest citizens (i.e., the bottom quintile). It is interesting to note that only in the U.S. do both the bottom and top quintiles experience improvement (albeit a moderate one) in relative income position from ages 55-64 to 65-74.

*Distributional Implications of Public Pension Policies* Our second hypothesis offers an explanation of income inequality trajectories as observed in Table 2. It states that countries with stronger public income security programs are better able to smooth income inequalities as cohorts move from traditional working to retirement ages. Tables 4 and 5 provide the data to test this hypothesis.

Table 4 displays the percent of total gross (before tax) household income from public (government transfers) and private (earnings, investments, and occupational pensions) sources. Households in the U.S. receive the smallest percentage of income from government sources -- this figure ranges from a low of 3.2 percent at ages 45-54 to 42.7 percent at ages 75+. Sweden generally has the highest reliance on public transfers -- 12.2 percent at ages 45-54 to 76.9 percent at ages 75+. These are also the countries with the highest and lowest Gini coefficients respectively. Overall, cross-national differences in income inequality are significantly accounted for by differences in the percentage of government transfers in the composition of household income at all stages of the later life

course -- the  $r^2$  coefficient for the relationship between the "Gini ratio" as reported in Table 2 and the "percentage of income from government transfers" as reported in Table 4, after controlling for age, is 0.501.

*(Table 4 about here)*

Table 5 expands these findings to show that there is generally a heavier reliance on government benefits for all income quintiles in countries with the lowest rates of income inequality. Public sources in Sweden make up 92.6 and 39.5 percent of the income of the bottom and top quintiles respectively at ages 65-74; the comparable figures in the U.S. are only 81.8 and 14.7 percent. In Canada, which has a moderate level of income inequality, these figures fall between the Swedish and U.S. numbers -- 88.7 and 17.7 percent of income is received from government transfers by Q1 and Q5.

*(Table 5 about here)*

## **Conclusion**

Both hypotheses are supported by the data. However, one has to be careful in how strong a set of conclusions one draws from these data. As stated by the OECD 2001 (p35) study:

*This discussion illustrates the care that needs to be taken in interpreting measures of outcome, particularly income distribution measures. Measures that show increased inequality, or even reduced levels of economic well-being, do not necessarily indicate a policy problem. They may, in some cases, simply be the consequences of achieving a more important objective, such as more independent living arrangements or a more balanced system with a larger role for private pensions and earnings.*

Yet we believe that the data allow us to form the following conclusions:

- There is a negative correlation between the level of retirement income provided by government-sponsored systems and post-retirement income inequality;
- Some countries come closer to achieving an optimal outcome of these two variables than others;
- Income replacements ratios at retirement are surprisingly high which indicates that in general there is not a large dislocation in one's standard of living at retirement;
- Some countries, notably Canada, use pension and social security systems that are highly targeted to the poor, with the goal of alleviating poverty in retirement;

- Levels of income inequality decline as cohorts cross from working to retirement ages. This is because public benefits are more progressively distributed than income from the labor market;
- Wealth redistribution in Sweden and Norway is from the richest quintile to all other quintiles;
- Wealth redistribution in Canada and the U.K. is mainly a shift from the richest quintile to the poorest quintile. Thus, the systems in these countries could be said to be highly focused on the alleviation of poverty;
- Public pension policies play a pivotal role in reducing income inequalities within cohorts as their members leave the workforce and enter retirement.

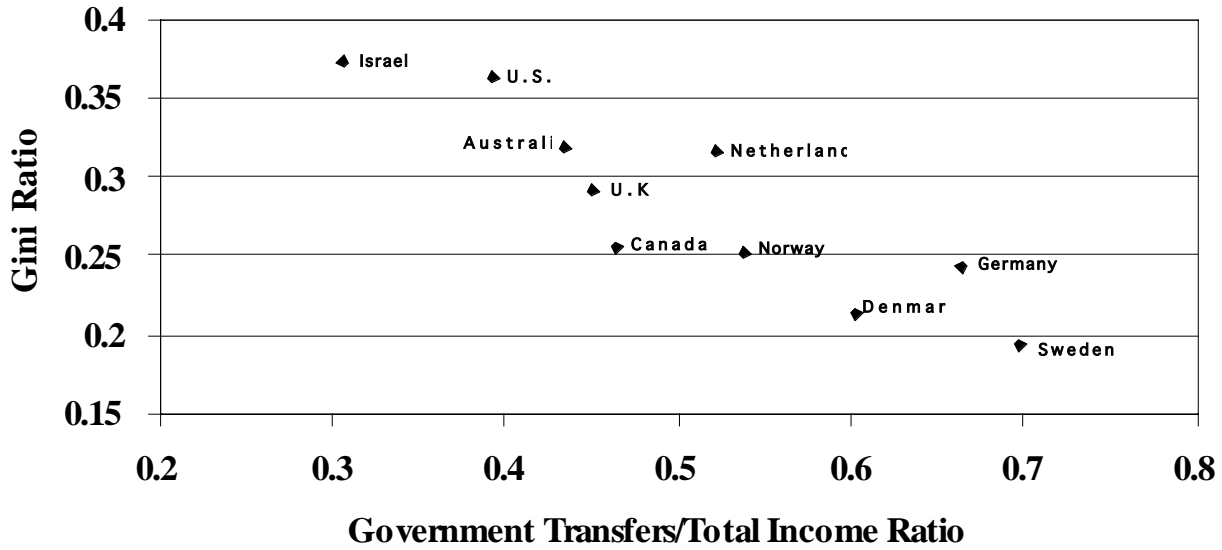
The authors of this paper sincerely hope that there are lessons to be learned from this analysis especially in a period of time when many pension and social security systems are being reformed.

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## Figures/Tables

Figure 1 Percentage of Household Income from Government Transfers by Gini Coefficient, for Selected Countries, Household Heads Aged 65+.



Source: Brown and Prus, 2004, p35.

Table 1 Disposable Income of the Population aged 65 and over by Income Decile compared with the Population aged 18 to 64 in the same Income Decile, in Percentages, mid-1990s

<b>Decile</b>	Canada	Finland	Germany	Italy	Japan	Netherlands	Sweden	U.K.	U.S.
<b>1</b>	148	101	102	128	72	83	89	76	80
<b>2</b>	107	83	90	92	73	77	84	69	78
<b>3</b>	94	78	84	86	75	74	81	66	77
<b>4</b>	87	75	82	81	77	72	80	64	78
<b>5</b>	85	73	80	78	77	74	79	64	78
<b>6</b>	86	72	79	76	78	77	79	65	81
<b>7</b>	86	72	78	76	81	80	79	67	83
<b>8</b>	86	72	79	77	84	82	83	72	94
<b>9</b>	87	73	81	77	87	80	79	67	83
<b>10</b>	96	75	79	75	94	82	83	72	94

Source: OECD, 2001, p24.

Table 2: Gini Coefficients of Disposable Household Income for selected OECD Countries, by Age of Household Head <sup>a</sup>

	<i>Age</i>			
	<b>45-54</b>	<b>55-64</b>	<b>65-74</b>	<b>75+</b>
Canada	.301	.330(+ 9.6%)	.266(-19.4%)	.259(- 2.6%)
Germany	.239	.282(+18.0)	.256(- 9.2)	.254(- 0.1)
Netherlands	.261	.271(+ 3.8)	.241(-11.1)	.238(- 1.2)
Norway	.255	.281(+10.2)	.224(-20.3)	.209(- 6.7)
Sweden	.226	.273(+20.8)	.231(-15.4)	.201(-13.0)
U.K.	.339	.357(+ 5.3)	.301(-15.7)	.286(- 5.0)
U.S.	.351	.385(+ 9.7)	.375(- 2.5)	.370(- 1.3)

a. Percentage changes in Gini coefficients between subsequent age groups are in brackets.

Table 3: Percentage Share of Total Disposable Household Income by Income Quintile Rank for selected OECD Countries, by Age of Household Head <sup>a</sup>

	Canada	Germany	Netherlands	Norway	Sweden	U.K.	U.S.
<b>45-54</b>							
Q1	7.7%	9.9%	8.0%	10.2%	10.4%	6.8%	6.2%
Q2	13.5	15.1	15.0	15.1	15.3	12.6	12.4
Q3	18.0	18.3	19.1	17.8	18.7	17.1	17.2
Q4	23.0	22.7	23.5	20.9	22.4	22.6	22.5
Q5	37.8	34.0	34.4	36.1	33.2	40.9	41.7
<b>55-64</b>							
Q1	6.3	8.4	7.7	9.1	9.3	5.8	5.2
Q2	12.9	13.8	13.7	14.4	14.5	12.3	11.3
Q3	17.9	17.8	18.1	17.7	17.8	16.9	16.6
Q4	23.6	22.8	22.8	21.2	21.6	23.5	23.0
Q5	39.4	37.1	37.7	37.6	36.9	41.6	43.9
<b>65-74</b>							
Q1	9.8	9.6	10.2	11.0	10.8	8.8	6.0
Q2	13.7	14.5	14.7	14.9	14.7	13.2	11.3
Q3	17.4	17.8	17.8	18.3	18.0	16.7	16.2
Q4	22.6	22.5	22.7	22.3	22.4	22.3	22.5
Q5	36.5	35.5	34.7	33.5	34.0	39.1	44.1
<b>75+</b>							
Q1	10.7	9.7	11.2	12.3	12.4	9.2	6.6
Q2	13.8	14.4	14.1	15.1	15.7	13.5	11.2
Q3	16.9	18.1	16.7	17.7	17.8	17.2	16.0
Q4	21.6	22.6	22.3	21.8	21.4	22.2	22.2
Q5	37.0	35.2	35.7	33.2	32.7	37.9	44.0

a. May not total exactly to 100% due to rounding.

Table 4: Percent of Total Gross Household Income by Source for selected OECD Countries, by Age of Household Head <sup>a</sup>

	Canada	Germany	Netherlands	Norway	Sweden	U.K.	U.S.
<i>Source</i>							
<b>45-54</b>							
Earnings <sup>b</sup>	89.0%	89.1%	89.3%	82.7%	84.0%	88.1%	90.5%
Investments <sup>c</sup>	5.0	3.5	1.7	9.0	3.4	3.4	5.2
Pensions <sup>d</sup>	1.1	0.4	0.2	0.6	0.4	1.9	1.2
Gov. Transfers	4.9	7.0	8.8	7.7	12.2	6.6	3.2
<b>55-64</b>							
Earnings	72.7	72.3	59.5	73.9	67.4	68.2	79.7
Investments	7.5	5.4	5.1	10.2	9.4	7.0	7.7
Pensions	11.5	3.2	15.9	30.1	5.2	12.1	6.3
Gov. Transfers	8.3	18.8	19.5	12.8	18.0	12.6	6.2
<b>65-74</b>							
Earnings	20.1	17.5	5.3	28.2	14.9	18.9	39.2
Investments	11.8	7.5	6.2	7.7	8.9	12.5	15.1
Pensions	28.6	13.1	40.5	14.7	14.5	24.3	15.3
Gov. Transfers	39.5	62.0	48.0	49.4	61.8	44.3	30.3
<b>75+</b>							
Earnings	6.0	5.7	7.4	7.7	2.9	10.6	21.8
Investments	17.1	9.0	5.6	9.7	8.3	11.9	18.9
Pensions	28.8	16.1	33.3	15.2	11.8	19.7	16.6
Gov. Transfers	48.1	69.3	53.7	67.4	76.9	57.7	42.7

a. May not total exactly to 100% due to rounding.

b. Includes self-employment income.

c. Includes other income from private sources.

d. Private (occupational) pension income.

Table 5: Percent of Total Gross Household Income from Government Transfers by Income Quintile Rank for selected OECD Countries, by Age of Household Head

	Canada	Germany	Netherlands	Norway	Sweden	U.K.	U.S.
			<b>45-54</b>				
Q1	29.4%	30.4%	36.3%	31.0%	43.9%	53.3%	20.1%
Q2	9.0	10.3	15.4	11.6	17.5	11.6	6.1
Q3	4.6	7.2	9.2	7.2	13.1	4.7	3.2
Q4	2.9	4.6	5.5	4.5	8.6	2.9	2.6
Q5	1.1	2.1	3.3	2.2	3.6	1.0	0.9
			<b>55-64</b>				
Q1	46.9	75.6	64.3	57.0	56.6	68.6	42.6
Q2	17.6	50.1	31.0	24.0	33.2	34.8	14.2
Q3	10.3	20.1	25.0	13.8	20.9	12.8	8.1
Q4	5.1	10.9	12.8	7.0	12.6	6.4	4.5
Q5	1.8	4.2	9.9	2.7	5.8	2.1	1.6
			<b>65-74</b>				
Q1	88.7	91.2	88.0	87.7	92.6	87.4	81.8
Q2	73.5	89.8	77.6	76.7	83.4	79.1	62.3
Q3	49.4	82.5	61.4	61.5	75.7	64.4	44.5
Q4	34.0	64.4	39.0	46.0	60.4	40.0	29.7
Q5	17.7	33.4	27.7	24.8	39.5	19.1	14.7
			<b>75+</b>				
Q1	91.2	93.8	94.7	93.4	94.9	91.2	85.6
Q2	81.4	90.0	87.7	87.6	89.4	85.3	80.8
Q3	65.6	85.3	76.4	80.6	86.3	79.7	65.7
Q4	46.0	73.5	43.0	69.8	82.2	64.1	44.9
Q5	22.6	44.6	28.8	44.0	58.4	28.4	21.3