The influence of work time adjustment on joint activities and the demand for child care

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The influence of work time adjustment on joint activities and the demand for child care *

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Abstract

In this paper we examine if partners in households coordinate their working times. Also we examine how this coordination influences the (in)formal demand for child care and the time spent on joint activities. The activities that we distinguish are the time that partners spent together, spent jointly on household tasks and spent jointly on child care.

We find that partners de-synchronize their work times when there are children present in the household while they synchronize their work times when there are no children present in the household. Households where women are higher educated tend to synchronize there work times.

Partners who synchronize their work times spent more joint hours on household tasks. Partners who de-synchronize their work times less spent more time together. We do not find a relation between work timing and the time that parents spent together caring for their children.

The demand for (in)formal child care is affected by the coordination of work schedules by partners. Partners who de-synchronize their work times more, demand less (in)formal child care. Moreover, active work time de-synchronization and the demand for child care appear to be substitutes.

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1 Introduction

The hours of labor that individuals supply on the labor market in multi-person households depend on the income that is generated by working a certain amount of hours on the labor market and on the extent to which partners are capable of adjusting their work schedules. While there is general consensus that the timing of work is important when discussing labor supply decisions (see Hamermesh (1996, 2002), Sullivan (1996), Hallberg (2003), Jenkins & Osberg (2005) and Van Klaveren & Maassen van den Brink (2007)), most studies examine this timing aspect in a rather descriptive manner.

In this paper we examine if partners actively coordinate their work schedules and, if so, how this active work time coordination influences the demand for child care and the time spent on joint activities. Moreover this study sheds light on how the coordination of work times influences labor supply choices. This information is of economic importance when considering policies regarding child care, female labor supply, fertility and the flexibility of work times. Furthermore, it contributes to a better understanding of the labor supply decision process within households given that labor supply decisions of partners are interdependent.

In general there are two circumstances that determine the extent to which partners coordinate their work schedules and if partners synchronize or de-synchronize their work times.

The first circumstance is the presence of (young) children. Partners can take care of the children themselves but can also choose to outsource child care tasks to the market or to family/friends. Since in the Netherlands formal child care is expensive we hypothesize that partners with (more) children actively de-synchronize their work hours in order to reduce the child care costs. The correlation between how partners coordinate their work times and the demand for informal child care is less clear. On the one hand we would expect that informal child care can be a cheaper substitute for formal child care and hence when formal child care becomes more expensive, partners substitute formal

child care for informal child care. In this case work time coordination and the demand for informal child care need not to be correlated. However, generally partners prefer to spend (at least a certain amount of) time with their children and have an intrinsic motivation to provide child care themselves. In this case partners demand less informal and formal child care by de-synchronizing their work times.

The second circumstance that is underlying the active coordination of work times is the time that is jointly spent on certain activities. We distinguish three joint activities, namely, joint time with the partner, joint child care time and joint time spent on household tasks. In general partners without children have a preference for togetherness and as a consequence they are likely to synchronize their work times in order to spend more leisure time together. Partners might also synchronize their work times such that they can jointly perform household tasks. Furthermore it is likely that partners with children prefer to spend time together with all household members and hence synchronize their work times. Consequently we expect that the joint child care time for these households is higher.

The estimate that measures the effect of partner's coordinating their work schedules itself, should not contain 'factors of society' that might play a role and hence we distinguish a 'society'-effect and an 'active-coordination'-effect. We notice that in this paper the main focus is on the latter component. In order to capture the 'active-coordination' effect we use a methodology that was developed in an earlier paper by Klaveren & Maassen van den Brink (2007).

The outline of this paper is a follows. In section 2 we describe the data that are used. In section 3 the matching procedure is explained and simulation results are discussed. In section 4 we examine how the coordination of work schedules influences the time that is spent on joint activities and the demand for (in)formal child care. Section 5 concludes.

2 Data

The data are from the so-called NIPO Post initial Schooling Survey that were collected in December 2005. The data are collected by $TNS\ NIPO$ (The Dutch Institute for Public Opinion and Market Research). This is the third round of a cross-section survey which was first administered in 1999. While the first two rounds were held by telephone, this survey was held using the internet.

The data are a cross-section of the Dutch population aged from 16 to 64. Questions are asked concerning various background characteristics such as age, gender, formal education and employment status. In the 2005 wave several questions are asked related to to how respondents coordinate their work schedules with their partner, if they had one. In this study we use data of 1830 couples for which holds that both partners are performing paid work.

In order to obtain accurate work time information we asked respondents and their partners on which days they work during the week and on what time they start and end their working days.

-Insert Figure 1 & 2 about here-

Figure 1 and 2 shows a graph of the work timing of men and women. The y-axis indicates the fraction of males/females that work on hour i of the day, where i is 1 up to 24, since there are 24 hours in a day. Notice that, for example, hour 9 on the x-axis indicate the ninth hour and this refers to the fraction of males/females that begin their work day between 8 and 9 o'clock. The average work timing of the male is indicated by a straight line while the average work timing of the female is indicated by a dotted line.

As expected for the Netherlands, the fraction of employed women is smaller compared to that of men. Furthermore, we observe that the fraction of women that is active on the labor market is largest between 10 am and 11 am and decreases afterwards. The fraction of employed men appears to be rather constant between 8 am and 5 pm. Furthermore, not many persons work on a Saturday or Sunday which is as expected. In table 1 the descriptive statistics on working

days and working hours per week are reported for men and women separately.

-Insert Table 1 about here-

From the descriptive statistics in table 1 and figure 1 and 2 it is clear that men are mostly full-time workers. About 83 percent of the males performs paid labor for 5 days per week or more and the average working hours per week is 44.2. This explains the constant fraction of males that is observed in the graphs. Women are in many cases part-time workers since about 65 percent of the females work 4 days per week or less and the average amount of labor hours is 27.14.

Why do we observe the work time patterns in figure 1 and 2, given the number of hours that individuals choose to work on the market? A first explanation that can be given is that individuals with more similar characteristics, like education, age etc., find jobs that are accompanied with more similar work schedules. A second explanation that can be given is that partners actively coordinate their work schedules such that it fits their personal situation best. For example, partners without children might aim at working as much simultaneous hours (synchronized work hours) on the market as is possible since this will increase their potential joint leisure time. However, partners with (young) children might de-synchronize their work hours in order to avoid the expensive day care. The first explanation can be seen as an external mechanism that 'silently forces' partners to work at certain hours. The second explanation can be seen as an internal mechanism which is the result of a decision process where two partners try to adapt their work situation as much as possible to their personal lives and preferences.

In order to examine to what extent partners actively synchronize their work hours we examined their work schedules. The descriptive statistics are shown in table 2.

-Insert Table 2 about here-

More than 50 percent of the men and women in the sample state that it

is possible to a large extent to influence the time on which they start (end) working. These partners have opportunities to actively coordinate their work schedules.

Respondents are also asked if they already had their jobs when they started living together. The descriptive statistics are given in table 3.

-Insert Table 3 about here-

There is a large fraction of men and women that already had their job before they started living together. These (fe)males are not able to coordinate their work schedules by job choice. Hence if there is a preference for coordinating work schedules then this can only be possible if partners are flexible in choosing their own work times. If these partners are also not or almost not flexible in choosing their own work times then coordination of work schedules is difficult or even not possible.

In order to examine what are the determinants of the amount of work time overlap, we regress the total number of weekly work time overlap hours on certain individual and household characteristics. The work time overlap measure is defined as the number of hours that both partners work on the market simultaneously per week.

Notice that since we have asked partners to fill in their work times for each day of the week we do not need to assume that partners synchronize their work schedules from the perspective of a daily dimension (as is the case in Jenkins & Osberg (2005), Hallberg (2003) and van Klaveren & Maassen van den Brink (2007)). In this paper, we allow for the fact that partners might (de-)synchronize their work schedules on a weekly basis, which is more realistic.

The explanatory variables are the number of children between certain age intervals, the weekly working hours of males and females, a dummy that indicates 1 if (fe)males had their job before they started living together, the education level, a set of dummies that indicate 1 if the (fe)male has paid employment on a certain day, the degree of work time flexibility and a set of dummies that indicate where partners of households have met each other at the beginning of

the relationship. The results are reported in table 4.

-Insert Table 4 about here-

If there are children present in the household partners tend to have less work time overlap. These partners have either actively de-synchronized their work times or these partners chose to work less hours on the labor market which likely decreases the hours of possible work time overlap. The latter is confirmed by various studies (See Hamermesh (2000), Hallberg (2003) and van Velzen (2001)).

When (fe)males work more hours on the labor market they are more likely to have more overlap in work hours.

The education variable indicates the highest attained education level and is an ordinal variable. The lowest education level is primary education and the highest education level is having a university degree. The amount of work time overlap is positively correlated with the education level of both male and female. Higher educated individuals are likely to be more flexible in choosing their work times and usually provide more labor hours which results in more work time overlap. Since we have information on the degree to which (fe)males are able to determine their own work times we can obtain the correlation coefficient between the degree of work time flexibility and education level. The correlation coefficient is 0.29 for males and 0.07 for females. For females it seems that the education level and the degree to which females can freely choose their work times are not highly correlated.

The degree to which (fe)males are able to determine their own work times does enter significantly in the work overlap equation indicating that partners who can self-determine their work times have more work time overlap, which is as expected.

Since there is selection into marriage it is possible that we find more work time overlap for individuals who started their relationship, for example, at work. In this case the causality is reversed and the higher work time overlap is then due to 'factors of society'. We see that none of the dummies, that give information on where partners have met each other, influences the amount of work time

overlap significantly. It is worthwhile to notice that the place were individuals have met each other is very diverse. We expected that the group of partners that met each other at work would be large and that we would observe more work overlap hours for them. From table 3 we can divert that from our sample 11.97 % ($\frac{219*100}{1829}$) have met at work.

3 Matching procedure and simulation results

In order to examine if partners actively coordinate their work schedules we simulate a control group (see van Klaveren and Maassen van den Brink (2007)). It should hold that the 'partners' of this control group time their work schedules according to outside factors and not according to the preferences of spouse/partner.

Based on characteristics that influence the amount of work time overlap we match each couple in our sample to another couple from the sample. Then the couples switch partners with the matched couples such that we have two new couples, which we refer to as the control group ($C1$ and $C2$). Notice that while the control group couples have about similar characteristics as the couple from our sample, they cannot coordinated their work schedules.

In order to test if partners actively coordinate their work schedules and hence synchronize their work times we do the following:

1. Compare the timing of market work of the couples in our sample with that of the matched couples.

2. Compare the timing of market work of the couples in our sample with that of the control group.

When we compare the timing of market work between the couples in our sample with that of the matched couples we should find no significant difference. Given that 1 is satisfied, finding a significant difference in the timing of market work between the couples in our sample with the control group couples is empirical support that partners actively coordinate their work schedules.

In order to match couples to other couples from the sample Mahalanobis distances are used[1]. When using Mahalanobis distances, the matched couples can be regarded as the nearest neighbors of couples in our sample. In other words, when we match a couple based on certain covariates to a couple in the sample, it should not be possible find another couple in the sample that is even more similar. A formal explanation of the matching procedure is given in Appendix A.

The matching variables used to define the Mahalanobis distances are those variables that are significant in the work time overlap regression (see table 4).[2] Table 5 shows the descriptive statistics of the matching variables and the work time overlap variable for the couples in our sample and the matched couples.

-Insert Table 5 about here-

The couples have about similar descriptive statistics compared to the matched couples. The mean differences of the matching variables are all insignificant with the exception of the degree to which females can freely choose their work times. Although this difference is significant, the difference is small. The mean work time overlap between couples and matched couples is not significantly different from zero and hence the amount of work time overlap that is caused by 'factors of society' is likely to be similar.

Comparing work time overlap of couples with that of the control group

In order to examine how partners actively coordinate their work times we use the following estimation strategy. First we regress the work time overlap of the couples in our sample and the control group[3] separately on a set of dummies representing certain individual and household characteristics. These dummy variables are related to the presence of children, the education level, the (gross)

[1] See Rubin (1979)

[2] Notice that we do not include the individual wage rates. This is because many individuals did not report their gross income and these couples would then drop out of the sample in the matching procedure. By including the number of labor hours and the education level for both male and female we assume that we (at least partly) capture the income effect.

[3] Actually, the control group exists out of two couples. Hence we define work time overlap as the average work time overlap of two control groups.

household income and the extent to which men and women can choose their own work times. The estimates that are obtained are used to determine how different characteristics on average influence the amount of work time overlap for the couples in our sample and the control group. Comparing these averages can then be interpreted as the difference in work time overlap that is caused by active work time coordination of couples in our sample. The estimation results are shown in table 6.

-Insert Table 6 about here-

The mean work time overlap is denoted as WTO. Furthermore Δ is the difference in mean work time overlap between the couples and the control group.

Partners without children tend to synchronize their work times and have potentially 2.25 hours per week more joint leisure time compared to parents who have at least one child. When there are children present in the household between 0 and 12, parents de-synchronize their work hours by about 2.5 hours per week. Parents also de-synchronize their work times when there is at least one child present who is 12 years old or older, but the effect smaller.

The education level of men does not influence the amount of work time overlap while the education level of women does. Households where women have a high education level, tend to have on average 1.26 hours more work time overlap due to coordination. Households where woman have a low or medium education level have less work time overlap than the control group. This suggest that these households are de-synchronizing their work times. In general, lower educated females have more children and have children at a younger age. Hence the observed effect is likely to be a de-synchronization effect due to the presence of children in the household.

When the household income is high (medium, low) there is positive (negative) effect on the amount of work time overlap due to coordination. Household income is divided in three categories. The intervals of respectively the first, second and third household income category are (0,45000], (45000,68000], and $>$ 68000. The numbers are representing the gross yearly household income mea-

sured in Euros'. We notice that the income variable contains many missing values.[4]

Males and females who can determine their working times to a large extent have significantly more work time overlap compared to the control group. However, although we do find this effect for males and females who can completely control their own work schedules this effect is smaller. It is likely that a person with a responsible job is allowed to determine his or her own work schedule but cannot alter the amount of work time overlap since he or she has to work more labor hours. The estimation results suggest that households where individuals can not easily determine their own work times de-synchronize their work times.

4 Coordination of work schedules and the influence on joint activities and the demand for child care

Households without children, households where the female is higher educated and where partners have more freedom in choosing there own work times, synchronize their work times more than other household do. However, the question that remains is: "what happens with these synchronized hours?". It can be hypothesized that partners who actively synchronize their work hours have more potential hours available to perform joint activities. In this section we will examine how work time adjustment influences the amount of time that is spent on joint activities.

Furthermore, the results from table 6 indicate that the presence of (young) children influence how partners adjust their work schedules. Partners without children tend to be work time synchronizers, while partners with children tend to be work time de-synchronizers. We hypothesize that the amount to which partners are able to (de-)synchronize their work times will have an effect on the

[4]Because 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.

amount of (in)formal child care that households demand.

The allocation of (de-)synchronized work hours on joint activities

We will make a distinction between partners that synchronize their work times and those who de-synchronize their work times. In order to do so so we estimate the following OLS equation:

$$O_{rc} = \alpha_0 + \alpha_1 \cdot O_{C1} + \alpha_2 \cdot O_{C2} + \epsilon \tag{1}$$

Where O stands for the work time overlap of respectively the couples in our sample and the two control couples. The variation in O_{rc} caused by coordination of work schedules is then captured by the ϵ-term. If the ϵ-term > 0 we refer to this household as synchronizers and if the ϵ-term < 0 we refer to this household as de-synchronizers. In the remainder of this section we will refer to the synchronizers as type S households and to the de-synchronizers as type D households.

Respondents are asked how many hours per week they spent on joint household tasks, joint care for the child(ren) and leisure time with the partner. We focus first on the hours that partners jointly spent on household tasks. Notice that some partners may simply spent more hours on household tasks than other households and the observed joint household hours are influenced by this amount of hours. Hence we express the Relative Joint Household Hours ($rjhh$) as:

$$rjhh = \frac{2 \cdot jhh}{\Sigma_{i=m}^{f} hh_i} \tag{2}$$

where jhh stands for the the amount of time that partners spent jointly in the household and hh stands for the individual household hours for i = m(ale), f(emale). The Relative Joint Household Hours is defined as the time that partners spent together performing household activities (times 2) relative to the sum of individual household hours.

In table 7 the mean work time overlap of the couples ($WTO_{Couples}$) is compared with that of the control couples($WTO_{Control}$) by means of a t-test. We distinguish type D households from type S households and distinguish different intervals of relative joint household time.

-Insert Table 7 about here-

The estimation results suggest that 30 % of the total household time is spent jointly. From the $WTO_{Couples}$-numbers we can conclude that an increase in the number of hours of work time overlap is accompanied with an increase in the amount of joint household time. However this observed effect can be due to factors of society or active synchronization of work schedules. From the differences in mean work time overlap between the couples in our sample and the control group we can infer that a higher degree of synchronized (or less de-synchronized) work times leads to more joint household time. Apparently, partners who synchronize their work times are likely to synchronize their household tasks at least to a certain extent.

The effect of work time adjustment on the joint hours spent on child care can be examined in a similar way as we did with joint household hours. First we express the relative joint child care hours ($rjch$) as:

$$rjch = \frac{2 \cdot jch}{\Sigma_{i=m}^{f} ch_i} \tag{3}$$

where ch stands for the individual child care hours for i = m(ale), f(emale). The expectation is that for type D households we observe less joint child care time as household de-synchronize their work times more. Also we expect that the number of type S households will be smaller than the number of type D households.

Table 8 gives the t-test results where we compare the mean work time overlap of couples with that of the control group separately for type D and type S households, subdivided into intervals that indicate the fraction of the total child care time that is spent jointly.

-Insert Table 8 about here-

The estimation results do not confirm our expectations that less joint child care time is observed as households de-synchronize more. From table 8 it appears that the amount of joint child care time is not influenced by the extent to which partners (de-)synchronize their work times. The reason might be that parents usually do not perform synchronous care activities. This does not have to be the case when there are young children present in the household. Unfortunately our sample is not large enough to perform a t-test on the sub sample where parents have 2 or more young children. In general we do not find evidence that active coordination of work schedules influences the amount of joint child care time.

Although it is not possible to transform the joint time that is spent with the partner into fractions it is possible to use an different approach to examine the influence of coordinated work schedules on the weekly amount of hours that is spent with the partner.[5]

Consider the following equation:

$$t_{p,i} = \beta_0 + \Sigma_{j=1}^{J} \beta_j \cdot X_{j,i} + \beta_{j+1} \cdot \hat{\epsilon}_i + \mu_i \tag{4}$$

The left hand side variable is the number of hours that partners spent with each other. This variable is regressed on individual and household characteristics and on the earlier defined $\hat{\epsilon}$-term that was estimated in (1). The characteristics that are used are the number of children between certain age intervals, income level, the education level of male and female and the $\hat{\epsilon}$-term. The $\hat{\epsilon}$-term should capture the variation of work time overlap that is caused by active coordination of work schedules.

We would expect that partners try to synchronize their work schedules in order to spend more time with each other. However, it is expected that this is easier for type S households than for type D households. In table 9 we show the

[5]We notice that this estimation approach can also be done with joint household time and joint child care time. However, the findings are similar compared to the t-test results.

estimation results where the logarithm of joint time is regressed on the earlier mentioned covariates for both household types separately.

-Insert Table 9 about here-

The households that are defined as synchronizers spend on average more hours per week with the partner as is expected. Surprisingly, $\hat{\epsilon}$ is significant for type D households, while it is not significant for type S households. In general partners with children are de-synchronizers and they may have a stronger preference for togetherness since the time together with the partner is more scarce compared to partners without children.

The significance of the other explanatory variables are very similar for both household types. The presence of children in the household negatively influences the time that partners spent with each other. Households were men have a higher education level have less joint leisure time with the partner.

In general, the estimations results suggest that average work time synchronization influences the amount of time that is jointly spent on household tasks and the amount of time that de-synchronizers spent together with the partner. This togetherness effect is not found for synchronizing partners. The t-test results indicate that active coordination does not influence the amount of time that is jointly spent on child care activities.

Work time adjustment and the demand for child care

In this section we use the sub-sample of households that make use of informal or formal child care. The household decision process regarding the demand for formal and informal child care is complicated, since it is likely that partners simultaneously decide on the quantity of (in)formal child care hours and the labor hours they will provide. Moreover, the decision to enter the labor market and the use of child care is interrelated.

For simplicity we assume that partners decide in the first stage how many hours of child care is needed given the amount of labor hours they provide. In the second stage partners decide on who will be the provider of the child care.

We do allow for interdependency, in the sense that we hypothesize that partners can coordinate their work hours in the second stage which can lead to a more favorable outcome for the household. For example, if parents de-synchronize their work times, they themselves can provide more child care hours and hence they need less (in)formal child care. Another explanation related to informal child care is that partners might coordinate their work schedules with that of family members who take care of the child(ren). In this case partners that synchronize their work times might demand more informal child care.

In order to examine how the coordination of work schedules influences the demand for (in)formal child care we estimate the following equation:

$$t^{l}_{cc,i} = \delta_0 + \Sigma^{k}_{k=1}\delta_k \cdot X_{k,i} + \delta_{k+1} \cdot \hat{\epsilon_i} + \mu_i \tag{5}$$

where t^{i}_{cc} is the demand for child care per month for $l = f$ (ormal child care), i(nformal child care). The explanatory variables are the price of one hour (in)formal child care, the number of children between certain age intervals, the education level of male and female, the logarithm of household income, a dummy that indicates 1 if a certain household makes use of formal and informal child care and the $\hat{\epsilon}$-term. The estimation results are printed in table 10.

-Insert Table 10 about here-

An increase of the hourly price of formal child care decreases the demand for formal child care. This effect is not found for informal child care, although the sign is negative and the t-value is close to being marginally significant. Furthermore, when partners demand both formal and informal child care we see that the demand for formal child care or informal child care is less compared to parters who use only formal or informal child care.

For higher educated women the demand for formal child care increases while the demand for informal child care decreases. As is expected and found in many studies is that higher educated outsource child care.

Families with higher educated men tend to use more hours of informal child

care. We do not observe a relationship between the education level of men and the demand for formal child care. Higher educated men work more hours on the labor market and the estimation results suggest that the extra amount of child care that is needed is at least partly provided through informal child care.

The presence of children between 0 and 3 increases the demand for (in)formal child care as is expected. The presence of children between 4 and 12 negatively influences the demand for (in)formal child care. This is explained by the fact that in the Netherlands, children go to school when they are 4 years old.

We are particularly interested in the correlation between the $\hat{\epsilon}$-term and the amount of formal and informal child care. The $\hat{\epsilon}$-term enters significantly in both equations. The positive sign is as expected, since if partners synchronize their work hours more, this diminishes the time that one of the two partners is at home. Hence the demand for (in)formal child care is less for de-synchronizing households compared to synchronizing households. For households where work times are de-synchronized it holds that when work times are more de-synchronized the demand for child care will diminish. In other words, work time de-synchronization and the demand for child care are substitutes.

Table 11 shows the summary statistics on the number of (in)formal child care hours that households demand.

-Insert Table 11 about here-

Consider the $\hat{\epsilon}$ coefficient of 0.013 from the formal child care regression and the mean formal child care that is demanded of 63.84 hours per month from table 11. This means that if partners synchronize their work times one hour more per week, they will on average demand 1.3 %$\cdot$63.24 = 0.82 hours more formal child care per month. Doing the same for informal child care, we obtain that if partners synchronize their work times one hour more per week, they will need 0.8 hours more informal child care per month. On average partners with children de-synchronize their work times and the amount of synchronization influences the demand for (in)formal child care.

5 Conclusion

In this paper we examine the coordination of working times within the household. Also we examine how the coordination of work schedules influences the (in)formal demand for child care and the time spent on joint activities. The activities that we distinguish are the time that partners spent together, spent jointly on household tasks and spent jointly on child care.

We find that partners actively coordinate their work schedules. Partners that have children between 0 and 12 years old on average de-synchronize their work times with 2.5 hours per week. Parents who have children of 12 years old or older also tend to de-synchronize but the effect is smaller. Partners without children tend to synchronize their work times with 2.25 hours per week. Households where females are higher educated have on average 1.26 hours more work time overlap compared to the control group. Although we find that more work time flexibility leads to more work time synchronization or less work time de-synchronization, this effect is not found for persons who can entirely determine their own work times.

When partners synchronize their work times they tend to perform more household tasks jointly. De-synchronizers spent more time together when they de-synchronize their work times less. There is no empirical evidence that the coordination of work times and the time that parents spent together caring for their children are correlated.

From our study it can be deducted that the demand for (in)formal child care is affected by the coordination of work schedules by partners. Partners who de-synchronize their work times more, demand less (in)formal child care. Work time de-synchronization and the demand for child care appear to be substitutes. Two-earner household obviously de-synchronize their work times in order to reduce the child care costs.

The latter result is interesting considering the Dutch labor market policy. Based on our results we state that labor market policies should make the coordination of work schedules easier. This influences both child care costs and

'togetherness' within households. For two-earner households with children it is usually the case that females are part time workers. Stimulating the possibility of '*working at home*' for both men and women gives both partners the opportunity to reduce the expensive child care costs and might induce women to work more hours for their employer. An additional effect is that in both cases the household income will increase. We stress the importance of these labor market policies since they are likely to be cheaper than subsidizing child care itself, as the government policy currently does.

References

Halberg, D. (2003), 'Synchronous leisure, jointness and household labor supply', *Labor Economics* **10**(2), 185–203.

Hamermesh, D. (1996), 'The timing of work time: evidence from the us and germany', *Konjunkturpolitik* **42**, 1–22.

Hamermesh, D. (2000), 'Togetherness: Spouses' synchronous leisure, and the impact of children', *NBER Working Paper* (7455).

Hamermesh, D. (2002), 'Timing, togetherness and time windfalls', *Journal of Population Economics* **15**, 601–632.

Jenkins, S. P. & L. Osberg (2005), *"Nobody to play with? The implications of leisure coordination", Chapter 5, in Hamermesh and Pfann (eds), The economics of time use, contributions to economic analysis*, Vol. 271, Elsevier, pp. 113–145.

Rubin, D. (1979), 'Using multivariate matched sampling and regressionadjustment to control bias in observational studie', *Journal of the American Statistical Association* **74**(366), 318–328.

Sullivan, O. (1996), 'Time co-ordination, the domestic division of labour and affect relations: Time-use and the enjoyment of activities within couples', *Sociology* **30**(1), 79–100.

van Klaveren, C.P.B.J. & H. Maassen van den Brink (2007), 'Intra-household Work Time Synchronization: *Togetherness or Material Benefits?*', *Social Indicators Research* – forthcoming .

van Velzen, S. (2001), 'Synchronizing rhythms of work and leisure; an analysis of the timing of market work, household work, and leisure of dual-earner couples in the netherlands', *Third essay in Supplements to the Economics of Household Behavior, Doctoral Dissertation 242* (242), 97–127. Tinbergen Institute Research Series, University of Amsterdam,.

Appendix A

This appendix shows how couples are matched to other couples from the sample with nearest available pair matching using the Mahalanobis distance (for a more elaborate explanation see Rubin (1979)). For simplicity we show how this matching procedure works for one household using the similar notation as in Rubin (1979).

Let the sample G_1 of couples have sample size N_1 and let the sample of couples that can be matched have sample size N_2, where $N_2 = N_1 - 1$. Nearest available pair matching first orders the G_1 units and then matches each unit of G_1 to the closest unit of G_2.

x_i is the $N_i \times p$ data matrix of X based on the random sample G_i for $i = 1, 2$. $\bar{x}_i$ is the $1 \times p$ sample mean vector in G_i. The pooled within sample covariance matrix of X based on the random samples is then:

$$S = \frac{[(x_1{}^T x_1 - N_1 \cdot \bar{x}_1{}^T \bar{x}_1) + (x_2{}^T x_2 - N_2 \cdot \bar{x}_2{}^T \bar{x}_2)]}{(N_1 + N_2 - 2)} \tag{6}$$

The Mahalanobis distance between a unit from the sample G_1 with score X_1 and a unit from sample G_1 with score X_2 is then defined as:

$$(X_1 - X_2) S^{-1} (X_1 - X_2)^T \tag{7}$$

This algorithm matches a couple from the sample G_2 to a couple from the sample G_1 for which holds that the Mahalanobis distance has the smallest value compared to all other possible matches. Notice that this procedure is repeated for each household in the sample, where the -1 from $N_2 = N_1 - 1$ is the couple that is excluded from the sample G_2 which is the couple for which we are finding a match.

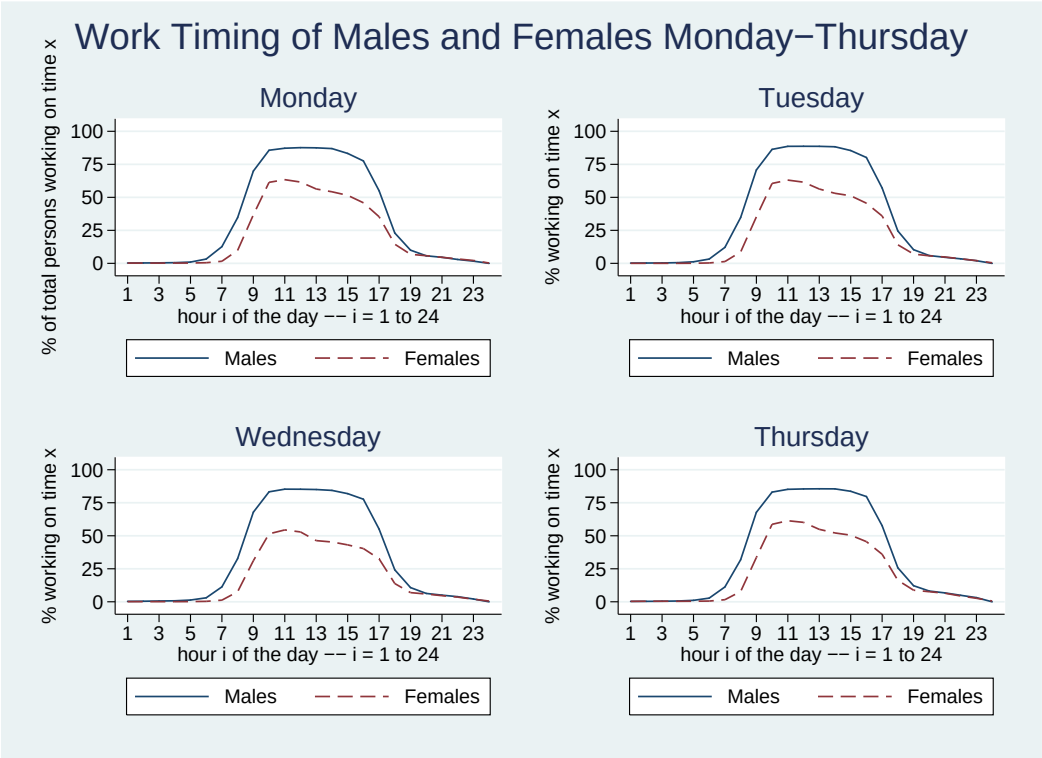

Figure 1: When do males and females work during the day? Part I

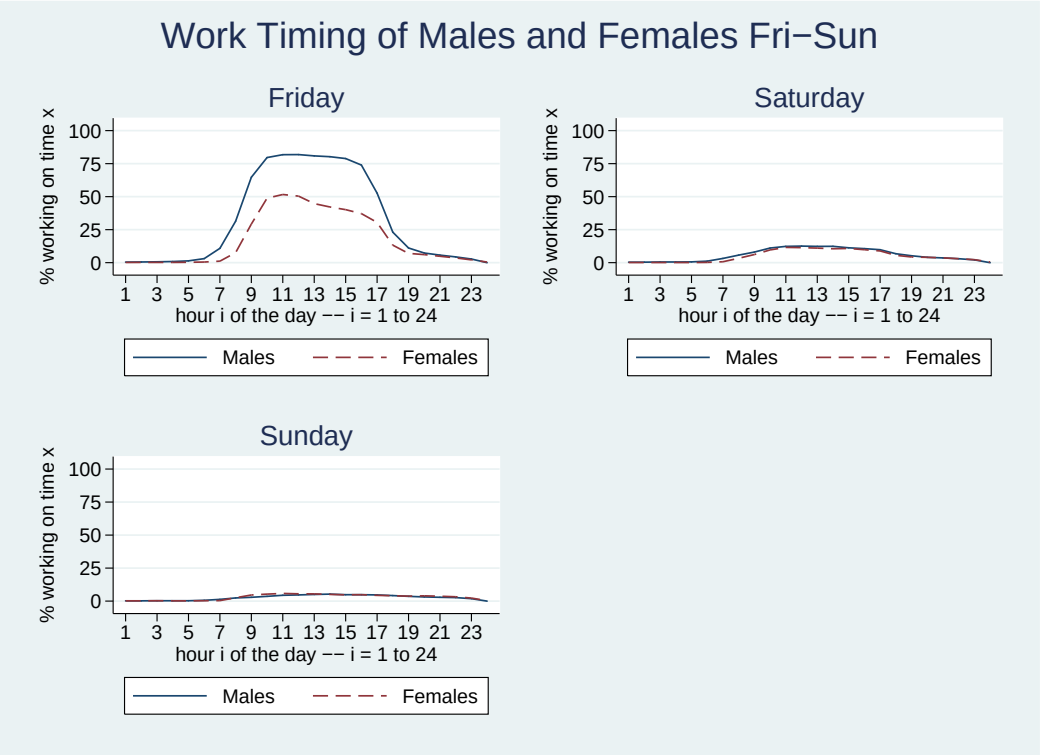

Figure 2: When do males and females work during the day? Part II

Table 1: **Descriptive statistics working days & working hours**

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

Table 2: **To what extent can you determine your starting (ending) hours?**

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

Table 3: **Did you already had your job when you started living together with your current partner?**

	Freq.	**%**
Males		
Yes	759	41.48
No	895	48.91
Non response	176	9.62
Total	1830	100
Females		
Yes	559	30.55
No	1095	59.84
Non response	176	9.62
Total	1830	100

Table 4: **Work time overlap regression**

Variable	β	t-value
# Children between 0-4	-1.844***	-4.69
# Children between 4-12	-1.709***	-7.11
# Children between 12 plus	-0.425*	-1.65
Weekly work hours male	0.177***	8.86
Weekly work hours female	0.603***	32.70
Male had job before living together†	0.304	0.76
Female had job before living together†	0.320	0.75
Education level male	0.291**	2.23
Education level female	0.539***	3.87
Female works Monday	1.033**	2.23
Female works Tuesday	1.319***	2.83
Female works Wednesday	0.970**	2.25
Female works Thursday	0.657	1.42
Female works Friday	0.141	0.34
Female works Saturday	-4.856***	-7.34
Female works Sunday	-8.037***	-10.30
Male works Monday	4.441***	5.69
Male works Tuesday	2.490***	2.72
Male works Wednesday	3.248***	4.27
Male works Thursday	1.956**	2.23
Male works Friday	3.360***	4.96
Male works Saturday	-1.120*	-1.79
Male works Sunday	-4.090***	-4.82
Degree of working on flexible times male	0.908***	5.27
Degree of working on flexible times female	0.400**	2.23
Partners met each other at work (N=219)‡	1.019	1.61
Partners met each other when going out(N=173)‡	-0.014	-0.02
Partners met each other through friends (N=317)‡	0.898	1.61
Partners met each other through the internet (N=102)‡	-0.303	-0.34
Partners met each other somewhere else (N=446)‡	0.572	1.13
Control†	2.326**	2.31
Constant	-25.412***	-15.79
Adjusted R^2	0.687	
#-obs.	1830	

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

†The male/female question did you had your job before you started living together contain 179 missing values that are replaced to -1. Hence we included a dummy variable *control* that is one for each -1-value and zero otherwise.

‡The reference group is partners met each other while going out (N=572).

Table 5: **Descriptive statistics of the conditioning variables for couples and matched couples**

	Couples			Matched couples			
	N	**Mean**	**Std.Dev.**	**N**	**Mean**	**Std.Dev.**	**Δ-mean**
# Children between 0-4	1830	0.23	0.52	1830	0.23	0.53	0.00
# Children between 4-12	1830	0.51	0.83	1830	0.50	0.82	0.01
# Children between 12 plus	1830	0.41	0.79	1830	0.38	0.76	0.03
Weekly work hours male	1830	48.84	12.52	1830	49.32	12.58	-0.48
Weekly work hours female	1830	29.56	14.58	1830	29.77	14.52	-0.21
Education level male	1830	3.04	1.64	1830	3.03	1.64	0.01
Education level female	1830	3.16	1.54	1830	3.12	1.52	0.04
Female works Monday	1830	0.74	0.44	1830	0.75	0.43	-0.01
Female works Tuesday	1830	0.74	0.44	1830	0.74	0.44	0.00
Female works Wednesday	1830	0.65	0.48	1830	0.66	0.47	-0.01
Female works Thursday	1830	0.74	0.44	1830	0.74	0.44	0.00
Female works Friday	1830	0.63	0.48	1830	0.63	0.48	0.00
Female works Saturday	1830	0.18	0.39	1830	0.17	0.38	0.01
Female works Sunday	1830	0.11	0.32	1830	0.11	0.31	0.00
Male works Monday	1830	0.93	0.26	1830	0.93	0.26	0.00
Male works Tuesday	1830	0.94	0.23	1830	0.95	0.22	-0.01
Male works Wednesday	1830	0.92	0.27	1830	0.92	0.28	0.00
Male works Thursday	1830	0.94	0.24	1830	0.94	0.24	0.00
Male works Friday	1830	0.90	0.30	1830	0.90	0.30	0.00
Male works Saturday	1830	0.19	0.39	1830	0.19	0.40	0.00
Male works Sunday	1830	0.10	0.30	1830	0.10	0.30	0.00
Degree of working on flexible times male	1830	2.22	1.15	1830	2.22	1.16	0.00
Degree of working on flexible times female	1830	1.99	1.06	1830	1.92	1.04	0.07***
work time overlap	1830	20.60	13.91	1830	20.90	14.22	-0.30

Note: * significant difference in mean at 10% level, ** significant difference in mean at 5 % level, *** significant difference in mean at 1 % level.

Table 6: **Test if mean hours of work time overlap differ between the couples and the control group**

		#-obs	$WTO_{Couples}$	$WTO_{Control}$	Δ
Child present	no	429	24.96	22.71	2.25***
Children present between 0-4	yes	338	15.32	18.07	-2.75***
Children present between 4-12	yes	592	15.92	18.34	-2.42***
Children present between 12+	yes	471	17.94	19.20	-1.26***
Education level male	low	450	21.14	20.71	0.43
	med.	881	20.42	20.45	-0.03
	high	499	20.43	20.72	-0.28
Education level female	low	310	17.62	18.56	-0.93***
	med.	1029	20.01	20.28	-0.28***
	high	491	23.90	22.64	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***
Job flexibility male	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***
Job flexibility female	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 10% level, ** significant at 5 % level,
*** significant at 1 % level.

Table 7: **How does coordination of work schedules influences the relative joint household time**

		#-obs	$WTO_{Couples}$	$WTO_{Control}$	Δ
Type D Households					
Relative joint	0-10 %	342	11.32	19.03	-7.72***
household time	10-20 %	261	13.03	20.08	-7.05***
	20-30 %	139	13.54	20.56	-7.02***
	30-40 %	73	14.34	20.69	-6.35***
	40-50 %	66	14.42	19.78	-5.36***
	50-75 %	45	15.63	21.37	-5.74***
	75-100 %	49	12.75	20.17	-7.42***
total observations		975			
Type S Households					
Relative joint	0-10 %	235	26.02	18.87	7.14***
household time	10-20 %	195	28.48	21.31	7.17***
	20-30 %	160	29.53	21.30	8.23***
	30-40 %	88	32.91	23.48	9.43***
	40-50 %	63	31.84	23.81	8.03***
	50-75 %	53	37.51	24.17	13.34***
	75-100 %	61	31.80	23.86	7.94***
total observations		855			

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

Table 8: **How does coordination of work schedules influences the relative joint child caring time**

		#-obs	$WTO_{Couples}$	$WTO_{Control}$	Δ
Type D Households					
Relative joint	0-20 %	115	11.10	18.98	-7.88***
child care hours	20-40 %	144	12.21	19.26	-7.05***
	40-60 %	83	12.05	19.41	-7.36***
	60-80 %	56	11.40	18.68	-7.28***
	80-100 %	102	11.29	19.69	-8.40***
total observations		500			
Type S Households					
Relative joint	0-20 %	80	24.75	18.75	6.00***
child care hours	20-40 %	83	25.24	18.12	7.12***
	40-60 %	58	24.70	20.20	4.49***
	60-80 %	29	25.76	15.86	9.89***
	80-100 %	83	25.76	18.61	7.14***
total observations		333			

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

Table 9: **How does coordination of work schedules influences the amount of time that is spent with the partner**

Variable	β	t-value
Type S Households		
$\hat{\epsilon}$	0.001	0.070
# Children between 0-4	-0.531***	-5.360
# Children between 4-12	-0.562***	-8.760
# Children between 12 plus	-0.433***	-6.330
Education level male	-0.170***	-2.680
Education level female	0.069	1.060
Log(household income)	0.073	0.650
Control dummy	0.166	0.530
Constant	3.105***	10.180
Average weekly hours with partner	22.44	
Type D Households		
$\hat{\epsilon}$	0.012***	3.100
# Children between 0-4	-0.309***	-4.540
# Children between 4-12	-0.549***	-11.490
# Children between 12 plus	-0.361***	-6.610
Education level male	-0.096*	-1.850
Education level female	0.050	0.870
Log(household income)	0.108	1.350
Control dummy†	0.294	1.320
Constant	3.030***	13.480
Average weekly hours with partner	20.87	
Household type	S	D
Adjusted R^2	0.130	0.145
#-obs.	975	855

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

†The income question contains 331 missing values that are replaced to 0. Hence we included a dummy variable *control* that is one for each 0-value and zero otherwise.

Table 10: **How does coordination of work schedules influences the demand of (in)formal child care**

Variable	β	t-value
Dep. Var. log(t^f_{cc})		
Formal child care hourly price	-0.601***	-6.19
# Children between 0-4	0.882***	5.26
# Children between 4-12	-0.185	-0.60
Education level male	-0.078	-0.50
Education level female	0.361*	1.83
Log(household income)	-0.133	-0.46
$\hat{\epsilon}$	0.013*	1.72
Dummy uses formal + informal child care	-0.460***	-3.65
constant	4.735***	5.86
Dep. Var. log(t^i_{cc})		
Informal child care hourly price	-0.102	-1.58
# Children between 0-4	0.707***	5.21
# Children between 4-12	-0.749***	-3.51
Education level male	0.306**	2.30
Education level female	-0.336**	-2.08
Log(household income)	0.195	0.61
$\hat{\epsilon}$	0.028***	4.34
Dummy uses formal + informal child care	-0.261**	-1.78
constant	2.291***	2.69
Dependent Variable	log(t^f_{cc})	log(t^i_{cc})
Adjusted R^2	0.346	0.166
#-obs.	140	334

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

Table 11: **Summary statistics for the demand of (in)formal child care**

	Freq.	**Mean**	**Min**	**Max**
Demand for formal child care	140	63.24	4	272
Demand for informal child care	334	28.41	1	168.5