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# Luxembourg Income Study Working Paper Series

Working Paper No. 91

Changing Inequality in Five Countries:  
The Role of Markets, Transfers and Taxes

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*(scanned copy)*



# Changing Inequality in Five Countries: The Role of Markets, Transfers and Taxes

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# 1 Introduction

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In this paper I examine the distribution of income among families in five industrialized countries, namely Canada, the Netherlands, Sweden, the United Kingdom and the U.S. Specifically, I account for the change in income inequality over time, exploring the effects of changes in markets, public policies and demographic shifts.

Income inequality increased in the 1980s in many industrialized countries. They share some, but far from all of the economic trends in the 1980s. For instance, many countries changed their tax systems.<sup>2</sup> Similar structural changes, such as de-industrialization and technological change, also affected many countries. On the other hand, demographic changes, so often blamed for adverse developments, can hardly have occurred rapidly enough to be able to account for the changes. However, existing systems of taxes and transfer payments can be expected to have different effects on the increases in factor income inequality. Thus, even with similar trends affecting factor incomes, I would still expect different trends in disposable income inequality.

My aim is to understand what, if anything, is common and what is different in the changes in income inequality in the five countries between the early- and the mid-1980s. I use an accounting framework, i.e., I use decompositions of income inequality indices either by income source or by population sub-groups.

To study the contribution of income sources to income inequality, I decompose the squared coefficient of variation, the  $CV^2$ , of disposable income into a sum of separate components due to the market economy (five components: earnings of head, earnings of spouse, self-employment income, property income and private sources), transfers (means-tested and social transfers) and taxes (payroll and income taxes) and assess the contribution

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<sup>1</sup>I am grateful to Jan Otto Andersson, Anders Björklund, Sheldon Danziger, Stephen Jenkins, Leif Nordberg and Johan Willner for helpful comments.

<sup>2</sup>See Pechman, 1988 and OECD Economic Studies, 10/1988.

of these components to the levels of income inequality. Then I decompose the *change* in disposable income inequality into its' different components. Finally, I examine the impact of the changing inequality of each component by holding constant all other parameters of aggregate inequality, but let the parameters of the specific component change, recording the change in income inequality that is due to the change in the parameters of that component.

To examine the role of changing demographic structure on income inequality, I study the extent of within- and between-group inequality of three different partitions of the population. These are by the age of the household head, the number of earners and family structure. I also decompose the *change* in both the  $CV^2$  and the mean logarithmic deviation to assess the relative importance of income inequality within each sub-group and the relative income differences between the groups.

I have three major findings to report. First, earnings account for much of the observed increase in income inequality, partly because of increased inequality of head's earnings and partly because of an increased share of spouse's earnings in household income. Second, the public sector can, in general, be assigned a moderating effect on these changes. Finally, demographic shifts cannot be assigned any major role in the increase in inequality.

This paper is organized as follows. The second section presents the data and methods used. The third section briefly discusses macroeconomic conditions over the time period I study. The fourth section reports the empirical results of the decomposition analysis of both levels and trends. The fifth section summarizes the paper.

## **2 Data and methods**

### **Data**

I study income inequality in Canada, the Netherlands, Sweden, the U.K. and the U.S. using LIS data. Canada and the U.S. are chosen because they are large economies with similar

structures, but which differ interestingly in the functioning and extent of the welfare state.<sup>3</sup> Sweden and the Netherlands, on the other hand, have well-developed welfare states which nonetheless are based on very different principles. Sweden redistributes income extensively, and has high levels of labour force participation as well as low unemployment rates. Many, or most, of its transfer schemes are earnings related. In the Netherlands the labor force participation of women is very low and the public sector transfers quite large amounts of cash to those outside the labor force. The UK is included to see if the policies pursued during the Thatcher years, similar in spirit as the US policies of Reagan, led to similar outcomes. For each country I have two years of data – early 1980s and mid-1980s. Table 2 shows the specific years of data from each country.

As an accounting identity, disposable income consists of earnings of the household head, the spouse, self-employment income, property income, other private income, social and means-tested transfers and payroll and income taxes. Earnings are defined as all labor income accruing to either the household head or the spouse during the accounting year. Unfortunately, LIS data do not allow us to separate self-employment income on the head and the spouse in the first wave of data, so this is only studied at the household level. Some other earnings-related components, such as work-related pensions or sick-pay are included in “other income”, along with all other private income sources.<sup>4</sup> Property income is income from capital. All means-tested social security income and near-cash transfers (e.g, food stamps) are included in means-tested transfers; all others – universal or earnings-related – are included in social transfers. Payroll taxes, i.e., employee social security contributions are separated from income taxes, if LIS records payroll taxes separately (which is not the case for Canada and Sweden).<sup>5</sup>

The level of aggregation and included variables in LIS constrain the level of the anal-

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<sup>3</sup>See Hanratty and Blank, 1992.

<sup>4</sup>LIS records no “other income” for Sweden in the first year. To avoid having different definitions across the years, I have lumped all other private income with self-employment income in the second year.

<sup>5</sup>See Smeeding et al (1990, p. 9) for details on income variables in LIS.

ysis. While I have attempted to find the "least common denominator" - level of aggregation, sometimes institutions are so different that it is not meaningful to follow that. For instance, social security contributions, i.e., payroll taxes, are in some countries paid wholly by the employer (Canada) and in some, partly by the employee and partly by the employer (e.g, the U.S.). However, I think it important that we distinguish between changes in income taxes systems and social security contributions. The latter tell us something about both the tax system *and* both transfer policy and employment structure, while income taxes are, in principal, not much affected by employment structure directly, only through the level of income this generates.

In the decompositions by population subgroup, I examine three partitions of the population. First, I have partitioned the population according to the age of the household head into nine categories according to a five-year classification scheme (20-24, 25-30 and so on). Second, I partition the households into four types of households, single persons, married couples without children, single parent and two-parent families. Third, I study a partition by the number of earners in the household: 0, 1, 2 and 3 earners.

I focus on households where the head is between 20 and 65 years old and all members are related through blood or marriage. I limit the age of the head to 65 years because I wish to study policies other than pension schemes. Although the aged population should be included in accounting for differences in the distribution of total well-being, in this paper I mainly attempt to understand differences in the distribution of income among the working age population. Cross-national differences in pension schemes would dwarf some of the other social transfers I am interested, making it more difficult to gauge the effects of other income sources. I leave the effects of pensions schemes and the aged population on income inequality for another study.

The unit of analysis is the individual, to whom I assign the equivalent household income using the equivalence scale implied by the U.S. official poverty line.<sup>6</sup> Technically, I

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<sup>6</sup>Thus, I use person weights and assign household income divided through by the number of equivalent

where  $\mu_k$  and  $\mu$  are the means of the  $k$ :th income component and disposable income, respectively,  $CV_k$  and  $CV$  are the coefficients of variation and  $\rho_{jk}$  is the correlation between the  $j$ :th and the  $k$ :th component. The square of the ratio of the mean of the  $k$ :th component to the overall mean can be interpreted as the weight on the income inequality of the  $k$ -th component. One possibility to assess the contribution of the income components to changing inequality is to change the weights, the coefficients of variation and the correlations sequentially, and to register the percentage change in overall inequality at each stage. An alternative is to change the three sets of parameters – the means, the variances and the correlations between different income components – sequentially.

The problem with these approaches is that the magnitude of each effect depends on the order in which the parameters are changed. This follows from the fact that changing the parameters sequentially creates different income distributions. Other approaches are available. In this paper I decompose the  $CV^2$  into a sum of  $k$  terms:

$$CV^2 = \sum_k \frac{Cov(y_k, y)}{\mu^2} = \sum_k \rho_k CV_k CV \frac{\mu_k}{\mu} = \sum_k S_k, \quad (2)$$

where  $\rho_k$  is the correlation coefficient between the  $k$ th component and disposable income. Dividing through by  $CV^2$ , I get the relative contribution of each  $k$  components,  $s_k$ , to overall income inequality:

$$\sum_k \frac{S_k}{CV^2} = \sum_k s_k \equiv 1. \quad (3)$$

These relative contributions can then be compared across years to assess the importance of each income component.  $S_k$  and  $s_k$  are measures of the importance of a component for total  $CV^2$ . Looking at how these terms change reveals how the contribution of each separate source of income changes in total inequality.<sup>9</sup>

I am also interested in another type of question, namely: What was the share of each component in the change in  $CV^2$  from the first year we have data,  $t1$ , to the second year,  $t2$ ? This can be studied by decomposing the change in  $CV^2$  into separate parts. Define the

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<sup>9</sup>See Jenkins, 1992, or Shorrocks, 1982.



only have information on the family (or, income-receiving unit). To study the individuals, rather than their families, I reconstruct the population of individuals by multiplying the sample weights by the number of individuals in each family. I assume that all individuals within each family are allotted an equal share of income, that is the possibility of age- or sex-discrimination within households is not taken into account.<sup>7</sup> To standardize for differences in needs between households of different composition, I use the equivalence scales implied by the U.S. poverty line.<sup>8</sup> These thresholds vary by family size and the presence of children. Roughly measured, the poverty line for a family of four persons is almost twice that of a single person. Thus, if the well-being of a single person is indexed as 1.0, families of 2,3,4,5 and 6 persons will have equivalent incomes if their actual incomes are 1.28, 1.59 2.01, 2.38, and 2.69 times this level, respectively.

## Decomposing income inequality

There is no best way of decomposing income inequality indices by income source, just as there is no one best income inequality index. A commonly used measure which satisfies some standard axioms, such as the principle of transfers, symmetry, Lorenz-dominance and sub-group consistency is the squared coefficient of variation,  $CV^2$ . Since it also has some convenient decomposition properties, I choose to work with the  $CV^2$ . This can conveniently be decomposed into separate components to assess the quantitative importance of each income source. A common method is the following: the  $CV^2$  can be written as

$$CV^2 = \sum_k \frac{\mu_k^2}{\mu^2} CV_k^2 + \sum_{j \neq k} \sum_k \frac{\mu_j}{\mu} \frac{\mu_k}{\mu} \rho_{jk} CV_j CV_k, \quad (1)$$

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adults. See Danziger and Taussig, 1979, Sen, 1979 or Uusitalo, 1989.

<sup>7</sup>In fact, all within-family inequality is assumed away – a dubious assumption which is the norm in income distribution research. Lazear and Michael, 1988, as well as Thomas, 1990 explicitly study the allocation of income between adults and children.

<sup>8</sup>See Coulter et al, 1992, for a review and possible pitfalls with respect to equivalence scales. See also Buhmann et al., 1988, for extensive empirical analyses, and Lazear and Michael, 1988, pp. 55-61, for a theoretical treatment of the topic.

annualized change as

$$\% \Delta = \frac{CV_{t2}^2 - CV_{t1}^2}{CV_{t1}^2} \cdot \frac{1}{\tau}, \quad (4)$$

where  $\tau = t2 - t1$ . This can be decomposed into a sum of the  $k$  parts; in order to study  $\% \Delta$  in terms of the percentage change in each components contribution,  $\% \Delta S_k$ , write

$$\begin{aligned} \% \Delta &= \sum_k \frac{S_{k,t2} - S_{k,t1}}{S_{k,t1}} \cdot \frac{S_{k,t1}}{CV_{t1}^2} \cdot \frac{1}{\tau} \\ &= \sum_k \% \Delta S_k \cdot s_{k,t1}, \end{aligned} \quad (5)$$

giving the contribution of each component to total change. The first part in the product in (5) is the annualized percentage change in the contribution and the second part is the relative contribution of the  $k$ :th income component for the starting period. Thus, the change in  $CV^2$  is expressed as the percentage change of each components contribution weighted by the relative contribution of that component in the base year.

Assume that we want to study the effect of a change in the distribution of a specific component on total change. In this paper, I study this under two scenarios. First, I study what  $CV^2$  would have been if the mean and variance of the  $k$ th component had not changed, but all other parameters had (i.e., the means, variances and correlations of the  $k - 1$  other income sources, as well as the mean and variance of disposable income are at their value in  $t2$ ) by defining

$$CV^2 \setminus k = \sum_{l \neq k} \rho_{l,t2} CV_{l,t2} CV_{t2} \frac{\mu_{l,t2}}{\mu_{t2}} + \rho_{k,t2} CV_{k,t1} CV_{t2} \frac{\mu_{k,t1}}{\mu_{t2}}. \quad (6)$$

Second, I hold also the correlation of the  $k$ th source with disposable income,  $\rho_k$  at it's value in  $t1$ :

$$CV^2 \setminus 'k = \sum_{l \neq k} \rho_{l,t2} CV_{l,t2} CV_{t2} \frac{\mu_{l,t2}}{\mu_{t2}} + \rho_{k,t1} CV_{k,t1} CV_{t2} \frac{\mu_{k,t1}}{\mu_{t2}}. \quad (7)$$

The effect of the change in the  $k$ th component is given by

$$\% \Delta_k = \frac{CV^2 - CV^2 \setminus k}{CV^2 \setminus k}, \quad (8)$$

and likewise for  $CV^2 \setminus k$ .

The methods for studying the effects of changes in population structure are the following. Assume that the population is decomposed into  $J$  mutually exclusive subgroups and let  $v_j$  be the population share of the  $j$ th subgroup. The  $CV^2$  can be decomposed into

$$CV^2 = \sum_j v_j \lambda_j^2 CV_j^2 + \sum_j v_j (\lambda_j^2 - 1), \quad (9)$$

where  $\lambda_j^2 = \mu_j/\mu$ ,  $CV_j^2 = \sigma_j^2/\mu_j^2$  for the  $j$ th subgroup. The first term in (9) is interpreted as the part of to  $CV^2$  attributable to "within" group inequality and the second term is the part attributable to differences in mean incomes between the groups. Dividing through by  $CV^2$  gives the proportion of income inequality due to within and between group variation.

Following Jenkins 1992, I also use the mean logarithmic deviation,

$$I_0 = 1/N \sum_{i=1}^N \log(\mu/y_i), \quad (10)$$

to assess the relative importance of population shares, relative incomes and within group inequality to the trend in inequality. This measure can be decomposed by sub-groups into

$$I_0 = \sum_j v_j I_{0,j} + v_j \log(1/\lambda_j), \quad (11)$$

where  $I_{0,j}$  is the inequality within group  $j$ .

I decompose the change in income inequality using two methods. The change in  $CV^2$  can be decomposed into different parts. The change from period  $t1$  to period  $t2$  can be decomposed as

$$\begin{aligned} \Delta CV^2 &= \sum_j (v_{t2,j} \lambda_{t2,j}^2 CV_{t2,j}^2 - v_{t1,j} \lambda_{t1,j}^2 CV_{t1,j}^2) + \sum_j (v_{t2,j} \lambda_{t2,j}^2 - v_{t1,j} \lambda_{t1,j}^2) \\ &= \underbrace{\sum_j \overline{v_j \lambda_j^2} \Delta CV_j^2}_A + \underbrace{\sum_j \Delta(v_j \lambda_j^2) \overline{CV^2}}_B + \underbrace{\sum_j \Delta v_j \overline{\lambda_j^2}}_C + \underbrace{\sum_j \overline{v_j} \Delta \lambda_j^2}_D, \end{aligned} \quad (12)$$

where a bar over a variable  $\bar{x} = 1/2(x_{t1} + x_{t2})$  denotes the mean of the two periods. Dividing through by  $\tau$  and  $CV_{t1}^2$  yields the contribution of each component to the annualized percentage change in  $CV^2$ ,  $\% \Delta CV^2$ . Term  $A$  gives the effect of the change in inequality within

the group. Term  $D$  gives the effect of changes in the relative incomes of the groups. Term  $C$  gives a “pure” effect of population share change and term  $B$  can be interpreted as an interaction term between changing population shares and mean incomes. In the analyses I focus on terms  $A$  and  $D$ .

I also use the mean logarithmic deviation to decompose the trend, because the change this measure can be decomposed into terms which have a much neater interpretation than the decomposition of the  $CV^2$ . Mookharjee and Shorrocks (1982) show that the change  $\Delta I_0$  can be approximated by

$$\Delta I_0 \simeq \underbrace{\sum_j \bar{v}_j \Delta I_{0,j}}_A + \underbrace{\sum_j \bar{I}_{0,j} \Delta v_j}_B + \underbrace{\sum_j (\bar{\lambda}_j - \overline{\log \lambda_j}) \Delta v_j}_C + \underbrace{\sum_j (\overline{v_j \lambda_j} - \bar{v}_j) \Delta \mu_j}_D. \quad (13)$$

The term  $A$  is the contribution of within group inequality change, terms  $B$  and  $C$  represent the effects of changing population shares and term  $D$  represents the effect of changing relative incomes.

### 3 The economic environment, potential causes and the decompositions

Jenkins (1992) provides the following checklist for potential causes of changes in income inequality:

1. Changes in the age distribution
2. Household composition changes
3. Changing employment structure
4. Changes in industrial structure
5. Business cycle influences and unemployment changes
6. Income tax and transfers changes
7. Wage inequality changes
8. Changes in income from capital

## 9. Changing patterns of international trade<sup>10</sup>

In my subgroup decompositions, I focus on 1 (decomp by age of head), 2 (decomp by type of family), and, to some extent 3 and 4 (decomp by number of earners). Gottschalk and Joyce (1992a,1992b) have studied principally 3 and 4. The decomposition by income source focuses on 3 and 4 (earnings of head and spouse, self-employment income, payroll taxes), 6 (social and means-tested transfers, payroll and income taxes) and 8 (property income). The effects of changes in the business cycle are not being controlled for.<sup>11</sup>

How do the decompositions relate to potential explanations? First, if shifts in age and family structure are to explain changes in inequality, then the population shares and between group terms should account for most of the change, not within group shifts. Changing employment structure should, in order to explain changes in inequality, show up in a number of places. Increased labour force participation of women should change the contribution of spouses to total  $CV^2$  in the decomposition by income source and should cause most of the change in inequality to be accounted by changing population share and relative incomes. On the other hand, employment and industrial structure changes should lead to both increased earnings contribution, especially of head's earnings, and a large contribution of within earnings group inequality to the trend. Changes in taxes and transfer policies would show up in the decomposition by income source.

The decompositions are by their nature only suggestive of which causes of inequality change are more likely. At the very most, some explanations can be crossed off the list. Several competing explanations might still remain just as likely as before. Especially, the explanations that relate to industrial structure, and therefore, earnings inequality, are not easy to discriminate among from these data. The explanations are by no means mutually exclusive. For instance, changing labor force attachment of women and men should lead to changing contributions of between group inequality for the partition by number of earners,

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<sup>10</sup>This item does not appear on Jenkins' (1992) list. I have dropped from this list his item 5, unemployment changes, mainly because it cannot be consistently analyzed with the data at hand.

<sup>11</sup>See Livada, 1992, for an international comparison of cyclical influences on the income distribution.

at the same time as earnings inequality within these groups could be changing because of a growing share of service sector jobs.

LIS constrains my choice of years, so there is little I can do to control for stages in the business cycle. However, I do not think that my results are biased by differences in macroeconomic conditions in the countries. Table 1 shows the unemployment and inflation rates as well as the growth rates of real GNP for the countries we study. GNP growth was higher in the second year for all countries except the Netherlands. Unemployment was lower in the second year in the Netherlands and Sweden, and higher in all the rest. Inflation rates are lower in the second year in all countries.

Generally, one would expect inequality to increase with high unemployment and to decrease during economic recoveries.<sup>12</sup> Thus, for Sweden, I would expect a decrease in income inequality. For the other countries, no simple expectation arises, because the trends in unemployment and GNP growth are mixed. However, inequality increased in all countries except in the Netherlands (including Sweden). Thus, although the data are sampled at slightly different stages of the business cycle, these differences can not explain the observed changes in income inequality.

It is often thought that countries differ so much in their institutions and other characteristics that comparing levels of inequality is not meaningful.<sup>13</sup> However, given a high degree of inertia in how these characteristics change, comparing *changes* across countries is thought to be meaningful, since this controls for what is constant over time. Below, I will briefly discuss transfer and tax policies, how these have changed and how these are likely to affect the income distribution.

The tax system affects the distribution of income principally through, social security contributions (payroll taxes), income taxation and taxes on wealth and income from wealth. Changes in any of these are likely to affect income inequality. Payroll taxes are generally a

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<sup>12</sup>See Danziger and Gottschalk, 1992.

<sup>13</sup>See, e.g., Blackburn and Bloom, 1990.

Table 1. Macroeconomic conditions

		Unemployment	Inflation	Real GNP growth
Canada	1981	7.5	11.3	3.4
	1987	8.8	3.1	4.2
	1981-1987	10.0	5.8	3.1
	1971-1990	8.0	6.3	3.8
Netherlands	1983	12.0	2.8	1.4
	1987	9.6	-0.2	0.8
	1983-1987	10.8	1.4	2.0
	1971-1990	7.0	5.0	2.4
Sweden	1981	2.5	12.4	0
	1987	1.9	5.3	2.8
	1981-1987	2.8	8.4	2.0
	1971-1990	2.3	9.0	1.9
UK	1979	5.0	13.6	2.8
	1986	11.2	4.4	3.8
	1979-1986	8.1	9	3.3
	1971-1990	5.25	6.65	1.3
US	1979	5.8	9.2	2.5
	1986	6.9	2.4	2.7
	1979-1986	7.6	6.1	2.3
	1971-1990	6.7	6.0	2.8

Source: OECD, 1991.

constant proportion of labour earnings. Increases in the rate at which they are collected will raise the taxes of earners and will tend to equalize relative income differences with respect to those not in the labour force. On the other hand, increases in payroll tax rates will worsen the situation for those who derive income mainly from labour relative to those with a higher degree of property or self-employment income. The effect of changes in payroll taxes is thus ambiguous.

Income taxes (i.e. taxes on total income), if progressive, decrease income inequality. Moves to less progressive taxes will then, *ceteris paribus*, increase income inequality (absent any labour supply effects). At least the U.S. and Sweden had tax reforms during the time period I study. A common goal of those was that the progressivity of the tax schedules should be decreased and the tax base broadened. Decreased progressivity will, *ceteris paribus*, increase the variability of income. The effect of the reform will still depend on the fate of various exemptions, capital taxation, the threshold at which households enter the tax rolls and so on.

However, a decrease in progressivity of the tax schedule combined with a movement of earners up in the earnings distribution will keep observed progressivity, and hence, the observed equalizing effect of taxes roughly constant (as will happen, e.g., when the earnings of women increase because of increased labour supply).<sup>14</sup>

Although a number of major changes in the Swedish tax system were introduced after the time period covered by the data sets in LIS, the tax system in Sweden was subject to some changes in during the time period we study. The main changes were a reduction in marginal tax rates, the number of tax brackets (to 4) and the number and rate of tax deductions. Joint taxation of capital income of married couples, the last income source that was jointly taxed, was abolished in 1986. Further, indexation of tax rates, formally introduced in 1979, was abolished in 1985 (Ljungh, 1988).

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<sup>14</sup>The question of whether the shift in labour supply is a response to changes in the schedule is not addressed here.



Most changes in the United Kingdom took effect in 1979, so these changes are accounted for in these data. The U.S. had two major tax reforms in the 1980's, those of 1983 and 1986. Generally stated, it seems that some changes that worsened the situation for low income groups in the first tax reform were repealed in 1986, too late for our data. However, it is not clear how the two reforms affected overall inequality.<sup>15</sup>

Means-tested transfers will account for a reduction of observed inequality. Earnings-related transfers will, on the other hand, tend to either be neutral or account for an increase in inequality. The sign of the effect of transfers on inequality depends on the correlation of transfers with income.<sup>16</sup> If the factor share or the dispersion of the means-tested transfers decreases, their inequality reducing effect will decrease. Conversely, if the relative mean (factor share) or dispersion of earnings-related transfers increases, their inequality augmenting effect will be stronger. Means-tested transfers are, by definition, negatively correlated with other income. Social transfers, on the other hand, may be positively or negatively correlated with income.

The multitude and diversity of various social transfer program precludes a lengthy review of the programs and changes in these in the countries I cover. I shall here concentrate on changes in two programs, namely those of unemployment benefits and family allowances in the two years for each country.<sup>17</sup>

Canada had no major institutional changes in either program over the time period we study, the last major change being the introduction of child tax credits in addition to the universal child allowance. There was no major change in family allowances in the Netherlands. Unemployment benefit rules changed after 1983, however. Earnings related

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<sup>15</sup>E.g., Gravelle (1992, p. 36, who concludes that "...the reality is probably that the Tax Reform Act of 1986 is now making lower-income individuals worse off and higher income individuals better off."

<sup>16</sup>That earnings-related transfers will account for a positive contribution to overall inequality when decomposing inequality into its income sources should not be confused with the fact that even earnings-related transfers equalize relative incomes between groups of receivers and non-receivers (e.g., employed and unemployed) and have an equalizing effect when analyzed in those terms.

<sup>17</sup>Information on transfer schemes are taken from U.S. Department of Health, 1979, 1981, 1983, 1985 and 1989.

unemployment benefits were 80% of earnings up to a maximum of 262 guilders a day. In 1985, this was down to 70% of earnings with an unchanged limit. In 1989, the limit was still only 263 guilder; thus, the real value of the limit was eroding. Means-tested unemployment benefits were down from 75 to 70 percent of earnings between 1983 and 1985.

In Sweden, rules governing unemployment benefits did not seem to change. The universal child allowance, having given a constant contribution per child, became progressive after 1981. No major changes in these programs were enacted between 1979 and 1986 in the U.K. In the U.S., there is no universal family allowance. The main source of social transfers to (families with) children is Aid to Families with Dependent Children (AFDC). During the early Reagan years, this partly federal and partly state-level program suffered some cut-backs, although the specifics of these cuts varied from state to state (Nathan and Doolittle, 1987). The duration of unemployment benefits also varied by state. The lower limit, 26 weeks duration remained unchanged. The higher limit of 39 weeks was reduced to 26 weeks. The maximum extension of up to 26 additional weeks duration in 1979 was reduced to 13 additional weeks by 1986.

The effects of these changes are not always clear. The effect of raising child allowances, or making them progressive, as in Sweden, depends on the distribution of children in different types of families, the position of these in the income distribution and so on. In as much as families with children are below or at average (in per capita equivalent) income, raising child allowances should reduce inequality. The effect of changes in unemployment benefits, again, depends on the extent of means-testing (or correlation with earnings), the normal incomes of the unemployed and their distribution across family types. It would, however, be surprising if restrictions in duration and/or the correlation with earnings would increase measured inequality – this would occur if those with high incomes were the unemployed, or if reductions in unemployment benefits were accompanied with increases in benefits to those with lower incomes (= mean preserving progressive transfers). In sum, the institutional changes I report above lead me to believe, at most, that there would be some increase in

equality in Sweden due to progressive child allowances. In the other cases, I would suspect changes to lead to increased inequality.

## 4 Previous studies

Explanations for changes in income inequality generally sort under three main headings. First, there are changes that occur due to changes in markets (earnings and property income). Second, there are changes that might occur because the demographic composition of the population is changing. Third, there are changes that can be due to changes in tax and/or transfers policies.

Naturally, all these headings conceal a large number of subheadings. Witness, for instance, the large literature (reviewed by Levy and Murnane, 1992) on the changes in earnings inequality in the U.S. Also, categories mix. For instance, labor markets might induce changes because the demographic composition of the labor force is changing.

Blackburn and Bloom (1990) study family income inequality in Australia, Canada and the U.S. using both waves of data available in LIS. They focus on gross income, i.e. household income before taxes and limit their sample to married couples with prime-aged (25 to 64 year old) husbands. The focus of their study is whether the observed increases in income inequality, especially that in the U.S., is best explained by changes in earnings inequality (hours \* wages), changes in the labour force participation of husbands and wives or an increased correlation in the earnings of couples. They find that the change in the inequality of husbands' earnings, and, for Canada and the U.S., the change in the correlation between husbands and wives earnings are important in explaining the increase in income inequality. They do not explicitly analyze the effects of other income components, and taxes do not enter the analysis at all.

This study represents an improvement over Blackburn and Bloom (1990) in that (a) I analyze a larger number of countries, (b) my concept of income inequality is household

income after tax, mostly thought to be a more welfare relevant measure of income, (c) I include single-person and single-parent households and (d) I study the effect of more income components and of demographic changes. They employ the decomposition of  $CV^2$  described by equation (1) to assess the contribution of different factors to the change in inequality, which produces a range of estimates of the effect, while I use exact decompositions. On the other hand, they examine in detail the changes in earnings inequality, i.e., whether the changes are due to changes in labour force participation, hours worked or wage rates. This level of detail is not possible in the present study, because hours worked are not available in most LIS data sets.

Cancian and Schoeni (1992) have also studied the impact of female labor force participation and earnings on family earnings inequality in 11 developed countries in LIS. In order to understand the patterns and changes in work behavior of wives and their impact on earnings inequality they study the labor force participation of wives in different parts of the earnings distribution of husbands. rather than overall patterns. They find large differences in both overall levels of participation and in the levels across the distribution. They also find large differences in the levels dispersion, correlation between spouses' earnings across the countries. But, by studying the change in earnings inequality when wives earnings are included, they find that in all countries, wives' earnings have a reducing effect on family earnings inequality. Where two waves of data were available, the inequality reducing effect of working wives increased over time.

Gottschalk and Joyce (1992a, 1992b) study different explanations for changes in the earnings distributions for full time male workers in Australia, Canada, France, the Netherlands, Sweden, the U.K. and the U.S. using LIS data. They limit analyses to males who are household heads, between 25 and 54 years of age and do not report self-employment income. They control for top-coding problems by studying a trimmed sample (the first 95 percent) and by studying percentiles, which are unaffected by top-coding. They focus on overall trends in earnings inequality and changes within and between age and education groups.

They find that all countries experienced increases in earnings inequality, but the magnitude of the change was largest in the U.S. The patterns of within and between group inequality are also, to a large extent shared, with within age group and between education group inequality increasing.<sup>18</sup> They also conclude that changes in industrial structure within the countries account for very little of the change, and, consequently, the similar structural changes are affecting economies across the globe. The fact that the magnitude of earnings inequality increases differ is attributed in part to differences in labour market policies.

Changes in industrial structure in the form of international competition and de-industrialization on the one hand, and technological change, on the other, have often been offered as explanations of increases in earnings inequality in the U.S. Gottschalk and Joyce (1992b) present data on changes in trade, industrial structure and technology. They conclude that changes in the internationalization of competition and technological change are more likely to explain the observed patterns of earnings inequality than de-industrialization. Both of the studies focus explicitly on trends in and explanations for changes in prime-age male earnings.

Fritzell (1992), also using LIS, studies the change in disposable income inequality. The countries included in the study are Canada, Germany, Sweden the U.K. and the U.S. He recodes negative income to 0.1 and recoded any income that is more than 1500 times the median income to this limit. For the most part, all households are included, but some are conducted also for a subset where the age of the head is 20 to 64 years old. Income inequality increased substantially in Sweden, the U.K. and the U.S., and more modestly in Germany. In Canada, the evidence is mixed.

Fritzell (1992) goes on to study the effect of demographic factors (age and family structure), income redistribution and the structure of market rewards. The effect of age and family structure are analyzed by decomposing the  $CV^2$  in  $t_2$  into within- and between group components. Then the age or family population shares in  $t_1$  is to produce an estimate of

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<sup>18</sup>Education variables are only available for Canada, the Netherlands and the U.S.

what inequality had been if all within-group means and variances had changed by the actual amounts but population share had stayed constant. In neither case can demographic change account for much of the change in inequality.

Fritzell studies the effects of income redistribution by comparing the pre-tax, pre-transfer distribution of income with the post-tax, post-transfer distribution. The analyses are conducted both for the full sample and for a sample of households with a non-aged head in order to exclude the influence of pensions. He concludes that changes in tax and transfer policies in Sweden, the U.K. and the U.S. had an augmenting effect of income inequality, i.e., the increase in income inequality would have been lower were it not for changes in redistribution. In Canada and Germany, on the other hand, he finds that the equalizing effect of the welfare-state increased between the sample years.

The effect of changing market rewards is analyzed for the non-aged population focusing on earnings. Earnings are divided into four groups, (i) those with incomes less than 50 percent of median income, (ii) between 50 and 150 percent of the median, (iii) between 150 and 200 percent of the median and (iv) over 200 percent of the median. This has the advantage of localizing the changes in earnings, but the disadvantages of using uncommon partitions of the distribution (instead of, say, deciles) and of comparing the distribution of earnings with the median of income. Fritzell concludes that in all countries, earnings distribution tended to widen.

Fritzell's study is closest to the present paper, in that it focuses on the same set of countries (except for Germany) and, broadly, the same set of explanations as I do. The methods, however, are different; Fritzell uses, essentially, a variant of shift-share analyses, i.e., he studies the effect of one factor at a time. My analyses by population subgroup produce exact decompositions, as do my decompositions by income source. I also study the different factors at a finer level of disaggregation.

## 5 Overall trends

While I do not attempt to fully explore the reasons for changes in inequality, I do to some extent sort out the sources of the changes. My main sample includes all households with families and single adults where the head is between 20 and 64. In many countries, very high incomes are top-coded, i.e., the true income of a unit in the sample is replaced by a maximum value if it exceeds this limit. I also study a trimmed sample where those with incomes in excess of the 95th percentile have been excluded, because the  $CV^2$  is sensitive to very high incomes. Changes in the top-codes might not reflect real changes but can still influence estimated inequality.

In Table 2 I report the level and the annualized percentage change in adjusted disposable income inequality summarized by three inequality indices, the Gini-coefficient, the variance of logarithms and the squared coefficient of variation for two samples. I show the statistics for the full and for the trimmed sample. Because the time span covered by the two samples for each country vary, I have divided the percentage changes by the number of years between the samples to make the changes comparable.

In both of the years for which data are available, the United States has the highest  $CV^2$  of all the countries. Sweden, on the other hand, has the lowest level of  $CV^2$  in any of the years. The inequality of disposable income increased in all countries. The increase was modest in Canada, sizeable in the Netherlands, the U.K. and the U.S. and largest in Sweden.

The trends in inequality are fairly uniform. With the exception of Canada, inequality increased by all measures during the sample period. In Canada, one of the measures displays a decrease in inequality but all others show an increase; the squared coefficient of variation for the truncated sample decreased slightly but all other measures show a small increase.

The Gini-coefficient is sensitive to extreme incomes, the squared coefficient of variation to high incomes and variance of logarithms to low incomes.<sup>19</sup> Thus, the overall im-

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<sup>19</sup>See Nygård and Sandström, 1981, pp. 407-408. Note that the variance of logarithms does not (under all circumstances) satisfy the so-called transfer criterion.

Table 2. Level and annual rate of change in disposable income inequality.

Sample		All				Truncated		
		1000×				1000×		
		Gini	LVar	$CV^2$		Gini	LVar	$CV^2$
Canada	1981	295	320	317	242	250	241	
	1987	304	330	342	261	270	234	
Change	0.51	0.52	1.31	1.31	1.33	-0.48		
Netherlands	1983	250	190	232	193	130	166	
	1987 271	260	288	229	200	188		
Change	2.10	9.21	6.03	4.66	13.46	3.31		
Sweden	1981	200	160	136	172	130	118	
	1987	215	200	258	178	170	122	
Change	1.25	4.17	14.95	0.58	5.13	0.56		
US	1979	270	230	283	203	150	198	
	1986	319	370	429	277	310	278	
Change	2.59	8.70	7.37	5.21	15.24	5.77		
US	1979	313	470	335	264	410	281	
	1986	350	510	467	314	450	354	
Change	1.69	1.22	5.63	2.71	1.39	3.71		

Note: Truncated sample consists of households with incomes at or below the 95th percentile.

Source: Authors calculations from LIS.



pression that the different measures give is, that the Lorenz curves for the two years do not intersect for the Netherlands, Sweden, the UK and the US either sample, while they do so for Canada in the truncated sample (but not in the full sample).

## 6 Decompositions by income source

In Table 3 I report the means, factor shares, and inequality of the various income sources. The earnings of households heads account for the bulk of households income; the share of family income ranges from a high of 99 percent in the Netherlands in 1987 to a low of 71 percent in Canada in 1981.<sup>20</sup> Real mean earnings of the head also grew in all countries except the U.K. Earnings inequality among household heads, measured by the  $CV^2$  increased in all countries in our sample. The U.K. and the U.S. have the largest increases, 12.4 and 4.2 percent annually. Canada, the Netherlands and Sweden have more modest increases, 0.3, 2.6 and 1.2 percent, respectively.

The earnings of the spouse accounted for far less, ranging from a low of 16 percent in the Netherlands in 1983 to a high of 32 percent in Sweden in 1987. In all countries, both the real level and the factor share of spouses' earnings increased over time. Earnings inequality among spouses decreased in all countries except the U.K.

The share of self-employment income ranged from 6 percent in Sweden and Canada to 17 percent in the Netherlands in 1987. The real level of self-employment income increased in all countries except Sweden, where it decreased. The importance of property income varies widely across countries. The largest factor share is in the U.S. in 1986, 6 percent, and lowest in the Netherlands, only 1 percent. Most notable is a large increase in both it's share and real level in Sweden, where the share increases from 1 to 4 percent. Property income inequality decreased in all countries except Canada. The share of other income is negligible in all countries, between 0 and 1 percent.

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<sup>20</sup>Note that payroll and income taxes are recorded as negative incomes, so theoretically, the income share of one component could exceed 100 percent.

Table 3. Decompositions by income source. All households.

Country	Mean $\mu$		Correlation $\rho_k$		Share $100\mu_k/\mu$		Inequality $\frac{1000CV^2}{10000}$		Relative Contribution $100s_k$		Absolute Contribution $1000S_k$		Change $\Delta S_{k,t_1,t_2}$		
	$t_1$	$t_2$	$t_1$	$t_2$	$t_1$	$t_2$	$t_1$	$t_2$	Change	$t_1$	$t_2$	$t_1$		$t_2$	
Canada															
Earnings head	20680	22716	1.6	0.5736	0.6715	71	76	719	733	0.3	61	75	195	257	3.3
Earnings spouse	5225	7247	6.5	0.4975	0.5651	18	24	3077	2205	-4.7	28	35	88	120	1.7
Self-employment	1847	2408	5.1	0.2703	0.2773	6	8	28154	17031	-6.6	16	16	51	54	0.2
Property income	1731	1233	-4.8	0.3836	0.3289	6	4	11883	17808	8.3	14	10	44	34	-0.6
Other income	0	0	N.A.	.	.	0	0	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Social transfers	1334	1835	6.3	-0.0795	-0.0971	5	6	3875	3018	-3.7	-1	-2	-4	-6	-0.1
Means-tested transfers	497	625	4.3	-0.2609	-0.298	2	2	11924	8466	-4.8	-3	-3	-9	-11	-0.1
Income taxes	-5664	-7366	5.0	-0.7931	-0.8606	-19	-25	1084	1019	-1.0	-29	-37	-90	-126	-1.9
Payroll taxes	0	0	N.A.	.	.	0	0	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Disposable income	29118	29704	0.3	1	1	100	100	317	342	1.3	100	100	317	342	1.3
Netherlands															
Earnings head	31510	32719	1.0	0.4703	0.5945	95	99	680	751	2.6	76	95	177	275	10.6
Earnings spouse	5464	7126	7.6	0.5014	0.6012	16	22	5558	4988	-2.6	40	54	93	156	6.8
Self-employment	4811	5509	3.6	0.3959	0.2493	14	17	14950	18436	5.8	46	33	107	96	-1.1
Property income	419	395	-1.5	0.2455	0.0941	1	1	117280	63368	-11.5	7	2	16	5	-1.2
Other income	191	74	-15.3	0.1372	-0.0139	1	0	115986	329721	46.1	2	-0	4	-0	-0.5
Social transfers	6085	5657	-1.8	-0.0032	0.0384	18	17	5182	4855	-1.6	-0	3	-1	8	0.9
Means-tested transfers	1253	1547	5.9	-0.1601	-0.1551	4	5	21912	15294	-7.6	-6	-5	-14	-15	-0.2
Income taxes	-6017	-7493	6.1	-0.745	-0.735	-18	-23	1597	3041	22.6	-35	-54	-82	-157	-8.1
Payroll taxes	-12048	-13852	3.7	-0.7941	-0.5858	-36	-42	315	581	21.1	-33	-35	-78	-101	-2.5
Disposable income	33310	32885	-0.3	1	1	100	100	232	288	6.0	100	100	232	288	6.0
Sweden															
Earnings head	107224	109325	0.3	0.6122	0.5325	81	81	508	545	1.2	95	62	130	161	3.8
Earnings spouse	38376	43116	2.1	0.6249	0.5337	29	32	1456	1305	-1.7	59	38	80	99	2.2
Self-employment	8317	9095	1.6	-0.1427	-0.1195	6	7	18419	11784	-6.0	-10	-5	-14	-14	0.0
Property income	1854	5392	31.8	0.0573	0.6313	1	4	841809	84687	-15.0	6	46	9	117	13.3
Other income	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Social transfers	30056	32480	1.3	0.0796	0.0597	23	24	2679	1724	-5.9	8	4	11	10	-0.2
Means-tested transfers	8302	2338	-12.0	-0.0026	-0.1438	6	2	8314	11311	6.0	-0	-2	-0	-4	-0.5
Income taxes	-59092	-64520	1.5	-0.563	-0.5841	-44	-48	645	652	0.2	-54	-44	-74	-114	-4.9
Payroll taxes	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Disposable income	133007	135462	0.3	1	1	100	100	136	258	14.9	100	100	136	258	14.9
Continued															

Continued

Table 3. *Continued*

Country	Mean		Correlation		Share		Inequality		Relative		Absolute		Change $\Delta S_{k s_{1,k}}$		
	$\mu$	$t_1$	Change	$\rho_k$	$t_1$	$t_2$	$100\mu_k/\mu$	$t_1$	$t_2$	Change	$100s_k$	$t_1$		$t_2$	
U.K.															
Earnings head	6749	6337	-0.9	0.6995	0.6495	81	72	622	1160	12.4	84	77	237	331	4.8
Earnings spouse	1435	1684	2.5	0.5269	0.5502	17	19	3039	3970	4.4	30	32	84	138	2.7
Self-employment	535	927	10.5	0.1939	0.3389	6	11	18510	14119	-3.4	10	21	28	88	3.0
Property income	187	355	12.9	0.2963	0.3075	2	4	29629	22625	-3.4	7	9	19	39	1.0
Other income	132	128	-0.4	0.0728	0.1111	2	1	54165	51227	-0.8	2	2	4	8	0.2
Social transfers	848	1032	3.1	-0.0437	-0.0812	10	12	2195	1503	-4.5	-1	-2	-3	-8	-0.2
Means-tested transfers	185	591	31.3	-0.1844	-0.2327	2	7	12208	4981	-8.5	-3	-5	-8	-23	-0.8
Income taxes	-1498	-1747	2.4	-0.6235	-0.7515	-18	-20	1184	1765	7.0	-23	-30	-65	-130	-3.3
Payroll taxes	-617	-882	6.1	-0.6044	-0.5253	-7	-10	629	904	6.3	-7	-8	-19	-33	-0.7
Disposable income	8352	8766	0.7	1	1	100	100	283	429	7.4	100	100	283	429	7.4
U.S.															
Earnings head	18603	19510	0.7	0.7141	0.7139	87	82	693	898	4.2	89	81	298	378	3.4
Earnings spouse	4299	5689	4.6	0.4849	0.5261	20	24	3115	2773	-1.6	30	31	99	143	1.9
Self-employment	2032	2261	1.6	0.2169	0.2424	9	9	20838	17275	-2.4	16	14	54	65	0.5
Property income	1079	1372	3.9	0.2691	0.4374	5	6	34999	24658	-4.2	14	18	46	85	1.7
Other income	178	192	1.2	0.02	0.0185	1	1	53063	43955	-2.5	0	0	1	1	-0.0
Social transfers	729	713	-0.3	0.0629	0.0077	3	3	17724	11652	-4.9	2	0	5	1	-0.2
Means-tested transfers	305	399	4.4	-0.2372	-0.2658	1	2	18565	13210	-4.1	-3	-2	-8	-11	-0.1
Income taxes	-4935	-5178	0.7	-0.5956	-0.7344	-23	-22	3306	2931	-1.6	-43	-40	-144	-186	-1.8
Payroll taxes	-1346	-1811	4.9	-0.7785	-0.7641	-6	-8	498	633	3.9	-6	-7	-20	-32	-0.5
Disposable income	21499	23867	1.6	1	1	100	100	335	467	5.6	100	100	335	467	5.6

Note: Changes reported are annualized percentage changes. Correlations  $\rho_k$  are the correlation of the  $k$ th income source with disposable income. Shares are ratio of  $k$ th component mean to mean of disposable income.

Source: Authors calculations from LIS.

Social transfers (earnings-related or universal) generally have a larger factor share than means-tested transfers. The relative sizes of both reflect prior beliefs; the countries with larger welfare states have a larger factor share of both, and a relatively larger share of social transfers. The factor share of social transfers in Canada and the U.S. is 6 and 3 percent in the later year. In the Netherlands it is 17, in Sweden 24 and in the U.K. 12 percent in the later year. Means-tested transfers were 2 percent in Canada and Sweden, 3 percent in the U.S., 5 percent in the Netherlands and 7 percent in the U.K. The large increase in the U.K. from 2 to 7 percent is probably explained by the much higher unemployment rate in the second year, 11.2 as opposed to 5 percent in 1979.

Income taxes are the dominant form of taxation. Income taxes range from 20 percent of disposable income in Canada to 48 percent in Sweden. The Netherlands, surprisingly, collects a larger share of taxes as payroll taxes than as income taxes, the factor shares are 42 and 23 percent. LIS does not contain any information on payroll taxes in Canada and Sweden (in 1987). The U.K. and the U.S. collect 10 and 8 percent of mean income in payroll taxes.

### **Decomposing levels of inequality**

The relative contributions of earnings, on the one hand, and income taxes, on the other, dominate the relative contributions to income inequality. The relative contribution of heads' earnings increased in Canada and the Netherlands but decreased in Sweden, the U.K and the U.S. For instance, household heads' earnings accounted for 95 percent of the  $CV^2$  in Sweden in 1981. In 1987, the share was only 62 percent.<sup>21</sup> The contribution of spouses' earnings to total  $CV^2$  also increased in all countries except Sweden. This increase in spouse's earnings' contribution is mainly due to their increased share of disposable income; the inequality of spouse's earnings mostly decreased.

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<sup>21</sup>The decreases in the relative contributions of earnings in Sweden are due to a high contribution of property income. When the sample is restricted to only 95 percent of the distribution, the relative contributions of earnings remain more or less constant over time, see table 4.

Table 4. Decompositions by income source. Income less than 95-percentile.

Country	Mean $\mu$		Correlation $\rho_k$		Share $100\mu_k/\mu$		Inequality $1000CV^2$		Relative Contribution $100s_k$		Absolute Contribution $1000S_k$		Change $\Delta S_{k,t_1,k}$		
	$t_1$	$t_2$	$t_1$	$t_2$	$t_1$	$t_2$	$t_1$	$t_2$	$t_1$	$t_2$	$t_1$	$t_2$			
Canada															
Earnings head	19984	20710	0.6	0.6497	0.6836	73	77	662	603	-1.5	79	84	190	197	0.5
Earnings spouse	4706	6091	4.9	0.5197	0.5401	17	23	3111	2250	-4.6	32	38	78	88	0.7
Self-employment	1390	1630	2.9	0.097	0.1122	5	6	19262	14408	-4.2	4	5	11	12	0.1
Property income	1303	873	-5.5	0.2871	0.2351	5	3	8955	13778	9.0	8	6	20	14	-0.4
Other income	0	0	N.A.	.	.	0	0	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Social transfers	1366	1928	6.9	-0.0614	-0.0463	5	7	3835	2881	-4.1	-1	-1	-3	-3	0.0
Means-tested transfers	521	675	4.9	-0.289	-0.3347	2	3	11358	7788	-5.2	-4	-5	-9	-11	-0.1
Income taxes	-4982	-6076	3.7	-0.7993	-0.8531	-18	-23	802	720	-1.7	-27	-34	-64	-79	-1.0
Payroll taxes	0	0	N.A.	.	.	0	0	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Disposable income	27268	26730	-0.3	1	1	100	100	241	239	-0.2	100	100	241	234	-0.5
Netherlands															
Earnings head	29929	30216	0.2	0.4737	0.5838	97	100	571	589	0.8	86	102	142	192	7.6
Earnings spouse	4839	5922	5.6	0.5375	0.5577	16	20	5707	4765	-4.1	50	55	82	102	3.0
Self-employment	2525	2360	-1.6	0.1921	-0.0833	8	8	21475	22719	1.4	18	-7	30	-13	-6.5
Property income	190	361	22.5	0.1093	0.1137	1	1	177484	62431	-16.2	2	2	4	5	0.1
Other income	135	80	-10.2	0.0144	-0.008	0	0	137190	304903	30.6	0	-0	0	-0	-0.1
Social transfers	6405	5818	-2.3	0.0577	0.0753	21	19	4981	4661	-1.6	7	7	11	13	0.4
Means-tested transfers	1352	1673	5.9	-0.1678	-0.1631	4	6	20246	14071	-7.6	-8	-8	-14	-15	-0.2
Income taxes	-4753	-5061	1.6	-0.7638	-0.8164	-15	-17	663	831	6.3	-24	-28	-39	-54	-2.2
Payroll taxes	-11110	-12228	2.5	-0.7446	-0.5097	-36	-40	273	438	15.1	-35	-31	-57	-59	-0.2
Disposable income	30734	30270	-0.4	1	1	100	100	166	191	3.7	100	100	166	188	3.3
Sweden															
Earnings head	101680	99584	-0.3	0.5674	0.5819	78	78	438	434	-0.1	86	85	101	103	0.3
Earnings spouse	36135	38617	1.1	0.6189	0.6268	28	30	1455	1344	-1.3	60	62	71	76	0.6
Self-employment	7922	8753	1.7	-0.1917	-0.2014	6	7	15205	10199	-5.5	-13	-12	-16	-15	0.1
Property income	1762	3844	19.7	0.0368	0.1461	1	3	925187	6755	-16.5	4	3	5	4	-0.2
Other income	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Social transfers	30694	33772	1.7	0.1115	0.1656	24	26	2628	1665	-6.1	12	16	15	20	0.7
Means-tested transfers	8534	2501	-11.8	0.0164	-0.1805	7	2	8097	10518	5.0	1	-3	1	-4	-0.7
Income taxes	-54661	-56983	0.7	-0.571	-0.7023	-42	-44	420	368	-2.1	-45	-54	-54	-66	-1.7
Payroll taxes	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Disposable income	129784	128365	-0.2	1	1	100	100	118	123	0.7	100	100	118	122	0.5
Continued															

Continued

Table 4. *Continued*

Country	Mean		Change	Correlation		Share		Inequality		Relative		Absolute			
	$t_1$	$t_2$		$\mu$	$\rho_k$	$t_1$	$t_2$	$100\mu_k/\mu$	$1000CV^2$	$100s_k$	Contribution	Contribution	$\Delta S_{k\,s1,k}$		
U.K.															
Earnings head	6311	5735	-1.3	0.6685	0.6215	80	72	518	987	13.0	87	85	172	235	4.6
Earnings spouse	1331	1424	1.0	0.5542	0.5106	17	18	2959	3699	3.6	36	33	72	93	1.5
Self-employment	447	731	9.1	0.0975	0.2078	6	9	15805	11992	-3.4	5	13	10	35	1.8
Property income	144	272	12.6	0.1577	0.2501	2	3	17992	13315	-3.7	3	6	5	16	0.8
Other income	133	131	-0.2	0.0941	0.1692	2	2	53757	50853	-0.8	3	4	5	11	0.4
Social transfers	868	1061	3.2	-0.008	-0.0298	11	13	2161	1467	-4.6	-0	-1	-1	-3	-0.1
Means-tested transfers	193	620	31.7	-0.1995	-0.2518	2	8	11727	4702	-8.6	-4	-8	-7	-23	-1.1
Income taxes	-1340	-1468	1.4	-0.605	-0.7054	-17	-18	874	1106	3.8	-22	-26	-43	-72	-2.1
Payroll taxes	-589	-819	5.6	-0.6416	-0.5384	-7	-10	539	839	8.0	-8	-10	-16	-27	-0.8
Disposable income	7865	8011	0.3	1	1	100	100	198	273	5.4	100	100	198	278	5.7
U.S.															
Earnings head	17279	17512	0.2	0.7359	0.732	86	81	602	721	2.8	92	87	259	309	2.6
Earnings spouse	3925	5092	4.2	0.4733	0.523	19	23	2945	2494	-2.2	30	34	84	120	1.8
Self-employment	1491	1601	1.1	0.1538	0.1212	7	7	20404	15273	-3.6	10	6	27	22	-0.3
Property income	665	931	5.7	0.2368	0.2954	3	4	15945	13600	-2.1	6	8	17	29	0.6
Other income	182	196	1.1	0.0319	0.025	1	1	52895	42753	-2.7	0	0	1	1	-0.0
Social transfers	755	739	-0.3	0.0857	0.0375	4	3	17097	11236	-4.9	3	1	7	3	-0.2
Means-tested transfers	321	421	4.4	-0.2547	-0.3112	2	2	17541	12464	-4.1	-3	-4	-9	-13	-0.2
Income taxes	-3629	-3751	0.5	-0.8957	-0.8917	-18	-17	1080	1112	0.4	-32	-28	-89	-100	-0.6
Payroll taxes	-1286	-1683	4.4	-0.801	-0.7971	-6	-8	488	600	3.3	-7	-8	-19	-30	-0.5
Disposable income	20186	21682	1.1	1	1	100	100	281	329	2.5	100	100	281	354	3.7

Note: Changes reported are annualized percentage changes. Correlations  $\rho_k$  are the correlation of the  $k$ th income source with disposable income. Shares are ratio of  $k$ th component mean to mean of disposable income.

Source: Authors calculations from LIS.

The negative contribution of income taxes increased in Canada, the Netherlands and the U.K., and decreased in Sweden and the U.S. Payroll taxes had a constant negative contribution to inequality in the U.K. and the U.S. but their equalizing contribution decreased somewhat in the Netherlands. There are telling and also somewhat surprising differences across countries in the relative contributions of taxes in the later year. Predictably, the Netherlands and Sweden have the largest relative contribution of income taxes. The U.K. has clearly the lowest contribution, followed by Canada; the U.S. has the third highest relative contribution.

Social transfers had small effects, the sign of which depends on their correlation with disposable income. In Canada and the U.K., social transfers had a small, but growing, negative relative contribution to  $CV^2$ . In the U.S. it was close to zero, in Sweden and the Netherlands the contribution was positive. Means-tested transfers, on the other hand, had a negative contribution to total  $CV^2$ . Also here, the effects were small, ranging from -2 percent in the U.S. in 1986 to -6 percent in the Netherlands in 1983.

The *absolute* contributions of the earnings of both the head and the spouse to inequality increased in all countries. Self-employment income increased its absolute contribution to inequality in Canada, the U.K. and the U.S. In the Netherlands its absolute contribution decreased, while, curiously, in Sweden self-employment income has a negative contribution to inequality. The contribution of property income increased in all countries except the Netherlands. In Sweden this increase is very large. In the trimmed sample (table 4) there is a small reduction, which points to the possibility that the increase in the contribution in property income is due to only a few extreme observations. The negative absolute share of both income and payroll taxes increased in all countries, as did the share of means-tested transfers. The negative contribution of social transfers increased in Canada and the U.K., while the positive share in Sweden and the U.S. grew.

## Decomposing the trend in inequality

What is common in the trends in inequality in the five countries? The earnings of the household head are by far the largest parts of the change in income inequality in all countries, with spouse's earnings being next largest, accounting for the bulk of the annual rate of change. This is not surprising, since these are the two largest income sources by far, accounting for between 91 and 121 percent of disposable income in the most recent year. Labour income accounts for the most part of the increase in income inequality, and earnings of the household head for the bulk of that. Moreover, Sweden, the U.K. and the U.S. all of the market income sources contributed positively. The negative contribution of income taxes to the trends were of comparable magnitude to that of earnings (see last column, Table 3).

The welfare state can be attributed a moderating effect on the increases in inequality. Only in the Netherlands can any of the increase in  $CV^2$  be attributed to any component associated with the welfare state; social transfers there had a positive share in the increase in  $CV^2$ . In all other cases transfers and taxes are assigned a decreasing effect.

Labour markets can be assigned a large positive share of the increase in income inequality in all countries. Transfers and taxes, with one exception, can be assigned a decreasing effect. The other market generated income sources, self-employment, property and other income/ had increasing effects in Sweden, the U.K. and the U.S. It seems that changes in labour markets can be assigned at least some responsibility for increased inequality in all countries. Heads' earnings increased inequality because the inequality of heads' earnings increased, spouses' earnings increased inequality because the factor share of these increased. Additional blame can be attributed to property income and self-employment income in some, but not all countries. Existing, even somewhat changed tax and transfer systems mostly had a decreasing effect on income inequality.



## Simulations

In this section I study the impact of the change in the  $k$ th components distribution on overall income inequality by simulations. Specifically, I proceed by calculating the  $CV^2$  as if component  $k$  had not changed, but all other components had. The difference between this and the actual number in the second year is a measure of how important the change that component was for the change in total inequality.

Recall from equation (2) that the  $S_k$  are equal to  $\rho_k CV_k CV_{\mu}^{\mu_k}$ . Before asking the counterfactual, I must decide what I shall hold constant. Namely, holding the  $S_k$  constant is not a good idea, since inequality of disposable income is part of the argument. Since this changes, it can hardly be held constant in the  $S_k$ . The  $S_k$  also involve two other parameters that are directly connected with disposable income, namely the correlation between the  $k$ th component and disposable income, and the mean of disposable income.

I present two types of counterfactual simulations. Panel A in Table 5 shows the change in income inequality that would have occurred if the mean and variance in the  $k$ th component had remained constant, but all other parameters had changed. Panel B shows the change that had occurred if also the correlation of disposable income and the component had been constant. I take it as a reassuring sign of robustness if the sign of the simulated effect remains unchanged on moving from Panel A to B. On the other hand, if the sign changes, then it seems evident that the changing correlation of the source of income with disposable income is central.

Earnings, both of the head and spouse, had large and positive simulated effects. In Sweden, the sign of the effect changes once also the correlation is allowed to change. For all other countries, changes in both of these earnings components were large and positive. For instance, in the U.S., if the change parameters of household head's earnings from 1979 to 1986 induced a simulated 15.1 percent increase in  $CV^2$ . In other words, if the parameters of household head's earnings had remained at their values in 1979,  $CV^2$  had been 15.1 less

Table 5. Effect of income components on inequality change: simulated percentage change.

	Canada	Netherlands	Sweden	U.K.	U.S.
Panel A. Holding $\mu_k$ and $\sigma_k^2$ constant					
Earnings head	8	8.7	3.4	20.5	15.1
Earnings spouse	5.5	11.5	2.3	8.9	6.5
Self-employment	0.2	7.7	0.8	7.5	0.2
Property income	-1.4	-0.7	-3.7	3.7	1.2
Other income	n.a.	0.1	n.a.	-0.1	0
Social transfers	-0.3	-0.3	-0.6	0	0
Means-tested transfers	-0.2	-0.2	3.5	-2.6	-0.2
Income taxes	-7.1	-18.5	-3.8	-8.3	0.5
Payroll taxes	n.a.	-11.2	n.a.	-3.1	-2.2
Panel B. Holding $\mu_k$ , $\sigma_k^2$ and $\rho_k$ constant					
Earnings head	20.9	35.6	-5.3	14.1	15.1
Earnings spouse	9.6	21.4	-3.7	10.1	8.7
Self-employment	0.6	-7.7	2.0	14.7	1.7
Property income	-3.2	-4.4	69.6	3.9	8.4
Other income	n.a.	-1.7	n.a.	0.5	0
Social transfers	-0.6	3.1	-2.0	-0.8	-1.1
Means-tested transfers	-0.5	0	-1.5	-3.2	-0.5
Income taxes	-9.0	-18.2	-5.1	-11.2	-6.7
Payroll taxes	n.a.	-4.4	n.a.	-3.1	-2.2

Note: Effects evaluated as the change on moving from *CV2* calculated using second year values for all other income components, but, for the excluded component, the first year parameter values, to the actual value of *CV2* in the second year. See text, equations (6) – (8).

Source: Authors calculations from LIS.

than it actually was in 1986. The other income components had more ambiguous effects. Self-employment income generally had increasing effects on  $CV^2$ . Property income had an increasing effect in the U.K. and the U.S., a decreasing effect in Canada and the Netherlands. In Sweden, it seems that the changing correlation of property income and disposable income is the source of the large effect of the former on  $CV^2$ .

Social and means-tested transfers had a robust reducing effect on  $CV^2$  in Canada and the U.K. In the other countries, again, the effect depends on the correlation of transfers with disposable income. Taxes, on the other hand, always had a reducing effect on  $CV^2$ , with the exception of payroll taxes in the Netherlands. The effects of taxes were not only mostly robust, they were fairly large, indicating large offsetting effects of taxes on income inequality.

The findings from the decompositions of inequality by income source are mostly in accordance with previous literature. Labour market earnings account for a large part of the increase in inequality in the countries I study. This does not very effectively discriminate between the various market-related explanations detailed above. Neither taxes nor transfers can be assigned a major part of the increase in inequality, despite that fact that some of the countries went through changes in tax and transfer policies during the time period studied. On the contrary, mostly taxes and transfers account for a negative contribution to the increases.

## 7 Decompositions by population groups

The decompositions by population groups reveal that with few exceptions, inequality increased within population subgroups. Thus, shifts in age or family structure, or between families with different numbers of earners, do not explain the changes, summarized in Table 6. In Panel A of Table 6 I show the overall inequality, within and between group components in the two years, measured by the mean logarithmic deviation and the coefficient of variation.

In Panel B I show the relative contributions of the same in percentage terms, i.e., the same statistics as in Panel A divided through by overall inequality. The patterns of within and between group inequality and the change over time are very similar for the two measures, giving a sense of robustness to the analysis.

The most robust finding is that the within group contribution to the level of inequality increased for every partition in all countries. Thus, at the very least, inequality increased within groups, resulting in increased inequality in every country. This was not always accompanied by an increase in between group inequality. On the contrary, in some cases income differences between groups decreased, in many cases between group inequality stayed constant. The most notable increase in between group inequality is that in the U.K. for the partition by number of earners in the household. Here, measured by both the  $CV^2$  and  $I_0$ , the between groups component approximately doubled from 1979 to 1986.<sup>22</sup>

The proportion of total variation accounted for within and between groups inequality is shown in Panel B of Table 6. Here there are some differences depending on which measure you use. Using  $I_0$ , the share of between groups inequality more often decreased than not.<sup>23</sup> Again, the partition by the number of earners in the household is an exception in the U.K. The proportion of total inequality between family groups also increased in the Netherlands, Sweden and the U.K. Between age group inequality also increased its share of total inequality in Canada, Sweden and the U.S. Using the  $CV^2$ , some of the increases in the share of between groups variation disappear. The share of between age groups variation still increased in

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<sup>22</sup>These results are at odds with those reported by Jenkins (1992) for the U.K. I think the different inferences can be traced in part to the different time periods covered (he studies the period ) and, more importantly, to the fact that his partition by number of earners includes more categories than I do. For instance, he separates married couple households with one earner by whether it is the spouse or the head who works. Jenkins also studies the whole population, while I limit analysis to households with non-aged heads.

<sup>23</sup>The relative contributions of within and between groups inequality is, in part, a function of the number of groups, i.e, by increasing the number of population groups analyzed one increases the relative share of variation due to between group differences. That this is so is perhaps best understood by letting each household be a population group. Then all of the variation is due to "between groups" inequality. However, I use consistent definitions of the subgroups both cross countries and over time, hence, the changes are comparable.



Table 6. *Continued*

Partition	Mean Logarithmic Deviation						Coefficient of variation					
	$t1$			$t2$			$t1$			$t2$		
	Overall	Within Group	Inequality	Between Group	Overall	Inequality	Within Group	Inequality	Between Group	Overall	Within Group	Inequality
Panel B. Relative contributions												
<u>Canada</u>												
Family	100	86		14	104		87		13	100	86	
Age	100	98		2	104		96		4	100	98	
Earners	100	83		17	104		84		16	100	86	
<u>Netherlands</u>												
Family	100	81		19	116		78		22	100	83	
Age	100	96		4	116		97		3	100	96	
Earners	100	76		24	116		79		21	100	78	
<u>Sweden</u>												
Family	100	85		15	128		80		20	100	84	
Age	100	96		4	128		90		10	100	96	
Earners	100	79		21	128		86		14	100	78	
<u>U.K.</u>												
Family	100	89		11	125		88		12	100	89	
Age	100	98		2	125		98		2	100	99	
Earners	100	81		19	125		74		26	100	86	
<u>U.S.</u>												
Family	100	82		18	124		85		15	100	82	
Age	100	96		4	124		93		7	100	96	
Earners	100	88		12	124		87		13	100	88	

Note: Partition by Family structure into 4 groups: single person, married couple with no children, single parent, married couple with children; by age into 10 5-year groups: less than 20-24, 25-30 and so on ; number of Earners into 4 groups: 0, 1, 2 and 3 earners (except in the Netherlands where there are 3 groups). Source: Authors calculations from LIS.

Canada, Sweden and the U.S. The proportion of between family groups inequality only increased in the Netherlands. Apart from these, the share of between groups inequality either decreased or remained constant.

The differences in the findings regarding the relative shares of within and between terms depending on which measure is used is not very surprising in itself. The measures weigh different parts of the distribution; what these differences tell us is that households in various parts of the distribution were experiencing changes in their relative income while others were not.

The decomposition of the trend in inequality measured by  $I_0$  and  $CV^2$  is shown in Table 7. The bulk of the change is due to changing within group inequality, the notable exception being the breakdown by number of earners.<sup>24</sup> Changes in relative incomes account for some of the trend in breakdowns by family structure in the Netherlands and Sweden and by age structure in Canada, Sweden, the U.K. and the U.S. Apart from these, changes in relative incomes are assigned a decreasing role in the change in inequality.

The overwhelming finding from the decomposition by subgroups is that most of the increase in inequality in the countries studied in this paper occurred within groups. Shifts in the relative incomes between groups or in the relative sizes of the groups can be assigned, at most, very small parts of the observed changes. This means that increases in the share of single-parent or single-person households, declining earnings or sizes of younger cohorts, or changing age structures can not be placed with the whole or most of the blame for the bulk of the increase in inequality. At the very most, and only in a few instances, can these factors be placed with any blame at all. The fact that changes in relative incomes between households distinguished by the number of earners can not account for any of the increase in inequality means that, e.g., changes in labor force participation of women can not account for the increase in income inequality.

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<sup>24</sup>This finding is at odds with the results Jenkins (1992, Table 4, reports for the U.K. between 1981 and 1986. He finds that most of the change is due to changing within earnings category inequality.

Table 7. Decomposition of change by population group.

Partition	<u>Change</u>		<u>Change in <math>I_0</math> accounted for by</u>			<u>Change</u>		<u>Change in <math>CV^2</math> accounted for by</u>		
	$1000 \times \% \Delta I_0$	<u>Within Group Inequality</u>	<u>Population Share</u>	<u>Between Group Inequality</u>	D	$1000 \times \% \Delta CV^2$	<u>Within Group Inequality</u>	<u>Population Share</u>	<u>Between Group Inequality</u>	D
<u>Canada</u>										
Family	7	8	1	-1	0	13	14	-0	13	-14
Age	7	5	-1	-0	4	13	13	1	3	0
Earners	7	10	-2	3	-5	13	14	-0	14	-15
<u>Netherlands</u>										
Family	40	36	-12	-2	17	60	63	4	-14	31
Age	40	39	2	-1	1	60	61	0	2	-1
Earners	40	41	-1	3	0	60	64	1	20	-15
<u>Sweden</u>										
Family	46	28	1	1	14	149	154	3	-3	18
Age	46	32	1	2	12	149	151	2	1	11
Earners	46	59	-7	-3	-5	149	153	-2	83	-93
<u>U.K.</u>										
Family	36	30	-0	2	3	74	76	1	4	-1
Age	36	35	-0	-0	1	74	74	0	-1	2
Earners	36	5	10	15	10	74	79	10	-88	117
<u>U.S.</u>										
Family	34	32	-0	1	1	56	60	0	8	-7
Age	34	28	-1	-1	8	56	57	3	3	4
Earners	34	30	-1	4	0	56	59	1	6	-4

Note: Partition by Family structure into 4 groups: single person, married couple with no children, single parent, married couple with children; by age into 10 5-year groups: less than 20-24, 25-30 and so on ; number of Earners into 4 groups: 0, 1, 2 and 3 earners (except in the Netherlands where there are 3 groups). Source: Authors calculations from LIS.



## 8 Summary

Inequality increased in Canada, the Netherlands, Sweden, the U.K. and the U.S. between early to mid 1980's. The changes are in part explained by an increased contribution of labour earnings. The earnings inequality of household heads increased over the time period in most countries, thus contributing more to overall inequality. The earnings of spouses, on the other hand, mostly became more equally distributed. However, because their earnings also became a more important part of household income, they are assigned a larger share of overall inequality and a positive contribution to the increase in inequality. Taken together these results suggest that spouse's earnings account for an increased share of income inequality not because of rising labor force participation but because of either (or both) hours worked increased and wages increased, both of which lead to spouse's earnings being a larger share of household income. Which of these, hours or (relative) wages is more likely to explain the changes is a question yet to be addressed.

Despite changes in both transfer and tax policies that could be expected to increase inequality, taxes and transfers are assigned a decreasing effect on income inequality. It is unlikely that this was due to any conscious effort to combat increased inequality, except for some changes in transfer policies, notably the progressiveness of child allowances in Sweden. Rather, it seems embedded in the system of progressive income taxes and taxes on earnings (payroll taxes) that increases in inequality will also lead to an increased inequality-reducing effect of these. It is also possible that some of the broadening of the tax base led to an increased inequality reducing effect. Demographic shifts can at most be given a minor role in increasing inequality, mostly they can not be assigned any of the increase.

The reasons for increased within groups inequality, or the increased variation in household heads' earnings have not been revealed. Gottschalk and Joyce (1992a, 1992b) argue that changes in trade patterns and technological change are more likely to explain increases in increase in earnings inequality than de-industrialization. Despite the fact that

many common trends are affecting income inequality, it seems evident that these trends do not result in identical patterns of income inequality, but that existing institutions, in the labour markets and in the public policy can and do affect these trends.

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