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Chapter 6

Intra-Household Work Timing: The Effect on Joint Activities and the Demand for Child Care[1]

6.1 Introduction

Economic models of labor supply generally distinguish between two effects that labor supply may have on a person's utility: a negative effect as the working effort reduces utility, and a positive effect since paid work generates income that enables consumption. Studies that examine these effects for dual-earner households usually focus on how spouses choose the optimal amount of labor, while the timing of these labor hours is often not taken into account.

Over the past 40 years there has been an enormous increase in female labor participation in Europe, and this has resulted in more dual-earner households over time. For the Netherlands, for example, the labor force participation rate for women as a percentage of the population of women aged between 15 and 64 increased from 26 percent in 1960 to 71 percent in 2007. A similar increase could also be observed in other European countries.[2] As a consequence, work timing between spouses is of more importance now than in the past. The argument for this is straightforward: the presence of two job schedules makes coordination of family time more difficult than in a traditional one-breadwinner household. Therefore, spouses of contemporary couples in Europe face two potentially conflicting work schedules

[1]In this chapter we mention the results of Carriero, Ghysels and Van Klaveren (2009). Furthermore, we would like to thank Carlijn Kamphuis of the Social and Cultural Planning Office of the Netherlands, who provided representative data for the Netherlands on work times, specifically for men and women.

[2]Statistics on the increase in female labor participation can be found in, among others, OECD Employment Outlook (2007) and Kaiser (2006).

when figuring out how to allocate their time over a week.

In this chapter we examine how the spouses of Dutch dual-earner households time their work hours. This is an intriguing question because, first of all, heterogeneity between spouses and between households in working schedule arrangements and restrictions in choosing the optimal work schedule are normally not part of the traditional time allocation model. As a result, neglecting the work timing behavior of the spouses may cause biased estimates of the (economic) incentives for labor supply and when it is performed (Hallberg (2003)). Second, parents who have more control of their work times may have different public child care demands. The latter is important for policy that is related to child care subsidy and female labor participation.

We consider the timing of work hours as an act that leads to hours of paid work performed by both spouses at the time, the joint nature of which cannot be explained by factors other than the partners' potential to communicate on the timing of their paid work. The timing of work hours is measured by the hours that spouses simultaneously work per week. We refer to this as the 'overlap in paid working hours', or ,in short, work time overlap (WTO).

Different behavioral arguments can underlie the observed WTO of spouses, and we illustrate two of them by using the notion that the spouses of a dual-earner household have in fact one joint work schedule. According to this work schedule, we can distinguish three situations: (1) both spouses are at work; (2) one of the two spouses is at work; and (3) none of the spouses are at work. When spouses have a preference for togetherness, they can decide to maximize the hours that they are both at work at the same time as this maximizes the potential for joint leisure time. Parents, on the other hand, may want to minimize the cost of paid child care or may prefer parental care to non-parental care. These parents maximize the hours that one of the parents is at work (i.e. situation 2) as this maximizes the potential time that one of the parents can care for their child.

How far WTO is the result of timing behavior is difficult to analyze, because it is hard to disentangle which part of the observed WTO is caused by the (non-observed) timing behavior of the spouses, and which part is caused by the fact that persons with certain characteristics end up in certain jobs with associated working times. The ideal setting for measuring work timing is one where we examine the WTO of two random samples, say sample I and II. The spouses in both samples are, on average, identical in their characteristics, with this difference: that the spouses in sample I cannot time their working hours, while the spouses in sample II can time their working hours. An estimate that measures the average amount of work timing is obtained by comparing the average WTO between the two samples. Given this setting, it would be possible to examine how the work timing measure varies for different

household types.

In practice, we can observe spouses who possibly time their work hours but we do not observe a control group where the possibility of work timing is ruled out. The nature of this problem relates to the potential outcome model (see (Splawa)-Neyman, J. (1923, 1990), Roy (1951), Rubin (1974), Rubin (1976) and Holland (1986)). According to this model, we would observe two potential outcomes for each household. The first outcome relates to the situation where spouses can time their paid working hours, and the second outcome relates to the situation where spouses cannot time their working hours. However, we can never observe both outcomes at the same time.[3]

Studies by Hamermesh (1996, 2000), Hallberg (2003), Jenkins and Osberg (2005), recognize this problem.[4] In both studies a control group is simulated where the possibility of work timing is ruled out. This control group consists of matched singles with characteristics similar to that of the spouses. The underlying thought is that, although the matched singles have similar characteristics than the spouses, they cannot interact, so that no timing behavior can take place. When Hallberg (2003) and Jenkins and Osberg (2005) compare the WTO of the spouses with that of the control group, a small but significant difference is found. This means that there is empirical evidence for work timing but that the effect that is found is small.

The drawbacks of using a singles sample for the construction of a control group are that: (1) singles are differently constrained and may have different preferences from non-singles. When comparing working time hours, it seems difficult to justify that singles with children are comparable to non-singles with children; and (2) there may be selection into marriage so that the probability of two persons becoming a couple increases when there is more WTO. In this case observing more WTO can be the result of marriage as such, rather than work timing. Because of these drawbacks, the work timing estimates of Hallberg (2003) and Jenkins and Osberg (2005) may be biased and consequently it is not clear whether their findings can be ascribed to work *timing* or if there are other factors involved.

The first contribution of this chapter is that we propose an alternative simulation method to distinguish between the work timing behavior of the spouses and the overlap in work times caused by the fact that persons with certain characteristics end up in certain jobs. Because we do not use information on singles we overcome the above-mentioned problems. We simulate how the amount of WTO would vary if spouses did not have the possibility to time their work hours and identify the amount of WTO that is the result of work timing.

[3]The outcome that is not observed is usually referred to as the counterfactual outcome.

[4]Other interesting studies that discuss the timing of work hours are Sullivan (1996) and Van Velzen (2001).

In this simulation we match couples to other identical couples in the sample and then the couples that are matched switch partners. The average WTO of the couples that remain after the partner switch can be regarded as the control situation where spouses have similar characteristic but cannot time their work hours. Comparing this control outcome with the observed WTO of the spouses provides us with a work timing estimate.[5]

The second contribution of this chapter is that we examine how the work timing estimate relates to the demand for child care and relates to the time that spouses spend jointly on other activities, such as, leisure, housework and, if applicable, child care.

The relation between the timing of work and the demand for child care is interesting as it may shed some light on how spouses decide on their labor supply, taking into account the timing possibilities they have and the current state of child care services and costs. Although the relation between labor supply and child care is discussed in many studies (see, among others, Becker and Lewis (1973), Maassen van den Brink (1994), Hamermesh (2000), Hallberg and Klevmarken (2003), Del-Boca and Vuri (2005)), the focus of these studies is mainly on the quantity of labor supply instead of the timing behavior. We may find, for example, that parents who create more WTO also demand less child care, which means that parents can avoid expensive child care costs by the timing of their work schedules or that parents have a preference for parental child care. Finding a correlation between the work timing estimate and the demand for child care is interesting from a policy perspective: more flexible working times could become one of the ingredients of a policy mix such that the focus is more on the work-family balance. Finding this balance is now often difficult for spouses in dual-earner households because labor market rigidities restrict them in the timing of their working hours (Carriero et al. (2009)).

The work timing behavior of spouses may relate to the time that spouses spend jointly on leisure, housework, and child care. The intuition is that when spouses create more WTO, they create potentially more time to perform other activities together. In van Velzen (2001), Hallberg (2003), Jenkins and Osberg (2005) and Van Klaveren and Maassen van den Brink (2007), there is empirical evidence that spouses have a preference for togetherness. Timing behavior may also relate to the time that spouses jointly spend on housework and child care but these relations have been little investigated in labor economics and sociology.

The outline of this chapter is a follows. In Section 6.2, the data are described. In Section 6.3, we illustrate the procedure that is used to simulate the control group and discuss the simulation results. In Section 6.4, we examine how work timing relates to the demand for child care and the time that spouses jointly spend on leisure, housework and child care. In

[5]In Van Klaveren and Maassen van den Brink (2007), we find a small work timing effect using this methodology.

Section 6.5, we summarize the results of a study by Carriero et al. (2009). In this study the authors study the work timing behavior of parents in Belgium, Italy and the Netherlands. Section 6.6 concludes.

6.2 Data

For this study we had the opportunity to ask several questions in the Post Initial Schooling Survey. The data set was collected in December 2005 by the Dutch Institute for Public Opinion and Market Research (TNS NIPO) and is a cross-section of the Dutch population aged from 16 to 64.

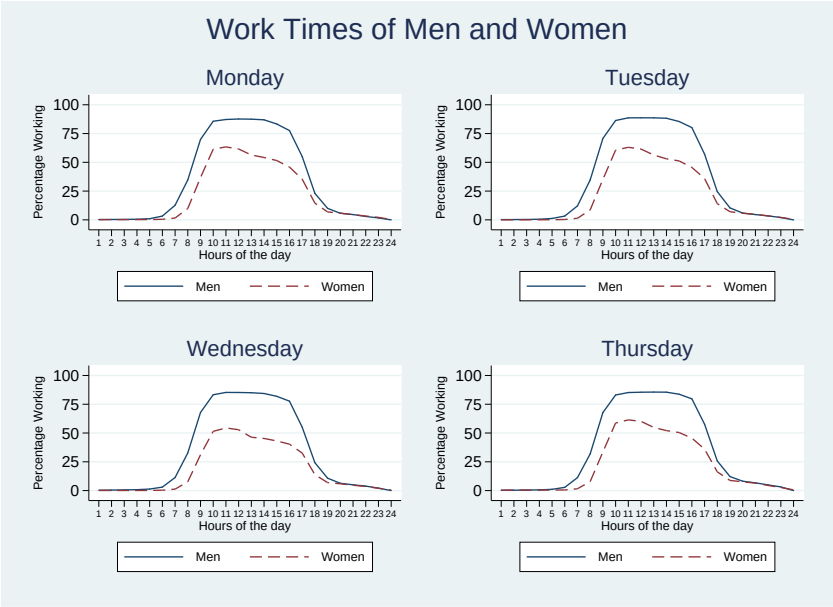
Various questions were asked in order to obtain accurate work timing information. Control questions were included, in order to minimize the effort required from parents to fill in their work schedules. For example, parents were asked (1) on which day of the week they usually work; and (2) whether they work during the same hours each day. If a spouse answered the second question affirmatively, then he or she had to fill in the working times for only one of the days he or she works. On the other hand, if a spouse did not answer the second question affirmatively, then he or she had to fill in the working times for each day of the week they usually work. This information suffices to determine when and how many hours both spouses work.

For this study we use data on 1830 two-earner households. For both spouses there is information available on when they work during the week, but it is possible that one of the spouses answered on behalf of the partner.

In Figure 6.1 we show during which hours the men and the women in our sample work. The horizontal axis represents the 24 hours of the day, while the vertical axis represents the percentage of men and women who work during these hours. Men are represented by a straight line, while women are represented by a dotted line.

Although most men work between 8 am and 5 pm, the labor activity of men starts around 6 am and finishes approximately around 7 pm. Most women work between 10 am and 5 pm and we observe a peak between 10 am and 12 noon. The labor activity of women starts somewhat later than men (around 7 am) and ends somewhat earlier than men (around 6 pm). As was to be expected, spouses usually do not work on a Saturday or a Sunday. These graphs confirm the patterns that are generally found for the Netherlands (see Breedveld, van den Broek, de Haan, Harms, Huysmans and van Ingen (2006) and the time use study of 2005 performed by the Social and Cultural Planning Office of the Netherlands (*in Dutch* :

het SCP Tijdsbestedingsonderzoek, 2005)).[6]



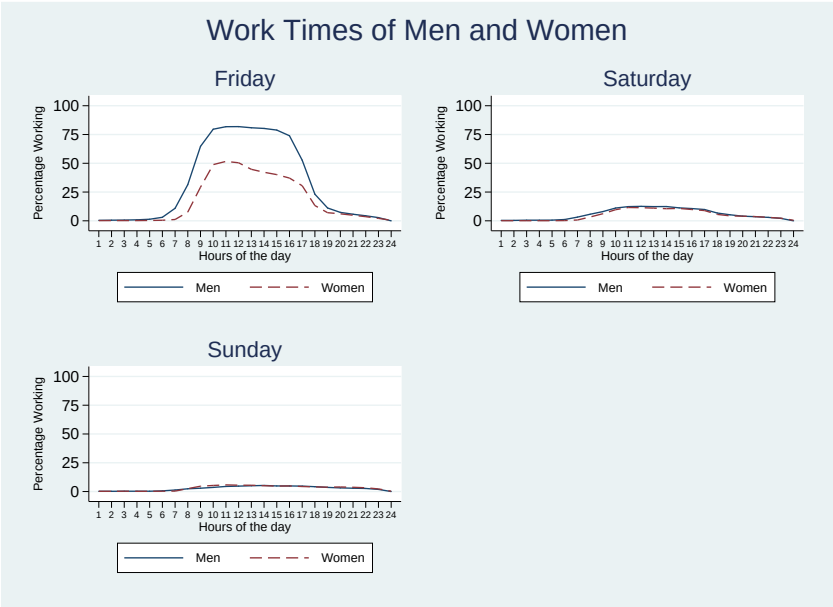


Figure 6.1: When do men and women work during the day?

[6]We would like to thank Carlijn Kamphuis of the Social and Cultural Planning Office of the Netherlands, who provided representative data for the Netherlands on work times for men and women.

Information regarding the working days and the working hours of spouses is shown in Table 6.1. Men usually work 4 or 5 days per week and about 83 percent of them work 5 days per week or more. Women are part-time workers since about 65 percent of the females work 4 days per week or less. On average, men work more labor hours (44.2 hours per week) compared with women (27.14 hours) as is generally found for the Netherlands.

Table 6.1: **Descriptive Statistics Working Days & Working Hours**

	Men		**Women**	
	Freq.	**%**	**Freq.**	**%**
# working days				
1	12	0.66	48	2.62
2	11	0.60	231	12.62
3	42	2.30	512	27.98
4	247	13.50	425	23.22
5	1,323	72.30	530	28.96
6	134	7.32	39	2.13
7	61	3.33	45	2.46
Total	1830	100	1830	100
Average labor hours	44.21		27.14	
St. Dev. of labor hours	11.44		13.44	

To find out if spouses are able to time their work schedules, we asked them if they can influence the time they start or end working. The descriptive statistics of their answers are printed in Table 6.2. 38 percent of the men and 43 percent of the women report that it is not possible or difficult, to influence their work timing substantially. For these persons we cannot distinguish between spouses for whom work timing is very difficult or for whom work timing is not even possible. On the other hand, 62 percent of the men and 57 percent of the women answer that they can time their work hours to a considerable extent. This means that these persons have the opportunity to time their work hours according to their preferences.

Table 6.2: **Flexibility in Work Times**

	Freq.	%
Men		
Not at all/very difficult	690	37.70
Within boundaries but I have to report it in advance	397	21.69
Within boundaries but I don't have to report it in advance	386	21.09
I can determine (almost) fully when I work during the day	357	19.51
Total	1830	100
Women		
Not at all/very difficult	791	43.22
Within boundaries but I have to report it in advance	512	27.98
Within boundaries but I don't have to report it in advance	279	15.25
I can determine (almost) fully when I work during the day	248	13.55
Total	1830	100

In Table 6.3 we show the respondents' answers on whether they found their current job before or after they started living together. This question was asked because persons have the opportunity to switch to jobs with more favorable work times, and this can be considered as work timing as well. If the spouses answered that they found their current job before they started living together, then more favorable work times have not been realized by means of a job switch. It is possible that these persons were able to realize more favorable working times at their current employer, and this may even be one of the reasons why they are still in their current job. However, on average, we would expect that in the latter case work time adjustments are more difficult as an agreement has to be reached with the employer. In our sample, approximately 42 percent of the men and 31 percent of the women were in their current jobs before they started living together, and so these persons did not time their work schedules by switching jobs. The work timing is therefore solely dependent on the extent to which they can influence the daily starting/ending times of their job.

Table 6.3: **Current job was obtained before living together**

	Men		**Women**	
	Freq.	%	**Freq.**	%
True	759	41.48	559	30.55
Not true	895	48.91	1095	59.84
Non-response	176	9.62	176	9.62
Total	1830	100	1830	100

Work timing is measured by the amount of paid labor hours hours that the spouses simultaneously work per week. In Table 6.4, we show the OLS estimation results, where we have regressed the WTO of spouses on variables that are thought to have a significant influence on this WTO.[7] In order to have an idea of the magnitude of the effects, we report the average amount of WTO.

We emphasize that the obtained estimates give an impression of how the amount of WTO varies over the different household types in the sample. They do not necessarily reflect how spouses time their work schedules because the significance of certain characteristics may also arise from the fact that there is selection into job types. For example, higher educated persons are more likely to self-select a full-time job, and as a consequence we find that the level of education is positively related to WTO. However, in this case the observed relation can not be ascribed to the timing of work schedules.

[7]For presentational convenience, we do not show the estimates of 12 dummies that indicate on which days the spouses work. The full estimation results are available on request.

Table 6.4: **Work Time Overlap Regression**

	Estimate	t-statistic
Household Characteristics		
# Children between 0-4	-1.844***	-4.69
# Children between 4-12	-1.709***	-7.11
# Children between 12 plus	-0.425*	-1.65
Spouses met each other at work (N=219)‡	1.019	1.61
Spouses met at a club (N=173)‡	-0.014	-0.02
Spouses met each other through friends (N=317)‡	0.898	1.61
Spouses met each other by the internet (N=102)‡	-0.303	-0.34
Spouses met each other somewhere else (N=446)‡	0.572	1.13
Men's Characteristics		
Weekly work hours	0.177***	8.86
Timing of current job and living together†	0.304	0.76
Education level	0.291**	2.23
Flexible work times	0.908***	5.27
Women's Characteristics		
Weekly work hours	0.603***	32.70
Timing of current job and living together†	0.320	0.75
Education level	0.539***	3.87
Flexible work times	0.400**	2.23
Control†	2.326**	2.31
Constant	-25.412***	-15.79
Set of work day dummies (– *results suppressed*–)		
Adjusted R^2	0.687	
N	1830	
$\overline{WTO}$	20.60	

Note: * significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level. †the relation between the start of the current job and the moment spouses started living together contains 179 missing values that are replaced to -1. To control for these missing values, we included a dummy variable, *control*, that is 1 for each -1-value and zero otherwise. ‡The reference group are partners who have met each other at places of entertainment (N=573).

The amount of WTO is lower when spouses have children and this effect is stronger the younger the children. Although parents may prefer to maximize the time that they themselves can take care of their children, it may also reflect the fact that women usually choose to work less hours when children are born. The latter reflects work timing by the job-hour choice, and this is not the effect we are interested in. The observation that WTO is lower when spouses have children is also found by Hamermesh (2000), Hallberg (2003), van Velzen (2001) and Van Klaveren and Maassen van den Brink (2007).

There may be selection into marriage, and therefore the probability of two persons becoming a couple increases when there is more WTO. As a consequence the 'realization' of a couple is caused by the fact that there is more overlap in work times in the first place. Therefore, we asked the spouses in our sample where they met each other, so that we can empirically test if there is a positive correlation between the place where partners meet and the amount of WTO. We find that the meeting place is not significantly correlated with the amount of WTO and so the variation in WTO, is not influenced by the selection into marriage.

Necessarily, the amount of WTO is significantly influenced by the working hours of both spouses. On the one hand, the maximum amount of WTO is determined by the spouse who works the smallest amount of labor hours. On the other hand, the probability of observing more WTO increases when the amount of working hours of the spouse who works the most is higher.

The education variables represent the highest attained education level of the spouses, and this level is measured on a scale from 1 to 7. The lowest education level represents primary education and the highest education level represents having a university degree. When spouses are higher educated they tend to have more WTO.

A large proportion of men and women found their current job before they started living together and, as we argued earlier, it is possible that these persons have less possibility to switch to jobs with more favorable work times. We find that when partners start living together does not influence the amount of WTO.

As was to be expected, we find that if spouses can influence when they start or end working, this is significantly and positively correlated with WTO.

6.3 Matching Procedure and Estimation Results

6.3.1 Matching Procedure

To obtain an estimate of work timing, it would be desirable to compare the WTO of the couples in our sample with the WTO of a control group of couples. Both the spouses and the control group should have similar characteristics, but while the spouses in our sample have the possibility to interact, this interaction should be ruled out for the control group.

In Van Klaveren and Maassen van den Brink (2007), this control group was simulated by using an exact matching strategy that matches households to other households. The problem of using an exact matching strategy is that the probability of finding an exact match decreases with the number of matching characteristics. Moreover, it is not possible to use continuous variables as matching variables as the probability of finding an exact match drops dramatically. As a result, it is less likely that a match can be found for households with unusual characteristics and the estimate that is obtained is then more similar to a regression-towards-the-mean-estimate. In this chapter, we therefore use a different matching technique than in our former research.

We start by matching each household in the sample to the best look-alike household in the sample, and this matching strategy is usually referred to as Nearest Neighbor Matching. In order to do so we use a distance measure that is referred to as the Mahalanobis distance. This distance measure is used to determine the distance from one household to another household and is based on certain matching characteristics (X) that are thought to influence that amount of WTO. The Mahalanobis distance measures the distance between the households, correcting for the statistical variation in the X-variables. We impose a matching rule that minimizes this distance between households. More formally, household i can be matched to another household j, in a sample with N households, according to the following rule:

$$M(i,j) = 1 \; if \; j = \arg \min_{j=1,\ldots,N^{-i}} (X_i - X_j)' \Sigma^{-1} (X_i - X_j),$$

where $M = 1$ if a match is possible, and where N^{-i} stands for the sample N with the exception of couple i. It can happen that household i is matched to more than one household and in this case we randomly pick a household from the group of potential matches. An advantage of the Mahalanobis distance is that it is non-parametric and consequently does not rely on any functional form or distribution.

The WTO of the control group is obtained as follows. Couples are matched with other identical couples in the sample based on the Mahalanobis distance measure and then the

couples that are matched switch partners. The average WTO of the couples that remain after the partner switch is regarded as the control outcome. We will refer to this outcome as WTO_c.

Let us define an indicator variable, I, that equals 1 if spouses can interact, and 0 otherwise. The WTO when the spouses do not interact is approximated by the WTO of the control group, WTO_c, such that we have:

$$\Delta = E(WTO|X, I = 1) - E(WTO_c|X_c, I = 0). \tag{6.1}$$

By construction, the spouses of the control group couples cannot interact, so that $I = 0$. The work timing estimate is represented in Equation (6.1) by Δ, under the assumption that differences in WTO cannot be attributed to the differences in individual and household characteristics between the couples and the matched couples.

6.3.2 Matching Results

The matching variables that enter the WTO regression significantly in Table 6.4 are used as matching variables. In Table 6.5, we show the descriptive statistics of the matching variables for the couples and the matched control couples selected by the Nearest Neighbor Matching method, i.e. the matched couples. The last column represents the difference of the means of these variables.[8]

[8] Again, we do not mention the 14 work day dummies as they are not significantly different, and presenting them in Table 6.5 would make the the table more difficult to read.

Table 6.5: **Descriptive statistics for couples and matched couples**

	Couples		Matched Couples		
	Mean$_1$	**Std.Dev.**	**Mean$_2$**	**Std.Dev.**	**Mean$_1$-Mean$_2$**
Household Characteristics					
# Children between 0-4	0.23	0.52	0.23	0.53	0.00
# Children between 4-12	0.51	0.83	0.50	0.82	0.01
# Children between 12 plus	0.41	0.79	0.38	0.76	0.03
work time overlap	20.60	13.91	20.90	14.22	-0.30
Men's Characteristics					
Weekly work hours	48.84	12.52	49.32	12.58	-0.48
Education level	3.04	1.64	3.03	1.64	0.01
Flexible work times	2.22	1.15	2.22	1.16	0.00
Women's Characteristics					
Weekly work hours	29.56	14.58	29.77	14.52	-0.21
Education level	3.16	1.54	3.12	1.52	0.04
Flexible work times	1.99	1.06	1.92	1.04	0.07***
N	1830		1830		

Note: * significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level.

The matching variables do not differ significantly between the couples and the matched couples, with the exception of the variable flexible work times of women. Although, the latter is significant, the difference is small. We also test whether the amount of WTO differs between the couples and the matched couples and we find that this is not the case. Obviously the amount of WTO was not included as a matching variable, since this is an outcome variable.

We conclude the match was successful, in the sense that the matched couples are good look-alike couples and that differences in WTO cannot be attributed to differences in individual and household characteristics.

Do couples time their work hours?

A work timing estimate is obtained by comparing the WTO of the couples with the WTO_c of the control couples. It may be that some couples minimize the amount of WTO, while other couples maximize this amount of WTO, and therefore we will examine the work timing estimate for different household types.

We first perform a regression where WTO and WTO_c are separately regressed on a set of dummies, that characterize the household. These household characteristics concern the presence of children of certain age levels, the education level of both spouses, the (gross) level of household income, and whether spouses have control over their own working times. The estimation results are shown in Table 6.6.

The first and second columns of Table 6.6 represent the household type that is considered. The third column shows the number of these household types in the sample. The fourth and fifth columns show the values of the predicted WTO and WTO_c. The sixth column represents the work timing estimates for the different household types. This work timing estimate is referred to as Δ, as in equation (6.2), and this is the variable of interest. We refer to work timing resulting in a positive (negative) estimate of Δ as couples who create more (less) WTO. All effects are measured in hours per week unless mentioned otherwise.

We find that couples create less WTO when there is a child present in the household, and this effect is more pronounced with younger children. Childless couples create on average 5 hours more WTO compared with parents of a child aged between 0 and 4. As children become older this effect diminishes.

Spouses without children create 2.25 hours more WTO, and these hours can be potentially used to spend more time on another joint activity, such as leisure. Parents, on the other hand, create less WTO. For parents with a child aged between 0 and 4, we find that they create 2.75 hours less WTO. Parents with a child aged between 5 and 12 or aged 12 years and older create -2.42 and -1.26 hours less WTO, respectively. This is in line with the intuition that parents minimize the amount of WTO to minimize costs of child care or because they prefer parental care over non-parental care. In Section 6.4.2 we return to this issue in more detail.

Table 6.6: **Comparison of the WTO of couples and the Control Group**

		Obs.	WTO	WTO_c	Δ
Household					
No child		429	24.96	22.71	2.25***
Child present aged 0-4		338	15.32	18.07	-2.75***
Child present aged 4-12		592	15.92	18.34	-2.42***
Child present aged 12 plus		471	17.94	19.20	-1.26***
Gross Household income	low	424	18.98	19.67	-0.70***
	med.	701	20.22	20.47	-0.25***
	high	381	23.44	21.92	1.51***
Men					
Education level	low	450	21.14	20.71	0.43
	med.	881	20.42	20.45	-0.03
	high	499	20.43	20.72	-0.28
Flexible work times	very low	690	18.84	19.46	-0.63***
	low	397	19.69	20.37	-0.67***
	high	386	21.96	20.54	1.42***
	very high	357	23.56	23.07	0.50***
Women					
Education level	low	310	17.62	18.56	-0.93***
	med.	1029	20.01	20.28	-0.28***
	high	491	23.90	22.64	1.26***
Flexible work times	very low	791	19.20	20.17	-0.97***
	low	512	20.76	20.46	0.30***
	high	279	23.67	21.58	2.09***
	very high	248	21.30	21.07	0.23***

Note: * significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level.

Men's education level does not affect the work timing estimate, but the education level of the women does. Couples where the woman has a high education level create 1.26 hours more

WTO. On the contrary, couples where the woman has a medium or a low education level create less WTO. An explanation is that the couples where the woman is higher educated have, on average, less children and the household income is, on average, higher. Consequently, these couples are presumably more flexible in arranging their work times and are more interested in maximizing the overlap in work times to maximize the amount of joint leisure.

The household income represents the gross yearly income measured in euros. We distinguish three categories: (0,45000], (45000,68000] and > 68000. Couples with a high (medium, low) household income create more (less) WTO. Similar to the education effect of women, it could be that higher income couples have less children, and are more interested in maximizing the overlap in work times to maximize the amount of joint leisure.[9]

Couples where men and women are more in control of their own working times create more WTO. However, this effect is not found for spouses who have full control over their own working times. An explanation is that these spouses have jobs with autonomous responsibilities and work on average more hours. These responsibilities and the number of job hours may limit these persons to time their work hours.

6.4 Work Timing, Joint Activities and Child Care Demand

Until now, we have examined whether there is work timing and how this work timing differs for different household types. There are different reasons why couples may time their working hours. When couples create more WTO, spouses can, for example, spend more time with their partner on other activities. In this section we test whether work timing behavior affects the amount of time that couples spend jointly on leisure, household tasks and child care. When couples create less WTO they can in principle spend less time together on other activities. However, parents may prefer such behavior as it increases the amount of time that one of the parents is at home taking care of the children. In this section we, therefore, test whether work timing behavior affects the demand for child care.

As in equation 6.1, the work timing estimate is represented by the difference between the WTO of the couples and that of the control group couples, i.e.

$$\Delta = WTO - WTO_c. \tag{6.2}$$

[9]The income variable contains many missing values. On account of these missing values, we replaced the records by zero, and added a dummy in the regression equation, indicating 1 when the information on household income was missing, and 0 otherwise.

6.4.1 Work timing and the Time Spent on Joint Activities

In this subsection we examine how work timing relates to the time that couples spend jointly on leisure, household tasks, and child care. We start our discussion by focusing on the relation between work timing and joint leisure.

The Effect of Work Timing on Joint Leisure

In the data there is information on the total amount of leisure (t_l) that is spent by each spouse per week, and there is information on the joint leisure that spouses spend with their partner per week ($t_{l,joint}$). For each household, we can construct a measure that represents the amount of joint leisure of the spouses as a fraction of the total amount of leisure time:

$$LTO = \frac{2 \cdot t_{l,joint}}{t_{l,male} + t_{l,female}} \tag{6.3}$$

where LTO represents a fraction and stands for the amount of leisure time overlap. The amount of joint leisure can never be more than the amount of the spouses leisure time that is lowest, i.e. $\min(t_{l,male}, t_{l,female})$. Therefore, we have multiplied the numerator by 2, such that the fraction LTO lies in the interval [0,1]. Besides the practical purpose of this multiplication, it is also intuitive as there are two spouses in the household who both enjoy the amount of joint leisure.

In Table 6.7, we present the distribution of LTO by means of a frequency table. For one of the households we did not have the appropriate information to construct LTO so there is information on 1829 households. The table can be read as follows. When we consider the first and the second columns, we find that 117 households have 10 to 20 percent LTO. From the third column we deduce that 117 households cover 6.4 percent of the households in the sample, and the fourth column indicates that 10.77 percent of the households have between 0 and 20 percent LTO.

We find that the distribution of LTO is skewed left. Although about 65 percent of the households have more than 50 percent LTO, we observe at the same time that households are well spread over the different LTO intervals.

Table 6.7: **Frequency table of Leisure Time Overlap**

% LTO	Freq.	%	Cum. %
0-10	80	4.37	4.37
10-20	117	6.40	10.77
20-30	104	5.69	16.46
30-40	176	9.62	26.08
40-50	169	9.24	35.32
50-60	170	9.29	44.61
60-70	181	9.90	54.51
70-80	186	10.17	64.68
80-90	275	15.04	79.72
90-100	371	20.28	100
Total	1829	100	100

We could use a linear regression model to model the relation between joint leisure and work timing. We would then regress LTO on Δ while controlling for several household characteristics. The estimation model would then look like:

$$LTO = \lambda_0 + \lambda_1 \cdot x_1 + ... + \lambda_n \cdot x_n + \delta_{LTO} \cdot \Delta + \varepsilon_{LTO} \tag{6.4}$$

where the estimation parameters are represented by λ and δ_{LTO}; x represent the n control variables; and Δ represents the work timing estimate. Since the equality in (6.4) will not hold exactly we add the usual error term $\varepsilon_{LTO} \sim N(0, \sigma_{\varepsilon_{LTO}})$. The problem that arises is that the model presented in (6.4) can predict values for LTO that are greater than 1 or smaller than 0, since the model does not 'know' that the dependent variable is a fraction with only values in the interval [0,1]. Therefore, we transform the LTO variable by using a logistic transformation and rewrite the model as:

$$\log(\frac{LTO}{1 - LTO}) = \lambda_0 + \lambda_1 \cdot x_1 + ... + \lambda_n \cdot x_n + \delta_{LTO} \cdot \Delta + \varepsilon_{LTO} \tag{6.5}$$

Because of the logistic transformation of LTO, the predicted LTO will always lie in the interval [0,1], although the model parameters can be any real number. The model is estimated using a maximum likelihood estimation procedure.

The control variables that we use in the estimation model are the following:[10]

- A dummy indicating if there are no children in the household;
- A dummy indicating if there are more than two children present in the household;
- A dummy indicating if there is a child present in the household aged between 0 and 4;
- A dummy indicating if there is a child present in the household aged between 4 and 12;
- Education level dummies for men and women, where we distinguish between a low, medium, and high education level (high is used as the reference group).

It is possible that the timing behavior of households with children is different from that of households without children. Therefore, we have interacted Δ with the dummy variable that indicates if there is a child present aged between 0 and 4, and with the dummy variable that indicates if there is a child present between 4 and 12.[11]

The estimation results are shown in Table 6.8. The amount of LTO is significantly lower when there are more than two children present in the household and when there are children present in the household aged below 12. The signs of the education levels of men are positive but insignificant. The lower woman's education level, the less joint leisure time both spouses have.

We are particularly interested in the effect of the work timing variables. We find that there is a constant work timing effect on LTO that is positive and significant. To have an idea of the impact of Δ on LTO, we simulate how increasing Δ by 1 hour affects the fraction LTO, evaluating all other variables in their sample averages. We find that the fraction LTO will increase by 0.0012 when Δ increases by 1 hour per week. When we express this number in terms of joint leisure hours it implies that couples increase the amount of joint leisure by 0.14 hours when they create 1 more hour of WTO more. We have calculated this as follows. An increase of the fraction LTO by 0.0012 means that couples spend 0.0012 percent of their total leisure time per week (L_{total} in the table) more on joint leisure. Because the sample average of the total amount of leisure equals 116.15 hours, the increase in joint leisure equals 0.0012·116.15=0.14 hours.

[10] We also included the household income, the size of the municipality, and the firm size, because we expected that these variables could be explanatory for the variation in LTO. However, it turned out that this was not the case and so we did not include these variables in the model.

[11] We have also included interaction effects with the education levels of men and women, but these interaction effects were not significant and were dropped from the model.

Table 6.8: **Leisure Time Overlap regression**

Dependent Variable: $\log(\frac{LTO}{1-LTO})$	Estimate	t-statistic
Control variables		
Dummy more than two children	-0.502***	-3.31
Dummy child present between 0-4	-0.295**	-2.47
Dummy child present between 4-12	-0.934***	-9.10
Male has low education level	0.169	1.26
Male has middle education level	0.067	0.59
Female has low education level	-0.334**	-2.22
Female has middle education level	-0.141	-1.27
Constant	1.210***	11.38
$\Delta\cdot$ Dummy child present 0-4	-0.041***	-3.33
$\Delta\cdot$ Dummy child present 4-12	-0.011	-1.14
Δ	0.019***	3.60
Likelihood	-3762.43	
Observations	1829	
$\overline{L}^{\dagger}_{total}$	116.15	

Note: * significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level. $^{\dagger}\overline{L}_{total}$ is the sample average of the aggregated leisure hours of men and women.

We also find that the amount of LTO is negatively and significantly influenced by Δ interacted with the dummy that indicates that there is a child present in the household aged between 0 and 3. This means that couples with a young child create less LTO by the timing of their work schedules than couples without young children. Again, we can simulate how increasing Δ by 1 hour affects LTO, conditioning on whether there is a young child present in the household or not. We find that when couples with a young child create 1 more hour of WTO this will result in -0.06 hours joint leisure. On the other hand, when couples without young children create 1 more hour of WTO, this results in 0.35 hours of joint leisure.

We conclude that the results are in line with the hypothesis that couples without (young) children increase the amount of joint leisure when they create more WTO. For couples with young children, we find a small and negative effect, meaning that they tend to reduce the amount of joint leisure by timing their work schedules. These findings are in line with the empirical findings of Hallberg (2003), Jenkins and Osberg (2005), and Van Klaveren and Maassen van den Brink (2007).

The Effect of Work Timing on Joint Housework

The relation between work timing and the joint time spend on household chores can be analyzed in a similar way as we did for joint leisure. Consequently, we do not elaborate on the estimation method in order to avoid repetition.

In the data used, there is information on the weekly joint hours that couples spend on household chores. Household chores include activities such as cooking, repairing the car, cleaning, and doing the laundry, but it does not include the household activities that are related to child care. The amount of joint housework as a fraction of the total time that both partners spend on housework is represented by:

$$HTO = \frac{2 \cdot t_{h,joint}}{t_{h,male} + t_{h,female}} \tag{6.6}$$

where HTO stands for housework time overlap; $t_{h,joint}$ is the joint time spent on housework; and $t_{h,i}$ is the amount of individual time spent on housework by $i = male, female$. In Table 6.9 we present the frequency table of HTO and the interpretation of this table is similar to that of Table 6.7. We find that the fractions of joint household time are clustered around the lower intervals. Almost 70 percent of the households in our sample spend less than 40 percent of the total housework time jointly.

Table 6.9: **Frequency table of Housework Time Overlap**

% HTO	Freq.	%	Cum. %
0-10	415	22.75	22.75
10-20	309	16.94	39.69
20-30	310	17.00	56.69
30-40	193	10.58	67.27
40-50	169	9.27	76.54
50-60	138	7.57	84.10
60-70	119	6.52	90.63
70-80	39	2.14	92.76
80-90	57	3.13	95.89
90-100	75	4.11	100.00
Total	1824	100	100

Performing a logistic transformation on HTO we estimate the following model:

$$\log(\frac{HTO}{1-HTO}) = \gamma_0 + \gamma_1 \cdot x_1 + ... + \gamma_n \cdot x_n + \delta_{HTO} \cdot \Delta + \varepsilon_{HTO} \tag{6.7}$$

with $\varepsilon_{HTO} \sim N(0, \sigma_{\varepsilon_{HTO}})$, where γ and δ_{HTO} are the parameters to be estimated, x represent the same n control variables that we used in (6.5); and Δ represents the work timing estimate.

We find that couples spend less joint time on household chores, the lower the woman's education level. An explanation is that women in conventional households are relatively lower educated and are mainly responsible for doing the household chores. As a consequence, the amount of joint housework time is lower. This reasoning may also explain the negative significance of the dummy that indicates that the man has a low education level. When there are children present in the household this negatively affects the amount of time that spouses spend jointly on household chores. However, only the dummy that indicates whether there are children present aged between 4 and 12 is significant.

Table 6.10: **Housework Time Overlap regression**

Dependent Variable: $\log(\frac{HTO}{1-HTO})$	Estimate	t-statistic
Control variables		
Dummy more than two children	-0.190	-0.88
Dummy child present between 0-4	-0.065	-0.38
Dummy child present between 4-12	-0.378***	-2.59
Male has low education level	-0.706***	-3.71
Male has middle education level	-0.108	-0.68
Female has low education level	-0.570**	-2.67
Female has middle education level	-0.282*	-1.79
Constant	-0.788***	-5.22
$\Delta\cdot$ Dummy child present 0-4	-0.019	-1.08
$\Delta\cdot$ Dummy child present 4-12	-0.032***	-2.43
Δ	0.036***	4.92
Likelihood	-4388.74	
Observations	1824	
$\overline{H}_{total}$	21.47	

Note: * significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level.

The effect of work timing on the joint time that spouses spend on household chores may be influenced by the presence of children in the household. Therefore we have interacted Δ with the two child dummies, as we did before. We find that there is a constant work timing effect of 0.036, and that work timing affects the amount of HTO positively and significantly. When we simulate how an increase of Δ by 1 hour affects the amount of HTO we find that the joint hours spent on household chores increases by 0.09 hours when couples create 1 hour more work time overlap.

When there are children present in the household aged between 4 and 12, this affects how work timing influences the amount of time that couples spend jointly on household

chores. When we simulate how an increase of Δ by 1 hour affects HTO, while conditioning on whether there is a young child present in the household or not, we find the following. Couples with a child between 4 and 12 spend 0.05 hours jointly on household chores when they create 1 more hour of WTO. When couples have no child between 4 and 12 and create 1 more hour of WTO they spend 0.01 joint hours more on household chores.

We conclude that the time that couples spend jointly on household chores is significantly related to how couples time their working hours, but the correlation is very small.

The Effect of Work Timing on Child Care

Finally, we examine whether work timing and joint child care are related. We again use the following measure that represents joint child care as a fraction of the total amount of child care:

$$CTO = \frac{2 \cdot t_{c,joint}}{t_{c,male} + t_{c,female}} \tag{6.8}$$

where CTO stands for child care time overlap and $t_{c,joint}$, $t_{c,male}$ and $t_{c,female}$ stand for respectively, the time that spouses jointly spend on child care and the time that each partner spends on child care in total. The frequency table of CTO is presented in Table 6.11.

Table 6.11: **Frequency table of Child care Time Overlap**

% CTO	Freq.	%	Cum. %
0-10	206	20.44	20.44
10-20	82	8.13	28.57
20-30	105	10.42	38.99
30-40	99	9.82	48.81
40-50	103	10.22	59.03
50-60	108	10.71	69.74
60-70	111	11.01	80.75
70-80	38	3.77	84.52
80-90	67	6.65	91.17
90-100	89	8.83	100.00
Total	1008	100	100

The number of observations necessarily drops because not all couples in our sample have

children. In Table 6.11 we do not observe a systematic pattern in how CTO is distributed. Most households answer that the amount of CTO is between 0 and 10 percent of the total amount of child care time. With the exception of the intervals 70-80 and 80-90, it seems that each of the other intervals contain about 10 percent of the households in the sample.

We estimate the following model:

$$\log(\frac{CTO}{1-CTO}) = \tau_0 + \tau_1 \cdot x_1 + ... + \tau_n \cdot x_n + \delta_{CTO} \cdot \Delta + \varepsilon_{CTO} \tag{6.9}$$

with $\varepsilon_{CTO} \sim N(0, \sigma_{\varepsilon_{CTO}})$, where τ and δ_{CTO} are the estimation parameters; x represent the same n control variables that we used before; and Δ represents the work timing estimate.

We note that only parents will appear in the estimation sample, so that having zero children is not possible. The small reference group is therefore parents who only have children older than 12 years old, and hence the result that the presence of children aged below 12 affects CTO positively seems plausible.

We do not find evidence that the timing of work hours affects the time that parents spend jointly on child care. We also estimated an alternative estimation model where we included the hours of child care that parents outsourced. These hours may affect the total amount of child care by the parents and may also affect CTO. However, the hours of child care that parents outsourced did not enter the regression model significantly.

A priori, we expected that parents with (more) young children are more likely to create less WTO, either because the have a preference for parental child care or because they want to avoid expensive child care costs. This behavior presumably leads to less CTO, because parents behave in a way that maximizes the time that *one* of the parents is at home. The hypothesis that (more) young children lead to less CTO is not supported by the data.

Table 6.12: **Child care Time Overlap regression**

Dependent Variable: $\log(\frac{CTO}{1-CTO})$	Estimate	t-statistic
Control variables		
Dummy more than two children	-0.462	-1.63
Dummy child present between 0-4	0.730***	2.96
Dummy child present between 4-12	1.060***	4.58
Male has low education level	-1.137***	-3.49
Male has middle education level	-0.471*	-1.70
Female has low education level	-0.090	-0.24
Female has middle education level	-0.117	-0.42
Constant	-1.001***	-3.14
$\Delta\cdot$ Dummy child present 0-4	-0.026	-1.05
$\Delta\cdot$ Dummy child present 4-12	-0.006	-0.25
Δ	0.017	0.85
Likelihood	-2653.61	
Observations	1008	
$\overline{C}_{total}$	10.74	

Note: * significant at the 10% level, ** significant at the 5% level, *** significance at the 1% level.

We will shortly summarize the findings of Section 6.4.1 on how work timing behavior affects joint leisure, the time spent on household tasks, and the amount of child care given by the parents together.

First of all, we find that work timing behavior hardly affects the joint time of spouses on household tasks, and does not affect the amount of child care given by the parents together. With respect to the latter, we expected that parents with (more) young children would create less WTO because these parents either have a preference for parental child care or want to avoid the expensive child care costs. This behavior would then, presumably, result in parents maximizing the time that one of the parents is at home, and this automatically comes at

the expense of the time that two parents are at home together. In this study, this relation between work timing and child care is not supported by the data.

We find empirical evidence that couples time their work hours so that they can spend more leisure time together, and this is usually referred to as a 'togetherness preference'. This result is in line with earlier studies, such as Hallberg (2003), Jenkins and Osberg (2005) and Van Klaveren and Maassen van den Brink (2007). However, an important difference is that we only find this togetherness preference for childless couples. Spouses with no children have 0.35 more hours joint leisure when they create 1 more hour WTO. On the other hand, parents have -0.06 less hours of joint leisure when they create 1 more hour WTO.

6.4.2 Work Timing and Child Care Demand

In this section we examine the relationship between work timing and the demand for child care. Before we start our analysis we explain how child care is arranged in the Netherlands. The government child care policy in the Netherlands drastically changed after January 2005. Before January 2005, formal child care institutions were financed by the local authorities so child care institutions could offer child care to parents for a lower price. However, this placed these child care institutions in a dominant position, for several reasons. First of all, parents were usually not aware about the actual costs of the child care they demanded. This was caused by the fact that the child care institutions and not the parents received a subsidy from the local authorities. In addition, the amount of the subsidy varied somewhat arbitrarily over different localities which made prices of child care non-transparent. Second, child care demand exceeded child care supply, and as a consequence parents could not freely choose between different alternatives of child care. Because of the long waiting lists, parents were happy if they could make use of the services of a child care institution, and this meant that they were less critical about the quality of the child care.

After January 2005 several changes were implemented to improve the way child care was arranged. Subsidies were no longer given to child care institutions but were given to the parents instead. Parents first paid the cost of child care themselves and then received a reimbursement from the government and the employer if they applied for it. Assuming that both spouses work, as is the case for the spouses in our sample, both employers had to reimburse one-third of the child care costs to the parents. The reimbursement of the government is income-dependent and logically decreases as the household income increases. For example, in the year 2005, for the first child in the household, this reimbursement changed from 63.2 percent when the yearly household income was 16.000 euros or less to 1.8 percent when the yearly household income was 71.883 euros (see Kok, Groot, Mulder and Sadiraj

(2006)). Because the level of the reimbursement is price dependent, the contribution that parents pay themselves is also price dependent. This gives parents an incentive to demand child care at a reasonable price.

As well as, or because of, the change in child care policy, the number of child care institutions increased enormously, such that child care demand was no longer higher than child care supply. A direct result was that parents could choose freely between the different child care alternatives, and could choose the child care institution that offered a good price/quality ratio. Given this new situation, child care institutions now have an incentive to offer efficient child care as they are competing with other institutions and this leads to lower prices and child care that is of better quality.[12]

For our study, parents were asked how many formal and informal child care hours they demand. As we mentioned, parents first pay the child care costs themselves and then receive a reimbursement. Therefore, we expect that parents have a fairly good idea of the amount *they* paid for the amount of child care they had demand.

In Table 6.13 we show the descriptive statistics of the child care demand per month and the prices they paid for this amount of child care. Parents use informal child care relatively more than formal child care. The hourly price of formal child care is much higher than that of informal child care, as would be expected. Informal child care is often supplied by grandparents, and parents usually do not pay them for their caring service. The hourly price of formal child care is 7.92 euros per hour and this is higher than the price of informal child care, as was to be expected. We note that parents may use both formal and informal child care, and this happens in 72 cases and the average demand for informal child care for these 72 couples is 29.1, which is about equal to the average informal child care in Table 6.13. The average demand for formal child care is higher than the average demand for informal child care. Parents are likely to demand more child care hours if they decide to supply more labor hours. Also it may be that grandparents supply child care hours up to a certain threshold level.

[12] An elaborate study (in Dutch) is given in Kok et al. (2006).

Table 6.13: **Child care demand and prices**

			Percentiles	
	Freq.	**Mean**	**5 %**	**95 %**
Quantity				
Formal child care demand	150	67.13	8	160
Informal child care demand	404	29.99	3	85
Prices				
Hourly price formal child care	150	7.92	2.39	18.04
Hourly price informal child care	404	1.47	0	7.69

In order to examine whether work timing affects child care, we estimate the following two equations seperately:

$$\begin{aligned} \log FC &= \kappa_0 + \kappa_1 \cdot z_1 + ... + \kappa_j \cdot z_j + \delta_{FC} \cdot \Delta + \varepsilon_{FC} \\ \log IC &= \eta_0 + \eta_1 \cdot z_1 + ... + \eta_j \cdot z_j + \delta_{IC} \cdot \Delta + \varepsilon_{IC} \end{aligned} \tag{6.10}$$

where FC and IC stand for, respectively, the hours of formal child care and the hours of informal child care. The model parameters are represented by κ, η, δ_{IC} and δ_{FC}. Δ represents the work timing estimate; and we also have the usual two error terms $\varepsilon_{FC} \sim N(0, \sigma_{\varepsilon_{FC}})$ and $\varepsilon_{IC} \sim N(0, \sigma_{\varepsilon_{IC}})$. In the regression we control for various household characteristics that are represented by the variables z. These characteristics are:

- Hourly price of child care;
- # of children aged between 0 and 4;
- # of children aged between 4 and 12;
- Education level dummies for men and women;
- Household income and a dummy variable that controls for the missing values;
- Dummy that indicates 1 if the household uses informal and formal child care.

Both equations are estimated separately, and we control for the fact that some households use both formal and informal child care by including a dummy variable in both regressions,

indicating 1 if households make use of both formal and informal child care, and 0 otherwise. Since the reimbursement of the government is income-dependent, and because households with a higher income can afford child care more easily, we include the logarithm of the household income. Income is measured in categories, and the income variable that we construct is the logarithm of the gross household income that represents the mid-income of the interval that is appropriate for the household.

Because we expected that the work timing behavior of parents relates to the presence of young children, we have interacted Δ with a child dummy that indicates 1 if there is a child present in the household aged between 0 and 4, and 0 otherwise. The estimation results are printed in Table 6.14.

Table 6.14: **The Effect of Work Timing on Child Care Demand**

Variable	**Estimate**	**t-statistic**
Formal Child Care		
Price per hour formal child care	-0.360***	-2.98
# Children between 0-4	1.009***	4.82
# Children between 4-12	0.048	0.28
Male has low education level	0.138	0.78
Male has medium education level	0.034	0.25
Female has low education level	-0.839**	-2.48
Female has medium education level	-0.166	-1.29
Log(household income)	-0.166	-0.6
Control for 22 missing values of the household income	-0.453	-0.58
Dummy: both formal and informal care	-0.387***	-3.32
Constant	4.763***	5.54
$\Delta\cdot$ Dummy child present 0-4	0.018	1.26
Δ	0.008	0.71
Informal Child Care		
Price per hour informal child care	-0.064	-1.02
# Children between 0-4	0.714***	4.05
# Children between 4-12	-0.187	-1.28
Male has low education level	-0.229	-1.53
Male has medium education level	-0.183	-1.49
Female has low education level	0.171	0.92
Female has medium education level	0.180	1.53
Log(household income)	0.281	0.88
Control for 73 missing values of the household income	1.042	1.19
Dummy: both formal and informal care	-0.257*	-1.88
Constant	2.058**	2.28
$\Delta\cdot$ Dummy child present 0-4	0.018*	1.74
Δ	0.014*	1.88
	Formal	Informal
Likelihood	-155.66	-567.07
Observations	150	404

Note: * significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level.

When the price of formal child care is higher, parents demand less child care, as was to be expected. We do not find such a price effect for the demand of informal child care, although the sign points in the right direction. This is likely caused by the fact that most of the prices of informal child care are either zero or very low, so it is the lack of variation of this variable that causes the insignificance.

Parents demand more child care when there are more young children in the household. This result is found for the demand for both formal and informal child care. When parents demand formal child care, this influences the demand for informal child care negatively, and vice versa. We do not find an effect for children aged between 4 and 12. This may be caused by the fact that, in the Netherlands, children go to school when they are 4/5 years old. Therefore, we would expect a reduction in the demand for child care at the point when the children go to school.

We do not find any income effect, which is surprising. We would expect that the demand for child care is higher when the household income is higher. First of all, households with more income can afford child care more easily. Second, when households earn more money they will, on average, also work more labor hours, which makes the need for child care higher. It may be that the small number of observations, together with the fact that income is measured on an interval level and has many missing values, results in an insignificant effect of income on child care demand.

Households where women are lower-educated demand less formal child care. For these women the differences between the hourly child care price and the hourly wages is relatively small, so that they are more likely to decide to take care of the children themselves.

Of course, we are particularly interested in whether the work timing estimate is related to the demand for child care. We find that work timing affects the demand for informal child care positively, but does not affect the demand for formal child care. There is a constant work timing effect on the demand for informal child care, but also the interaction effect with having a young child is significant.

On the basis of the estimates, we can simulate how the demand for informal child care

changes when parents create 1 more hour of WTO. In order to do so, we first predict the amount of informal child care based on the parameter estimates, where we evaluate all explanatory variables in their sample mean, i.e.

$$\widehat{IC}_{\Delta} = e^{\hat{\eta}_0 + \hat{\eta}_1 \cdot \bar{z}_1 + \ldots + \hat{\eta}_j \cdot \bar{z}_j + \hat{\delta}_{IC} \cdot \overline{\Delta}} \tag{6.11}$$

Then we replace Δ by Δ+1 and predict again the amount of informal child care as in 6.11:

$$\widehat{IC}_{\Delta+1} = e^{\hat{\eta}_0 + \hat{\eta}_1 \cdot \bar{z}_1 + \ldots + \hat{\eta}_j \cdot \bar{z}_j + \hat{\delta}_{IC} \cdot \overline{\tilde{\Delta}}} \tag{6.12}$$

with

$$\tilde{\Delta} = \Delta + 1$$

The difference between $\widehat{IC}_{\Delta+1}$ and $\widehat{IC}_{\Delta}$ then represents the change in informal child care when parents create 1 more hour of WTO. We note that we have corrected in the calculation for the fact that we measure work timing per week and the demand for informal child care per month. In Table 6.15 we show the descriptive statistics of $\widehat{IC}_{\Delta+1}$ - $\widehat{IC}_{\Delta}$.

In the first row of Table 6.15, we show the effect of work timing on the demand for child care without considering the interaction effect. We find that parents demand 0.127 hours more informal child care if they create 1 more hour of WTO per month. This is what we would expect, since the creation of more WTO results in less time that one of the two partners can be at home taking care of the child.

In this chapter, we have hypothesized that parents with young children create less WTO in order to avoid the cost of child care, and maximize the amount of time that at least one of the parents can care. Therefore, we have included the interaction effect to see if there is empirical support for this hypothesis. It is not likely that the cost avoiding behavior applies in the case of informal child care, since the hourly prices are often 0 or very low and do not significantly influence the demand of informal child care. Surprisingly, we find that parents

with young children create relatively more WTO. These parents demand 0.2 hours more informal child care when they create 1 more hour of WTO. Parents with children older than 4 years old demand 0.04 hours more informal child care when the create 1 more hour WTO. An explanation is that parents use more informal child care when the children are relatively young because this care is usually given by grandparents or other family members.

We expected that the presence of young children would affect the demand for *formal* child care through the parents' work timing behavior so that we would observe that parents create less WTO and/or use more informal child care. The empirical results do show that parents demand less formal child care when they make use of informal child care, but a work timing effect is not observed. Earlier, we hypothesized that parents minimize the cost of paid child care by their work timing behavior, but this hypothesis is not supported by the data.

Table 6.15: **The effect of work timing on the demand for informal child care**

			Percentiles	
$\widehat{IC}_{\Delta+1}$ - $\widehat{IC}_{\Delta}$	**Freq.**	**Mean**	**5 %**	**95 %**
All households with children	404	0.127	0.035	0.275
Households with child 0-4	216	0.200	0.322	0.056
Households with child ≥4	188	0.043	0125	0.313

6.5 Work timing behavior of parents in Belgium, Italy, and the Netherlands

It is interesting to place the work timing behavior of parents explicitly in a comparative framework to allow for cross-country differences.[13].

In a comparative study Carriero et al. (2009) examine the work timing behavior of dual-earner parents in Belgium, Italy and the Netherlands in 2005/2006. We rely on three distinct sources of time-use data. The Italian data were taken from the Time-use Survey carried out by ISTAT (Italian Statistical Institute); the data for the Belgian region of Flanders come from the Flemish Families and Care Survey (FFCS); and the Dutch data come from the NIPO Post-Initial Schooling Survey. Comparability between the three data sets was ensured by, first, selecting only two-earner households with children aged below 13 years old. Second, we recoded variables in order to obtain similar measures of the different (in)dependent variables. Finally, we recoded the time values into hourly measures. Although the use of three distinct data sources makes this study unique, the reader should bear in mind that the harmonization efforts to create one data set do not completely eliminate biases due to differences in data collection methods and the wording of the questions.

We find empirical support for work timing behavior in all three countries. The direction of this adjustment varies across countries. We find that, on average, Italian and Flemish dual-earner parents create more WTO, while Dutch parents create on average less WTO. The main explanation for this difference is that Dutch women work, on average, less paid labor hours than the Belgium and the Italian women, although the participation rates of the former group are higher. This means that Dutch women are more often part-time workers. The work timing estimate shows that these part-time workers not only work less hours, something we controlled for in the analysis, but also that Dutch parents on average create less WTO because Dutch women work part-time more often. When Belgium and Italian women work, they tend to work full-time and consequently they tend to create more WTO, presumably

[13]This section summarizes the result of a study performed by Carriero, Ghysels and Van Klaveren (2009)

to increase the amount of joint leisure time. In our study there was no information on the amount of joint leisure, so that we could not test the togetherness hypothesis for Belgium and Italian parents.

In addition, we simulated how the work timing estimate is affected when parents worked different working hours, holding all other variables that were used in the analysis constant. Interestingly, we find very similar results for all three countries. Dual-earner couples with both partners in full-time jobs are likely to synchronize their working time, while couples where a spouse is working part-time are likely to de-synchronize.

6.6 Conclusion

In this chapter we have examined the work timing behavior of spouses. With timing behavior we mean the behavior that results in the performance of paid labor at the same time that cannot be explained by factors other than the partners' potential to communicate on the timing of their work.

We find evidence for work timing behavior. More specifically, we find that couples create less work time overlap when there is a child present in the household and this effect is more pronounced the younger the children. Childless couples create, on average, 5 hours more work time overlap compared with parents with children aged between 0 and 4. These results are consistent with the idea that parents time their work hours so that the costs of paid child care are minimized.

The household types that create relatively more work time overlap are households with higher educated women, with a higher household income, with less children, and with spouses who are more in control of their own working times. This result is in line with the idea that these spouses have a relatively high preference for spending joint leisure time with their partner. The effects that we find correspond with the effects that are found in other empirical studies (see, for example, Hamermesh (1996, 2000), Hallberg (2003), Jenkins and Osberg (2005), Van Klaveren and Maassen van den Brink (2007) and Carriero et al. (2009).

When we examine how work timing behavior relates to the time that spouses jointly spend

on leisure, housework, and child care, we find the following. We find empirical evidence for a togetherness preference of spouses, as is also found in Hallberg (2003) and Van Klaveren and Maassen van den Brink (2007), but we only find this togetherness preference for childless couples. When spouses create 1 hour more work time overlap this results in 0.35 hours more joint leisure for childless couples and -0.06 hours less joint leisure for couples with a young child. Furthermore, we find that the joint time that spouses spend on household chores is significantly related to how couples time their working hours, but the correlation that is found is very small. We do not find evidence that the timing of work hours affects the time that parents spend jointly on child care.

When we examine how work timing behavior relates to the demand for child care, we find that work timing affects the demand for informal child care, but not the demand for formal child care. On average, parents demand 0.127 hours per month more informal child care when they create 1 more hour of work time overlap per month. This is what we would expect, since the creation of more work time overlap results in less time that one of the two partners can be at home taking care of the child. Parents with young children demand 0.2 hours more informal child care when parents create 1 more hour work time overlap. Parents who do not have young children, on the other hand, demand only 0.04 hours more informal child care when they create 1 more hour work time overlap.

Throughout this chapter, we have hypothesized that parents with young children create less work time overlap to avoid the cost of child care and/or to maximize the amount of time that at least one of the parents can care. However, in this study we find the opposite: parents with young children create relatively more work time overlap and demand more informal child care. This work timing behavior may be caused by the fact that the government subsidizes informal child care, such as that provided by the grandparents, in order to stimulate the labor participation (of women). In fact, the total expenditures of this subsidy were larger than was originally estimated, and one of the reasons was that the amount of child care provided by the informal sector was larger than was anticipated. In a policy revision in 2007 the subsidy was lowered but it is still 2.50 euros per hour per child.[14].

[14]See http://www.mik-online.nl/page.asp?id=658 (in Dutch).

It is interesting to continue the research of this chapter in several ways. An important extension would be to estimate a model where work timing and the labor supply decisions of both partners are studied simultaneously. Labor supply and work timing are then both considered as endogenous variables and this enables us to measure the effect of work timing on individual labor supplies. The outcomes of such a study are of importance for policy makers. Currently, government policies focus on increasing the labor supply of women, but the possible effects of work timing on labor supply are ignored. It may be that a policy that is more focused on work timing would be more effective and possibly even cheaper than a policy that results in subsidizing child care only.