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Working Paper

Economic inequality and household production: The effects of spezalization of genders

ETLA Discussion Papers, No. 867

Provided in Cooperation with:

The Research Institute of the Finnish Economy (ETLA), Helsinki

Suggested Citation: Heikkilä, Anni; Piekkola, Hannu (2003) : Economic inequality and household production: The effects of spezalization of genders, ETLA Discussion Papers, No. 867, The Research Institute of the Finnish Economy (ETLA), Helsinki

This Version is available at:

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Keskusteluaiheita – Discussion papers

No. 867

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**ECONOMIC INEQUALITY
AND HOUSEHOLD PRODUCTION
– The effects of specialization of genders**

HEIKKILÄ, Anni – PIEKKOLA, Hannu, ECONOMIC INEQUALITY AND HOUSEHOLD PRODUCTION – The effects of specialization of genders. Helsinki: ETLA, Elinkeinoelämän Tutkimuslaitos, The Research Institute of the Finnish Economy, 2003, 29 p. (Keskusteluaiheita, Discussion Papers, ISSN 0781-6847; No. 867).

ABSTRACT: Empirical evidence from several countries has shown that full income including the value of household production is more equally distributed than income earned from market work and unearned income. Trends in income distributions during 1988-2000 indicate an increase in economic inequality in Finland. However, the inclusion of the value of household production for a measure of full income partly reverses this trend. Inequality as measured using full income has actually decreased for women. This is despite the increase in unemployment rate as a consequence of the depression of the early 1990s and the increase in capital income of the highest income decile in the end of 1990s. Household work has the greatest equalizing effect for two-adult households. The specialization of genders allows the substitution of women's household work for paid market work. In two-adult households, women in the highest income decile do, on average, half as much housework, 21 hours per week, as women belonging to the lowest decile, who work 39 hours per week. Single women in the lowest income decile do significantly less household work, 28 hours per week. In fact, household work has a greater equalizing effect for single men than for single women.

JEL-codes: D31 J22 J16 J22

Keywords: income distribution, home production, time use research, leisure

HEIKKILÄ, Anni – PIEKKOLA, Hannu, ECONOMIC INEQUALITY AND HOUSEHOLD PRODUCTION – The effects of specialization of genders. Helsinki: ETLA, Elinkeinoelämän Tutkimuslaitos, The Research Institute of the Finnish Economy, 2003, 29 s. (Keskusteluaiheita, Discussion Papers, ISSN 0781-6847; No. 867).

TIIVISTELMÄ: Tutkimukset monista maista osoittavat, että kokonaistulot sisältäen kotitaloustyön ovat tasaisemmin jakaantuneet kuin ansiotulot tai pääomatulot. Vuodesta 1988 vuoteen 2000 tulonjaon eriarvoisuus Suomessa on kasvanut, kun mittarina käytetään ansiotuloja ja pääomatuloja. Kotitaloustyö huomioiden tulonjaon muutokset ovat olleet huomattavasti vähäisempiä ja eriarvoisuus on jopa vähentynyt naisten osalta. Tämä on tapahtunut huolimatta työttömyysasteen kasvusta laman myötä ja julkisten tulonsiirtojen jäädyttämisestä. Kotitaloustyö tasaa tulonjakoa eniten naimisissa tai avoliitossa olevien osalta. Työnjako miesten ja naisten välillä mahdollistaa sen, että naisten vähentäessä ansiotyötä kotitaloustyön määrä kasvaa. Suurituloisin kymmenys naimisissa tai avoliitossa olevista tekee kotityötä keskimäärin 21 tuntia viikossa, kun pienituloisimman kymmenksen kotityön määrä peräti 39 tuntia viikossa. Yksinelävillä naisilla kotitaloustyö on jakaantunut tasaisemmin riippumatta ansiotyön määrästä ja alhaisin tulokymmenes tekee keskimäärin 28 tuntia kotityötä viikossa. Itse asiassa kotitaloustyö tasaa jopa enemmän yksinäisten miesten kuin yksinäisten naisten tuloja.

Avainsanat: Tulonjako, kotitaloustyö, ajankäyttöaineisto, vapaa-aika

1 INTRODUCTION

Ignoring household production and its value clearly understates both aggregate output and total household income. Methods of including unpaid work and household production into national accounting are constantly being discussed and researched. According to Niemi and Hamunen (1999), estimates of the value of household work as a proportion of GDP have varied between 35-55 percent. Thus, household production is a significant factor when estimating the economic well-being of households. However, less attention has been paid to the impact of ignoring household production when assessing economic inequality.

At the present time there are only few studies clarifying the effect of the value of household production on economic inequality. Gottschalk and Mayer (1997) and Zick and Bryant (1985) for the US and Jenkins and O'Leary (1996) for the UK show that full income adjusted for the value of household production is substantially more equally distributed than money income. The objective of this paper is to examine how the inclusion of the value of household production affects economic inequality of Finnish households as measured by full income. The time use surveys conducted in Finland are comparable across time and have also worked as guidelines for the new time use studies in the EU coordinated by Eurostat. Deficiencies in the comparability of the earlier studies across time are well recorded. Jenkins and O'Leary (1996) even had to impute estimates of time use to the respondents of the British Expenditure Survey.

Household production is mostly conducted by women. In seven European countries (listed in Table 1), women accounted for 63% for employed and 59% for unemployed of total household production (see Piekkola and Harmoinen, 2003). These shares seem to have somewhat decreased compared to 1970s (see Chadeau 1992). Becker (1981) proposes a theory of comparative advantage to explain why men 'specialise' in paid work and women in unpaid work. Becker's notion is based on the idea of partnership and a concentration on the quantities of 'total work'. One way to defend the benefits of specialisation in paid and unpaid work is to analyse the fruits of production: the use of leisure time generated by joint effort in work. Bittman and Wajcman (1999) find evidence that men and women have similar quantities of total work, or free time, in a cross-section of countries, but the quality of leisure seems to differ. Harmoinen and Piekkola (2003) show evidence that total working hours are relatively constant irrespective of sex in seven countries considered. Spouses have also more similar leisure patterns after withdrawal from work and men bear

part of the household work burden (for non-employed persons see Huovinen and Piekkola, 2002, and after retirement see Ruuskanen, 2003).

In this study, we concentrate on examining economic inequality among three types of households: two-parent households and households headed by a single man or a single woman. This division is appropriate since “specialisation of genders” does not hold for singles and because it may have important consequences when considering the distribution of full income that includes household production. The proportion of single adult households has stayed around 40% of all households and 25% of all individuals considered (employed, unemployed or taking care of one’s own household). There seem to be notable income and household production differences between households headed by a single man or a single woman. In addition to the household study, we also examine trends in economic inequality and household production among Finnish men and women during 1988-2000.

Section 2 of this paper provides empirical evidence of the economic inequality of Finnish households and international results the effect of household production on economic inequality. The empirical data, the samples and the methods used in this study are described in Section 3. Section 4 provides our results of economic inequality and household production in Finland. Firstly, we analyse trends in economic inequality over 1988-2000 and secondly, we examine how household production affects inequality among Finnish two-adult households and households headed by a single man or a single woman. Concluding remarks are presented in Section 5.

This work has been carried out at the Research Institute of the Finnish Economy using the Finnish 1999-2000 Time Use Surveys made available by Statistics Finland.

2 PREVIOUS EMPIRICAL EVIDENCE

The investigation of economic inequality of households is a popular study area in economics. In this section we take a glimpse at the empirical evidence of the economic inequality of Finnish households and how it has developed during the past decade. We also present some international evidence of the effect of household production on economic inequality. Suoniemi (1999) has studied the development of income distribution in Finland during the period 1971-1996. He uses the Gini coefficient and its decomposition to estimate the changes in the distribution of functional income between different types of households, people with different educational backgrounds or socioeconomic status, people belonging to different age groups and living in different geographic regions. Suoniemi's general finding is that the positive trend of decreasing income inequality in Finland ended during the deep economic depression in the beginning of 1990s. The major reasons for rising income inequality during the 1990s are the increase in capital income of the highest income decile at the end of the decade, persistently high unemployment rate in excess of 9% compared to 3% before the recession, the frozen real level of public transfers and reductions in progressive income taxes to pre-recession levels. Suoniemi's more detailed findings of the development of income distribution among specific types of households cannot be utilised in this paper because his classification of households is too detailed for the purposes of this study.

The distribution of equivalent household income in Finland during the period 1987-2000 shows that inequality of Finnish households' disposable income increased between years 1993 and 2000 (Income Distribution Survey, Statistics Finland). Hence, the trend of increasing economic inequality during the first part of the 1990s found by Suoniemi (1999) continued until the end of the decade. The Gini coefficient of the distribution of disposable household income was 0.210 in 1993 but increased to 0.266 in 2000. The trend of increasing economic inequality among Finnish households seems to be turning in the beginning of the 21st century, because the Gini coefficient in 2001, 0.257, is slightly lower than in 2000.

The trend of increasing economic inequality can also be seen from the household income decile shares during the period 1990-2000 (Income Distribution Survey, Statistics Finland). The eight lowest income decile groups' share of total Finnish household income decreased during this time period while the highest (tenth) income decile group increased its share remarkably. The lowest income decile group earned 5.0 percent of the total

income in 1990 and its share had fallen to 4.3 percent in 2000. Meanwhile, the highest income decile group had increased its share from 18.4 percent to 23.4 percent. Decile shares for the year 2001 indicate that the trend of increasing income inequality in Finland seems to be turning. The lowest income decile group's share has remained at 4.3 percent but other low income decile groups have slightly increased their shares. At the same time the highest decile's share has fallen to 22.3 percent. The major reason for this is slower economic growth that has wiped out some of the capital incomes of the highest income decile group.

The purpose of the present paper is to examine how the addition of the value of household production to household income affects economic inequality. Gottschalk and Mayer (1997) have studied this effect for the USA. As a measure of inequality, Gottschalk and Mayer use the ratio of income at the twentieth percentile of the income distribution to median income (the p20/p50 ratio) and the income at the eightieth percentile of the distribution to median income (the p80/p50 ratio). Gottschalk and Mayer examine these ratios for the years 1976, 1977, 1987 and 1988. They find that inequality is lower in any year when income is adjusted for the value of household production than when it is not. Similar findings hold for the UK in Jenkins and O'Leary (1996) and for the US also in Zick and Bryant (1985).

Gottschalk and Mayer value household production with two different methods: the opportunity cost of time used and the replacement (market) cost of the goods and services produced at home. Their conclusions hold regardless of the valuation method used. We discuss the valuation methods of household production in Section 3.2. Gottschalk and Mayer also remind of the fact that in time use studies high-income households tend to report more hours of household work than low-income households. Thus, the absolute increase in income, which follows from adding the value of household production, tends to be largest for high-income households but it remains small relative to the base. Hence, the proportionate impact of adding the value of household production is smaller for high-income than for low-income households.

3 DATA AND METHODS

3.1 Data

The primary data used in this study come from the Finnish Household Time Use Survey 1999-2000 carried out by Statistics Finland. To estimate the 1988-2000 trends in economic inequality among Finnish men and women, we also use the Finnish Time Use Survey 1987-1988. (See Niemi and Pääkkönen, 1990, for a description of the 1987-88 survey and Väisänen, 2001, 2002, for a description of the 1999-2000 survey.) Next we will describe in detail how the data for 1999-2000 Time Use Survey were collected. The description draws from Väisänen (2001, 2002).

The Finnish Time Use Survey 1999-2000 data collected between 1 March 1999 and 29 April 2000 is the first one according to the Eurostat guidelines for harmonized European Time Use Surveys. The sampling design used was two phased single-cluster sampling, where households were regarded as clusters and individuals were the elementary units. Firstly, a sample of Finnish people older than 15 years of age was collected by Bernoulli sampling. Secondly, every person over 10 years of age living in the same household was taken into the sample. This resulted in 4800 households with 10978 people.¹

The households in the sample were uniformly divided to weeks and days. The sample consisted of 92 or 93 households for each weekday during the survey period lasting for a year. The weekend closest to the assigned weekday was assigned to each household, dividing Saturdays and Sundays equally.² People belonging to the sample were interviewed and they were asked to keep time-use diaries. Each individual was asked to complete a time-use diary for one day during the week and one day during the weekend. The same days were assigned to each member of a household.

The final sample consisted of 10,278 individuals, 6,272 of whom responded. Out of this group 5,224 people had both answered the interview and time-use diary for two days as requested. This resulted in time-use data for a total of 10,561 days. Before collecting the time-use diaries all members of the households were surveyed about necessary background information and data from administrative files were merged into this survey.

¹ Persons that had died or emigrated during the data collection period and those living in institutions were excluded. This reduced the size of households to 4677.

² Wednesdays were divided in half between the previous and following Saturdays.

The Household Sample Used

A subsample of households, comprising adults between 25 and 64 years of age, was selected for our study. Similarly to Gottschalk and Mayer (1997), the adult members of the household (both parents in two-parent households) included in our sample are either employed, unemployed or taking care of the household. This excludes students and retired people (also people on disability pension). People holding two jobs were excluded from our sample. Gottschalk and Mayer (1997) divide their 2,300 to 3,800 households between the years 1976 and 1988 also depending on whether they have children or not. We do not use this division, however, in the present study.

The subsample of two-parent households used in the present study consists of 854 Finnish households. The subsample of single men households includes 171 observations and the subsample of single women households consists of 189 observations. Yearly income (after taxes) and income statistics for the three subsamples are given in Table A.3 in the appendix. Income also includes post-tax capital gains, transfer disposable income and self-employment income. Full income consists of money income and the value of household production (the valuation method of household production we use is explained in Section 3.2). In Table A.4, we present statistics for the yearly values and weekly hours of household production and weekly hours of labour market work for each household type. Weekly hours of labour market work statistics were computed based on, first, reported hours of work and, second, on the predicted hours of work imputed with the Heckman selection model (see Section 3.2).

The Samples of Individual Men and Women Used

The 1987-1988 Time Use Survey does not include information on households, so we are only able to compare inequality among men and women as individuals. We set similar restrictions for men and women subsamples as we set for the household sample as described above. This similarity makes the inequality results comparable between different samples. The 1988 subsample of Finnish men and women consists of 4,505 observations 2,267 of which are women and 2,238 are men. The 2000 sample is smaller containing 2,441 individuals 1,253 of whom are women and 1,188 are men.

3.2 Methods

Our first measure of income is the traditional money income measure without accounting for home production or leisure:

$$Y_1 = H_h w_h + H_s w_s + O , \quad (1)$$

where H_h and H_s are the hours of market work of the head and spouse (if present); w_h and w_s are their wages and O is other income received by the household. Other income includes all non-labour income sources such as capital income, rents, family allowance and unemployment benefits. Money income assigns a value of zero to hours spent on unpaid work.

Piekkola and Harmoinen (2003) discuss the inclusion of the value of household production in family income when assessing option values for retirement. Valuing household work involves two steps: first we have to account for the time allocated in these activities and, second, an economic value has to be assigned to the time. In the present paper, household work is defined as activities performed without pay, and are related to the upkeep of the household and providing for its members. It includes housework such as cooking, cleaning, laundry, childcare, shopping, maintenance-related odd jobs, and related travel. Other main time use categories are paid work, leisure and personal care (including sleeping).

The two most widely used ways to value the time spent on household production are the market cost and opportunity cost valuation methods (Murphy, 1978). In the opportunity cost approach all hours are valued at an individual's wage under the assumption that home production is worth its opportunity cost, which is the income the individual could have earned had that time been spent in the labour market. Gottschalk and Mayer (1997) also assess the alternative of valuing all hours the same, also those spent in leisure. The market cost valuation method values time spent on household work at the hourly net wage of persons performing the same task in the market. In this paper we use the market cost valuation method. Thus our measure of full income is:

$$Y_2 = w_h H_h + w_s H_s + R(D_h + D_s) + O , \quad (2)$$

where D_h and D_s are the hours of home production of the head and the spouse (if present) and R shows the market cost of household work. The market cost of an hour

devoted to household work is the average net hourly wage of a Finnish communal household help worker, € 7.76. A Eurostat task force report (2003) suggests that if the purpose of the analysis is to describe “expenses forgone”, gross wages should be used as a value of household production. On the contrary, when it is thought that households earn the money by producing the services themselves it is more appropriate to use the net wage in the analysis (the household does not have to pay taxes or social security contributions to themselves). The purpose of this paper is to calculate “total disposable income” for the household, including the value of household production, so we use net wage as the value of household production.

Table 1 provides the values of household work (€ per hour) for Finland and six other European countries (Piekkola and Harmoinen, 2003). The wage costs to the employer include the social security payments paid by the employer, which equal the difference between the wage costs and the gross wage of the employee. The difference between the gross and net wage includes the social security payments made by the employee and income tax. After accounting for taxes and social security payments as described above, the net hourly rate is acquired.

Table 1. Wage rates for household work (euro per hour) in seven European countries in 2000

	Belgium	France	Finland	Germany	Netherlands	Portugal	UK
Wage costs to employer	8.96	11.12	12.84	9.63	7.43	2.12	6.31
Gross wage	7.07	8.35	9.80	8.00	7.00	1.89	6.31
Net wage	3.10	6.83	7.76	5.13	5.86	1.52	6.30

Source: Piekkola and Harmoinen (2003). In France the employer (if it is a household) can deduce from his taxes a sum that is approximately equal to 3 euros per hour while the employee can have a premium (in order to compensate for the negative utility of working because he is close to the assistance revenue) which is around € 0.3. In the Netherlands employer receives a wage cost subsidy of € 0.89 ($7.43 - 1.32 + 0.89 = 7.00$). In Germany the figures correspond to a full-time worker. In the UK calculated for someone who works 20 hours per week and 48 weeks per year. Assumes the person does not have a child under 16 living with them. This disqualifies them from the Working Families Tax Credit. It also assumes that the person has no income apart from this work. The figure is the lower quartile of the pay for part-time women workers found in the New Earnings Survey for 2000.

Like Gottschalk and Mayer (1997), we predict wages for persons with zero earnings with Heckman selection model. The purpose of using the Heckman model is to correct for selection into the labour market. The wage equation shown as Table A.1 in appendix includes variables for age, educational level, years of work experience and its quadratic, whole/part-time work, daytime work/night or shift work/period, weekend or other work and marital status. The selection equation includes the following identifying variables: age,

educational level, marital status, ownership of a home, city size and notable health problems affecting everyday life. In addition to these variables, the selection equation for women includes variables for children under age seven and spouse's (if present) participation in the labour market. The variables in the Heckman wage equation and selection equation are the same for both 1987-1988 and 1999-2000 data sets. The Heckman method is explained in detail in appendix A.

The Time Use Survey diary also includes the self-assessed reservation wage rate for the unemployed. The reported reservation wage is higher than the net hourly wage rate predicted by Heckman's model, as seen from the following table.

Table 2. Reservation wages and predicted wages of unemployed

Variable	Men	Women
Predicted net wage	6.8	4.8
Reservation wage	8.8	7.5

Note. Weighted by sample weight.

The reservation wage being higher than the predicted wage is in conformance with economic theory predicting that job offers are not accepted when reservation wages exceed the wages of job offers (for opposite results from Swiss data, see Sousa-Poza, Schmid, Widmer, 2001). The reservation wages are seemingly high given that many of the unemployed are long-term unemployed and have already lost some human capital.

Our data sets include several observations, 28% of all, where the respondent works less than 19 hours a week and still earns more than 4,800 euros per year. In 25% of individuals annual earned income exceeds € 10,000, while reported hours of work per week is less than 10 hours. This is rather unrealistic, so we decided to use Heckman selection model to predict the labour supply for this 28% share of suspicious observations. The labour supply equation shown as Table A.2 in appendix includes variables for age, educational level, years of work experience and its quadratic, whole/part-time work, daytime work/night or shift work/period, weekend or other work and marital status. The selection equation includes the following identifying variables: age, marital status, spouse's (if present) participation in the labour market, ownership of a home, city size and notable health problems affecting everyday life. The selection equation for women also includes a variable for children under age seven. We had to remove certain variables from the 1988 selection equation for men due to deficiencies in the 1988 data set related to too few men in non-employment.

Results for the Heckman selection model of labour supply are presented in Table A.2 in the appendix. Table 3 below shows mean statistics for men and women samples (some values are predicted with the Heckman model). Note that annual net income statistics in Table 3 differ from the statistics presented in Table A.4 in the appendix. In Table 3 annual net income and predicted annual net income contain net income from market work, entrepreneurial income and unemployment benefits. In the sample statistics of Table A.4 in the appendix income is determined in the same way as predicted income but also includes post-tax capital gains and family allowance.

Table 3. Sample Statistics of Men and Women in 2000 and 1988

Variable	Men 2000		Men 1988		Women 2000		Women 1988	
	Mean	Std. Err	Mean	Std. Err	Mean	Std. Err	Mean	Std. Err
Hourly wage incl. holiday accrual	14.3	0.740	17.9	0.468	10.4	0.232	12.5	0.289
Hourly wage	13.0	0.670	16.5	0.433	9.4	0.199	11.5	0.266
Predicted hourly wage incl. holiday accrual	15.4	0.776	18.0	0.466	11.3	0.219	12.8	0.286
Work per week	31.2	0.765	35.8	0.680	25.2	0.624	26.8	0.603
Predicted work per week	36.2	0.649	43.3	0.534	30.6	0.525	33.8	0.508
Domestic work per week	14.6	0.380	13.2	0.318	26.0	0.479	27.6	0.434
Annual net income	16196	524	17189	178	12705	180	12641	136
Predicted annual net income	23317	1239	20204	238	16082	320	14175	191
Net capital income	1989	424	47	6	833	251	34	4
Domestic work income	5898	154	5329	129	10520	194	11174	175
Age	43	0.339	37	0.263	43	0.305	37	0.257
% having children 0-6 years	20 %	0.012	23.2 %	0.010	19 %	0.012	24.0 %	0.010
% married	74 %	0.017	72.7 %	0.010	78 %	0.014	73.6 %	0.010
% owner-occupied house	72 %	0.016	75.8 %	0.010	77.9 %	0.014	74.8 %	0.010
% in employment	91.1 %		96.1 %		87.0 %		90.0 %	
% in employment and entrepreneurs	15.3 %		14.8 %		8.9 %		11.0 %	
% in unemployment	8.5 %		3.8 %		8.9 %		6.9 %	
% at home	0.4 %		0.1 %		4.1 %		3.1 %	

Note. Weighted by sample weight. All values are in euros. Predicted values are imputed with the Heckman selection model. Annual net income and predicted annual net income contain net income from market work, entrepreneurial income and unemployment benefit.

Table 3 above shows average values for employed, unemployed and those taking care of the household as all are included in our analysis. Predicted annual net income of employed non-entrepreneurs is slightly higher than the values shown in Table 3, i.e. € 26,233 for men and € 18,146 for women in 2000 (inclusion of entrepreneurs does not change dramatically

the average values). The annual income of all full-time employed recorded by Statistics Finland exceeds this by 13% for men and by 23% for women in 2000 (this is € 29,663 for men and € 23,375 for women in 2000, obtained by multiplying monthly earnings by 12.5 months). Thus, our estimate of average earnings fits rather well in the official statistics, when taking into account that 6% of workers work less than 30 hours per week. It is also noteworthy that in the comparison of 1988 and 2000, ageing of the working age population is shown as an increase in the average age from 38 to 43 years. The unemployment rate of men is also over two times higher in 2000 as compared to 1988. The share of the workforce in part-time work has remained at 6% for men and increased from 14% to 18% for women from 1989 to 2002 (Statistics Finland, 2003).

It is seen that men did more and women slightly less domestic work in 2000 as compared to 1988. The median of the weekly hours women allocate to household work decreased from 23 hours and 24 minutes to 22 hours and 44 minutes during the period 1988-2000 (not reported). At the same time men have increased their median weekly hours of household work from 10 hours and 32 minutes to 12 hours and 2 minutes. When men and women are put together, the median weekly hours have decreased slightly, from 17 hours and 33 minutes to 17 hours and 3 minutes. In Table A.4 in the appendix we present income and full income statistics for men and women together and separately based on both 1987-1988 and 1999-2000 data sets.

4 INCOME INEQUALITY RESULTS

In this study, the income inequality of households is measured by the Gini coefficient and by the income distribution percentile ratios $p90/p10$, $p90/p50$ and $p10/p50$ ($p90$ means income at the ninetieth percentile of the income distribution, $p50$ means median income and $p10$ means income at the tenth percentile of the income distribution). These inequality measures are calculated first for income including capital gains, transfer disposable income and self-employment income (all incomes are calculated after taxes). Then, the Gini coefficient and percentile ratios are calculated for full income meaning the sum of money income and the value of household production. Thus, our income definition approaches the Haig-Simons comprehensive definition, see Gottschalk and Smeeding (1997).

We begin by comparing trends in income and full income inequality over 1988-2000 among Finnish men and women all calculated after taxes. We continue with a more detailed review of income and full income inequality in 2000 concentrating on the inequality among Finnish two-parent households and households headed by a single man or a single woman.

4.1 Inequality and Household Production in 1988 and 2000

As discussed, the Time Use Survey 1987-1988 provides us only with information on individuals, not on households. Thus, in Table 4 we assess income inequality trends by comparing the income distributions of Finnish 25 to 64 year old men and women between the relevant years.

A general conclusion is that economic inequality increased in Finland during 1988-2000 but the trend is partly reversed when measured by full income. The most important factor behind the increase in inequality is probably the rise in capital income revenues of the highest income decile and the permanent increase in unemployment in Finland as a consequence of the deep depression of the early 1990s. This also explains why the greatest proportionate increase in inequality has taken place in the income distribution of men. During the period 1988-2000 the income Gini coefficient of men increased from 0.263 to 0.378. The increase in men's full income inequality was more moderate with the Gini coefficient rising from 0.253 to 0.314 over the same period.

Table 4. Individual Income Distribution in 1988 and 2000

Individuals	p90/p10	p90/p50	p10/p50	Gini Coefficient
Income Distribution				
1988	5.21	1.69	0.33	0.288
2000	4.99	1.95	0.39	0.363
Full Income Distribution				
1988	3.31	1.52	0.46	0.232
2000	2.80	1.63	0.58	0.264
Men Income Distribution				
1988	3.76	1.67	0.44	0.263
2000	5.07	1.97	0.39	0.378
Men Full Income Distribution				
1988	3.78	1.59	0.42	0.253
2000	3.36	1.75	0.52	0.314
Women Income Distribution				
1988	6.42	1.58	0.25	0.290
2000	4.78	1.76	0.37	0.315
Women Full Income Distribution				
1988	2.81	1.45	0.52	0.209
2000	2.25	1.48	0.66	0.203

The income inequality of women excluding household production, as measured by the Gini coefficient, has increased only a little, from 0.290 in 1988 to 0.315 in 2000. For women full income inequality has actually decreased during the period examined. The full income Gini coefficient has decreased from 0.209 in 1988 to 0.203 in 2000.

Some interesting remarks can be made when looking at the income and full income distribution percentile ratios for men and women separately and together. The overall trend of the p90/p50 and the p10/p50 ratios indicates that both extreme ends of the income distributions have improved their relative position while people with median income have lost ground. The p90/p50 ratios of both male and female income distributions have increased during the period 1988-2000, implying increased inequality. When we take the value of household production into account, the increase of the p90/p50 ratios becomes more moderate. The p10/p50 ratios have, generally speaking, increased indicating that the inequality gap between the lowest ends and the middle parts of the income distributions has narrowed. The increase in the p10/p50 ratio, indicating declining inequality, is greater when the value of household work is added to the income distributions. This effect is stronger for women and explains the decrease in Gini coefficient.

The results suggest that men and women in the lowest and highest income decile groups have increased the daily hours they devote to household work relative to individuals at median incomes. The number of weekly hours spent on household production for women who belong to the fifth income decile group decreased from 28 hours and 31 minutes in 1988 to 25 hours and 43 minutes in 2000. The amount household work done weekly has instead stayed relatively constant at around 40 hours for women in the lowest income decile group. Women's full income percentile ratio p10/p50 in thereby increased during the period studied. For both men and women, the equalizing effect of household production was greater in 2000 as compared to 1988.

4.2 Inequality of Two-Parent Households in 2000

A median Finnish two-parent household where both adults are either employed, unemployed or taking care of the household (the sample used is described above) allocates, on average, 38 hours and 30 minutes per week to household work. According to the data used in this study, the median net income of a Finnish two-parent household is 36,887€ per year. When the value of household production is added to net income, the median income of a two-parent household increases to € 53,698 per year.

The Gini coefficient of the distribution of Finnish two-parent households' net income is 0.303. When households' income is adjusted for the value of household production, the Gini coefficient decreases to 0.229, which indicates remarkably less severe economic inequality among two-parent households. The percentile ratios of the income distribution also indicate less economic inequality. The p90/p10 ratio for the distribution of income is 3.38 but using the full income measure it decreases to 2.36. This narrowing of the income distribution can be observed also when comparing income at the ninetieth and tenth percentile of the income distribution to median income. The p90/p50 ratio declines from 1.74 to 1.57 after adding the value of household production to net income. The p10/p50 ratio increases from 0.51 to 0.67, which also indicates a more equal distribution of income. All the inequality measures described above are presented in Table 5.

Table 5. Inequality Measures for Two-Parent Households

Two Adults	p90/p10	p90/p50	p10/p50	Gini Coefficient
Income Distribution	3.38	1.74	0.51	0.303
Full Income Distribution	2.36	1.57	0.67	0.229

Hence, both the Gini coefficients and income distribution percentile ratios show less inequality among Finnish two-adult households when household income is adjusted for the value of household production. Two-adult households belonging to the highest earning income decile allocate on average 36 hours and 38 minutes to household production every week. This is less than 46 hours and 40 minutes, the weekly average allocated to household work by the lowest income decile group. These figures give an explanation to the remarkably lower full income p90/p10 percentile ratio. The Gini coefficient of the distribution of household production is 0.288. This is lower than the net income Gini coefficient because hours of household production decrease with income level in two-parent households. The major explanation for this is the adjustment in female household work following from the specialisation of genders as analysed by Becker (1965, 1981). The following table shows mean market work and household work hours performed weekly by four labour supply categories of women.

Table 6. Mean weekly hours of earned work and household work by female labour supply categories

Women weekly labour supply	Obs	Female spouse			Male spouse		
		Earned work	House work	Total work	Earned work	House work	Total work
less than 10 h	195	1.5	39.0	40.4	38.2	17.1	55.2
10-35 h	195	29.1	25.6	54.7	53.1	14.2	67.0
35-40 h	232	38.8	20.8	59.6	52.5	13.0	65.2
over 40 h	226	49.2	17.0	66.2	55.4	13.0	68.3
All	848	30.2	25.3	55.5	49.9	14.3	64.0

Note. Earned work is work with earned income including travelling to work and lunch hours.

It is seen from Table 6 that couples who are married or in consensual union work 9 hours more than men. Women also appear to clearly specialize in their work so that a decrease in their earned work hours is followed by an increase in household work. The labour supply of men is, instead, fairly insensitive to female labour supply.

The table 7 shows the amount household work done by various income deciles of the respective gender.

Table 7. Mean weekly hours of household work by gender's income deciles

	p10	Median	p90
Women Weekly Household Work			
Married	38.9	23.8	20.9
Single	27.5	19.1	20.2
Men Weekly Household Work			
Married	16.1	12.5	12.9
Single	16.2	11.3	10.4

Note. p10 and p90 indicate the weekly average hours of household work of these net income deciles. Median indicates daily median hours of household work of the group.

It is seen that household work of female spouse systematically decreases when her earned income increases. Married women in the highest income decile do on average two times less housework, 21 hours per week, than married women belonging to the lowest decile, 39 hours per week. Single women in the lowest income decile do significantly less household work, 28 hours per week. Much of the equalizing effect of household work attributes then to the allocation of total work between earned work and household work among married women. Gender specialisation cannot take place among singles, leading to much lower decrease in household work as paid work increases.

Figure 1. Lorenz Curves for Two-Parent Households

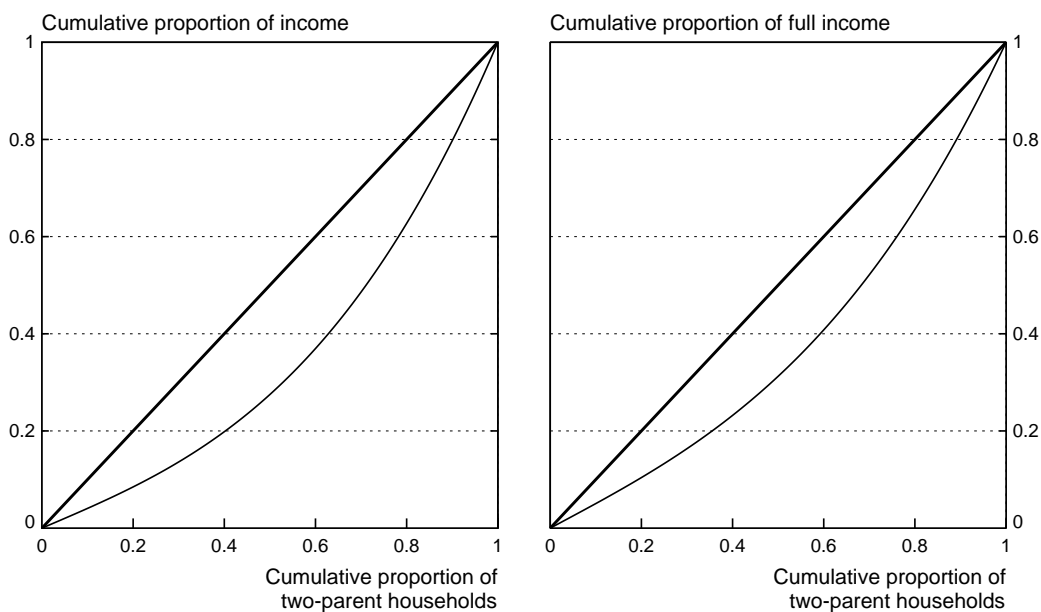


Figure 1 above illustrates Lorenz curves that depict income and full income distributions for Finnish two-parent households. The equality distribution is represented by a diagonal line. The greater the deviation of the Lorenz curve from this line, the greater the inequality.

4.3 Inequality of Households Headed by a Single Adult in 2000

Economic inequality of Finnish single adult households seems to be greater than inequality of Finnish two-parent households. A median Finnish single woman (the sample used in this paper is described above) allocates an average of 19 hours and 10 minutes per week to household work. It should not come as a surprise that a median Finnish single man (in our sample) allocates remarkably less time to housework, only 11 hours and 20 minutes per week. The data of our study show the median income of a single woman at € 16,118 per year. This figure increases to € 24,200 per year when the value of household production is taken into account. For Finnish single men the median income, € 18,370 per year, is a little higher than for single women. When the value of household production is added to net income, the median income of single men increases to € 22,523 per year. This lower full income median figure also indicates the fact that single men devote less time to household work than single women. According to Piekola (2003), women perform on average 10 hours more household work each week during their lifetime. All the inequality measures of single men and women are shown in Table 8.

Table 8. Inequality Measures for Households Headed by Singles

Single Households	p90/p10	p90/p50	p10/p50	Gini Coefficient
Men				
Income Distribution	7.20	1.98	0.28	0.422
Full Income Distribution	4.32	1.85	0.43	0.341
Women				
Income Distribution	4.45	2.02	0.46	0.323
Full Income Distribution	2.39	1.64	0.69	0.232

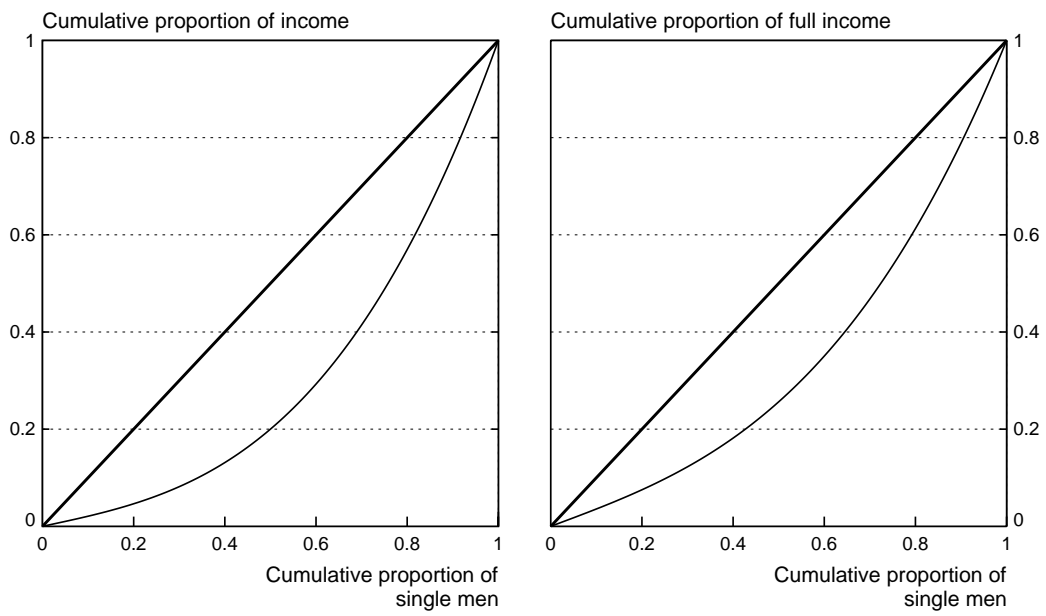
The Gini coefficient of the income distribution of single men is as high as 0.422 but the equivalent full income measure is significantly lower at 0.341. The Gini coefficient of single women's income distribution, 0.323, is almost ten percentage points lower than the corresponding figure for single men. The inclusion of household production drops this to 0.232.

The p90/p10 percentile ratio of the distribution of single men's income is as high as 7.20 indicating that single men belonging to the highest decile of the net income distribution earn 7.2 times more than single men belonging to the lowest decile of the same distribution. This p90/p10 ratio falls to 4.32 when the value of household production is taken into account. The corresponding p90/p10 ratios for single women are 4.45 and 2.39. A comparison between single men and women shows that household production has a more significant effect for men at the extreme ends of single's income distributions. These results can also be explained by the absence of the possibility of specialisation of female work as in two-parent households. Household work is much more evenly spread between single women than between non-single women. The Gini coefficient of the distribution of household production is indeed 0.415 for single men and 0.341 for single women. Single women belonging to the lowest net income decile spend 27 hours and 32 minutes every week on average on household work, while the highest net income decile of single women spends 20 hours and 11 minutes (see Table 7 before). The respective figures for single men are 16 hours and 13 minutes and 10 hours and 23 minutes.

The p10/p50 percentile ratios show the equalizing effect of household production to be clearest in the lower ends of single's income distributions. Single men's alarmingly low income p10/p50 percentile ratio, 0.28, increases to 0.43 when the value of household production is taken into account. The full income of the lowest decile of single men is thus 43 percent of single men's median full income. Single women's p10/p50 ratios rise from 0.46 to 0.69 for full income. The magnitude of the equalizing effects of household work tends to reverse on the upper tail of the income distribution. The p90/p50 ratio of single men's income distribution, 1.98, decreases to only 1.85 when the value of household production is added to the calculations. Household production results in a larger decline in single women's corresponding p90/p50 percentile ratio from 2.02 to 1.64.

The income distribution of Finnish single men and especially its lowest end provokes more concerns than income distributions of single women or two-parent households. The Gini coefficients of single men's income and full income distributions are the highest of all the Gini coefficients examined here. On the other hand, household production has a surprisingly remarkable equalizing effect even in the distribution of single men's income. Figure 2 shows Lorenz curves that depict income inequality between Finnish single men. Here again, one of the curves depicts the inequality of the distribution of income and the other depicts the same thing for full income including the value of household production.

Figure 2. Lorenz Curves for Households Headed by A Single Man



5 CONCLUSION

In this paper we have shown that the value of household production has an important decreasing effect on economic inequality in Finland. This study used data from the Finnish Time Use Surveys 1999-2000 and 1987-1988 to determine the amount of household work performed by Finnish men and women (in 1988 and in 2000) and by Finnish two-parent households as well as households headed by a single man or a single woman (in 2000). Similar to findings in other countries, full income including the value of household production is more equally distributed than plain net income for all the groups examined both in 1988 and in 2000. This result held regardless of whether we used the Gini coefficient or income distribution percentile ratios to measure inequality.

The 1988-2000 trends in income indicate an increase in economic inequality in Finland. This increase is due to the increase in capital incomes of the highest income decile and the persistent high unemployment rate as a consequence of the depression of the early 1990s. The freeze in public transfers only partially explains our results, since only family allowances and unemployment benefits are included. However, this trend of increasing inequality became less severe or even reverses for women when we added the value of household production to income. This is despite the fact that during the time period 1988-2000 Finnish women with the lowest net income have reduced their weekly average hours of household work while Finnish men with the lowest net income have increased their weekly hours of household work.

The specialisation of genders in two-adult households leads to the greatest equalizing effect of household work. Households belonging to the lowest decile of the net income distribution allocate notably more time to household production than households belonging to the highest decile of the net income distribution. This difference was greatest among women in two-adult households, where the lowest net income decile spends 1.9 more time on household work than the highest net income decile (Table 7). The comparable difference is 1.4 times for single women.

Economic inequality among Finnish single adult households is more severe than inequality among Finnish two-parent households. This plausibly attributes to the lower socio-economic position of single adults. Economic inequality of single men is clearly greater than inequality of single women or two-parent households. The Gini coefficient of single men's income distribution is as high as 0.422 and even after adding the value of household production into the calculations it still amounts to 0.341. Household work is

most unequally distributed between Finnish single men but in a way that it also has a stronger equalizing effect than for single women. Single men belonging to the highest net income decile earn 7.2 times more net income than single men belonging to the lowest income decile, and after adding the value of household production they still earn 4.3 times more. To compare, two-parent households belonging to the highest net income decile earn 3.4 times more net income and 2.4 times more full income than two-parent households belonging to the lowest income decile.

Bibliography

- Bittman, Michael and Wajcman, Judy (1999): The Rush Hour: The Quality of Leisure Time and Gender Equity, Social Policy Research Centre Discussion Papers 97. Sydney.
- Blundell, Richard and Macurdy, Thomas (1999): Labour Supply: A Review of Alternative Approaches. In *Handbook of Labour Economics*, Volume 3, Chapter.27, Ed. by Ashenfelter and Card. Elsevier Science B.V.
- Becker, Gary S. (1965): A Theory of Allocation of Time. *The Economic Journal*, 75:299, 493-517.
- Becker, Gary S. (1981): *A Treatise on the Family*. Cambridge, Massachusetts, USA.: Harvard University Press.
- Carlin and Flood (1997): Do children affect the labour supply of Swedish men? Time diary vs. survey data. *Labour Economics*, , 167-183.
- Carroll R.J., Ruppert D. ja Stefanski L.A. (1995): Measurement Error in Nonlinear Models. London: Chapman & Hall.
- Chadeau A. (1992): What is households' non-market production worth? *OECD Economic studies* 18. Paris.
- Flood, Lennart and Gräsjö, Urban (1999): Regression Analysis and Time Use Data: A Comparison of Microeconomic Approaches with Data from Swedish Time Use Survey, Working Papers in Economics no.5, School of Economics and Commercial Law, Göteborg University.
- Gottschalk, Peter and Mayer, Susan E. (1997): Changes in Home Production and Trends in Income Inequality. *Boston College Working Papers*, No. 382.
- Gottschalk, Peter and Smeeding, Timothy M. (1997): Cross-National Comparisons of Earnings and Income Inequality. *Journal of Economic Literature*, 35, 633-687.
- Task force report for Eurostat (2003): Household Production and Consumption. Proposal for a Methodology of Household Satellite Accounts., Unit E1. Forthcoming.
- Jenkins, Stephen and O'Leary, Nigel (1996): Household income plus household production: the distribution of 'extended income' in the U.K., *Review of Income and Wealth*, 42, 401-419.
- Jenkins, Stephen and O'Leary, Nigel (1997): Gender differential in domestic work, market work, and total work time: UK time budget survey evidence fro 1974/5 and 1987, *Scottish Journal of Political Economy*, 44, 153-164.
- Murphy, Martin (1978): The Value of Nonmarket Household Production: Opportunity Cost Versus Market Cost Estimates. *Review of Income and Wealth*, 24, No. 3, 243-255.
- Niemi, Iris and Pääkkönen, Hannu (1990): Time use changes in Finland in the 1980s. *Statistics Finland Studies No. 174*. Helsinki.
- Niemi, Iris and Hamunen, Eeva (1999): Developing a Satellite Account of Household Production. *Bulletin of the International Statistical Institute*, Proceedings from the 52nd session, Tome LVIII, Finland 1999.
- Piekkola Hannu (2003): ”Työssä jaksaminen kiireiden ja vapaa-ajan puristuksissa – tutkimus ikääntyvien ajankäytöstä” (Well being at work under busy life and leisure attractions, Well being at work program), Työssä Jaksamisen Ohjelma.
- Piekkola, Hannu and Harmoinen, Liisa (2003): Options for Retirement: Time Use and Health in a Cross-Section of Countries. The Research Institute of the Finnish Economy Discussion Paper 868. Helsinki.

- Sousa-Poza, Alfonso; Schmid, Hans and Widmer, Rolf (2001): The allocation and value of time assigned to housework and child-care: An analysis for Switzerland. *Journal of Population Economics*, 14, 599-618.
- Statistics Finland (2003): Income Distribution Survey. Accessed at <http://www.stat.fi/tk/el/tulo/tulonj.html>. 9.6.2003.
- Statistics Finland (2003): Changes in working time (Työajan muutokset). Helsinki.
- Suoniemi, Ilpo (1999): Tulonjaon kehitys Suomessa ja siihen vaikuttavista tekijöistä 1971-1996. *Labour Institute for Economic Research, Studies* no. 76.
- Väisänen, Paavo (2001): Ajankäyttötutkimuksen painokertoimet (The Use of Weights in Time Use Survey). *Lecture notes*. Statistics Finland.
- Väisänen, Paavo (2002): Estimation Procedure of the Finnish Time Use Survey 1999-2000. *Mimeo*. Presented at the IATUR annual conference in Lisbon, Portugal October 15th -18th 2002. Statistics Finland.
- Zick C.D. and Bryant W.K (1985): Income Distribution Implications for Rural Household Production, *American Journal of Agricultural Economics* (December).

Appendix A: Data and Imputation of Market Wage and Work

The Finnish Time Use Survey contains information on annual salaries, entrepreneurial income and unemployment benefits from the official registers. Hourly wages are assessed using regular weekly working time (differing most clearly in part-time and full-time jobs). Holiday arrangements can also be excluded from working hours given the lower accrual in part-time and temporary work. The Heckman method is used for imputing the hourly wage rate, when initial hourly wage is zero euros (even with a positive labour supply). The specifications used are:

$$w = \mathbf{x}\boldsymbol{\beta} + e_1$$

where w is the gross wage rate. The selection equation is:

$$\mathbf{z}\boldsymbol{\gamma} + e_2 > 0$$

where:

$$e_1 \sim N(0, \sigma^2), \quad e_2 \sim N(0, 1)$$

$$\text{corr}(e_1, e_2) = \rho$$

The exogenous variables \mathbf{x} in the wage equation are age-cohort dummies, dummies for educational level, years of work experience and its quadratic, a part-time work dummy, a working time dummy (daytime work/night or shift work/period, weekend or other work) and a marital status dummy (see Table A.1). The exogenous variables \mathbf{z} in the selection equation for doing market work include age-cohort dummies, dummies for educational level, a marital status dummy, an owner occupied house dummy, a region dummy (city/smaller town or countryside) and a dummy for notable health problems affecting everyday life. In addition to these variables, the women's selection equation includes a small children dummy and a dummy for spouse's participation in the labour market. The threshold variable in the selection equation is the maximum level of benefits attainable by not working in Finland (5,000 euros per year in 2000). Equivalent values for 1988 have been corrected for using an index of wages (i.e. by factor of 1.623, see also Table A.4 later).

The implied wage rates are estimated separately for males and females. This is because there is evidence that the male participation in the labour market is determined by different factors than the female participation.³ Heckman's method passes the rho-test when applied to both women and men. Table A.1 below shows the estimation results

³ For empirical facts and recent trends in female and male participation rates look for example Blundell and MaCurdy (1999).

Table A.1 Heckman Wage Estimation Results

Wage Equation	Men 2000		Men 1988		Women 2000		Women 1988	
	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.
Age 25-34	-0.411	(0.253)	0.039	(0.068)	0.379	(0.296)	-0.227	(0.083)**
Age 35-44	-0.326	(0.216)	-0.039	(0.086)	0.331	(0.232)	-0.127	(0.104)
Age 45-54	0.106	(0.166)	-0.103	(0.08)	0.374	(0.179)*	-0.048	(0.096)
Education: vocational	0.090	(0.096)	0.220	(0.042)**	0.125	(0.093)	0.131	(0.049)**
Education: university	0.452	(0.107)**	0.781	(0.059)**	0.563	(0.113)**	0.739	(0.065)**
Work experience	0.059	(0.019)**	0.071	(0.011)**	0.034	(0.024)	0.054	(0.011)**
Work experience squared	-0.002	(0)**	-0.001	(0)**	-0.001	(0)	-0.001	(0)**
Part time work	0.360	(0.187)	0.191	(0.092)*	0.167	(0.085)*	0.409	(0.067)**
Night / shift work	0.131	(0.056)*	0.065	(0.045)	0.045	(0.034)	-0.111	(0.042)**
Period / weekend / other work	-0.540	(0.078)**	-0.436	(0.063)**	-0.812	(0.103)**	-0.811	(0.092)**
Married	0.015	(0.088)	0.191	(0.055)**	0.020	(0.084)	-0.120	(0.044)**
Constant	4.189	(0.425)**	2.722	(0.101)**	3.286	(0.459)**	3.303	(0.091)**
Selection Equation								
Age 25-34	-0.087	(0.248)	0.460	(0.209)*	-0.139	(0.199)	0.640	(0.14)**
Age 35-44	-0.080	(0.245)	0.477	(0.201)*	0.104	(0.218)	0.768	(0.194)**
Age 45-54	-0.029	(0.232)	0.575	(0.557)	-0.248	(0.179)	0.316	(0.141)*
Education: vocational	0.083	(0.158)	0.423	(0.124)**	0.181	(0.142)	0.466	(0.104)**
Education: university	0.533	(0.24)*	0.218	(0.317)	0.145	(0.171)	0.289	(0.176)
Married	0.568	(0.144)**	0.345	(0.157)*	-0.144	(0.14)	-0.053	(0.129)
Owning a home	0.305	(0.145)*	0.042	(0.158)	-0.069	(0.126)	-0.168	(0.097)
Living in a town / in countryside	0.051	(0.128)	-0.176	(0.177)	-0.148	(0.106)	-0.332	(0.17)
Serious health problems	-0.333	(0.122)**	-0.424	(0.394)	-0.171	(0.104)	-0.671	(0.155)**
Children under 7 years					-0.626	(0.145)**	-0.330	(0.133)*
Spouse is working					0.226	(0.115)*	0.240	(0.117)*
Constant	0.054	(0.374)	0.887	(0.355)*	1.565	(0.345)**	1.211	(0.237)**
No. observations	1035		1719		1181,000		2010	
Rho	-0.962		-0.980		-0.938		-0.921	
Sigma	0.866		0.641		0.912		0.806	
Lambda	-0.833		-0.628		-0.855		-0.742	

Note. * Significant at 95% confidence level, ** Significant at 99% confidence level.

The table shows that educational level, age group (age cohort 55-64 is the reference), work experience, working time, marital status and serious health problems are all important determinants, although statistically more significant in the 1988 study. The coefficients are surprisingly similar in 1988 and 2000 indicating the stability of the model.

The amount of zero responses for hours worked is a common problem with time use surveys. For example in the data for 2000, 17% of workers with an annual income exceeding € 4,800 report zero working hours. One reason for this is that although weekly working hours are usually longer for some reason work was not done during the day diary was completed. Another possibility is that the employee no longer participates in the labour market. Depending on the reason for the zero observations, this problem is usually handled by an application of either the Tobit model, Heckman's selection model, Cragg's Double-Hurdle model or other models correcting for measurement errors (see Carroll, 1995). Flood and Gråsjö (1999) compared the suitability of the Double-Hurdle model and Heckman selection model and found Double-Hurdle model not necessarily better than the Heckman model or even Tobit model.

The exogenous variables used in the Heckman labour supply model are almost the same as those used in the Heckman wage model. The educational level dummy is not used in the labour supply selection equation and we also had to remove certain variables from the men's 1988 labour supply selection equation due to deficiencies in the 1988 data set (Table A.2). In the wage and labour supply equations (Tables A.1 and A.2), the most significant variables in explaining labour force participation were age group (age cohort 55-64 is the reference), educational level (only in wage equation), marital status (only for men), and the presence of small children (only for women). Although not always statistically significant, the coefficient of serious health problems had the expected sign: it reduced labour market participation. Surprisingly a spouse's participation in the labour market seemed to increase women's participation and this effect was even statistically significant in the women's wage equation.

The information was then used to calculate the annual wage rate based, not on average weekly hours, but on the data from the diaries. There is evidence that much information about hours of market work differs between time use data and other records. Diaries provide better data on the true hours worked accounting for breaks, sickness and other interruptions. The difference can lead to serious variation in the estimation results. For example, Carlin and Flood (1997) show that only time-use data yield evidence of a negative effect of the presence of children on male labour supply. As our purpose was to analyse

income distribution based on time devoted to market work and domestic work, the natural starting point is to use diary figures also for paid market work. Annual unemployment benefits adjusted for months in unemployment are instead used as a basis for income if the individual was unemployed in the period the survey was conducted. Results for the annual income calculations are shown in Tables A.3 and A.4 below.

Table A.2 Heckman Labour Supply Estimation Results

Supply Equation	Men 2000		Men 1988		Women 2000		Women 1988	
	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.
Age 25-34	-9.136	(8.279)	4.321	(2.259)	-5.566	(6.445)	-8.647	(2.818)**
Age 35-44	-4.880	(6.135)	5.035	(2.391)*	-5.698	(4.797)	-8.348	(3.542)*
Age 45-54	1.366	(3.749)	1.245	(2.671)	-1.245	(3.287)	-4.373	(3.322)
Education: vocational	1.447	(2.344)	0.000	(0)*	-0.510	(1.605)	-2.211	(1.41)
Education: university	3.203	(2.973)	-4.454	(2.871)	-0.050	(2.353)	-4.602	(3.025)
Work experience	-0.517	(0.675)	0.000	(0)**	-0.088	(0.489)	0.484	(0.362)
Work experience squared	0.001	(0.013)	0.000	(0)**	-0.003	(0.009)	-0.011	(0.008)
Part time work	-10.796	(3.663)**	-7.237	(4.112)	-4.144	(2.398)	-10.614	(1.696)**
Night / shift work	-3.177	(2.591)	0.000	(0)	2.633	(1.83)	-3.221	(1.568)*
Period / weekend / other work	-12.802	(2.102)**	-6.826	(2.105)**	-13.004	(2.282)**	-11.097	(1.835)**
Married	-1.571	(2.201)	1.972	(1.898)	2.823	(1.83)	-3.920	(1.7)*
Constant	52.870	(13.053)**	28.898	(3.239)**	34.831	(9.753)**	44.447	(3.19)**
Selection Equation								
Age 25-34	0.769	(0.239)**	0.146	(0.076)	0.212	(0.187)	0.803	(0.15)**
Age 35-44	0.525	(0.234)*	0.170	(0.081)*	0.591	(0.208)**	0.760	(0.13)**
Age 45-54	0.570	(0.21)**	0.042	(0.09)	0.269	(0.174)	0.410	(0.135)**
Married	0.640	(0.196)**	0.067	(0.064)	-0.126	(0.164)	-0.111	(0.121)
Spouse is working	0.231	(0.179)			0.171	(0.119)	0.121	(0.104)
Owning a home	0.467	(0.176)**			-0.003	(0.14)	-0.222	(0.094)*
Living in a town / in countryside	-0.078	(0.178)			-0.064	(0.13)	-0.082	(0.091)
Serious health problems	-0.254	(0.192)			-0.263	(0.122)*	-0.623	(0.147)**
Children under 7 years					-0.621	(0.136)**	-0.431	(0.102)**
Constant	-0.386	(0.394)	0.976	(0.109)**	1.387	(0.357)**	1.494	(0.201)**
No. observations	1035		1798		1181		2010	
Rho	-0.604		1		-0.863		-0.956	
Sigma	21.725		29.604		20.693		28.042	
Lambda	-13.113		29.604		-17.852		-26.803	

Note. * Significant at 95% confidence level, ** Significant at 99% confidence level.

Table A.3 Family and Single Income Profiles by Deciles in 2000

	10 %	50 %	90 %	Mean	Std. Dev.
Income Percentiles 1988					
Men and Women	5 869 €	18 045 €	30 558 €	18 559 €	9 768 €
Men	9 226 €	20 815 €	34 724 €	21 440 €	10 285 €
Women	3 905 €	15 832 €	25 063 €	15 527 €	8 162 €
Full Income Percentiles 1988					
Men and Women	11 940 €	25 917 €	39 500 €	26 082 €	10 900 €
Men	10 860 €	25 802 €	41 077 €	26 172 €	11 888 €
Women	13 409 €	25 993 €	37 671 €	25 989 €	9 776 €
Income Percentiles 2000					
Men and Women	6 997 €	17 915 €	34 900 €	21 695 €	43 352 €
Men	8 160 €	20 995 €	41 329 €	25 759 €	59 206 €
Women	5 968 €	16 226 €	28 515 €	17 526 €	13 351 €
Full Income Percentiles 2000					
Men and Women	15 373 €	26 478 €	43 085 €	29 830 €	43 180 €
Men	13 992 €	26 940 €	47 005 €	31 622 €	59 166 €
Women	17 239 €	26 230 €	38 749 €	27 992 €	13 444 €

Note. In difference to Table 3 income includes post-tax capital gains and family allowance.

Table A.4 Men and Women Income Profiles by Deciles in 1988 and 2000

	10 %	50 %	90 %	Mean	Std. Dev.
Income Percentiles					
Two Adults	18 964 €	36 887 €	64 172 €	42 842 €	75 887 €
Single Men	5 057 €	18 370 €	36 384 €	22 143 €	23 954 €
Single Women	7 327 €	16 118 €	32 611 €	19 293 €	14 342 €
Full Income Percentiles					
Two Adults	35 730 €	53 698 €	84 153 €	59 689 €	74 741 €
Single Men	9 639 €	22 523 €	41 592 €	27 412 €	23 973 €
Single Women	16 591 €	24 200 €	39 588 €	27 709 €	14 717 €
Yearly Value of Household Production					
Two Adults	6 882 €	15 581 €	28 798 €	16 896 €	8 761 €
Single Men	1 146 €	4 586 €	10 857 €	5 482 €	4 525 €
Single Women	2 564 €	7 753 €	15 844 €	8 470 €	5 462 €

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