

Session Number: 7A (continued)  
Session Title: Time use and inequality  
Paper Number: 2  
Session Organizer: Joachim Merz and Andrew Harvey  
Discussant:

*Paper Prepared for the 28<sup>th</sup> General Conference of  
The International Association for Research in Income and Wealth  
Cork, Ireland, August 22 – 28, 2004*

**CHOOSING BETWEEN HIS TIME AND HER TIME?  
THE MARKET WORK GAP AND HOUSEWORK GAP OF DANISH COUPLES**

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Choosing between his time and her time?  
The market work gap and housework gap of Danish couples

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March 2004

**Abstract**

Adding everything together, Danish men and women work about the same during a day. However, while the men do the major share of the market work, the women do the major share of the non-market work. In this paper, we investigate the interaction between the different time use activities in couples. The analysis is based on the Danish Time Use Survey 2001 from which we have detailed time use information for both spouses. We investigate time used by each spouse as well as the determinants of the time gaps. A large share of non-market work consists of childcare, which may be structurally differently from ordinary housework. We investigate this hypothesis by splitting non-market work into the two time use activities: housework and childcare, as well as splitting the non-market work gap into two: the housework gap and the childcare gap.

**JEL-code:** D13, J22

**Keywords:** Labour supply, family and work, time use

## **1. Introduction**

During the last decades, Danish women have increased their average working hours dramatically, while men's working hours have decreased (Lausten and Sjørup, 2003). According to market working hours, the gap between Danish men and women are thus closing, although it remains positive. However, several analyses have shown that men and women are still far from equal concerning wages and career opportunities (Datta Gupta and Rothstein, 2001, and Lausten, 2001). A suggested explanation for this inequality is that women are main responsible for the non-market work. Looking at the combined workload of both market work and non-market work, Danish men and women are found to work about the same on average (Lausten and Sjørup, 2003), where the difference in market work hours is almost exactly offset by the difference in non-market work hours. Thus, equality on the labour market cannot be separated from equality within families.

The aim of this paper is to investigate time used on market work as well as non-market work for both spouses in Danish couples. Of special interest is the interdependence between market work and non-market work as well as the interdependence between the spouses, i.e. the importance of the division of labour in determining the dual labour supply. In extension of estimating the level of time use of each spouse, we also estimate the time gaps.

In addition, we go one-step further and split non-market work in two separate categories: housework and childcare. This split is based on the assumption that housework and childcare presumably are seen as two different 'tasks' by both men and women and therefore will enter the individual preferences differently.

Without modelling the preferences, the theoretical base for this paper lies within Becker's theory of the family, Becker (1965, 1994), the collective bargaining model with sharing rules and individual preferences, Chiappori (1997), and theories on assortative mating, Ermisch and Francesconi (2002). We thus expect to find evidence of division of labour between the spouses, along with evidence of individualistic maximisation. The data used are from the Danish Time Use Survey 2001.

Many papers concerned with non-market work issues only look at women. However, an important aim of this paper is to analyse possible gender differences within the couples. Therefore, we simultaneously estimate hours worked in the market and hours worked at home for males and females in couples, taking the personal time budget constraint, the interdependence of the labour supply, and division of labour into account. Notice however, that we do not include earnings as an explanatory variable, as Bittman et al. (2003). Instead, job-specific variables and the actual time used on market work measures the impact from the labour market relations.

In other words, this analysis contributes to the research on working time contra family time by combining the simultaneous decision of men and women (husband and wife) on market work and non-market work, taking into account that non-market work can be split in two; housework and childcare, giving three kinds of time use for two persons to decide on simultaneously. Additionally, time gaps, first the market work gap and the non-market work gap, and second the market work gap, the housework gap, and the childcare gap, are estimated simultaneously.

Not much previous work has combined labour supply outside and inside the home. Hochschild has characterised the relationship between working time and family time as “the time bind”, i.e. the phenomenon that working schedules are gradually characterising all parts of life, especially when both parents are working (Hochschild, 1997). Hessing (1994) analyses how women organise their lives to accomplish their many tasks. Presser (1994) shows that variations in employment schedules are significant determinants of a husband’s share in traditional female household tasks. Glick (1999) shows that a woman’s time in the labour market and in home production activities are affected by her human capital, household income and demographics, and community factors; analysing data from an urban area of a developing country. With a little different approach, Bonke, Datta Gupta and Smith (2002) investigate how the amount of and the timing of housework affect wages earned in the market. Our contribution to this topic is through the expected interdependence between market work and housework for Danish women and men.

The paper is organised as follows. The econometric framework is introduced in section 2. Data are discussed in section 3, and results from the empirical analysis on market and non-market work are presented in section 4. In section 5, non-market work is split into housework and childcare, and finally, concluding remarks are found in section 6.

## **2. Econometric framework**

We investigate hours worked for females and males in couples as well as time gaps. Total hours worked for an individual is equal to hours worked in the market (market work) and hours worked in the home (non-market work). A special concern is the work concerned with children in the household. In traditional time use analyses childcare is included in the non-market work, and in the first part of the analysis we take this traditional approach. However, many will argue that time spent caring for children is not only work but also creating utility in itself. Thus, in the second part of the analysis we divide non-market work into two components: housework and childcare.

From the time spent on each activity by the spouses, we define time gaps as the difference between the male and the female time use on each activity. We thus define a market work gap, a non-market work gap, a housework gap, and a childcare gap, respectively.

In the econometric analysis, we estimate the level of time used on the different activities as well as the time gaps. Clearly, time used on different activities are interdependent, both for the individual but also between spouses. The more a person works outside the house, the less time is left for housework. And the more housework a person has to do, the less time is left for market work. Furthermore, spouses can divide tasks, such that one is primarily responsible for market work and the other one for non-market work. Presser (1994) argues that employment schedules are important for the division of housework among dual-earner spouses. Employment schedules can be fixed or flexible and can be placed at different times of the day (days/evenings/nights). Although, we do not take the timing of the different activities into account, it is evident that the endogeneity of the different tasks is important.

A special feature of the time activities is that they are truncated distributions – we do not observe negative hours. Therefore we apply a tobit specification. Consider the estimation of time used on market work and non-market work. Let  $H_m^m$  and  $H_m^f$  be market hours for the male and the female, respectively, and  $H_{nm}^m$  and  $H_{nm}^f$  be the non-market hours. Defining  $H_m^{m*}$ ,  $H_m^{f*}$ ,  $H_{nm}^{m*}$  and  $H_{nm}^{f*}$  as the latent variables corresponding to  $H_m^m$ ,  $H_m^f$ ,  $H_{nm}^m$  and  $H_{nm}^f$  the model is as follows (where  $x_m^m$ ,  $x_m^f$ ,  $x_{nm}^m$  and  $x_{nm}^f$  are vectors of exogenous variables and  $\gamma$  and  $\beta$  are parameters)

$$(1) \quad \begin{aligned} H_m^{m*} &= \gamma_1^2 H_m^f + \gamma_1^3 H_{nm}^m + \gamma_1^4 H_{nm}^f + \beta_1 x_m^m + u_1 \\ H_m^{f*} &= \gamma_2^1 H_m^m + \gamma_2^3 H_{nm}^m + \gamma_2^4 H_{nm}^f + \beta_2 x_m^f + u_2 \\ H_{nm}^{m*} &= \gamma_3^1 H_m^m + \gamma_3^2 H_m^f + \gamma_3^4 H_{nm}^f + \beta_3 x_{nm}^m + u_3 \\ H_{nm}^{f*} &= \gamma_4^1 H_m^m + \gamma_4^2 H_m^f + \gamma_4^3 H_{nm}^m + \beta_4 x_{nm}^f + u_4 \end{aligned}$$

and

$$(2) \quad \begin{aligned} H_m^m &= H_m^{m*} \quad \text{if} \quad H_m^{m*} > 0 \\ &= 0 \quad \text{if} \quad H_m^{m*} \leq 0 \\ \\ H_m^f &= H_m^{f*} \quad \text{if} \quad H_m^{f*} > 0 \\ &= 0 \quad \text{if} \quad H_m^{f*} \leq 0 \\ \\ H_{nm}^m &= H_{nm}^{m*} \quad \text{if} \quad H_{nm}^{m*} > 0 \\ &= 0 \quad \text{if} \quad H_{nm}^{m*} \leq 0 \\ \\ H_{nm}^f &= H_{nm}^{f*} \quad \text{if} \quad H_{nm}^{f*} > 0 \\ &= 0 \quad \text{if} \quad H_{nm}^{f*} \leq 0 \end{aligned}$$

In the estimation of (1) and (2), we apply Amemiya's Generalised Least Squares (AGLS) for tobit models with endogenous regressors (Amemiya, 1974 and 1979). With the AGLS estimator, the endogenous regressors are treated as linear functions of the instruments and the exogenous variables, while correcting for the truncated distribution of the dependent variable. In essence, the AGLS is thus a variant of the traditional GLS estimator. For details of AGLS, see Maddala (1983).

In the second part of the analysis, we split the non-market work into two dimensions: housework and childcare. The implication for the time use model is straightforward: the non-market work equations in (1) and (2) are replaced by two equations, one for housework and one for childcare, and likewise the number of endogenous regressors in the equations increase. The estimations method, however, remains unchanged.

In addition to estimating time use, we also estimate time gaps. The market gap is defined as male time spent on market work minus female time spent on market work. The non-market gap is defined the other way around as female time spent on non-market work minus male time spent on non-market work. The market work gap and non-market work gap are thus

$$(3) \quad \begin{aligned} MG &= H_m^m - H_m^f \\ NMG &= H_{nm}^f - H_{nm}^m \end{aligned}$$

This reversion of the non-market gap to the market gap (reverse in gender terms) is consistent with the usual supposition that men work more at the market than women, making most market gaps positive, and women work more in the non-market (i.e. at home), making most non-market gaps positive. By defining the gaps this way, the interpretation is more straightforward and understandable.

The estimation of the time gaps is based on the following specification

$$(4) \quad \begin{aligned} MG &= \alpha_1 NMG + \delta_1 x_{MG} + \varepsilon_{MG} \\ NMG &= \alpha_2 MG + \delta_2 x_{NMG} + \varepsilon_{NMG} \end{aligned}$$

When estimating (4), we correct for the endogenous regressors by applying a GLS estimator, more specifically 3SLS. In the second part of the analysis, we replace the non-market work gap by the housework gap and childcare gaps, respectively, and adjust equations (3) and (4) accordingly. All estimations are done using STATA8.

### **3. Data: the Danish Time Use Survey 2001**

In order to investigate the interrelation between market work and non-market work, we use the Danish Time Use Survey from 2001. The design of the survey follows the guidelines developed by an expert group in Eurostat (2000). Two diaries – one for a weekday and one for a weekend day – and a preceding questionnaire was given to approximately 4.700 representative Danish households. In households with a married or cohabiting couple, data were collected for both persons.

The interviewees completed the time use diaries by stating main and secondary activity for each 10-minute interval of the day, where the activity took place, and the presence of other persons. The questionnaire includes information about income, socio-demographic variables, family background, educational background, relation to the labour market etc. Furthermore, the data have been merged with register information from Statistics Denmark, adding for instance educational background for the spouses.

The sample is restricted to 2,387 households containing couples, where both spouses completed the time diaries. The couples are aged 18-80 and are thus not restricted to the working-age population. Sample means of the variables used in the analyses are given in table 3.1 to 3.4. The individual-specific variables have means for males and females separately, whereas the couple-specific variables are joint variables.

Our definitions of time use for the different activities - market work, non-market work, housework, and childcare - are:

Time used on market work is defined as time spent performing a job, either at the job or at home, time spent travelling to and from work, and time spent on education.

Time used on non-market work is defined as time spent in or around the house doing

- housework (preparing food, dish washing, cleaning, laundry-work, gardening, handcrafting, caring for pets, or shopping) and
- childcare (active child caring such as feeding/bathing the child, educating the child, reading for, talking to, and playing with the child, or accompanying the child to child-related activities).

Consequently, time spent sleeping and time spent on leisure activities are not considered in this analysis.

**Table 3.1 Time use in Danish couples**

	Female		Male	
	Mean	Std. Dev.	Mean	Std. Dev.
Total time-use for work	7.075	(3.666)	6.824	(4.044)
Market work	2.955	(3.870)	3.875	(4.401)
Non-market work	4.119	(2.585)	2.949	(2.423)
- House work	3.406	(2.233)	2.560	(2.247)
- Child care	0.713	(1.417)	0.389	(0.912)

In table 3.1, we find the time use averages for women and men in the sample. In 2001 Danish men and women spent about the same amount of hours working, approximately 7 hours per day. Splitting this up in market work and non-market work, women use 3 hours on market work and 4 hours on non-market work, whereas men use 4 hours on market work and 3 hours on non-market work.<sup>1</sup> Thus, the data indicates that division of labour within households is substantial.

Splitting the non-market work into housework and childcare, we find that women on average use 3.4 hours on housework and 0.7 hours on childcare. Men on the other hand use 2.6 hours of housework and 0.4 hours of childcare on average. Hence, Danish men use approximately three quarters of the time Danish women use on housework and about half the time on childcare. Notice, that this is an average of the sample as a whole, whether or not the couples do housework or have children.

The time gaps, defined as the difference between the spouses' time use on each activity, are presented in table 3.2. The market gap shows an average of almost 1 hour, whereas the non-market gap shows an average of 1.1 hour, reflecting that men use 1 hour more than women on market work and women use 1 hour more than men on non-market work. The non-market

<sup>1</sup> The working hours are averages over 7 weekdays of completed time use diaries for all persons with all kinds of labour market attachment, thus resulting in relatively low averages.

work gap is divided into a housework gap of about 0.8 hour and a childcare gap of about 0.3 hour. The main part of the non-market work gap thus consists of the housework gap.

**Table 3.2 Time gaps**

	Mean	Std. Dev.
Total time gap	0.250	(3.486)
Market work gap	0.920	(4.112)
Non-market gap	1.170	(2.970)
- Housework gap	0.846	(2.687)
- Childcare gap	0.324	(1.229)

Descriptive statistics on the individual-specific variables are found in table 3.3. The average age in the sample is 44 years for the women and 46 years for the men, while women and men have about the same length of education, 13.3 years for the women and 13.5 years for the men.

**Table 3.3 Individual-specific variables**

	Female		Male	
	Mean	Std. Dev.	Mean	Std. Dev.
Age	43.926	(13.193)	46.475	(13.756)
Age squared	21.035	(11.977)	23.491	(13.164)
Length of education	13.305	(2.859)	13.522	(2.714)
Employed	0.740	(0.439)	0.717	(0.451)
Self-employment	0.030	(0.171)	0.100	(0.300)
Unemployed	0.037	(0.189)	0.023	(0.149)
Out of the labour force	0.175	(0.380)	0.160	(0.366)
Level of responsibility at work:				
No subordinates	0.859	(0.348)	0.736	(0.441)
1-5 subordinates	0.085	(0.280)	0.123	(0.328)
More than 5 subordinates	0.056	(0.229)	0.141	(0.348)
Flexibility through working hours:				
Can vary working hours	0.157	(0.364)	0.295	(0.456)
More than 1 hours of transportation	0.199	(0.399)	0.278	(0.448)

The sample is split into four categories of labour market attachment: employment, self-employment, unemployment, or non-employment (outside the labour force). The patterns for men and women look very much alike; however, the women are marginally more employed, unemployed, or non-employed, while the men are more often self-employed.

Larger gender differences appear in the variables connected to employment. The main part of the individuals in the sample has no subordinates, 86 pct. of the women and 74 pct. of the men. For those who do, women more often have 1-5 subordinates, while men more often have more than 5 subordinates.

Men have the opportunity to vary their daily working hours as they wish on a larger scale than women (30% vs. 16%). And finally, men more often have more than 1-hour transportation to their workplace than women, 27.8 pct of the men compared to 20 pct of the women.

**Table 3.4 Couple-specific variables**

Couple-specific variables:	Mean	Std. Dev.
Age gap	0.211	(0.521)
Education gap (length)	0.217	(3.093)
Dummy for weekend	0.491	(0.500)
Housing conditions:		
Single family house	0.643	(0.479)
Other kind of residence	0.357	(0.479)
Number of rooms	4.777	(5.016)
Area of living:		
Urban area	0.650	
Rural area	0.351	(0.477)
Pct. having children	0.432	(0.495)
Average number of children:		
0-18 year olds	0.772	(1.024)
0-2 year olds	0.141	(0.390)
3-6 year olds	0.166	(0.427)
7-17 year olds	0.465	(0.812)

In table 3.4, the variables that are the same for both parts of the couple, the age and education gaps, housing, area of living and number of children are found.

These variables are used, not to find differences within the couples, but to find differences between couples. Time use is expected to differ between couples living in rural areas, compared to couples living in urban areas. In addition housing conditions, as size and having a garden, is expected to influence on the time use. Number of children also influences the in-house time use.

Within the couples, the age gap shows that men are on average 0.2 years older than their spouse. The education gap has the same size, giving on average 0.2 years more education to men than their female counterparts. Half of the observations are collected on a weekend day. This has to be taken into account when analysing market work, as most market work are done on weekdays. Roughly speaking, two thirds of the sample lives in single-family houses, two thirds of the sample lives in urban areas, and two thirds of the sample does not have children.

#### **4. Market work and non-market work**

The first results to be presented are from the estimation of market work and non-market work. First, we focus on the actual amount of time spent on market work and non-market work. Second, we investigate the determination of the market gap and the non-market gap.

##### ***Time use***

In table 4.1, the results from the estimation of market work and non-market work are presented. In the first two columns, we find the estimated parameters for the market work equations for male and females, and in the last two columns we find the corresponding estimated parameters for the non-market work equations. In all columns, three types of variables are included. First, we find the endogenous variables. In the estimation of male market work, female market work, male non-market work, and female non-market work are thus all endogenous variables. The instruments used for the endogenous variables are all variables in the model not included in the specific equation. Second, the model includes individual specific variables, and third a number of couple-specific variables.

**Table 4.1 Market work and non-market work**

	Market work		Non-market work	
	Female	Male	Female	Male
Intercept	1.503	0.161	0.747	-0.773
<hr/>				
Endogenous variables:				
Market work Female		0.607***	-0.355***	0.283***
Market work Male	0.363*		0.324***	-0.331***
Non-market work Female	-1.470***	0.888***		0.576***
Non-market work Male	1.015*	-1.560***	0.717***	
<hr/>				
Individual-specific variables:				
Age	0.199**	0.151**	0.032	0.060**
Age squared/100	-0.251**	-0.182**	-0.011	-0.066**
Length of education	0.020	0.065	-0.044**	0.028
1-5 subordinates	0.757**	0.137		
6+ subordinates	-0.353	0.089		
Can vary working hours	0.683**	0.261		
More than 1 hour of transportation	0.396	0.164		
Self-employed	0.789	0.860**		
Unemployed	-3.649***	-5.003***		
Out of the labour force	-4.542***	-5.130***		
<hr/>				
Couple-specific variables:				
Weekend	-5.941***	-4.972***		
Single-family house			-0.100	0.247**
Number of rooms			0.018**	-0.011
Living in rural area			0.216**	-0.228**
Number of 0-2 year olds			1.030***	0.277
Number of 3-6 year olds			0.594***	0.081
Number of 7-17 year olds			0.212**	0.061

Note:

\*\*\* Indicates significance at 1% level, \*\* significance at 5% level, and \* significance at 10% level.

In all equations, we find that the interrelation between the time use activities is very important. Other things equal, the female spouse decreases her market work hours the more she works at home, and likewise she decreases her non-market work the more she works in the market. The same is the case for the males: non-market work decreases if market work

increases, and market work decreases if non-market work increases. Thus, we find a substitution effect between market work and non-market work for both males and female.

The substitution between the market and non-market activities is expected as they are subject to the same time budget constraint. The typical utility maximising problem includes the maximisation of utility from leisure as well as maximisation of utility from goods either produced in the market or at home. Given a desired level of leisure, increasing market work implies that less time is available for non-market work, and the other way around. The findings concerning the maximising behaviour of the individuals thus confirm the prediction of individual preferences from the Chiappori model (Chiappori, 1997).

However, substitution is not only found for the time use of the individual, but also between the spouses. We find that both the male and the female increase non-market work if the spouse works more in the market. An explanation for this could be that the more one of the spouses work outside the home, the more the other spouse must work in the home in order to get all chores done. Likewise, we find the opposite: the more she works at home, the more he works in the market; and the more he works at home, the more she works in the market. This finding is consistent with the hypothesis of shared preferences within the household, and furthermore evidence for the theory of division of labour based on comparative advantages (Becker, 1994). Furthermore, it is interesting to note that the effects are symmetric, i.e. husbands and wives react similarly to each other's labour supply.

The last interaction effects are between spouses for the same time use activity. For market work we find a strong positive correlation between husband and wife: either they both tend to work more, or they both tend to work less. This result is as expected, especially because some of the older couples in the sample both are retired. But also for younger couples, positively correlated working hours will result from assortative mating and theories of the marriage (Becker, 1994). Also in the non-market equation, a positive correlation is found: the more he works in the home, the more she works, and vice versa. An interpretation of this finding could be that the theory of assortative mating also applies to "home-values" such as preferences for the home standard or childcare.

Turning to the other explanatory variables, we begin by discussing the market work. For both males and females, age is included with a linear term and a quadratic term, implying an inverse u-shaped effect of age on market work. The positive linear term and the negative quadratic term implies that market work is increasing with age for men up to the age of approximately 41 years and decreasing afterwards, while market work for women increases with age up to approximately 40 years and decrease afterwards. Thus, regarding age no gender difference is found.

The effect of education is insignificant. Neither for women, nor for men, we thus find an effect from education on market work,. This is contrary to findings in studies of earnings that are highly dependent on education, but nevertheless working hours during a day are independent of education.

Two dummy variables indicating responsibility for 1-5 or more than 5 subordinates at work are included in the estimation of market work. The only significant effect is found for women subordinating 1-5 persons. The effect is positive and thus the women with a small group of subordinates work longer hours, whereas having more subordinates does not imply longer hours. Although men more often than women have jobs with subordinates, no significant effect are found for the male market work.

An ongoing public debate discusses whether increased flexibility in the labour market is primarily to the benefit of the employers or to the employees. The results here show that the ability to vary working hours makes females, but not males, work more in the market. The finding is in line with other studies that show how increased flexibility at work makes workers work more (Czonka, 1999, and Hochschild, 1997).

The opposite of flexible working hours is a long commuting distance to work. Transportation to and from work is included in the definition of market work time and thus we would expect a positive effect. However, the long commuting distance does not seem to have any effect on working hours, suggesting a trade-off between working hours and commuting.

The final individual-specific variables in the market work equations are the dummies for labour market attachment, either through self-employment, unemployment, or non-

employment (the left-out category is wage-earners). Being a self-employed male significantly increase the market working hours, whereas the self-employed women do not work more than women employed in wage-earner jobs. And not surprising, being unemployed or outside the labour market significantly decreases market work for both males and females.

As mentioned earlier, some of the respondents filled out time use diaries on weekdays and others on weekend-days. The time use information being from a weekend-day has a strong negative impact on market work hours, which is exactly as expected: Although some people work on weekends, the dominant share of market work is exercised on weekdays.

Turning to the non-market work equations, age is found to be insignificant for the females. Thus, the level of non-market work for females does not depend on age, whereas for men non-market work increase up to the age of approximately 45 years and then decrease. Length of education has a significant negative effect on non-market work for women, but not for men. Thus, other things equal women work less hours in the home, the longer their education is, while the level of non-market work for males is independent of education.

In addition to the individual-specific variables, the non-market work equations include a number of couple-specific variables. Living in a single-family house as opposed to other housing has a positive effect on males' non-market work, but no effect on females' non-market work. On the other hand, a larger home (more rooms) increases females', but not males', non-market work. Living in a single-family house typically implies having a garden and thus relatively more outside work. Hence, the results suggest a traditional division of labour within the households, where women are main responsible for the work inside the home, while men are main responsible for the outside work. Furthermore, the effect from living in a rural area as opposed to an urban area is the opposite for men and women. Thus, living in a rural area makes women do more and men do less non-market work. Again, a possible explanation is that couples living in rural areas are more traditional in their division of chores, such that the women do a larger share of work in the home than women living in urban areas.

The last variables are the number of children in the three age groups: 0-2 years, 3-6 years, and 7-17 years. For females, children increase non-market work significantly, and the younger the children the more non-market work increases. This result reflects that the extent of child-related work declines when the children grow older. However, somewhat surprising there are no significant effect of children on male non-market work. Thus, although Danish fathers do take part in the childrearing, it does not show up in the estimation of their non-market work. The reason may be that they cut down on non-child related work, such that the net-effect is zero. We return to the issue of childcare versus non-child work (housework) in section 5.

### *Time gap*

The results above show the strong interrelationship between the different time use activities. To get more insight into the division of labour in the household, we turn to investigating the time gaps, i.e. the market gap and the non-market work gap. As shown in table 3.2, in the average couple the man works more than the woman in the market and the woman works more than the man in the home. The results from the estimation of the time gaps are presented in table 4.2. The estimation includes the same set of explanatory variables as the time use estimations, with some minor modifications. Thus, the age gap is included instead of male age, and the education gap is included instead of male length of education. These gaps are defined as male age minus female age and male length of education minus female length of education, respectively. In addition, the levels of time use on both market work and non-market work of the females are included.

A first result from table 4.2 is that not only the time use activities, but also the time gaps are interrelated. A higher non-market work gap increases the market gap other things equal and visa versa. Thus, if the husband does a larger share of the non-market work, the non-market work gap decreases, implying a lowering of the market work gap. We thus find that more equality in the non-market work leads to more equality in market work hours. We also find a positive effect from the market work gap on the non-market work gap, implying that the more the man works relative to the women in the market, the larger is the non-market gap, i.e. the less the man works relative to the woman in the home. The finding is thus that the size of the gaps are positively correlated when measuring the gaps: the greater the difference between the

spouses in one time use dimension, the greater difference is found in the other time use dimension.

**Table 4.2 Market work gap and non-market work gap**

		Market work gap	Non-market work gap
Intercept		4.351***	-0.141
Market work gap			0.148***
Non-market work gap		0.115***	
Market work Female		-0.760***	
Non-market work Female			0.691***
Age, Female		0.072**	-0.027
Age squared/100, Female		-0.086**	0.020
Age gap		-0.042	-0.212**
Length of education, Female		-0.016	-0.044**
Education gap		-0.012	-0.012
1-5 subordinates:	- Female	-0.026	
	- Male	0.092	
6+ subordinates:	- Female	0.116	
	- Male	0.192	
Can vary working hours:	- Female	-0.189	
	- Male	0.202	
More than 1 hours of transportation:	- Female	-0.528***	
	- Male	0.218	
Self-employment:	- Female	0.582*	
	- Male	0.882***	
Unemployed:	- Female	0.098	
	- Male	-3.182***	
Out of the labour force:	- Female	0.051	
	- Male	-2.997***	
Weekend		-4.149***	
Single-family house			-0.281***
Number of rooms			0.008
Living in rural area			0.166*
Number of 0-2 year olds			-0.644***
Number of 3-6 year olds			-0.328***
Number of 7-17 year olds			-0.139**
Pseudo R-sq		0.5019	0.5144

Note: \*\*\* Indicates significance at 1% level, \*\* significance at 5% level, and \* significance at 10% level.

The result suggests that the finding of total work being the same is not only an average phenomenon, but widespread. Some couples do the same amount of work in both dimensions, other couples divide labour, but either both gaps are small or both gaps are large.

Turning to the level of female time use, we find that the level of female market work decreases the market work gap significantly, and the level of female non-market work increases the non-market work gap. In short, this means that the more she works in the market, the lower is the market gap, and the more she works at home, the larger is the non-market gap.

Concerning age, we find a significant effect of the woman's age on the market work gap, but no significant effect on the non-market work gap. The market work gap thus increases with female age for women up to approximately 42 years, and decrease afterwards. Thus, women work less in the market than men, when they are young and when they are old. However, this result is probably a mix of two different generation effects. The young women work less than the men, because they take more care of the children and generally are more absent from work due to child-related causes. On the other hand, the older women in the sample belong to a cohort where part-time employment has been more dominant. In the longer run, the fewer work hours for the older group of women may thus disappear.

No significant effect of age is found on the non-market work gap. Instead, the age gap is found to be important. The older the male is relative to the female, the smaller is the non-market work gap. An explanation for this finding may be that couples with a large age difference are more focused on her career than on his, and, hence, he does a larger share of the non-market work.

Length of female education and the education gap do not have a large impact on either the market work gap or the non-market work gap. The only significant effect is found for the non-market work gap, which decreases with length of female education. Hence, the more the female is educated, the larger is the male's share of non-market work.

In addition to these variables that are in both the time gap equations, a number of equation-specific variables are included as well. For the market gap we include job-specific variables such as number of subordinates, flexibility in working hours, and labour market attachment, whereas in the non-market gap couple-specific variables such as living area and number of children are included.

The market work gap is found to decrease if the female has more than 1 hour of transportation time, if the male is unemployed, or if the male is outside the labour force, whereas the market gap is found to increase if the male or the female are self-employed. Additionally, the market gap decreases if the time diary was completed on a weekend day. However, no significant effects are found for either having subordinates or flexible working hours.

For the non-market work gap, we find that living in a single-family house makes the gap smaller, while living in a rural area makes it larger. Thus, couples living in single-family houses are more equal concerning the time they spent on non-market work than other couples, while the difference is greater for couples in rural areas as opposed to couples living in urban areas. Finally, we find that number of children in each of the three age groups, 0-2, 3-6, and 7-17 years, all decreases the non-market work gap. The presence of children in the household thus makes work in the home more evenly distributed between the spouses. This result is somewhat in contrast to the finding in table 4.1 where children increase women's non-market work but are insignificant for the men's non-market work. Keep in mind, though, that the two models are different. Thus, in table 4.1 the level of time use is measured, where table 4.2 is concerned with the difference in time use levels and thus the opposing results are not necessarily contradictions.

However, the findings concerning the children point to the problem discussed earlier about the nature of child related work. Although the presence of children in the household naturally increases the amount of work to be done, at the same time both parents presumably get pleasure from spending time with the children. It could be the case that both parents want to take the child related share of the non-market work and leave the not child-related work to the spouse. To investigate the interaction between childcare on the one hand and the rest of the

non-market work – the housework – on the other hand, we split the non-market work into these two components in the next section.

## **5. Market work, house work and childcare**

Dividing the non-market work into housework time and childcare implies that three sets of equations are estimated: one set for market work (male and female), one set for housework (male and female), and one set for childcare (male and female). In addition, in this section we estimate three time gaps: the market work gap, the housework gap, and the childcare gap. In doing this, we split the couple-specific variables such that the housing variables are included in the housework equations, while the number of children is included in the childcare equations.

### *Time use*

The results for the three time use equations are presented in table 5.1. First of all, we find that splitting non-market work into two does not change the market work equations much (the only exception is female flexible hours that becomes insignificant), although evidently there are changes in the endogenous variables. Looking at the market work equations, the same interactions between the spouses' market work as in the previous section are found. The more the female works in the market, the more does the male work; and the more the male works in the market, the more does the female work. The interrelation between the individuals' own time use activities also remains unchanged, such that more housework or childcare by the male reduces male market work; and more housework or childcare by the female reduces female market work, although the effect of female housework on female market hours is insignificant. For both males and females, we find that the effect of childcare is larger than the effect of housework. Thus, spending time caring for children at home has a larger effect on market working hours than 'ordinary' housework.

The 'cross-effects', i.e. the effect of female housework and childcare on male market work, and the effect of male housework and childcare on female market work also remains positive. Thus, the more one spouse works at home, the more the other works in the market. However, where the effect of housework seems to be of the same magnitude for the two spouses (1.12 for the female and 1.04 for the male), the effect of childcare differs significantly between the

man and the woman. Thus, increasing male childcare has a marginal effect on female market work that is almost three times the marginal effect of female childcare on male market work (4.36 and 1.59, respectively). The women are thus more sensitive to the spouse taking part in the childcare duties than the other way around.

**Table 5.1 Market work, housework, and childcare**

	Market work		House work		Child care	
	Female	Male	Female	Male	Female	Male
Intercept	2.946	-0.538	0.926	-0.725	-7.120***	-6.944***
<u>Endogenous variables:</u>						
Market work Female		0.667***	-0.325***	0.253***	-0.196**	0.298**
Market work Male	0.377		0.274***	-0.331***	0.303***	-0.305**
Housework Female	-0.784	1.040**		0.357	0.006	0.399
Housework Male	1.118*	-1.356**	0.590**		0.588**	-0.412
Child time Female	-3.406***	1.586*	-0.664	0.944**		2.640***
Child time Male	4.355**	-2.923**	1.144	-1.431*	1.907***	
<u>Individual-specific variables:</u>						
Age	0.047	0.131	0.037	0.087***	0.207***	0.205***
Age squared/100	-0.118	-0.168*	-0.015	-0.086***	-0.299***	-0.245***
Length of education	0.033	0.071	-0.047***	0.022	0.001	0.047
1-5 subordinates	0.919**	0.073				
6+ subordinates	-0.151	-0.048				
Can vary working hours	0.381	0.329				
More than 1 hour of transportation	0.275	0.096				
Self-employed	0.762	0.928*				
Unemployed	-3.804***	-4.989***				
Out of the labour force	-4.914***	-5.146***				
<u>Couple-specific variables:</u>						
Weekend	-6.420***	-4.876***				
Single-family house			-0.017	0.255*		
Number of rooms			0.020**	-0.004		
Living in rural area			0.303**	-0.206		
Number of 0-2 year olds					0.819	-2.931*
Number of 3-6 year olds					0.416	-1.063
Number of 7-17 year olds					0.419**	-0.182

Note: \*\*\* Indicates significance at 1% level, \*\* significance at 5% level, and \* significance at 10% level.

Turning to the housework and childcare equations, some interesting results are found. Regarding the individual-specific variables, age is only significant for males in the household time equations, but not for females. This is in line with the result for the non-market work, where a significant effect of age was also found for males. However, concerning childcare age is significant for both males and females, with a peak at about age 35 for females and age 42 for males. Because children are primarily found in younger households, this result is expected, and furthermore the result that male childcare peaks a little later than women's is in line with the average father being a bit older than the average mother.

Education, on the other hand, does not matter for childcare neither for males nor females, but has a negative effect on female housework, like it did for female non-market work. Whereas higher educated women spend less time on housework chores, education does not make any difference on the time they spent caring for children. For men, there is no effect of education, neither on housework nor on childcare.

For the couple-specific variables, as mentioned the housing variables are placed in the housework equations and the child variables are placed in the childcare equations. The effects of the housing variables are almost the same as in the non-market equations in the previous section. Thus, living in a single-family house relative to other housing still increases male housework, while a larger house – with more rooms – increases female housework. However, contrary to the earlier finding, living in a rural area does not decrease male housework, as it did for male non-market work. On the other hand, women living in rural areas do more housework relative to women in urban areas. The difference regarding the results for men suggests that it is the child-related parts of the non-market work that is negatively associated with living in a rural area for men.

Turning to the number of children in the childcare equations, we find that childcare increases for females with the number of 7-17 year olds and that childcare decreases for males with the number of 0-2 year olds. Keep in mind, however, that only families with children spend time on childcare, whereas childcare observations for families without children are truncated at zero. The result should thus be interpreted as saying that given the family has children; the father spends less time taking care the younger the children are. And that given the family has children; the mother spends more time on childcare the older children she has. An explanation

for the finding concerning the father could be that babies typically are the domains of the mother, leaving less work for the father. Furthermore, an explanation for the finding concerning the mother could be that care for children do not stop at the age of 7 – for instance school children need help with their homework. However, the interpretation of the child variables must be cautious, as the number of especially young children is limited in the sample.

Finally in table 5.1, we find the effects of the endogenous variables in the housework and childcare equations. We find that splitting non-market work into housework and childcare reveals some interesting differences. Thus, concerning the interrelation between an individuals different time use activities, we find the expected negative trade-off between housework and market work and between childcare and market work. Hence, both males and females do less housework if they work more in the market; and do less childcare if they work more in the market. The interrelationship between housework and childcare is not as straightforward, however. If men spend more time on childcare, they decrease time spent on housework, while the parallel effect for women is insignificant. Further, the effect of housework on childcare is insignificant for both males and females. We thus find a spill over effect from time spent on childcare to housework for men, but not for women; but not a spill over effect from childcare to housework. This follows the findings in table 4.1, where the child variables are insignificant for males, indicating that the net-effect of childcare and housework for fathers is zero. Hence, the results suggest that fathers' housework are substituted into childcare.

The hypothesis of division of labour between the spouses is not supported by the data. The more housework that is done by the male, the more housework is done by the female (while the parallel effect for males is insignificant); and the more childcare that is done by either spouse, the more is done by the other spouse. Thus, either a lot of work is done in a given time use dimension, or a little is done.

Finally, the crossover effects are all positive like in the previous section. In general, the male does more housework, the more his spouse work in the market or with childcare, and vice versa for the female; and likewise for the childcare equations. A few of the effects are

insignificant, however. Female housework thus does not depend on male childcare, and male childcare does not depend on female housework. The interrelation between female housework and male childcare is thus not as strong as the other interrelationships.

In general, we find by splitting non-market work into housework and childcare that substantial differences between the two are concealed in the previous section. Thus, in studies of housework and the interaction between spouses, it is important to realise that housework and childcare is not the same, and that disregarding this fact could cause misleading results.

### *Time gap*

In table 5.2 we present the results for the estimation of the three time gaps: the market work gap, the housework gap, and the childcare gap. Like in the previous section, all variables in the time use equations are included in the estimation of the time gaps, with minor alterations.

Concerning the market work gap, the only difference between this estimation and the result in table 4.2 is related to the non-market work gap that is split into two. The essence of the result remains unchanged, however. Both the housework gap and the childcare gap thus have positive effects on the market work gap, although the effect of the childcare gap is marginally larger. Considering, that both the housework gap and the childcare gap are typically positive, larger gaps in the in-house chores thus imply a larger market work gap as well.

**Table 5.2 Market work gap, housework gap, and childcare gap**

		Market work gap	House work gap	Child care gap
Intercept		4.358***	-0.496	0.307*
Market work gap			0.130***	0.021***
Housework gap		-0.080*		0.007
Child care gap		-0.216***	-0.088*	
Market work Female		-0.763***		
Housework Female			0.660***	
Child care Female				0.837***
Age, Female		0.072**	-0.006	-0.012
Age squared/100, Female		-0.083**	0.002	0.013
Age gap		-0.058	-0.261***	0.058**
Length of education, Female		-0.021	-0.043**	-0.009
Education gap		-0.013	-0.013	-0.003
1-5 subordinates:	- Female	-0.021		
	- Male	0.107		
6+ subordinates:	- Female	0.119		
	- Male	0.204		
Can vary working hours:	- Female	-0.180		
	- Male	0.194		
More than 1 hours of transportation:	- Female	-0.527***		
	- Male	0.225		
Self-employment:	- Female	0.580*		
	- Male	0.883***		
Unemployed:	- Female	0.092		
	- Male	-3.155***		
Out of the labour force:	- Female	0.025		
	- Male	-3.005***		
Weekend		-4.147***		
Single-family house			-0.342***	
Number of rooms			0.009	
Living in rural area			0.079	
Number of 0-2 year olds				-0.688***
Number of 3-6 year olds				-0.421***
Number of 7-17 year olds				-0.160***
Pseudo R-sq		0.4953	0.462	0.656

Note:

\*\*\* Indicates significance at 1% level, \*\* significance at 5% level, and \* significance at 10% level.

The new features in table 5.2 are the housework gap and the childcare gap. Compared to the estimation of the non-market work gap, we find few differences concerning the individual-specific and couple-specific variables. Female education, the age gap between the spouses, and living in a single-family house all contribute to a smaller housework gap. On the other hand living in a rural area does not have an effect on the housework gap, contrary to the finding regarding the non-market gap.

For the childcare gap, we find a positive effect of the age gap. Thus, the further away from each other the spouses are in age, the larger is the difference in time they spend on childcare. On the other hand, we find a large effect of children, decreasing with the children's age. The childcare gap is thus smallest in couples with the smallest children and largest in the families with the older children.

Unlike for the market work gap that decreases with the level of female market work, we find that the housework gap increases with the level of female housework and that the childcare gap increases with female childcare. Across all three gaps, we thus find a marked difference in the level effects.

Furthermore, going back to the interaction effect of the gaps, we find a positive interaction effect from the market work gap and a negative interaction effect from the childcare gap on the housework gap. A large difference in market work gap thus increases the difference in time spent on housework, while a larger difference in childcare decreases the difference in time spent on housework.

A large market work gap increases the childcare gap, while the effect of the housework gap on the childcare gap is insignificant. A large difference in market work gap thus increases the difference in time spent on childcare, while differences in housework have no impact on the difference in childcare. This indicates that the substitution goes from childcare to housework, but not from housework to childcare. Again, these findings suggest that adding housework and childcare time into one variable disguises important features of intra household allocation of time.

## 6. Concluding remarks

In this paper, we have analysed the interrelations between time use activities for Danish couples, as well as the interaction between time gaps. The time use activities that we consider are market work and non-market work, where the latter is split further into housework and childcare. The time gaps considered are the market work gap and the non-market work gap – which also is split into a housework gap and a childcare gap.

The sample includes 2,339 couples that have answered time diaries in a Danish time use survey from 2001. The time spent on the different activities are estimated taking the endogeneity between time uses and between spouses, as well as the truncation of the time use variables into account. Time use is thus estimated by AGLS (Amemiya's GLS), while time gaps are estimated by 3SLS.

We find a substitution effect between market work and non-market work for both males and females. The substitution is not only found for the time use of the individual, but also between the spouses. This finding is consistent with the hypothesis of shared preferences and the theory of division of labour based on comparative advantages (Becker, 1994). Furthermore there is evidence for assortative mating as the couples seems to either work much at the market or work little at the market. The same is happening for the non-market work. I.e. interaction matters and market work is not estimated properly without taking other kinds of time use into account.

Breaking the non-market work into housework and childcare, we see differences between housework and childcare. The substitution between market work and housework still exists and is supplemented by a corresponding substitution between market work and childcare. Spending time caring for children has a larger negative effect on market work than housework has.

The assortative mating effect does not show as clear, when using three different kinds of time use. We see that more female childcare enables more male childcare. But the effect of male market work has no effect on the female market work in this framework, and the female housework does not have any effect on the male housework. Instead, male housework has a

positive effect on female childcare. And female childcare has a positive effect on male housework. This indicates some extent of labour division of the non-market work; the more childcare the woman is doing, the more housework her husband does. However, at the same time there is no effect on female housework from male childcare. For both males and especially females, there is a positive crossover effect from childcare to market work, though. One spouse taking care of the children, thus enables the other spouse to work longer hours.

When using three kinds of time use the substitution effects for the individual and between spouses become more complex. More of one kind of time use by the male/female leads to more of another kind of time use by the spouse, but not necessarily the other way around. However, most substitution effects are significant. We thus conclude that time seems to be a binding factor in Danish couples, who use all sorts of substitutions in order to make time-ends meet.

The analyses on the timegaps support the analyses on time use. The larger the market gap, the larger the non-market gap. If he works a lot outside the house, she works a lot inside the house. However, the assortative mating theory also applies here: The more the woman works at the market, the smaller is the market work gap, i.e. they both work a lot at the market.

The basic results remain unchanged when splitting the non-market gap into a household gap and a childcare gap. Both the housework gap and the childcare gap have a positive effect on the market work gap, with the childcare gap having the largest effect. The market work gap also has a positive effect on both the housework gap and the childcare gap. There is substitution from childcare to housework, but not from housework to childcare. In other words, if childcare increases, housework is decreased to some extent; but if housework increase, there is no effect on childcare. Although similar results are found regarding the two types of work, we conclude that there are substantial disparities between the two. Thus, adding them into one time use activity conceals important differences.

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