

# Comparability of income data across households/individuals and over time

Rolf Aaberge

Research Department, Statistics Norway

## 1. Introduction

An underlying assumption for the meaningfulness of comparing and ranking a set of income distributions according to the degree of inequality is that the assessment carries over to the distributions of economic well-being. This requires that there must be insignificant interpersonal variations in the conversion of individual incomes into individual well-beings. Otherwise, an equal distribution of income may yield significantly unequal well-being levels, and it becomes hard to justify equality in the income space in terms of distributional justice. The reason is that income is a good that does not have intrinsic value but is important merely as an instrument for individuals to pursue well-being. This implies that the population in a study of income inequality should, in principle, consist of identical income-recipients in every relevant aspect other than income. For this reason, comparisons of incomes across countries seek to adjust country currencies to common measures by accounting for important non-income differences such as variation in the pattern of prices across countries, typically by the use of purchasing power parities. Acknowledging, however, that the welfare basis of such real income comparisons may be rather limited due to methodological and data issues ranging from the basic index-number problem to disparities in national household surveys, cross-country studies of inequality regularly confine the comparisons to intra-country relative measures and do not seek absolute comparisons of levels of incomes in different countries.<sup>1</sup> By contrast, empirical analysis of income distributions *within a country* does usually not consider the implications of non-income differences between individuals beyond accounting for resource sharing and scale economies in the households by the use of equivalence scales or various dominance criteria. Since empirical evidence suggest other important sources to comparability problems of incomes within a country, such as a substantial price difference of housing between urban and rural areas, intra-country relative measures may nevertheless suffer from a lack of welfare basis. Consequently, the conventional assessments of income distributions risks to be biased or as stated by Cowell and Mercader-Prats (1999): “At the heart of any distributional analysis, there is the problem of allowing for differences in people’s non-income characteristics”.

As the LIS-project has demonstrated (see Atkinson et al, 1995), attaining cross-country comparability of income distributions in a single year is a time-consuming and demanding task. Doing so for multi-year studies has only rarely been attempted. Atkinson et al. bring forward differences in measurement techniques and definitions as major sources of non-

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<sup>1</sup> Whilst Smeeding et al. (1993) and Atkinson et al. (1995) refrain from making absolute comparison of incomes across countries and limit the cross-country study exclusively to intra-country relative measures, many studies attempt to assess the world income distribution; see e.g. Milanovic (2002) and Sala-i-Martin (2006).

sampling errors and, moreover, point out that cross-country comparisons may depend on the choice of the methodological framework. The purpose of this paper is to provide a discussion of some comparability problems related to the standard definition and measurement of income, independent of whether the data is based on administrative registers or sample surveys. First, we focus attention on how to deal with the problems of measuring dividends and capital gains that arises when income reporting behaviour is affected by tax changes. The second issue discussed in this paper is concerned with comparability of incomes when prices of basic goods, such as housing, differ significantly between urban and rural areas.

### **Tax reforms and income shifting behaviour**

It has become universally acknowledged that cross-country comparisons of income distributions should be interpreted with caution. As demonstrated by Atkinson et al. (1995) the survey methods of the OECD countries appear to be quite diverse. Some of the surveys are based on administrative and income tax records whereas others collect income data by interviewing a sample of individuals (households). The former method has formed the basis for collecting income data in the Nordic countries. Thus, there may be a better basis for cross-national comparisons in the Nordic area than in the entire OECD area. However, since tax reported incomes (as well as survey reported incomes) may depend both on the tax basis and the structure of the tax system the important question arises whether conventional income data produced by national statistical agencies are comparable over time. This question is particularly relevant when a major tax reform has taken place and pre- and post-reform income data are used as basis for comparing trends in income inequality<sup>2</sup>. The origin of the comparability problem is due to the standard practice of using yearly tax reported dividends and capital gains as a measure of the returns from equities. Section 2 discusses an alternative approach that improves comparability of income data over time. As an alternative to the standard practice of using yearly tax reported dividends and capital gains as a measure of the returns from equities, it appears more relevant to use a measure derived from a Hicksian version of the definition of income. The "Hicksian" measurement of the stock returns is less sensitive to changes in income reporting behavior than the conventional income definition and may thus provide a better basis for analyzing the trend in income inequality and the contribution to income inequality from stocks when the income concept is meant to capture the consumption potential of the individual.

### **Region-specific heterogeneity in prices and habits**

To be meaningful, the measurement of income inequality of a country requires pattern of prices of goods that do not vary across regions. Since empirical evidence suggests that the prices of basic goods, such as housing, differ significantly between urban and rural areas, the conventional analyses of income inequality based on the distribution of equivalent income within a country might be biased. Accounting for regional variation in consumer prices could be achieved in countries where region-specific price indices are produced. Unfortunately, this type of information is normally not available in the OECD-countries. Furthermore, it appears plausible that differences in observed prices, at least partly, reflect unobserved heterogeneity in the quality of goods. If this is the case, an equal distribution of income may yield significantly unequal well-being levels even after adjusting for differences in observed prices. In addition, even in cases where neither the pattern of prices nor the quality of goods varies across regions, norms and consumption habits might turn out to be region-specific. Thus, there might be no perfectly egalitarian income distribution after controlling for heterogeneity in price patterns and quality of goods at which the persons are equally well off. As pointed out

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<sup>2</sup> Björklund et al. (1995) report a jump in income inequality in Sweden from 1989 to 1991 due to realized capital gains that possibly can be explained by changes in the tax legislation.

in Coulter et al. (1992) and Cowell (1995), there are two possible strategies available for coping with these type of non-comparability problems. Either one transforms the income measure by incorporating the relevant non-income heterogeneity and aggregates across persons, or one uses the observed income data and accounts for non-income heterogeneity at the aggregation stage. In practice, however, the first strategy seems infeasible, since the data requirements are far beyond what is available. It is, therefore, necessary to reconsider the standard approaches conventionally applied at the aggregation state of measuring income inequality and poverty. Section 2 provides a critical discussion of this issue.

## 2. Tax reforms, income shifting and comparability of reported capital incomes<sup>3</sup>

Empirical results for Norway and Sweden suggest that income inequality in the early 1990s first and foremost increased owing to a rising disequalizing contribution of capital income<sup>4</sup>. The rise in income inequality reported by the national statistical agencies coincided, however, with the implementation of major tax reforms that affected the financing incentives in the corporate sector and the income shifting incentives in small enterprises. Thus, when yearly tax reported dividends and capital gains are used as a measurement of the returns from shares, changes in the standard estimates of income inequality may be a result of changes in the income reporting behavior rather than factual changes in the distribution of income. If this is the case then alternative methods for measuring the returns from stocks are called for.

1992 was for several reasons a turning point in the Norwegian economy. First, although the entire period of 1986-1991 experienced a continuous and significant reduction in the personal tax rates, 1992 was the year of the tax-reform that finally completed the transformation of the tax system. Second, the business cycles changed dramatically in 1991-92, from a long period of recession and high real interest rates to more prosperous times and lower interest rates. Third, the economy experienced structural changes during the 1990's, from traditional manufacturing to services and technology. Such changes are likely to affect the relative wage rates in different industries. Because of the central importance of these changes, we will concentrate our analysis on the changes between the two distinct periods of 1986-1992 and 1993-1998.

Official Norwegian income statistics show a sharp increase in dividends received by households after the 1992 tax reform. The reported capital gains rose as well, but not as much as dividends. A government white paper<sup>5</sup> concluded that "The increase in income from 1986 to 1996 has, in relative terms, been greatest for those with the highest incomes" and that "The most important reason for the greater increase in high incomes is that capital incomes have been more unevenly distributed in the 1990s. This was due in particular to the sharp increase in dividend payments and gains from the sales of shares etc." The results of Table 2.1, which summarizes the changes in official statistics from 1986, show a substantial rise in the proportion of capital income received by the highest decile. Moreover, the proportions of pensions and public transfers received by the 2<sup>th</sup> - 5<sup>th</sup> deciles have increased substantially during the period.

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<sup>3</sup> Section 2 relies on Fjærli and Aaberge (2000).

<sup>4</sup> See Aaberge et al. (2000).

<sup>5</sup>The Equitable Redistribution White Paper (the E.R. White Paper) on the distribution of income and living conditions in Norway, The Ministry of Health and Social affairs (1998-1999).

**Table 2.1. The composition of gross income with respect to wage earnings, self-employment income, capital income and public transfers (percent) in 1986 and 1996.**  
**Percent**

Decile	Year	Wage earnings	Selfemployment income	Capital income	Public transfers
1	1986	29.3	3.5	4.5	62.6
	<b>1996</b>	<b>29.3</b>	<b>2.6</b>	<b>0.8</b>	<b>67.4</b>
2	1986	52.3	7.1	4.1	36.5
	<b>1996</b>	<b>31.4</b>	<b>5.9</b>	<b>2.2</b>	<b>60.5</b>
3	1986	63.7	9.3	3.7	23.3
	<b>1996</b>	<b>48.8</b>	<b>7.7</b>	<b>2.5</b>	<b>41.0</b>
4	1986	70.5	8.9	3.7	16.9
	<b>1996</b>	<b>63.6</b>	<b>6.7</b>	<b>1.9</b>	<b>27.8</b>
5	1986	75.0	6.5	3.8	14.6
	<b>1996</b>	<b>70.7</b>	<b>6.4</b>	<b>1.7</b>	<b>21.2</b>
6	1986	77.1	7.3	3.8	11.7
	<b>1996</b>	<b>76.4</b>	<b>6.4</b>	<b>1.7</b>	<b>15.5</b>
7	1986	77.6	7.7	3.8	10.9
	<b>1996</b>	<b>78.2</b>	<b>6.2</b>	<b>1.9</b>	<b>13.8</b>
8	1986	78.4	9.9	3.9	7.8
	<b>1996</b>	<b>79.5</b>	<b>7.4</b>	<b>2.1</b>	<b>11.0</b>
9	1986	81.3	8.0	4.4	6.2
	<b>1996</b>	<b>80.4</b>	<b>8.1</b>	<b>3.1</b>	<b>8.5</b>
10	1986	68.5	20.5	6.8	4.3
	<b>1996</b>	<b>64.2</b>	<b>12.9</b>	<b>18.4</b>	<b>4.6</b>
All	1986	72.1	10.5	4.5	12.9
	<b>1996</b>	<b>68.5</b>	<b>8.3</b>	<b>6.0</b>	<b>17.3</b>

Source: Table 3.4 in the E.R.White Paper (Figures produced by Statistics Norway)

Moreover, the complete time-series for the trend in dividend receipts and capital gains during 1986-1996 show that the observed incomes from share ownership (in particular dividend receipts) increased sharply soon after the implementation of the 1992 tax reform.

There is a vast literature dealing with the effect of taxes on firms' dividend policy and choice of financing strategies. Indeed, the incentives imposed by the non-integrated and asymmetric taxation of capital was pointed out as one of the major problems in the pre-reform tax system in Norway as well as in many other OECD countries. The 1992 tax reform was first and foremost motivated by narrow tax bases and the problem of wide variation in effective tax rates and entailed changes in the taxation of capital income at both the personal and the corporate level, towards a tax regime that was supposed to be neutral across different sources of finance and payback alternatives.

An important issue that has been at focus in the economic literature is the problem of income shifting. Income shifting can be defined as actions taken by taxpayers to reclassify income. There is some international evidence on income shifting responses to tax reforms. Slemrod (1990) and Gordon and Mackie-Mason (1995) found timing and income shifting responses to the 1986 US tax reform. In Norway, the Ministry of Finance found evidence of income shifting through changes in organizational form (Ministry of Finance, 1997), as well as through income reporting (Ministry of Finance, 1998).

One example of income shifting is to reclassify wages to dividends (this is of course a possibility that is particularly relevant for the owner-managers of closely held firms). Before the tax reform, it would not always be profitable for owner-managers to receive all cash as

dividends. Normally, a tax-minimizing strategy would imply a mix of both wages and dividends<sup>6</sup>. After the reform, payment of dividends is unquestionably the most favorable form of pay out compared to wages. Thus, some of the dividends received by households after 1992 cover not only return to capital but also reflects compensation for work effort by the owner-managers of closely held firms. It appears that the increase in dividends after the 1992 tax reform is particularly significant in smaller firms, which emphasizes the importance of such income shifting motives.

Since tax-incentives might play an important role for financial decisions in the corporate sector and for the choice of type of payout from small corporations to owners, the treatment of capital income in empirical analyses of the income distribution may be crucial for the results. Accounting for biases that may arise from changes in the income reporting behavior appears particularly important in periods where major tax reforms have taken place. This calls for a definition of income that is less sensitive to changes in the reporting of income than the conventional definitions used in empirical analyses.

An alternative approach is to use an income definition that captures the contribution from investments in stocks to the households' long-term consumption possibilities. To this end the income definition proposed by Hicks (1939) appears appropriate. Hicks defined income as the maximum amount that an individual can spend during a period and still expect to be as well off at the end of the period as at the beginning<sup>7</sup> (in real terms). The Hicksian income definition depends on the notion of *expectation* and *permanence*, and has for that reason only in exceptional cases been considered appealing as a basis for practical tax policy. For example, in Norway business income from self-employment is after the 1992 tax reform divided into (low-taxed) capital income and labor income by an imputation rule where a normal rate of return is applied to the book value of real assets. Furthermore, the tax base for the resource rent tax on hydropower plants is also calculated by imputation in a similar way. The use of administratively determined rates of return in the Norwegian tax system is justified on the basis of suppositions regarding the expected return to certain real assets and represents a "Hicksian" element in the definition of the tax base.

The empirical counterpart of the chosen Hicksian income definition, which subsequently will be denoted *Hicksian income*, is determined by imputation. The estimated market value of the households' stocks is multiplied by the long-run average rate of return on the Oslo Stock Exchange. Of course, it is not straightforward to pick a proper rate of return, since it can depend on the period chosen or geographically. Siegel (1998) reports an average total real rate of return on U.S. stocks of 9 percent in the entire post-war period 1946-1997 (arithmetic average of real annual returns). In the period of 1982-1997 the rate was 13.6 percent. Based on the index of Oslo Stock Exchange<sup>8</sup>, the annual average real rate of return of quoted stocks proves to be 8.9 per cent for the period of 1986-1998 (calculated on the basis of annual means). This estimate should capture the long-term expected rate of return of the entire market portfolio fairly well. The results reported in the next section do not depend critically on the chosen rate, and admits minor deviations<sup>9</sup>.

Another problem related to the conventional income definition is the treatment of negative incomes. The Gini coefficients reported in the E.R. White Paper are based on disposable

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<sup>6</sup> Fjærli and Lund (2001)

<sup>7</sup> Actually, Hicks (1939) introduces three alternative versions of his general definition.

<sup>8</sup> The OSE index is a total return-index that includes dividends.

<sup>9</sup> The procedure for estimation of the market values of non-quoted stocks is explained in Fjærli and Aaberge (2000).

income larger than or equal to zero. In order to make the results comparable, we have used the same truncation rule. However, the non-negativity restriction creates a problem when it comes to decomposing income by different income sources. Implicitly, truncating total income allows for example capital income or incomes from self-employment to be negative, as long as the remaining income components are sufficiently large. This procedure makes it, however, hard to interpret the contribution to income inequality from the various income components. To abandon this problem, we have introduced an alternative procedure by making separate truncations for each income component. Although the choice of truncation rule turned out to have a minor effect on the estimated Gini coefficients, it may nevertheless have a significant impact on the income components' contribution to overall income inequality.

The Hicksian measure of income is defined as the sum of the following income components:

- 1) Earnings
  - 2) Self-employment income
  - 3) Pensions and transfers
  - 4) Interest receipts (net of the inflation component)
  - 5) Imputed total real return to equities (equal to 0.089 times the estimated market value of stocks)
- Minus
- 6) Taxes (net of childcare allowances).

Thus, the Hicksian income differs from the standard income definition by using a measure of expected total return rather than tax reported dividends and capital gains and losses as a basis for the measurement of stock returns.

As indicated above the standard reported estimates of income inequality rely on an income definition that is closely related to taxable income and thus might be rather sensitive to changes in the tax reporting behavior. However, by employing the more comprehensive Hicksian type of income definition suggested above, where observed dividends and capital gains are replaced by imputed total return to shares, the referred problems related to changes in income reporting behavior are abandoned. Table 2.2 displays the mean tax-reported returns to stocks and the alternative imputed return. Before the 1992 tax reform the imputed total return was about 4 - 6 times higher than the dividend receipts and capital gains reported for taxation. This result shows that only 15-25 percent of the nominal returns to equities were reported as taxable income in the period before the tax reform. By contrast, reported returns and imputed returns to equities were of the same magnitude after the tax reform. Accounting for inflation has greatest impact in the 1980's because the rate of inflation was substantially higher than in the 1990's.

**Table 2.2. Mean tax reported dividend receipts and net capital gains vs. total return to stocks by imputation in equivalent amounts\*. 1998 NOK**

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Mean observed dividends and capital gains	918	1509	858	1227	975	709	983	3323	4277	5060	8169	9433	7642
Mean imputed total return to shares, nom. rate of return	6531	5731	6998	2711	4576	4478	3931	3735	3865	6212	5724	7646	6145
Mean imputed total return to shares, real rate of return	3536	2832	3913	1758	3087	3198	3095	2940	3318	4844	4965	5854	4836

\*Incomes are divided by the square root of the household size

Empirical evidence from national studies of income distribution based on the standard definition of income demonstrates that share ownership without exception is strongly concentrated in the upper part of the income distribution. Thus, the increase in dividends after the 1992 reform concerns first and foremost the upper decile of the income distribution. Results reported in Fjærli and Aaberge (2000) show that the 10<sup>th</sup> decile had a real growth in disposable income of about 5 percent from 1992 to 1993, largely due to the increase in dividend receipts, whereas the average real income did almost not change. Dividends have continued to increase in 1994-1996. This fact has been considered to be the major cause of the observed increase in income inequality in Norway during the 1990s.

The trend in income inequality 1986-1998 based on the Gini coefficient and two alternative definitions of capital gains and dividends are reported in Table 2.3. Based on the standard definition we find that income inequality increased by 9.1 percent from the pre-reform period to the after-reform period. By contrast, when the Hicksian income definition forms the basis of measuring capital gains and dividends then income inequality is found to solely rise by 3.3 percent.

**Table 2.3. Trend\* in income inequality when income is measured according to Standard income and Hicksian income, 1986-1998**

	Income inequality, Standard income	Income inequality, imputed real return (Hicksian income)
Year	G	G
1986	0.224 (0.002)	0.233 (0.002)
1987	0.224 (0.003)	0.226 (0.002)
1988	0.223 (0.002)	0.230 (0.003)
1989	0.233 (0.004)	0.231 (0.003)
1990	0.232 (0.002)	0.236 (0.003)
1991	0.232 (0.003)	0.236 (0.003)
1992	0.23 (0.003)	0.241 (0.003)
1993	0.240 (0.005)	0.235 (0.004)
1994	0.249 (0.002)	0.243 (0.002)
1995	0.247 (0.003)	0.240 (0.002)
1996	0.255 (0.004)	0.243 (0.003)
1997	0.260 (0.004)	0.246 (0.003)
1998	0.249 (0.003)	0.237 (0.003)
Average of (1986-92)	0.229 (0.001)	0.233 (0.001)
Average of (1993-98)	0.250 (0.001)	0.241 (0.001)
Percentage change, (1986-92) - (1993-1998)	9.07 %	3.27 %

\*Standard deviation in parentheses

By decomposing the Gini coefficient with respect to income components the changes in income inequality can be explored more carefully. Table 2.4 shows the results of the decomposition for each year and for both definitions of income. Owing to the very high concentration coefficients, the stock returns contributed much more to overall income inequality than to total disposable income.

Dividends' share of inequality is negligible before 1993, but increases sharply from 1993. Adjusting for the effect of changes in income reporting behavior, the contribution to inequality from stocks shows to be less important than what has been suggested by the standard reported estimates based on observed dividend receipts. While the standard income definition underestimates the effect of share ownership on inequality during the pre-reform tax regime by approximately 33 percent, the two income concepts provide a similar results of the decomposition of income inequality after the tax reform.

As seen from Table 2.4 the contribution from stock returns to the change in overall inequality between and after the tax reform is less significant when we replace tax reported returns with imputed returns. It appears that all income components apart from taxes show increased contributions to inequality. The contribution from pensions and transfers increased by the same magnitude as the contribution from total returns, while the contributions from earnings and self-employment income increased slightly less. By contrast, the contribution from dividends to income inequality when income is based the standard income increased more than the joint contribution of the remaining income components. Table 2.5 reports the contributions from respectively return to stocks, taxes and other income components to changes in average income inequality.

**Table 2.4. Contribution to mean income and income inequality (Gini coefficient) of stock returns when income is measured according to Standard income and Hicksian income**

Year	Income share		Contribution to inequality		Inequality share	
	Standard income	Imputed real returns	Standard income	Imputed real returns	Standard income	Imputed real returns
1986	0.006	0.022	0.004	0.016	0.016	0.070
1987	0.009	0.017	0.006	0.011	0.029	0.050
1988	0.005	0.024	0.004	0.018	0.017	0.079
1989	0.007	0.011	0.006	0.007	0.026	0.030
1990	0.006	0.019	0.005	0.014	0.021	0.059
1991	0.004	0.019	0.003	0.014	0.014	0.060
1992	0.006	0.018	0.005	0.014	0.020	0.059
1993	0.020	0.018	0.019	0.014	0.078	0.061
1994	0.025	0.020	0.023	0.016	0.093	0.065
1995	0.029	0.028	0.027	0.023	0.108	0.096
1996	0.045	0.028	0.042	0.022	0.165	0.090
1997	0.050	0.032	0.046	0.024	0.178	0.099
1998	0.039	0.025	0.035	0.021	0.142	0.090
Average of (1986-92)	0.006	0.018	0.005	0.014	0.020	0.058
Average of (1993-98)	0.035	0.025	0.032	0.020	0.127	0.084
Percentage change from (1986-92) to (1993-1998)	470.65 %	37.09 %	590.18 %	48.36 %	528.57 %	43.55 %

**Table 2.5. Contributions to change in average pre- and post-reform income inequality (Gini) when income is measured according to Standard income and Hicksian income**

Income component	Standard income	Imputed real returns (Hicksian income)
Wages	0.029	0.028
Self employment	-0.012	-0.010
Pensions and transfers	-0.007	-0.005
Other capital income	-0.006	0.001
Return to shares	0.027	0.007
Taxes	-0.011	-0.011
Total change (ΔG)	0.021	0.009

The results presented above question the conventional wisdom of a significant rise in income inequality in Norway during the 1990s as well as the claim that the rise in income inequality was associated was largely due to a rising disequalizing contribution of capital income. However, since these results rely on a definition of income that fails to account for changes in income reporting behavior it is doubtful whether data from tax records for different years are comparable, especially when the actual time period covered the implementation of a tax reform.

### 3. Heterogeneity in prices and comparability of income<sup>10</sup>

As pointed out in Coulter et al. (1992) and Cowell (1995), there are two strategies available for coping with intra-country problems of comparability to assess distributions of income that mirror the distributions of unobserved well-being; either one transforms the income measure by incorporating the relevant non-income heterogeneity and aggregates across individuals, or one uses the observed income data and accounts for non-income heterogeneity at the aggregation stage.

The standard practice for identifying the poor in most OECD countries is to use a poverty line defined as a specific fraction of the median equivalent income within a country. To be meaningful, this approach requires identical prices on goods and services as well as uniform norms and consumption habits across regions. Since empirical evidence suggests that these conditions are not fulfilled the results from poverty analysis based on a joint country-specific poverty line might be biased.

Accounting for regional variation in consumer prices could easily be achieved in countries where region-specific price indices are produced.<sup>11</sup> However, this type of information is normally not available in the OECD-countries. Moreover, even in cases where the pattern of prices does not vary across regions, norms and consumption habits might turn out to be region-specific. Thus, an alternative approach to the standard method for measuring poverty in a country would nevertheless be required. Instead of attempting to transform the income measure to account for relevant non-income heterogeneity, it may thus be necessary to reconsider the standard approaches conventionally applied at the aggregation stage of measuring income inequality and poverty. To this end, we propose a method that enables us to measure income inequality and poverty when incomes cannot be made adequately comparable between subgroups. By dividing the municipalities into groups determined by geographic location and prices on basic goods comparability of income within but not between subgroups may be justified. By considering the distribution of individual equivalent income for each of the groups we may construct a set of group- or region-specific poverty lines. The objective is to increase the comparability of income between individuals who face identical prices and share norms and consumption habits, when income is supposed to capture the consumption potential for households/individuals.

To achieve full comparability of incomes within the country, it is transform observed incomes into real incomes according to relevant non-income differences in the population.

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<sup>10</sup> Section 3 relies on Mogstad et al. (2005).

<sup>11</sup> Wodon (1999) pursues such an approach following a direct definition of poverty by using information about the cost of 'minimal nutritional requirements' as well as data about non-food expenditure in different geographic areas. However, this estimation approach may suffer from lack of theoretical justification with respect to determining appropriate level of minimal nutritional requirement, deciding which non-food goods that are necessities, allowing for different tastes etc.

Because the essential purpose of the income transformation carried out in this paper is to permit comparisons of income between individuals with different region of residence, we must be particularly interested in non-income differences that are systematically correlated with the general income levels across the regions. Such non-income differences will bias the result of the whole exercise of measuring inequality within a country. Thus, accounting for variation in housing prices across the subgroups is critical for obtaining reliable estimates of real incomes. To this end, we use information about relative prices per square meter on houses sold across the economic regions as a proxy for the underlying vector of housing prices.

### 3.1. The impact of heterogeneity in prices and needs on the measurement of poverty

In most OECD countries, the poor are defined as those with command over resources significantly below what is considered normal in the society, i.e. it is the economic distance aspect of inequality that defines poverty (O'Higgins and Jenkins, 1990). In practice, the poor are typically identified on the basis of a relative income poverty line defined as a specific fraction of the median equivalent income within a country.<sup>12</sup> In the language of economics, the income an individual commands is relevant for evaluating individuals ability to pursue well-being because it tells us something about the set of commodity bundles he may achieve for a given set of prices. However, it is not straightforward to draw inferences about who are unable to attain a reasonable level of well-being based on income data, since the capability to achieve well-being from a given level of income may vary between individuals. In particular, it might be significant interpersonal variations in the conversion of incomes, just as in other kinds of resources and primary goods, into the ability to do this or be that.<sup>13</sup> Thus, one might infer that if one wants to go beyond describing the distribution of important means to achieve well-being, such as income, and extend the perspective to assessing the ability to achieve well-being a link has to be established between the ability to convert the relevant means to achieve into basic achievements.

In order to provide such a link, a first step is to confront the two fundamental problems of the indirect approach to measuring poverty in terms of income short-falls, put forward by Sen (1979, 291):

*"First, if the pattern of consumption behaviour has no uniformity there will be no specific level of income at which the 'typical' consumer meets his or her minimum needs. Second, if prices facing different groups of people differ, e.g. between social classes or income groups or localities, then poverty threshold will be group-specific, even when uniform norms and uniform consumption habits are considered. These are real difficulties and cannot be wished away".*

Thus, the meaningfulness of poverty analysis based on a joint country-specific poverty line requires a pattern of prices that do not vary across regions. However, empirical data from Norway and other OECD countries show that prices on basic goods, such as houses, differ significantly between urban and rural areas. Thus, a given amount of income will give greater consumption possibilities in areas with low housing prices than in areas with high housing prices. Therefore, neglecting price differences between regions can result in biased estimates of poverty, when income forms the basis of the measurement of poverty. Furthermore, one could also question whether individuals' needs apply broadly to the entire nation or differ

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<sup>12</sup> A large body of empirical research on poverty employs relative income poverty lines. This approach is followed in the study of poverty on national level and by region in the Nordic countries (Gustafsson and Pedersen, 2000). Furthermore, it is used to describe the poverty pattern in the OECD countries (Forster and Pearson, 2002), in the European Union (O'Higgins and Jenkins, 1990) and in the US (Formby, 1997).

<sup>13</sup> See Sen (1992).

according to geographic location. Arguably, the perception of minimum needs depends on the reference group's circumstances, which presumably are heavily influenced by the community to which they belong. If one agrees with Sen (1984) that there is significant variability in the commodity requirements within a given country, then using a joint country-specific poverty line may appear inappropriate even when prices across regions are similar.

A possible response to these problems, which is compatible with the relative income poverty line approach, is to introduce a set of region-specific poverty lines. This can be achieved by classifying the municipalities according to region and price level on basic goods. Each group's region-specific poverty line can then be determined by a certain fraction of the median equivalent income in that group. The purpose of applying region-specific poverty lines is to improve poverty estimates by restricting comparison of income to individuals who live in the same community and compete in the same consumer market and therefore face similar prices on key consumer goods. The poor are then defined as those whose incomes fall considerably short of the income commanded by the "representative" individual in their community.

### 3.2. A region-specific approach for measuring poverty

To account for differences in prices and needs in the measurement of poverty in Norway, it appears relevant to classify the 435 municipalities according to their regional location. Furthermore, since the level of housing costs is the main expenditure for most households, especially for those with low income, housing prices will be used as a second classifying variable. Specifically, we divide the municipalities into quartiles according to their average housing price per square meter.<sup>14</sup> This is possible since data on prices per square meter for houses sold in each municipality are available for the year 2001.<sup>15</sup> Next, we divide the municipalities into three groups corresponding to the quartiles they belong to; the 1<sup>st</sup> quartile is labelled *low housing prices*, the 2<sup>nd</sup> and 3<sup>rd</sup> quartiles *medium housing prices*, and the 4<sup>th</sup> quartile *high housing prices*.

By combining the three housing price categories with seven regions, the municipalities are divided into 21 groups. Next, region-specific poverty lines are determined as half of the median equivalent income in each of the respective groups (Table 3.1). As expected we find a positive association between a municipality's region-specific poverty thresholds and the average housing price. This relationship may arise because individuals' capacity to purchase goods, such as housing, depends on the level of resources of the other individuals around them through the geographic pattern of competition, which makes it likely that housing prices increase with the general income level in a municipality. Furthermore, a high general income level means that the median income will be high and in turn the poverty threshold as well. Therefore, a resident in a municipality with high housing prices will need relatively high income to be defined as non-poor, compared to an individual living in a municipality where housing prices are relatively low.<sup>16</sup>

The region-specific poverty line approach allows identification of the poor by restricting comparison of equivalent income to individuals who belong to the same group of municipalities. Hence, one avoids comparing income between individuals from municipalities

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<sup>14</sup> In this paper, we will group the municipalities according to real estate prices. One could argue that rental prices would be a more appropriate classifying variable for identification of poverty thresholds. However, detailed data on local level for rental prices are not available in Norway. Moreover, most people in Norway are, by large, owners rather than renters. Furthermore, Norwegian data show that the geographic pattern for real estate prices is relatively stable and remarkably similar to the geographic pattern for rental prices (Langsether and Medby, 2004).

<sup>15</sup> Source: Statistics Norway, Division for Construction and Service Statistics.

<sup>16</sup> The relevance of this method is supported by the empirical results of Van Praag et al. (1982), where survey data indicate that the socially perceived level of income necessary to avoid poverty is greater in cities compared to rural areas.

with high housing prices and individuals from municipalities with relatively low housing prices, even if these municipalities are neighbours. For example, the urban municipality of Trondheim with high housing prices will not belong to the same group of municipalities as its rural neighbouring municipality Agdenes where housing prices are low. By contrast, analyses based on a joint country-specific poverty line specify the poverty threshold in terms of the median equivalent income in the country as a whole. Hence, one implicitly makes the contentious assumption that all individuals within a country face the same prices and have identical minimum needs (after accounting for differences in economics of scale in consumption according to the equivalence scale that is selected). By comparing the poverty thresholds in Table 3.1, it is clear that the country-specific poverty line is below the region-specific poverty lines in some of the regions with high housing prices. On the other hand, the country-specific poverty line is larger than the region-specific poverty lines when housing prices are low or medium.

**Table 3.1. Region-specific and country-specific poverty lines, 2001**

Region	Housing prices	No. of municipalities	Poverty line (NOK) (defined as half of the median equivalent income)
Oslo and its surrounding municipalities	Low	0	-
Oslo and its surrounding municipalities	Medium	2	81700
Oslo and its surrounding municipalities	High	21	93800
Eastern Norway	Low	8	73700
Eastern Norway	Medium	33	76900
Eastern Norway	High	7	81500
South Eastern Norway	Low	2	79000
South Eastern Norway	Medium	37	79500
South Eastern Norway	High	33	83000
South Western Norway	Low	5	75400
South Western Norway	Medium	31	77400
South Western Norway	High	20	83000
Western Norway	Low	17	77000
Western Norway	Medium	62	78700
Western Norway	High	19	83400
Mid Norway	Low	25	73000
Mid Norway	Medium	18	76100
Mid Norway	High	6	83800
Northern Norway	Low	50	78100
Northern Norway	Medium	36	79400
Northern Norway	High	3	86100
Norway		435	83200

The objective of this section is to compare the effects on the national level of poverty as well as the pattern of the geographic and demographic poverty profiles when using region-specific rather than country-specific poverty lines. The informational basis for the empirical analysis is a household register covering the entire resident population of Norway for 2001, which is supplemented with detailed income data from the Tax Assessment Files. Furthermore, we use yearly income after tax as an indicator of individuals' economic resources.<sup>17</sup> Income after tax, which is defined in close agreement with international recommendations (e.g. Expert Group on Household Income Statistics, 2001), incorporates earnings, self-employment income, net capital income, public cash transfers and taxes. To enable the comparison of incomes across individuals belonging to households of varying size and composition the standard OECD equivalence scale is applied, for which the weight of the first adult is set to 1, additional adults are given weights of 0.7, and each child gets a weight equal to 0.5. The joint country-specific as well as the region-specific poverty lines are determined as half of the corresponding median equivalent income.

The results presented in Table 3.2 show that there are 3.2 per cent of the Norwegian population is classified as poor in 2001, when the standard country-specific threshold is applied. In comparison, the population of poor estimated on the basis of a set of region-specific thresholds is equal to 3.3 per cent. Thus, the national poverty estimate is only slightly affected by the use of a set of region-specific thresholds instead of a joint country-specific threshold.

**Table 2. Poverty rates for Norway by urban and rural municipalities, 2001\***

	Urban municipalities	Rural municipalities	Total population
Country-specific poverty line (defined as half of the median equivalent income)	3.2	2.9	3.2
Region-specific poverty lines (defined as half of the median equivalent income in each group)	3.5	2.2	3.3

\*Urban and rural municipalities include 232 and 203 local jurisdictions, respectively

Although the overall extent of poverty in Norway in 2001 is rather insensitive to the choice between region-specific and country-specific poverty lines, the empirical results show that both the geographic and demographic poverty profiles depend largely on this methodological choice. In fact, the results demonstrate that the analysis of poverty based on a country-specific threshold produces downward biased poverty rates in urban areas and upward biased poverty rates in rural areas. Specifically, a comparison of the poverty rates by municipality reveal that the poverty rate increases in most city municipalities as well as in the majority of the municipalities in the surroundings of Oslo when a joint country-specific poverty line is replaced by a set of region-specific poverty lines. A common feature for these municipalities is that housing prices are relatively high. Previous empirical studies on poverty in Norway based on a joint country-specific poverty line have concluded that young singles, and both first- and second-generation non-western immigrants dominate the poor segment of

<sup>17</sup> In order to make inference about the geographic as well as demographic composition of the poor, survey data will not suffice due to too few observations. Thus, we have used data from the 2001 Census where the income accounting period is one year. However, there can be problems related to such an approach since some individuals can temporarily have low yearly income without suffering from serious deprivation, while others can temporarily have high yearly income but still suffer from deprivation.

the Norwegian population.<sup>18</sup> Introducing region-specific poverty lines makes this structure even more clear. For example, the poverty rate for second-generation immigrants increases by 4.6 percentage points when a joint country-specific poverty line is replaced by region-specific poverty lines.

In order to evaluate and design poverty reduction programs, it is necessary to provide an understandable picture of the poverty profile in a society. It is thus important to introduce poverty thresholds that account for the heterogeneity in prices and minimum needs within a country. The method proposed in this paper relies on information about individuals' places of living and key prices as a basis for specifying a set of poverty lines. According to the different region-specific poverty lines, the poor can then be identified as those whose incomes fall significantly short of the income commanded by the "representative" individual in their community.

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<sup>18</sup> See for example Andersen et al. (2003).

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