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Changes in the Inequality of Income and the Value of Housework Time in Finland in 1979-2000

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1 Introduction

Finnish economy was growing and economic wellbeing increased rather steadily in all population sub-groups until the end of 1980s. The economic depression of the early 1990s led to a rapid and large decline of gross domestic product and a steep increase in unemployment, and, as a consequence, to substantial declines in household incomes. Gross domestic product continued its considerable downturn until 1994 and unemployment remained high through 1995 (see Table 1). (Ministry of Social Affairs and Health, 1994; Aaberge et al., 2000, p. 79–81; Riihelä et al., 2001b).

Economic inequality rose rapidly between 1994–2000. At the same time share of individuals below low income line, set to 50% of the median income, increased rather steadily. This development suggests faster increases in real incomes and larger gains in terms of economic wellbeing in high income deciles compared to low income deciles after the depression. However, the inequality and poverty measures used to study these trends are based primarily on observed monetary income. Since the end of 1970's, there have been large changes in population structure, in household composition, in patterns of labor force participation and in the economic environment. Focussing on monetary incomes alone may over- or understate changes in the distribution of economic resources and in the wellbeing of individuals and households.

Valuing in monetary terms the time spent on productive household activities – using shadow and/or market prices – and adding this value to money income measure allows us to examine the distribution of *consumption possibilities*. This is particularly useful when examining changes in the distribution of economic wellbeing over time, as variation in household production can show up as income declines, even if such choices are freely made.[1] That is, changes in the distribution of income may suggest alterations in wellbeing that can not be said, in light of how household production has developed, to have taken place.

The paper looks at the change, the level and structure of income distribution and distribution of consumption possibilities in individual and household level as well as in various sub-groups between years 1979 and 2000. Another interest is to look at the changes in low incomes when the concept of income is expanded to include a monetary measurement of household production. Low income indices are relative measures where the poverty line (here *low income line*) is chosen to be 50% of the median. I ignore the value of leisure time because of difficulties

[1]Economic wellbeing is not an easy concept to measure or define. Normally economic wellbeing is measured only by money income, meaning all income readily measurable with money terms. In the present paper I define *economic wellbeing* as household's or individual's total access to goods and services (see e.g. Bryant and Zick, 1985). This definition enables the comparability of *household production* - producing goods and services within a household - and *money income* - providing means to either buy or produce goods and services. Leaving out the value of household production means that empirical estimates of economic wellbeing can be biased. (see e.g. Bryant and Zick, 1985, p. 1100).

Table 1: Unemployment, Gini-coefficient and proportion of individuals below low income line in Finland in 1979-2000

Year	All unemployed, 1000 persons	Unemployment rate	Gini-coefficient	Proportion (%) of individuals below low income line*
1979	143	6.0	.	.
1980	114	4.7	.	.
1981	121	4.9	20.5	.
1982	135	5.4	.	.
1983	138	5.5	.	.
1984	133	5.2	.	.
1985	129	5.0	20.3	.
1986	138	5.4	.	.
1987	130	5.1	19.7	3.4
1988	116	4.5	20.2	3.1
1989	80	3.1	20.4	2.9
1990	82	3.2	20.2	2.5
1991	169	6.6	20.1	3.1
1992	292	11.7	19.7	2.6
1993	405	16.3	20.9	2.7
1994	408	16.6	20.9	2.3
1995	382	15.4	21.7	2.4
1996	363	14.6	22.1	2.9
1997	314	12.7	23.5	3.2
1998	285	11.4	24.6	4.0
1999	261	10.2	25.9	3.5
2000	353	9.8	26.5	4.0

Source: (Statistics Finland; Statistics Finland, 2003b)
Note: The Gini-coefficient is calculated between individuals by using disposable income and modified OECD equivalence scale.
* Low income line is set to 50% of the median income. Traditional OECD equivalence scale used.

in distinguishing between different leisure activities and valuing these activities. The paper applies time-use data, collected by Statistics Finland in 1979, 1987-1988 and 1999-2000. When comparing the full time period only the data from September to November are considered each year. This is labelled fall 1979, 1987 and 1999. When the full data collected during the whole year are included the two of the latest data sets, years 1987-1988 and 1999-2000, are included. Most of the results are both at individual level and at household level.

The paper departs from the observation that time spent in household production is an important ingredient in the wellbeing of individuals, which is not captured by income- or consumption-based welfare indices. Several studies have shown that the value of household production (in many studies the value of 'unpaid housework') varies depending on the method of estimation between 20%-50% of gross domestic product. Some researchers have suggested figures as high as 70%.[2] Time-use analysis further shows that the work done in households takes up a considerable proportion of the individual's time compared to actual paid work (Vihavainen, 1995, p. 5).

2 Literature

2.1 Level and trend of income inequality and poverty

Economic inequality in Finland, measured in disposable income, fell from 1966 to 1976 and changed little until the early 1990s. Atkinson et al. (1995, p. 40–46) recorded that in the late 1980s Finland had one of the most equal distributions among 15 OECD countries measured by Gini-coefficient and 90/10 ratio. The Lorenz curve for Finland dominated those for all other countries included in the study.[3]

The depression did not increase inequality at the beginning of 1990, partly because there was a substantial fall in real income of all households. Since 1994, however, inequality has risen considerably (see Table 1). After the depression, average real incomes and capital incomes grew substantially - particularly income from dividends. The top incomes have risen faster than the average real income and at the bottom of the income scale there has been little or no increase at all in real incomes. High income households have benefited also from reductions in progressive taxation. (Statistics Finland, 2000a; Statistics Finland, 2000b; Riihelä et al., 2001b, p. 1–4; Statistics Finland, 2003a).

Riihelä et al. (2001a) and Riihelä et al. (2003) examined trends in poverty in Finland using the Household Budget Survey and Income Distribution Statistics.

[2]By definition housework is only one input in the process of household production. Other inputs are, in conventional models, household durable and market goods.(Ruuskanen, 1995, p. 6). Both of the terms household production and housework are used in the present study to illustrate the unpaid work carried in households providing consumption possibilities to its members.

[3]This is at least partly due to welfare state structure in these countries; high taxes and public expenditures aiming at equalizing economic outcomes. (Atkinson et al., 1995; Aaberge et al., 2000, p. 77–79; Atkinson et al., 1995, p. 40–46).

From the early 1970s to the mid 1990s, the relative poverty rate declined, using a poverty line that is 50% of median or mean income and rose during the latter part of the 1990s.[4] Table 1 shows similarly that the proportion of the population below 50% of median income raises towards the end of 1990s (Statistics Finland, 2003a). Income poverty has also become increasingly severe and incomes among the poor have become more unequally distributed than earlier. Unemployed households are the most vulnerable group of the population. There has been absolute fall in mean real disposable income for the all unemployed households during 1990s. (Riihelä et al., 2001a, p. 9–13; Riihelä et al., 2003, p. 8–10; Riihelä et al., 2001b).

2.2 Structure and time-use of households

Household structure measured by the number of individuals within a household, has decreased over time being 2.6 in 1979 and 2.16 in 1999 (see Table 2). This means that the number of single person and lone parent households have increased and the number of larger households has declined. It is likely that the amount and composition of household activities has also changed.

Table 2: Changes in household structure and in time used on housework (hours and minutes in a day)

Year	Number of households	Persons on average /household	time used on housework, all	men	women
1979	1831000	2.6	2.46	1.50	3.39
1987	2082000	2.3	2.47	2.01	3.35
1999	2365000	2.16	2.51	2.03	3.36
1987-1988	.	.	3.04	3.50	2.15
1999-2000	.	.	3.10	3.47	2.27

Source:(Statistics Finland; Pääkkönen and Niemi, 2002; Niemi and Pääkkönen, 2001)
Note: The time-use on housework includes 10-64 years old in fall 1979, 1987 and 1999 and over 10 years old in 1987-1988 and 1999-2000.

Changes in labor force participation over the time period studied has also been substantial. Women's labor force participation is high in Finland, being normally between 70-80%. During the depression, that rate dropped, especially for those with children below school-age. The increase in unemployment and the introduction of the home care subsidy at the end of 1980's may account for why women stayed at home taking care of their children and household. Men's labor force participation dropped during the depression mainly due to unemployment. (Statistics Finland, 1994).

[4]The choice between the mean and median is partly a matter of relative statistical properties of these measures and partly a matter of the level of poverty line.

Despite these changes, the overall time-use has not changed very much between the end of 1970 to year 2000, measured in Time-Use Studies. Changes in the labor market and the expansion of information society show their effects in time-use data but do not alter remarkably the main structure of time-use. On average, employment, housework, sleeping and free-time take a little more than 20 hours of the average day of 10-64 years of old. The structure of time-use has become more similar throughout the years between various social groups and between men and women. However, there can be considerable variation in time-use between individuals or sub-groups. (Juntto, 2002, p. 33). Housework is still divided by traditional gender roles. Men spend more time in work outside the home than women do and women conduct more housework compared to men (see Table 2).

The amount of household production carried out is greatly dependent on the life-cycle stage of the family concerned. Parents with small children carry out more housework than other groups. For example, according to the Time-Use Study 1987-1988 (Niemi et al., 1991, table 27), women who were employed, married and had children used 34.24 hours and minutes in a week in all housework tasks. The same figure for women who were employed but had no children was 17.01 hours and minutes in a week. Both women and men increase the amount of time allocated to housework when unemployed.

2.3 The measurement and valuation of household production

The measurement and valuation of household production involve several critical problems since there is no agreement as to what should be measured, or what method to use for valuation. (see e.g. Goldschmidt-Clermont, 1982, p. 4). Furthermore, estimates of consumption possibilities are very sensitive to the selection of productive household activities and to the choice of the money price of these activities.

When deciding on the unit of measurement of household production, the process can start by measuring either volumes or values, of either inputs or of outputs. (Goldschmidt-Clermont, 1982, p. 4–7). In the present paper, values of time-use inputs are chosen for the unit of measurement. In order for it to be comparable with the national accounts, household production should be valued on the basis of output. This would allow for the assessment of productivity. However, the output-based method of valuation requires data which are not readily available[5] and there are no market equivalents to all household products. (see e.g. Taimio, 1991, p. 1,4; Eurostat, 1999). The Eurostat (1999) report recommends that household production is valued through the inputs (meaning the costs of inputs) used in the production.

The next step is to choose the productive activities of a household. Often the so called main functions of a household are taken as productive. These include

[5]Few efforts have been made to measure output in physical units and labelling these with market price.

providing housing, providing nutrition, providing clothing, providing care and education, and volunteering. The ancillary activities (shopping, transportation, gardening) are productive when they are performed in connection with one or more than one of the main functions. (Eurostat, 1999; System of National Accounts, 1993). Ancillary activities like animal care, gardening and shopping are included in the present study. Helping other households and travel related to household production are counted as well.

Finally a market value for productive time-inputs is needed. Ruuskanen (1995, p. 21) cite Chadeau (1985, p. 242) and divides the methods of valuing time spent in housework in two as does Taimio (1991).

- the forgone wage method or the Wage equals Opportunity Cost of Time, WOCT
- the forgone expense methods:
  - The Market Alternative - Housekeeper Cost, MAHC
  - The Market Alternative - Individual Function Cost, MAIFC.

The forgone wage method values an hour of housework on the basis of the opportunity cost of that time - normally the market wage of an individual. The valuation of the forgone expense method is based on the cost of purchase of the goods or services on the market. The method is again divided in two. The MAHC - method[6] hires one person to carry out all household tasks and the value of housework is dependent on the wage of a hired person (for example wage of a domestic servant).[7] The MAIFC - method values household tasks on the bases of a specialized market laborer. (Hawrylyshyn, 1977, p. 90; Ruuskanen, 1995, p. 22; Taimio, 1991, p. 12,14–16)

The values these different methods assign to household production differ considerably from each other. Consequently, extra care should be taken when using the methods since the choice made has an effect on the results obtained. The housekeeper cost method is applied in the present study and sensitivity analysis of the method is presented in the Appendix.

2.4 Earlier studies on household production and extended income

Household production adds to the economic wellbeing of household members. Empirical evidence shows that full income, extended income or imputed income (income including the value of household production), is more equally distributed among households than the traditionally measured disposable income.

[6]The forgone expense methods are based on the widely applied third party criterion. By a definition, if an activity can be delegated to somebody else, it is considered economically productive.

[7]One of the main problems with MAHC approach is the fact that the method transfers the wage differences in market work between men and women to household sector. (Taimio, 1991, p. 12–16).

Heikkilä and Piekkola (2003) used data from Finnish Time-Use Surveys 1999-2000 and 1987-1988 collected by Statistics Finland, and examined changes in economic inequality and household production from 1988 to 2000 by applying MAHC - method (see chapter 2.3) for the valuation of household production. They examined how the inclusion of the value of household production to household income affects economic inequality in Finland. The study was based on Becker's notion on comparative advantage to explain why men specialize in paid work and women in unpaid work. The main conclusion was that the value of household production has an decreasing effect on economic inequality, as measured by the Gini-coefficient and income deciles. The decline is greater in two-adult households compared to other kind of households because of gender specialization. (Heikkilä and Piekkola, 2003, p. 19).

Bryant and Zick (1985) studied how rural and urban income distributions change if the value of household production is added to money income. They used U.S. data from the Panel Study of Income Dynamics, PSID, (for 1975-1976 and 1979-1980). Only white, married-couple households with working husband were included in the study. The WOCT -method was used (see chapter 2.3). For those wives who were not in employment they imputed wages based on Heckman's selectivity correction wage equation estimates, (see Appendix B). Bryant and Zick (1985, p. 1102) noticed that on average, urban households have greater access to goods and services than do rural households, including both marketplace and in the home. Household production significantly raises the average family's access to goods and services. Furthermore, husbands contribute more in terms of earnings and wives in terms of household production in both rural and urban households. The Gini-coefficients suggest, among other things, that poor rural households make greater use of household production in order to increase their access to goods and services than do urban households. (Bryant and Zick, 1985, p. 1103).

Gottschalk and Mayer (1997) studied household production and its effect on trends in economic inequality in the USA. They used the U.S. Panel Study of Income Dynamics (PSID) including years 1976 and 1988. Households headed by 25 to 64 years old were included. The paper used three methods to measure income and the results showed that housework reduced the observed inequality among households, even when inequality increased between 1976 and 1988, regardless of the income measure used.

Jenkins and O'Leary (1994) studied the distribution of extended income in the U.K. Extended income measures were derived by combining household money income data and the value of household production time. The paper estimated models of household time-use with data from the 1987 Social Change and Economic Life (SCEL) time-budget survey, and used the estimates to impute time-use to respondents to the 1986 Family Expenditure Survey (FES). The paper modified the assumptions of traditional full-income concept[8], and

[8]Full income was formulated in modern economic terms by Becker (1965). Full income is defined to be the maximum amount of money income available to a consumer. Full income could in general be obtained by devoting all the time and resources to earning income, with no regard to consumption. The amount of time spent on other activities (sleep, food etc.)

subdivided time spent at home into two activities: household production (domestic work), H and 'pure' leisure, L. Due to difficulties of distinguishing genuine leisure activities from other leisure activities leading to valuation problems, Jenkins and O'Leary (1994) decided not to incorporate pure leisure activities within the calculations of income. The results showed that extended incomes are more equally distributed than money income for non-elderly one-family households. The result holds regardless of which method is used to value household production; opportunity cost method or housekeeper wage method. Broadening the income definition increases the income shares of the poorest tenths and decreases those of the richest tenth. (Jenkins and O'Leary, 1994, p. 10–11).

Bonke (1992) explored in Denmark what implications the inclusion of household production has on distribution of economic resources. The data were drawn from the Time-Use Survey for the year 1987, which is a random sample of about 5000 individual adult Danish people. The economic information were taken from the register of income taxation for the respondents in the time-use survey. The MAHC method is applied to value the time spent on housework (see chapter 2.3). Bonke (1992) found that the housework increases the access to goods and services as much as working in the labor market. The inequality of distribution of monetary income diminishes when household production is measured by Gini-coefficient. This suggests that low income households compensate their low earnings by a relatively large household production.

3 Research strategy

Consumption possibilities refer here to income subject to state taxation (either to be consumed directly or to be used as inputs in the household production process) combined with the value of productive household activities. Other sources of income, wealth, borrowing or savings are not taken into consideration (due to data restrictions). Consumption possibilities provide wellbeing directly or indirectly to individuals or households.

We must assume that the income subject to state taxation (*here* money income) and the output of household production are comparable and substitutable in terms of consumption possibilities. It does not matter for an individual or a household whether the consumption possibilities are generated by income or by household production.

I do not make any assumptions of the decision-making process of individuals or households between different time-uses, including labor supply. Nor do I concentrate on productivity of individuals in various housework tasks or personal characteristics affecting the productivity.[9]

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would be determined by the effect on income and not by any effect on utility. (Kooreman and Wunderink, 1997, see e.g.). Full income approach assumes that time can be converted into goods through money income. (Becker, 1965, p. 495–498). Full income F is defined to be

$$F = wT + y, \tag{1}$$

where w is an hourly wage rate, T is the disposable time and y is non-labor income.

[9]Michael Bittman, Paula England, Nancy Folbre, and George Matheson (2001, p. 1–5)

An ideal data to study consumption possibilities would include each year the time-use of all household members, income, transfers, taxes, wealth, savings and borrowing at the individual and household level plus household characteristics. This would report the total available income of the household and total productive housework carried out. Furthermore, an ideal measure of the value of household production would include both primary activities and productive secondary activities. At the moment lot of activities carried out simultaneously with primary activities are missing from the data which means that especially many care activities are excluded.

The data available for the present study do not include each year the time-use of all the members of the same household nor all simultaneous activities, neither is available the information on savings or borrowing. However, the data required to study consumption possibilities at the individual level need to include at least the amount of time spent on primary activities and the money income information plus background characteristics. The time-use data applied by the present paper, collected by Statistics Finland in 1979, 1987-1988 and 1999-2000 covering the time period of interest, satisfy these mentioned requirements.

The time-use data, gathered through detailed time-diary surveys and augmented with interviews, are combined with money income, that has been linked at the person level to the time-use data. The data sets are representative sample surveys and are considered to be of high quality, while the income information that is linked into the data are similar to that available in the typical income distribution surveys in Finland that rely heavily on register information. The survey includes persons 10–64 years old who were not living in institutions. The respondents were advised to record in ten minutes intervals their primary and secondary activities. These data provide an opportunity to examine the distribution of consumption possibilities during two decades and can provide us a rich picture of the changes across time in the distribution of economic wellbeing.

The first Time-Use Study was carried out in 1979. The size of the original random sample was 7355 and the net non-response rate was 17.6%. The survey is based on individual sample, which means that not all the members of the same household are included.[10] The data cover total of 12057 days. The data were gathered through September to November 1979. The respondents kept diary for two successive days, the first of which was selected randomly and the background information was filled in by interviews. Each day of the week is

found three dominant perspectives to explain how couples allocate time to household work, and therefore make decisions on labor supply and time allocation on leisure. These perspectives are

- traditional neoclassical perspective, like Becker (1991) emphasizing relative efficiency of women and men at performing different tasks;
- bargaining models, based mainly on game theory approach, emphasizing bargaining power of individuals
- sociological emphasis that gender has pervasive effects at many levels: structuring identities, expectations, norms and institutions.

[10]Random sample was drawn from Central Register of Population (Niemi, 1983, p. 7)

equally represented in the data. (Niemi et al., 1981).

The second time-use study in 1987-1988 included the full year, not just the fall like in 1979. The non-response rate in the 1987-1988 survey was 22.1%. The survey is based on individual sample and the respondents kept diary for two successive days. (Niemi and Pääkkönen, 1989). The third and the latest time-use survey was carried out in 1999-2000. The data were collected at both the household and individual level by using interviews and diaries, similarly with the two other time-use studies. Thus both households and individuals are survey units. The survey was implemented according to the Eurostat guidelines for harmonized European Time-Use Surveys. The respondents kept a diary for two days, one being a week-day and the other either Saturday or Sunday. The respondents were all 10 years and older household members. (Väisänen, 2002). Household and personal interviews were used to gather background information on the respondents. The final sample size was 10278 individuals of whom 6272 responded. A total of 10 561 days are included in the final data.

I use data for persons aged 25–64, who are either employed, unemployed or taking care of their own household. Thus, students, pensioners and the unemployable are excluded from the main analysis, as their time-use patterns are likely quite different from others. The focus of the paper is thus on individuals for whom both labor market work and household production are important (see e.g. Jenkins and O'Leary, 1994). Those who kept time-use diary only for a one day are excluded. From the 1987-1988 data, one outlier is dropped from the analysis due to excessively high income of this observation. Household level comparison is possible for money income only, because the data of 1987-1988 do not include time-use information of all the members of the same household. Unlike the individual level analysis, household level analysis considers all age groups.

All the figures used in calculations of inequality and low income measures are annual figures. The monetary measures are altered to correspond euro values in year 2000 by using the standard of living index. The average net wage of a communal houseworker is chosen to represent the value of housework time (see chapter 2.3).

Comparative results are calculated by excluding parts of the data and by taking all population groups including students, pensioners and unemployable. Heckman's selection correction method is discussed in Appendix B. This method is widely applied when calculating the value of household production by opportunity cost method. Using the opportunity cost method leads to situation where those earning high wages in labor market have higher value of production within household than those earning lower wages. This is why the opportunity cost method is not applied in the main results.

Consumption possibilities are

$$C_i = M_i + RH_i, \tag{2}$$

where C is consumption possibilities of an individual i, M is the income before taxes and non-taxable income transfers, it includes wages, taxable income

transfers and income from capital, H is the hours of productive housework and R is the wage of a communal houseworker. For the household the same function becomes

$$C_h = \sum_{i=1}^{n} M_i + R \sum_{i=1}^{n} H_i, \tag{3}$$

where C is the consumption possibilities of a household h.

Levels and changes of inequality are analyzed by using the half the squared coefficient of variation, GE(2), and the Gini-coefficient. GE(2) belongs to the class of Generalized Entropy $GE(\alpha)$ indices which are very useful due to their decomposability. Decomposition by subgroups provide a picture of inequality profiles. More detailed decomposition than the one based on population subgroups is not meaningful in the case of the data used and sample chosen. In order to examine levels of and changes in low incomes head count ratio (H), and poverty gap ratio (here PGR), are used. An individual (or household) is regarded having low incomes if her income or consumption possibilities remain below the predetermined low income line. This means that low income measures reflect poverty related to access to economic resources determined via money income and consumption possibilities.

A simple equivalence scale is applied in studying inequality and low incomes in the level of households:

$$\frac{W}{S^{0.5}} \tag{4}$$

where W is the total income of a household and S is the number of household members.

4 Results

4.1 Aggregate trends

Table 3 reports the decile group means of money income and consumption possibilities of individual data in 1987-1988 and 1999-2000. The decile group means of consumption possibilities are considerably higher than corresponding means of money income. The percentage change from money income to consumption possibilities is greatest in low income deciles and respectively smallest in high income deciles. The ratio between the highest and the lowest income deciles drops significantly when moving from money income to consumption possibilities.

The results suggests that, as a share of consumption possibilities, household production is more important for low income earners than for high income earners. For high income earners, money income dominates the composition of consumption possibilities. For the lowest decile, household production is approximately 70% of the total value of consumption possibilities when the same ratio for the highest decile is around 20%. Household production increases the

consumption possibilities of all income groups but its effect is by far the greatest in low income deciles. Household production thus equalizes consumption possibilities.

The Finnish time-use data indicate that, on average, the amount of time spent in household production drops when income increases and/or when hours of market work rises. High income households may also conduct less housework compared to low income households since it can be assumed that high income earners own more household durable (domestic appliances) and save time required in housework or hire outside help to carry out various activities. Many of the household productive activities are time-consuming and if these can be bought from the market saved time is spent on, as an example, leisure activities. High income earners can also be assumed to spend money on ready prepared food or eat out in restaurants and thus spend less time is food preparation than low income earners.

Table 4 shows "transition matrices" of individual data. Money income and consumption possibilities are divided in five deciles (quantiles). Each of the figures, $p_{ij}, i = 1, ..., n, j = 1, ..., k$ in the table represents the possibility that individual in group i (the money income group) is also in the group j (consumption possibilities group). That is, we can see whether individuals move or not from one quantile to another when money income is altered to consumption possibilities. The sum of all rows equal 1.00 (there are small distinctions due to rounding) because each individual either has to stay in original location or move to another one. It seems that an individual either stays in the same quantile than before or moves one quantile up or down compared to the original one. Those either in the first money income quantile or in the fifth money income quantile tend to remain in their original quantile groups. Individuals in the middle quantiles have the greatest variation between different locations. It must be noticed that individuals in the highest money income quantile never move to the lowest consumption possibility quantile and very rarely even to the second one. However, individuals in the lowest money income quantile do make their way rater often to higher quantiles in consumption possibilities and in some occasion even to the highest one.

Table 3: Decile group means in euros of money income and consumption possibilities and % change in 1987-1988 and 1999-2000 (individual data)

Year	Decile groups									
income	1	2	3	4	5	6	7	8	9	10
1987-1988	3541	9790	13543	15682	17681	19610	21931	25176	30088	46041
1999-2000	5157	10260	14709	18068	20397	22728	25458	29080	35212	59961
consumption possibilities	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)	6 (%)	7 (%)	8 (%)	9 (%)	10 (%)
1987-1988	13003 (267)	20229 (107)	23528 (74)	26203 (67)	28793 (63)	31503 (61)	34623 (58)	38356 (52)	44030 (46)	59495 (29)
1999-2000	14749 (186)	22782 (122)	26739 (82)	29803 (65)	32650 (60)	35367 (56)	38359 (51)	42208 (45)	48686 (38)	72760 (21)

Source: Author's calculations from the Time-use data

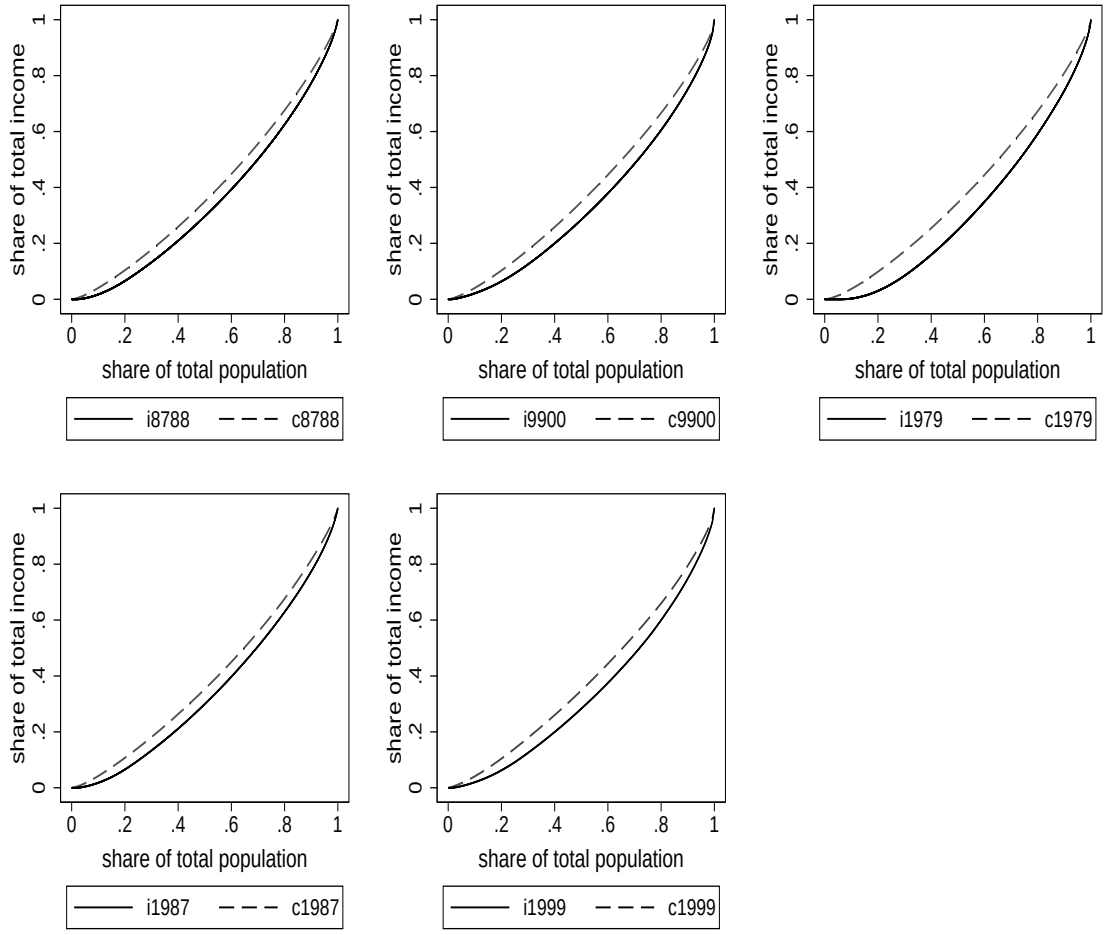
Table 4: Transition matrices, full year 1987-1988, 1999-2000 and fall 1979, 1987, 1999

		Consumption possibilities				
Money income		1	2	3	4	5
1987-1988	1	0.54	0.19	0.13	0.09	0.05
	2	0.31	0.28	0.18	0.15	0.08
	3	0.13	0.32	0.26	0.20	0.08
	4	0.02	0.21	0.36	0.27	0.14
	5	0.00	0.00	0.08	0.28	0.65
1999-2000	1	0.54	0.20	0.13	0.09	0.04
	2	0.35	0.27	0.21	0.12	0.05
	3	0.11	0.34	0.29	0.18	0.08
	4	0.01	0.19	0.31	0.33	0.16
	5	0.00	0.00	0.06	0.27	0.67
1979	1	0.47	0.18	0.16	0.13	0.06
	2	0.36	0.25	0.16	0.13	0.10
	3	0.15	0.30	0.26	0.20	0.09
	4	0.02	0.26	0.29	0.25	0.17
	5	0.00	0.01	0.13	0.29	0.58
1987	1	0.53	0.17	0.15	0.12	0.04
	2	0.33	0.26	0.16	0.15	0.10
	3	0.13	0.32	0.29	0.17	0.09
	4	0.01	0.25	0.32	0.30	0.12
	5	0.00	0.00	0.08	0.27	0.65
1999	1	0.58	0.18	0.13	0.08	0.02
	2	0.30	0.33	0.23	0.11	0.04
	3	0.12	0.33	0.28	0.19	0.08
	4	0.00	0.16	0.33	0.42	0.10
	5	0.00	0.00	0.04	0.21	0.76

Source: Author's calculations from the Time-use data

The overall trends in inequality are shown using Lorenz-curves in Figure 1. The Lorenz curves for individual data each year, first for full year data 1987-1988 and 1999-2000 and then for fall data 1979, 1988, 1999, are drawn for money income and consumption possibilities. These Lorenz curves do not cross. Consumption possibilities are more equally distributed than money income. This trend is as would be expected based on decile group means (see Table 3). The Lorenz curve for the year 1987-1988, or 1987, is closer to the diagonal than in other years. Standard inequality measures, used later in the paper, have to show consumption possibilities more equally distributed compared money income.

Figure 1: Lorenz curves for money income (i) and consumption possibilities (c) in full year 1987-1988, 1999-2000, and fall 1979, 1987, 1999



Source:Author's calculations from the Time-use data

4.2 Inequality results: levels and trends

The evidence shows that consumption possibilities are more equally distributed than money income, Table 5. The estimated inequality measures are smaller for consumption possibilities than for money income in all the years whether comparing the full year data in 1987-1988 and 1999-2000 or fall data in 1979, 1987 and 1999. Thus, extending the money income concept changes the shape of the inequality distribution. When comparing the changes between years, we

can see that the inequality measures first drop, from 1979 to 1987, and then rise from 1987 to 1999 or from 1987-1988 to 1999-2000 regardless of whether we look at individual figures or households figures.

Table 5: Individual and household inequality results full year 1987-1988, 1999-2000 and fall 1979, 1988, 1999, (i) refers to money income and (c) refers to consumption possibilities

	Individual				Household	
Year	100xGE(2)		100xGini		100xGE(2)	100xGini
full year	i	c	i	c	i	i
1987-1988	17.47	8.51	30.33	21.90	11.48	25.3
1999-2000	26.23	12.10	32.50	22.77	19.92	30.29
fall	i	c	i	c		
1979	29.72	10.38	37.34	22.73		
1987	17.29	8.19	29.94	21.47		
1999	26.79	12.89	32.95	23.00		

Source: Author's calculations from the Time-use data

In order to examine if change in the tails and/or extreme observations account for differences across years, I also analyzed three reduced samples. I first excluded the bottom 5%, then the top 5% and finally both top and bottom 5%. In all the cases, either individual data or household data and in every year, the estimated inequality measures drop. The least changes are caused when the lower end is cut. This is probably explained by the large number of zero or very small money income values in the data. The most substantial changes are caused when both of the ends are cut. Compared to the original data the cut in the lower end also keeps the direction of changes in the inequality measures the same between years. The cut in both ends causes the most perverse results in the direction of changes in consumption possibilities when moving from one year to another. As a conclusion, the inequality results obtained from the original sample are sensitive to deletion of observations from either or both ends.

Table 6: Individual and household aggregate inequality results full year 1987-1988, 1999-2000 and fall 1979, 1988, 1999, when A. 5% of the data is cut from both ends; B. 5% of the data is cut from the lower end; and C. 5 % of the data is cut from the top end, (i) refers to money income and(c) refers to consumption possibilities

	Individual				Household	
	100xGE(2)		100xGini		100xGE(2)	100xGini
A.	i	c	i	c	i	i
1987-1988	8.30	5.78	22.90	18.87	5.93	19.58
1999-2000	9.03	5.14	23.92	17.87	8.27	22.86
1979	13.32	6.23	29.32	19.72		
1987	7.88	5.56	22.35	18.51		
1999	9.56	5.53	24.41	18.30		
B.	i	c	i	c	i	i
1987-1888	14.55	7.93	27.15	21.08	9.69	22.93
1999-2000	23.35	11.44	29.85	21.84	17.68	27.96
1979	25.82	10.13	34.12	22.34		
1987	14.45	7.73	26.82	20.82		
1999	23.81	12.60	30.25	22.59		
C.	i	c	i	c	i	i
1987-1988	11.04	6.36	26.44	19.77	7.63	22.20
1999-2000	11.39	5.78	26.95	18.95	10.20	25.50
1979	16.78	6.53	32.99	20.18		
1987	10.53	6.03	25.84	19.25		
1999	12.01	5.84	27.49	18.84		

Source: Author's calculations from the Time-use data

As a comparison, if we include also the initially excluded population groups in the sample – i.e. rather than including only the employed or unemployed also include students, pensioners and unemployable, the inequality measures increase, apart one case in 1999. It seems that inequality measures for consumption possibilities rise less than those for money income evidencing the importance of housework as an consumption possibilities equalizer. The trend between years stay the same, inequality measures first drop from 1979 to 1987/1987-1988 and then rise from 1987/1987-1988 to 1999/1999-2000.

Table 7: Individual and household, aggregate inequality results full year 1987-1988, 1999-2000 and fall 1979, 1988, 1999, when students, pensioners and unemployable are included in the data, (i) refers to money income and (c) refers to consumption possibilities

	Individual				Household	
Year	100xGE(2)		100xGini		100xGE(2)	100xGini
full year	i	c	i	c	i	i
1987-1988	19.84	9.08	32.15	22.49	10.21	25.60
1999-2000	27.95	12.30	33.75	23.19	13.30	28.84
fall	i	c	i	c		
1979	33.95	11.06	40.48	23.79		
1987	19.05	8.49	31.61	21.92		
1999	28.16	12.77	34.07	23.18		

Source: Author's calculations from the Time-use data

4.3 Incidence of low income: levels and trends

The estimates of the head count ratio (H) and poverty gap ratio (PGR)[11], when low income line is set to 50 % of the median income or median consumption possibilities, are given in Table 8. The overall trend (H) indicates that the proportion of individuals below the low income line drops considerably when moving from money income to consumption possibilities. Comparing the development over time shows that the proportion of low income individuals increase from 1987-1988 to 1999-2000 measured both by money income or by consumption possibilities. The trend from 1979 to 1987 shows that the proportion of low income individuals drops during this period. The extent or severity of low incomes (PGR) also decreases when comparing money income and consumption possibilities. The trend between years implies that, according to this data, the severity of individual low incomes drops in all cases. When all population groups are included in the sample (also students, pensioners and unemployable), all of the low income measures increase compared to results from the original sample.

[11]Poverty gap ratio or FGT(1) measure, expresses the average distances of the poor below the low income line

Table 8: Individual low income indices (head count ratio, H, and poverty gap ratio, PGR) in full year 1987-1988, 1999-2000 and fall 1979, 1988, 1999, (i) refers to money income and (c) refers to consumption possibilities. Low income line is 50% of the median

	Individual			
Year	H		PGR	
full year	i	c	i	c
1987-1988	14.03	5.95	6.65	1.76
1999-2000	16.26	6.42	6.03	1.67
fall	i	c	i	c
1979	22.22	7.34	13.79	2.33
1987	14.64	5.15	6.71	1.53
1999	15.37	6.35	6.16	1.45

Source: Author's calculations from the Time-use data

Table 9: Individual low income indices full year 1987-1988, 1999-2000 and fall 1979, 1988, 1999, when students, pensioners and unemployable are included in the data, (i) refers to money income and (c) refers to consumption possibilities

	Individual			
Year	H		PGR	
full year	i	c	i	c
1987-1988	16.96	6.78	7.24	2.09
1999-2000	18.12	7.21	6.26	1.96
fall	i	c	i	c
1979	26.64	8.99	16.82	3.03
1987	17.16	6.26	7.13	1.89
1999	17.95	6.81	6.59	1.69

Source: Author's calculations from the Time-use data

4.4 The structure of inequality

The decomposition of inequality measures of individual and household level data are shown in Table 10. The decomposition by household type, region, age group and sex are documented at individual level data and by household type and region at household level data. The inequality of money income and consumption possibilities as measured by GE(2) is divided in within-group inequality and between-group inequality. These categories are further divided in two in the case of individual data: money income and consumption possibilities.

In general, within-group inequality dominates the between-group inequality both on the individual level and household level. Money income has the highest values in within-group component in the household type decomposition and between-group component for sex decomposition. Consumption possibilities has the highest values in within-group component for the sex decomposition and between-group component for household type decomposition. The trend over years of within group inequality follows the general development, inequality first drops and then rises again towards 1999-2000. Between-group inequality does not have as consistently similar trend since there are some deviations of general development in the data of 1999 and 1999-2000.[12]

When we look at the decomposition results by household type, it is clear that within-group inequality dominates the between-group inequality for each year. The between group component is 8% or less of total inequality for both money income and consumption possibilities. This means that there are striking differences and variation in income and in consumption possibilities within household types. There is no clear trend which of the household types has the greatest within-group variation, since the domination of the household type varies between years.

The decomposition by region also shows a dominance of within-group component even when between-group inequality plays a bit stronger role than in the case of household type decomposition. It seems that the metropolitan area has often the highest within-group inequality figures for both money income and for consumption possibilities but not in all of the cases.

The division by age-group has similar results, the within-group component dominates the between-group one. Greatest within-group differences in both cases, in money income and in consumption possibilities and in every year, are found in the highest age-group, 55-64 years at age.

Decomposition by sexes shows that between group inequality of money income has higher figures than any of the other decompositions but this effect vanishes when looking at the decomposition of consumption possibilities where the share of between group inequality has dropped. This suggests that, since men earn higher wages than women, women compensate lower income by carrying out more household production activities than men do. This is evidenced also by time-use studies. Why this difference taken place is not discussed here. One interesting result in sex decomposition is that within-group inequality of money income has an increasing trend between years and between-group inequality correspondingly decreasing trend. This reflects many things among which are the increased labor force participation of women and slight drop in gender differences in wages.

[12] Within-group and between-group inequality does not necessary sum exactly to aggregate inequality due to rounding.

Table 10: Decomposition of individual and household income inequality and inequality of consumption possibilities by population sub-groups, full year 1987-1988, 1999-2000 and fall 1979, 1988, 1999, (i) refers to money income and (c) refers to consumption possibilities, % is percentage of the corresponding aggregate inequality

Individual		100xGE(2)			
Subgroup	Year	Within-group inequality		Between-group inequality	
	full year	i (%)	c (%)	i (%)	c (%)
Household type	1987-1988	17.26 (98.80)	7.96 (93.54)	0.21 (1.20)	0.55 (6.46)
	1999-2000	25.99 (99.09)	11.81 (97.60)	0.24 (0.91)	0.29 (2.40)
Region	1987-1988	16.27 (93.13)	8.22 (96.60)	1.20 (6.87)	0.29 (3.41)
	1999-2000	25.19 (96.04)	11.74 (97.02)	1.03 (3.93)	0.36 (2.98)
Age group	1987-1988	17.14 (98.11)	8.40 (98.71)	0.33 (1.89)	0.11 (1.29)
	1999-2000	25.69 (97.94)	11.95 (98.76)	0.53 (4.39)	0.15 (1.24)
Sex	1987-1988	15.44 (88.38)	8.49 (99.76)	2.03 (11.62)	0.02 (0.24)
	1999-2000	24.64 (93.94)	12.05 (99.59)	1.59 (6.06)	0.05 (0.41)
Subgroup	fall	i (%)	c (%)	i (%)	c (%)
Household type	1979	29.45 (99.09)	9.88 (95.18)	0.27 (0.90)	0.50 (4.83)
	1987	17.12 (99.02)	7.70 (94.02)	0.17 (0.98)	0.50 (6.11)
	1999	26.31 (98.21)	12.42 (96.35)	0.48 (1.79)	0.47 (3.64)
Region	1979	28.07 (94.45)	10.05 (96.82)	1.65 (5.55)	0.33 (3.14)
	1987	15.77 (91.21)	7.86 (95.97)	1.52 (8.79)	0.33 (4.03)
	1999	25.37 (94.70)	12.36 (95.89)	1.42 (5.30)	0.53 (4.11)
Age group	1979	29.28(98.52)	10.28 (99.04)	0.45 (1.50)	0.09 (0.88)
	1987	17.01 (98.38)	8.12 (99.15)	0.28 (1.62)	0.07 (0.85)
	1999	26.27 (98.06)	12.74 (98.84)	0.52 (1.94)	0.15 (1.16)
Sex	1979	25.85 (86.98)	10.37 (99.90)	3.87 (13.02)	0.01 (0.01)
	1987	15.25 (88.20)	8.18 (99.88)	2.04 (11.80)	0.02 (0.24)
	1999	25.30 (94.44)	12.82 (99.46)	1.48 (5.52)	0.07 (0.54)
Household		Within-group inequality		Between-group inequality	
Subgroup	full year	i (%)		i (%)	
Household type	1987-1988	10.62 (92.51)		0.86 (7.49)	
	1999-2000	19.00 (95.38)		0.91 (4.57)	
Region	1987-1988	10.36 (90.24)		1.10 (9.58)	
	1999-2000	19.20 (96.39)		0.72 (3.61)	

Source: Author's calculations from the Time-use data

Note: HOUSEHOLD TYPES, 1. living with parents, unmarried, no-children under 18-years at age; 2. unmarried, divorced or widow, no children under 18-years at age; 3. married or living in cohabitation, no children under 18-years at age; 4. married or living in cohabitation, children under 18-years at age; 5. single parent, children under 18-years at age.

REGION, 1979: 1. Metropolitan area; 2. Other Southern Finland; 3. Central-Finland; 4. Northern Finland; 1987 and 1987-1988: 1. Helsinki; 2. Other Metropolitan area; 3. Other Southern Finland; 4. Central-Finland; 5. Northern-Finland; 1999 and 1999-2000: 1. Metropolitan area; 2. Uusimaa; 3. Northern-Finland; 4. Eastern-Finland; 5. Central-Finland; 6. Northern-Finland;

AGE-GROUP, 1. 25-34; 2. 35-44; 3. 45-54; 4. 55-64.

5 Conclusions

The paper analyzed the effect of consumption possibilities on inequality and low income results. Consumption possibilities are formed by money income supplemented by the value of household production. The data included three Time-Use Surveys of the Statistics Finland from 1979 to 2000. The main analysis was carried out for 25-64 years of old who were either employed, unemployed or taking care of one's household. Decomposition analysis showed how inequality is divided in within-group and between-group components. Comparative results were calculated, as an example, when parts of the data were excluded.

There is no single correct way to measure the value of household productive activities. The present study used the wage of a communal houseworker to value the time-inputs spent in main functions of the household. Some of the ancillary activities as well as volunteering were also included. The results of the study show that household production increases consumption possibilities of all income groups but its effect is most significant in low income deciles. As a share of consumption possibilities household production forms significantly more important part for low income earners than for high income earners. For high income earners money income dominates the formation of consumption possibilities.

Consumption possibilities are more equally distributed than money income among individuals. Thus, widening the traditional money income concept by including the value of productive household activities alters our understanding of the distribution of economic resources. Similarly, the amount of individuals below the low income line drops when moving from money income to consumption possibilities. Even when structure of households changes and labor force participation alters it is obvious that work carried out in households clearly raises individual's access to consumption goods and services in all times.

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A Descriptive statistics of the main sample

Table 11: Sample sizes

	1979	1987	1999	1987-1988	1999-2000
Households				5071	1959
All individuals	6948	2818	1403	8540	5623
Males	3294	1414	660	4214	2682
Females	3654	1404	743	4326	2941
Employed	6214	2570	1240	7878	4895
– males	3182	1348	611	4036	2437
– females	3032	1222	629	3842	2458
Unemployed	240	88	91	224	460
– males	106	46	43	124	217
– females	134	42	48	100	243
Taking care of one's household	484	120	62	350	248
– males	2	0	2	6	16
– females	482	120	60	344	232
Other main activity	10	40	10	88	20
– males	4	20	4	48	12
– females	6	20	6	40	8
Unmarried living with parents	300	128	27	384	130
– males	226	104	25	308	108
– females	74	24	2	76	22
Unmarried, divorced, widow	816	362	144	1114	565
– males	300	160	70	474	274
– females	516	202	74	640	291
Married, cohabiting, no children	1764	894	492	2732	2135
– males	826	434	235	1384	1042
– females	938	460	257	1348	1093
Married, cohabiting, children	3850	1356	698	4066	2627
– males	1926	702	328	2020	1236
– females	1928	654	370	2046	1391
Single parent, children	218	78	42	244	166
– males	20	14	2	28	22
– females	198	64	40	216	144

Source: Author's calculations from the Time-use data

Table 12: Sample means and standard deviations, males, females

	1979		1987		1999		1987-1988		1999-2000	
Individual data	mean	std.dev.	mean	std.dev.	mean	std.dev.	mean	std.dev.	mean	std.dev.
MALES										
Age	40	10	40	10	43	10	40	10	43	10
Income under state's tax	22167	15018	23904	13137	30164	21136	24449	13432	28650	20638
Time spent on market work[a]	374	254	373	268	272	270	357	276	243	268
Time spent on household production[b]	756	678	771	667	817	654	826	686	916	716
FEMALES										
Age	41	11	41	10	43	10	41	10	43	10
Income under state's tax	12615	9257	15982	8289	21293	15050	16272	8699	19976	12654
Time spent on market work	261	241	271	253	198	233	251	249	172	226
Time spent on household production	1641	916	1481	905	1434	846	1531	906	1553	902

Source: Author's calculations from the Time-use data

[a]Hours and minutes in a year
[b]Hours and minutes in a year

B Opportunity cost method

As a comparison to earlier obtained results, opportunity cost estimates by using individual wage rates, WOCT-method (see chapter 2.3), are applied to value housework time by using 1987-1988 individual data only. In the data there are no wage information for all individuals[13] and thus opportunity cost estimates are derived by using selectivity correction method of Heckman (Heckman, 1979). Heckman model eliminates bias due to missing data. It is a two equation model including both regression equation and selection equation. The variables in the selection equation are assumed to determine whether the dependent variable is observed or not. In the present case we have one equation predicting wages and other one predicting whether an individual will be working or not. Separate regressions are carried out for women and men. The model estimates a regression model of the hourly wage rates observed for those having value for hourly wage, and use this estimate to impute wage rates to all the adults in the sample (see e.g. Jenkins and O'Leary, 1994, p. 9). Estimated opportunity wage rates differ between individuals, unlike the wage value of a communal houseworker. Due to wage differences between individuals the inequality results obtained for consumption possibilities by using housekeeper's average wage are likely to be smaller than those obtained by using individual wage rates.

Hourly wage rates are calculated by using reported regular weekly working hours and salary obtained from register data (including already benefits in kind). Wage is the dependent variable which is assumed to be determined by education level, age and region. Education variable is a dummy for higher education, age is a continuous variable and region is a dummy for region of living. The selection equation includes age and dummies for region, marital status, higher education and children under 7-years at age. Dummy for husband's work status is included in women's selection equation.

The regression model is of the form,

$$y = v\beta + u_1 \tag{5}$$

and the selection model,

$$z? = u_2 > 0 \tag{6}$$

where the following holds,

$$u_1 \sim N(0, s), u_2 \sim N(0, 1), corr(u_1, u_2) =? \tag{7}$$

The results show that inequality indices GE(2) and Gini-coefficient for consumption possibilities as well as low income indices H and PGR for consumption possibilities rise when household production is valued by individual imputed wage rate, Table 13. Table 14 shows the estimation results first for wage equation and secondly for selection equation.

[13]Some of the individuals are not working or they are taking care of their households and thus have missing wage values.

Table 13: Individual aggregate inequality and low income results full year 1987-1988, by using opportunity cost method to value household production (i) refers to money income and (c) refers to consumption possibilities

	Individual							
Year	100xGE(2)		100xGini		H		PGR	
full year	i	c	i	c	i	c	i	c
1987-1988	17.47	10.67	30.33	23.87	14.03	7.12	6.65	2.04

Source: Author's calculations from the Time-use data

Table 14: Estimation results of the Heckman model

	1987-1988	
Wage equation	women	men
Intercept	7.471*	9.468*
Age	-0.004	0.022*
Higher education	0.519*	0.271
Region of living, 0 class is Helsinki:		
Other Metropolitan area	0.069	0.415
Other Southern Finland	-2.282*	-3.184*
Middle-Finland	-2.753*	-4.304*
Northern Finland	-2.119*	-3.787*
Selection equation	women	men
Intercept	2.411*	1.965*
Age	-0.016*	-0.006
Higher education	0.023	-0.041
Married or cohabiting	-0.400*	0.932*
Children under 7-years at age	-0.756*	-0.105
Husband working	0.365*	
Region of living, 0 class is Helsinki:		
Other Metropolitan area	0.034	0.065
Other Southern Finland	-0.256*	-0.397
Middle-Finland	-0.345*	-0.712*
Northern Finland	0.026	-0.823*
Number of observations	4326	4214
rho	-0.135	-0.334
sigma	3.520	4.875
lambda	-0.476	-1.627

Source: Author's calculations from the Time-use data
Note: *Significant at 95% confidence level.