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IZA DP No. 5636

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April 2011

Forschungsinstitut
zur Zukunft der Arbeit
Institute for the Study
of Labor

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ABSTRACT

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

This study examines if couples time their work hours and how this work timing influences child care demand and the time that spouses jointly spend on leisure, household chores and child care. By using a innovative matching strategy, this studies identifies the timing of work hours that cannot be explained by factors other than the partners' potential to communicate on the timing of their work. The main findings are that couples with children create less overlap in their work times and this effect is more pronounced the younger the children. We find evidence for a togetherness preference of spouses, but only for childless couples. Work timing also influences the joint time that is spent on household chores, but the effect is small. Finally, work timing behavior affects the demand for informal child care, but not the demand for formal child care.

JEL Classification: D13, I31, J12, J22

Keywords: labor supply, work timing, time allocation

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1 Introduction

Over the past 40 years there has been an enormous increase in female labor force 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.[1] 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 when figuring out how to allocate their time over a week.

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.

The sociological literature recognizes the issue of work timing and coordination aspects, but only recently (see Sullivan (1996), Lesnard (2004)). This aspect is generally framed within the work-life balance problem and the transformation engendered by greater flexibility of the economy, on the one hand, and the changing role of women in the family and society, on the other (Moen (2003), Crompton (2006)). Also it is mentioned that work schedules overlap less now than in the past because of the growing service economy (sometimes referred to as the "24/7 economy", Presser (1999, 2003)). Poor alignment of work schedules within households is usually viewed as something negative as the reduced time that can be spent together may threat family solidarity (Strazdins, Korda, Lynette, Broom and DSouza (2004)). However, some potential benefits are also postulated and have been empirically tested. For example, having more control over working times may allow dual-earner couples to arrive at a more equal division of housework (Presser 1994) and child care responsibilities (Lesnard (2005)). In this sense, having non-overlapping schedules may constitute a resource and an alternative to child care services for working parents, rather than a harmful feature of contemporary family life.

In this study 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)). Secondly, parents who have more control over their work times may have different child care demands. The latter is important for policy that is related to child care subsidy and female labor force participation.

In this study work timing is considered as an act that leads to hours of paid work performed by both spouses at a 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 this by using the notion that dual-earner households 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. From a togetherness perspective, spouses may 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. Along

[1]Statistics on the increase in female labor participation can be found in, among others, OECD Employment Outlook (2007) and Kaiser (2006). We note that the Netherlands is a specific case because people are relatively more in control over the timing of their work schedules due to the existence of part-time jobs.

similar lines we can reason that spouses may want to maximize the potential for joint housework time and joint child care time.

It is difficult 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 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 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.[2]

Studies by Hamermesh (1996, 2000), Hallberg (2003), Jenkins and Osberg (2005), recognize this problem.[3] 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 than 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 study 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. 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.[4]

The second contribution of this study 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

[2]The outcome that is not observed is usually referred to as the counterfactual outcome.
[3]Other interesting studies that discuss the timing of work hours are Sullivan (1996) and Van Velzen (2001).
[4]In Van Klaveren and Maassen van den Brink (2007), we found a small work timing effect using this methodology.

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 less WTO also demand less child care, which may reflect that parents 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, Ghysels and Van Klaveren (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 and these relations have been little investigated in labor economics and sociology.

The structure of this paper is a follows. In Section 2, the data are described. In Section 3, we illustrate the procedure that is used to simulate the control group and discuss the simulation results. In Section 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. Section 5 concludes.

2 Data and Descriptive Results

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. 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.

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.

In Figure 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 and 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)).[5]

[5]We would like to thank Carlijn Kamphuis of the Social and Cultural Planning Office of the Netherlands, who provided

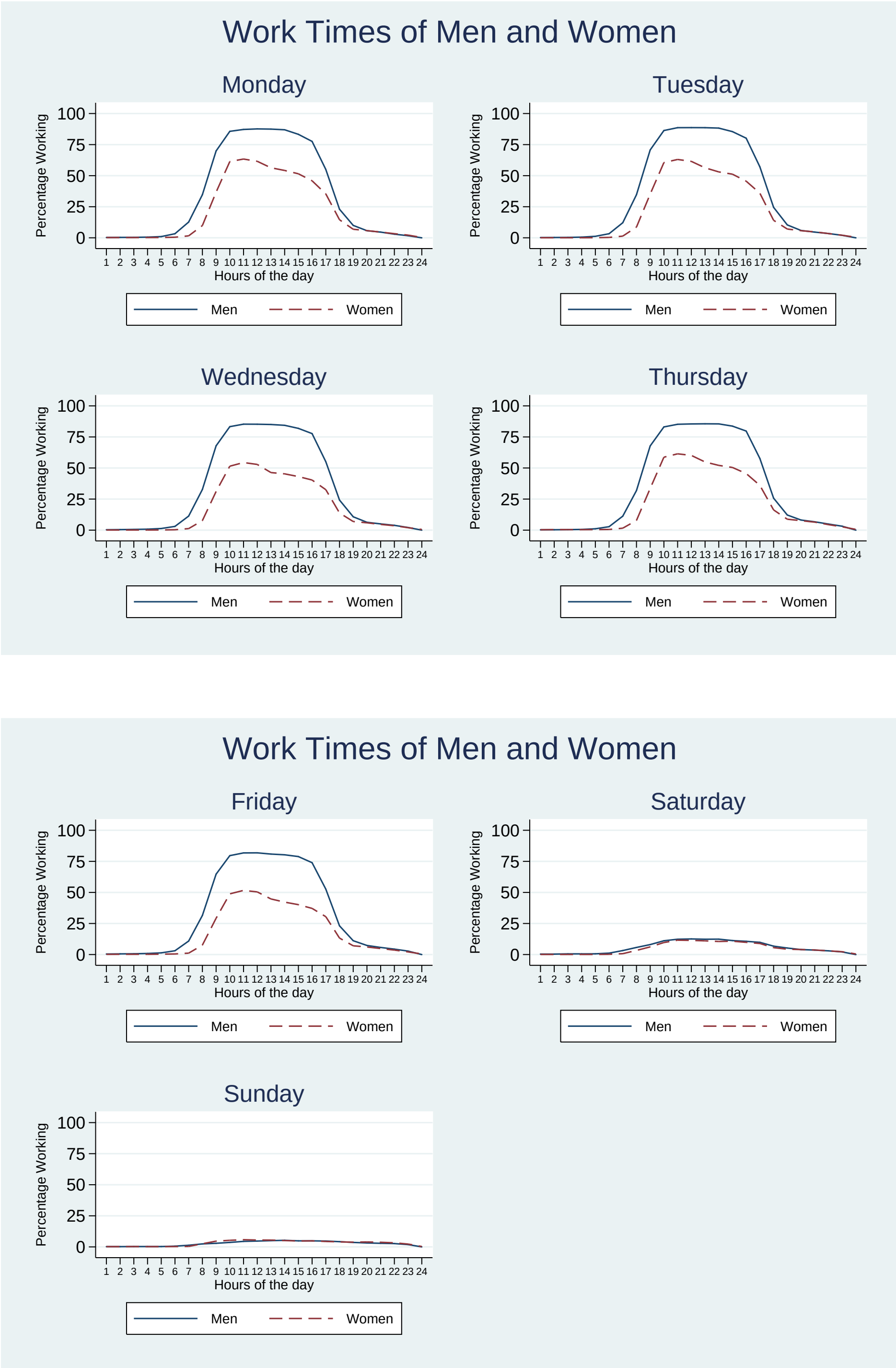

Figure 1: When do men and women work during the day?

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 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 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 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 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 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 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 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.[6] 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.

[6]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 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. We addressed this selection problem by including, first of all, dummies that indicate where partners have met each other and, secondly, dummies that indicate if the (fe)males worked in their current job before the partnership formation took place. The idea of including the first set of indicators was that partners are more likely to meet each other when there is more overlap in work times to begin with. For example, the probability of meeting each other at work increases when work schedules overlap more. However, the meeting dummies are all insignificant. The second indicator is included, because persons who already had their current job before the partnership formation did not change their working times due the job choice. Suppose, for example, that the male meets his partner and that both he and his partner agree that the current work times are not optimal and a burden for a good-quality relationship. Then the easiest way to address this problem is that he will look for another job with more convenient working times. Hence, observing a switch after the moment of partnership formation could indicate work timing by changing jobs. The empirical results, however, do not support this view.

Obviously the amount of WTO is significantly influenced by the working hours of both spouses. The maximum amount of WTO is determined by the spouse who works the smallest amount of labor hours, and at the same time the probability of observing more WTO increases if the working hours of the spouse who works the most increases.

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.

3 Matching Procedure and Estimation Results

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 this 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. 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, that measures the distance from one household to another household on the basis of certain matching characteristics (X) that are thought to influence WTO. 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:

$$\Delta = E(WTO|X, I = 1) - E(WTO_c|X_c, I = 0). \quad (1)$$

By construction, the couples with switched partners with characteristics X_c cannot actively synchronize their work schedules, such that $I = 0$. The work timing estimate is represented in Equation (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.

3.2 Matching Results

The significant variables in the WTO regression (Table 4) are used as matching variables. In Table 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. The p-values in the last column indicate if the differences between the couples and the matched couples are significant.[7]

Table 5: **Descriptive statistics for couples and matched couples**

	Couples		Matched Couples		
	Mean$_1$	**Std.Dev.**	**Mean$_2$**	**Std.Dev.**	**Difference (p-value)**
Household Characteristics					
# Children between 0-4	0.23	0.52	0.23	0.53	0.824
# Children between 4-12	0.51	0.83	0.50	0.82	0.737
# Children between 12 plus	0.41	0.79	0.38	0.76	0.208
work time overlap	20.60	13.91	20.90	14.22	0.956
Men's Characteristics					
Weekly work hours	48.84	12.52	49.32	12.58	0.245
Education level	3.04	1.64	3.03	1.64	0.883
Flexible work times	2.22	1.15	2.22	1.16	0.900
Women's Characteristics					
Weekly work hours	29.56	14.58	29.77	14.52	0.660
Education level	3.16	1.54	3.12	1.52	0433
Flexible work times	1.99	1.06	1.92	1.04	0.121
N	915		915		

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

Table 5 shows that the match was successful. First of all, the matching variables do not differ significantly between the couples and the matched couples.[8]This may seem trivial, since the variables presented in Table 5 are the conditioning variables in the matching procedure. However, the matching procedure matches household on the basis of the entire set of conditioning variables, but this does not ensure that households are similar with respect to each individual conditioning variable. Secondly, the matching model does not ensure that couples and matched couples have the same work time overlap. If we condition on all 'relevant' characteristics that capture both selection into work schedules and active synchronization of work schedules,

[7]Again, we do not mention the 14 work day dummies as they are not significantly different, and presenting them in Table 5 would make the the table more difficult to read.

[8]

then we should find that work timing is not significantly different between couples and matched couples. However, if we would find a significant difference in work time overlap after the matching procedure, this would raise the question whether the appropriate conditioning variables were included in the matching. The finding that couples and matched couples have the same work time overlap therefore provides empirical support for the hypothesis that we used the appropriate conditioning variables.

Do couples time their work schedules?

To examine whether couples time their work schedules we perform separate regressions for couples and control couples and estimate how work time overlap varies with a set of dummies that characterizes the household. The following household characteristics are distinguished: the presence of children by age category, the education level of both spouses, the (gross) level of household income, and whether spouses have control over their own working times.

Table 6 shows the predicted hours of work time overlap by the distinguished household characteristics. The fifth column shows whether the predicted hours of work time overlap differs between couples and control couples. This difference represents the work timing estimate, Δ, as in equation (2).

Spouses without children create 2.25 hours more WTO, and these hours can potentially be used to spend more time on another joint activity, such as leisure. Parents, on the other hand, create less WTO. Parents with a child aged between 0 and 4, create 2.75 hours less WTO. Parents with a child aged between 5 and 12 or aged 12 years and older create, respectively, 2.42 and 1.26 hours less WTO. This is in line with the intuition that parents minimize the cost of child care by minimizing the amount of WTO or that they prefer parental care over non-parental care. In Section 4.2 we return to this issue in more detail.

Table 6: **Comparison WTO Couples and Control Couples**

		WTO	WTO_c	Δ
Household				
No child		24.96	22.71	2.25***
Child present aged 0-4		15.32	18.07	-2.75***
Child present aged 4-12		15.92	18.34	-2.42***
Child present aged 12 plus		17.94	19.20	-1.26***
Gross Household income	low	18.98	19.67	-0.70***
	med.	20.22	20.47	-0.25***
	high	23.44	21.92	1.51***
Men				
Education level	low	21.14	20.71	0.43
	med.	20.42	20.45	-0.03
	high	20.43	20.72	-0.28
Flexible work times	very low	18.84	19.46	-0.63***
	low	19.69	20.37	-0.67***
	high	21.96	20.54	1.42***
	very high	23.56	23.07	0.50***
Women				
Education level	low	17.62	18.56	-0.93***
	med.	20.01	20.28	-0.28***
	high	23.90	22.64	1.26***
Flexible work times	very low	19.20	20.17	-0.97***
	low	20.76	20.46	0.30***
	high	23.67	21.58	2.09***
	very high	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 with higly educated women create 1.26 hours more WTO, whereas other couples with less educated women create less WTO. The household income represents the gross yearly income measured in euros. We distinguish three categories: (0,45000], (45000,68000] and > 68000.[9] Couples with a high (medium, low) household income create more (less) WTO. These result are likely to be driven by the underlying characteristic-package of households that (partly) explain how traditional households are. In other words, the effect of being a less (or more) traditional household is captured by the characteristic-package: being higher educated, working more hours, and having less children. These less traditional households presumably have more control over their work schedules and maximize the amount of joint leisure.

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 ability to time their work hours.

[9] The income variable contains many missing values. To account for 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.

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. One of them is that when couples can spend more time with their partner on other activities when they create more WTO. In this section we, therefore, test whether work timing behavior affects the demand for child care. As in equation 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.

$$\Delta = WTO - WTO_c. \tag{2}$$

4.1 Work timing and the Time Spent on Joint Activities

In this subsection we examine how work timing is related to the time that couples jointly spend on leisure, household tasks, and child care. We first focus on the relation between work timing and joint leisure.

The Effect of Work Timing on Joint Leisure

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

$$LTO = \frac{2 \cdot t_{l,joint}}{t_{l,male} + t_{l,female}}, \tag{3}$$

where LTO stands for the amount of leisure time overlap. The amount of joint leisure time can never be more than $\min(t_{l,male}, t_{l,female})$ and so we multiplied the numerator by 2, such that the fraction LTO lies in the interval [0,1]. More importantly, the multiplication is necessary, because in the denominator, any joint leisure time is counted twice and therefore joint leisure time should be counted twice in the numerator as well.

In Table 7, we present the frequency table of leisure time overlap. For one of the households it was not possible to construct LTO. When we consider the first and the second columns, we find that 117 households have 10 to 20 percent LTO. From the third and fourth column we deduce that these 117 households cover 6.4 percent of the households in the sample and 10.77 percent of the households in the sample have between 0 and 20 percent LTO.

The table shows that the distribution of LTO is skewed to the left. About 65 percent of the households have more than 50 percent LTO, but at the same time households are well spread over the different LTO intervals.

Table 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:

$$LTO = \lambda_0 + \lambda_1 \cdot x_1 + ... + \lambda_n \cdot x_n + \delta_{LTO} \cdot \Delta + \varepsilon_{LTO}, \quad (4)$$

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 (4) will not hold exactly we add the usual error term $\varepsilon_{LTO} \sim N(0, \sigma_{\varepsilon_{LTO}})$. However, the model in (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 has only values on the interval [0,1]. Therefore, we apply a logistic transformation and rewrite the model as:

$$\log(\frac{LTO}{1 - LTO}) = \lambda_0 + \lambda_1 \cdot x_1 + ... + \lambda_n \cdot x_n + \delta_{LTO} \cdot \Delta + \varepsilon_{LTO}. \quad (5)$$

The predictions of LTO of the logistic model are in the interval [0,1], although the model parameters can be any real number. The model is estimated using a maximum likelihood estimation procedure and the following control variables are used in the estimation model:[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).

Because the timing behavior of households with children could be different from that of households without children, we interacted Δ with two dummy variables, namely, if there is a child aged aged 0 to 4, and if there is a child present aged 4 to 12.[11]

[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 8 presents the estimation results. 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 find a positive constant work timing effect on LTO. To have an idea of the impact of Δ on LTO, we simulated how increasing Δ by 1 hour affects the fraction LTO, evaluating all other variables in their sample averages. We find that couples increase the amount of joint leisure by 8.4 minutes when they create 1 more hour of WTO.

Table 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.

The amount of LTO is negatively related to Δ interacted with the child dummy that indicates that there is a child in the household aged 0 to 4. Parents with children aged between 0 and 4 tend to create less LTO, because the estimated coefficient offsets the constant work timing effect. Simulating how an increase of Δ by 1 hour affects LTO, and considering the interaction effects, we find that parents with children aged 0 to 4 decrease the amount of joint leisure by 3.4 minutes. For other couples we find that an increase of Δ by 1 hour results in 21 minutes more LTO. This finding 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

A similar analysis can be performed for the time that couples jointly spend on household chores. Household chores include activities such as cooking, repairing the car, cleaning, and doing the laundry, but it does not include child care related activities. The amount of joint housework as a fraction of the total time that both partners spend on housework is represented by:

$$HTO = \frac{2 \cdot t_{h,joint}}{t_{h,male} + t_{h,female}}, \tag{6}$$

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 9 we present the frequency table of HTO and the interpretation of this table is similar to that of Table 7. We find that the fractions of joint household time are clustered around the lower intervals. Apparently, household chores are mostly performed alone, since 70 percent of the households spend less than 40 percent of the total housework time jointly. This may be explained by a gender ideology, in the sense that household chores are predominantly male-activities, such as repairing chores, or female-activities, such as doing the laundry (West and Zimmerman (1987), Ferree (1990), South and Spitze (1994), Becker (1994), Greenstein (1996)). It may also be explained by a relative resources theory, in the sense that the spouse who earns the most specializes in paid labor, while the partner specializes in household chores (Sampson and Lichter (1991), Ferree (1991) and Kamo (1988)).

Table 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

The following model is estimated to examine how HTO depends on work timing, while controlling for several background variables:

$$\log\left(\frac{HTO}{1 - HTO}\right) = \gamma_0 + \gamma_1 \cdot x_1 + ... + \gamma_n \cdot x_n + \delta_{HTO} \cdot \Delta + \varepsilon_{HTO}, \tag{7}$$

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 (5); and Δ represents the work timing estimate.

We find that the time spent jointly on household chores is lower, as the woman's education level is lower and when their are children present aged 4-12. This is in line with the relative resources model that predicts that women in more traditional households, with lower education levels and children, perform most of the household chores, which on its turn should reduce the time that spouses jointly spend on household chores (e.g. Ferree (1991)).

Table 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.

We find that there is a constant and positive work timing effect, but, at the same time, there is a negative effect of the work timing variable interacted with the child 4-12 dummy. By simulation, we find for couples with a child aged 4 to 12 that they spend 0.06 minutes less time on joint housework as a result of a one hour increase in Δ. For the other households we find that they spend 3.77 minutes more time on joint housework as a result of a one hour increase in Δ. This work timing effect is in line with the specialization behavior as predicted by the relative resources theory (e.g. Becker (1994)).

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:

$$CTO = \frac{2 \cdot t_{c,joint}}{t_{c,male} + t_{c,female}} \tag{8}$$

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 11.

Table 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. We do not observe a systematic pattern in the distribution of CTO. 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:

$$\log(\frac{CTO}{1 - CTO}) = \tau_0 + \tau_1 \cdot x_1 + ... + \tau_n \cdot x_n + \delta_{CTO} \cdot \Delta + \varepsilon_{CTO} \tag{9}$$

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. Because parents appear in the estimation sample only when they have children, the reference group is now parents who have only children older than 12 years old.

The estimation results in Table 12 show that parents with children younger than twelve years old tend to spend more time on joint on child care. This may reflect a preference of parents to care for the children together, especially when they are young. Alternatively, it may be that children who are older than 12 have a preference for less time with their parents. Moreover, the CTO measure could be noisier for older children, because they simply need less care.

With respect to the timing of work schedules, we expected that parents with young children would create less WTO, either because of the preference for parental child care or because they want to reduce the cost of child care. The estimation results, however, show that the work timing variable interacted with the child dummies are not significant. The hypothesis that less WTO would lead to less CTO is therefore not supported by the data.

Table 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.

4.2 Work Timing and Child Care Demand

In this section focuses on the relation between work timing and the *actual* demand for child care. We first shortly 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 them in a dominant position, for several reasons. First of all, parents were not aware about the real costs of the child care they demanded, also because the amount of the subsidy varied somewhat arbitrarily over different localities which made child care prices non-transparent. Second, child care demand exceeded child care supply, and as a consequence parents could not freely choose between different child care alternatives.

After January 2005 several changes were implemented to improve the way child care was arranged. Subsidies were given to parents instead of to child care institutions. Parents first paid the cost of child care themselves and then received a reimbursement from the government and the employer. When both spouses worked, employers together had to reimburse one-third of the child care costs to parents. The reimbursement of the government was income-dependent and decreases as with the household income. In the year 2005, the reimbursement for the first child was 63.2 percent when the yearly household income was 16000 euros and less than 1.8 percent when the yearly household income was 71.883 euros (see Kok, Groot, Mulder and Sadiraj (2006)). The new policy gave parents an incentive to demand child care at a reasonable price, because they had to pay an own share.

The number of child care institutions increased enormously (maybe due to the change in child care policy), 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 had an incentive to offer efficient child care as they competed with other institutions, which lead to lower prices and better quality child care.[12]

For our study, parents were asked how many formal and informal child care hours they actually demanded. As we mention above, 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 demanded.

In Table 13 we show the descriptive statistics of the monthly child care demand and the prices they paid for this child care. Parents use informal child care relatively more frequently than formal child care. The hourly price of formal child care (7.92) is, as expected, much higher than that of informal child care (1.47). Informal child care is often supplied by grandparents, and parents usually do not pay them for their caring service. In 72 cases parents use both formal and informal child care and these parents demand on average 29.1 informal child care hours, which is about equal to the average informal child care in Table 13. Parents demand more hours formal child care than informal child care.

Table 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:

$$\begin{aligned} \log FC &= \kappa_0 + \kappa_1 \cdot z_1 + ... + \kappa_j \cdot z_j + \delta_{FC} \cdot \Delta + \varepsilon_{FC} \\ \log IC &= \eta_0 + \eta_1 \cdot z_1 + ... + \eta_j \cdot z_j + \delta_{IC} \cdot \Delta + \varepsilon_{IC} \end{aligned} \tag{10}$$

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

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

use of both formal and informal child care, and 0 otherwise.[13] 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 expect that the work timing behavior of parents is related to the presence of young children, we interacted Δ with a child dummy indicating whether there is a child present aged 0-4. The estimation results are printed in Table 14.

[13]Including an indicator that indicates whether parents use both types of child care might be problematic, because this variable is partly determined by the outcome variable. Therefore we examine how the effect of work timing on child care demand changes when we re-estimate the model while excluding this variable. We find that exclusion of this variable does not affect the estimated effect of work timing on child care demand.

Table 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, and so parents will demand more informal child care, or will provide the child care themselves. With respect to the latter situation, the theoretical literature on labor supply and child care demand unanimously predicts that the woman will be responsible for providing the child care in that case. Either because she usually has the least resources (Ferree (1991), Becker (1994)), or because child care is a female activity (Greenstein (1996)), or because the (on average) lower income and education level give here a weaker bargaining position (Lundberg and Pollak

(1993)). 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.

We are particularly interested in whether work timing is related to child care demand. 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. Both estimates are positive indicating that when parent create more overlap in their work schedules demand more child care.

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.

$$\widehat{IC}_{\Delta} = e^{\hat{\eta}_0 + \hat{\eta}_1 \cdot \bar{z}_1 + \ldots + \hat{\eta}_j \cdot \bar{z}_j + \hat{\delta}_{IC} \cdot \overline{\Delta}} \tag{11}$$

Then we replace Δ by Δ+1 and predict again the amount of informal child care as in 11:

$$\widehat{IC}_{\Delta+1} = e^{\hat{\eta}_0 + \hat{\eta}_1 \cdot \bar{z}_1 + \ldots + \hat{\eta}_j \cdot \bar{z}_j + \hat{\delta}_{IC} \cdot \overline{\tilde{\Delta}}} \tag{12}$$

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 15 we show the descriptive statistics of $\widehat{IC}_{\Delta+1}$ - $\widehat{IC}_{\Delta}$.

In the first row of Table 15, we show the effect of work timing on the demand for child care without considering the interaction effect. We find that parents demand 7.62 minutes 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.

We hypothesized that parents with young children create less WTO to avoid the cost of child care, and so we included and interaction effect. Cost avoiding behavior is not relevant in the case of informal child care, due to the low hourly prices. We find that parents who create more WTO demand more informal child care, and this effect is more pronounced when there are young children in the household (12 minutes). The latter likely reflects that the preference for informal child care is even stronger when children are young.

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 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	7.62	2.1	16.5
Households with child 0-4	216	12.00	3.36	19.32
Households with child $\geq$4	188	2.58	1.32	6.18

5 Conclusion

In this study we 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. Parents create less work time overlap and the effect is more pronounced the younger the children. Childless couples create, on average, 5 hours more WTO than parents with children aged between 0 and 4. These results are consistent with the idea that parents time their work hours to minimize the costs of formal child care.

Household 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 have more control over their work times. This is in line with the idea that the spouses of these households have strong preferences for spending time on joint activities (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).

Therefore, we examine how work timing behavior is related with the time that couples spend jointly on the activities leisure, housework and child care. We find a togetherness preference, as is also found in Hallberg (2003) and Van Klaveren and Maassen van den Brink (2007), but only for childless couples. When spouses create 1 hour more work time overlap this results in 21 minutes more joint leisure for childless couples and in 3.4 minutes less joint leisure for couples with a young child. The timing of working hours is also related to the time spouses spend jointly on household chores. Parents with a child aged 4-12 who create 1 hour more work time overlap spend 0.06 minutes less time jointly on housework. For other households the creation of 1 hour more work time overlap results in 3.77 minutes more time on joint housework. The timing of work hours is not related with joint child care time.

Finally, we examined how work timing behavior is related with the demand for child care. We find that work timing affects informal child care demand, but not formal child care demand. On average, parents demand 7.62 minutes per month more informal child care if one more hour of work time overlap is created per month. Parents with young children demand 12 minutes more informal child care when one more hour of work time overlap is created.

We hypothesized that parents with young children create less work time overlap to avoid the cost of child care. We find, however, that parents who create more overlap in their work schedules demand more informal child care, but not formal child care. This may be explained by the fact that the government subsidizes informal child care, such as that provided by the grandparents, in order to stimulate the labor force participation (of women). 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].

It is interesting to continue this line of research 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 the 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 more focused on work timing would be more effective and possibly even cheaper than a policy that results in subsidizing child care only. Alternatively, it may be that parents time their work hours to avoid work time overlap because of lack of child care, and this can cause a lot of stress. The observed work timing behavior may therefore actually be evidence of lack of sufficient child care.

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

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