

# The Effect of Child Care Subsidies on the Time Allocation and Well-Being of Parents\*

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## Abstract

We study the effects of a substantial cut in child care subsidies in the Netherlands on the time allocation and well-being of parents. We use differences-in-differences, the treatment group consists of parents with a youngest child 0 to 12 years of age and the control group consists of parents with an older youngest child. We find that the reform did not significantly affect the number of hours worked by mothers or fathers. However, we do find a significant increase in the number of hours spent on household work (including informal child care) by mothers, though not by fathers. The increase in household work by mothers goes at the expense of their leisure time, but this does not significantly affect their well-being.

**JEL codes:** C23, H31, J22

**Keywords:** Child care subsidies, time allocation, well-being, diff-in-diff

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\*In this paper we use data from the LISS (Longitudinal Internet Studies for the Social sciences) panel, administered by CentERdata (Tilburg University). We have benefited from comments and suggestions by participants of the NED 2016 in Amsterdam. Remaining errors are our own.

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# 1 Introduction

We study the causal effect of child care subsidies on the time allocation and well-being of parents. Since the 1990s, policies have been implemented to stimulate the labor supply of women in OECD countries (Blau and Kahn, 2013). Before, female participation rates were substantially below male participation rates (Jaumotte, 2003), and an important reason for the relatively low participation rate of women is the birth of and care for children (Apps and Rees, 2005). The effect of child care policies on formal labor participation has been studied extensively in the literature. The earlier literature primarily used (semi-)structural econometric models and cross-sectional data and found that the cost of child care only had only a modest effect on formal labor supply (Blau and Robins, 1988; Connelly, 1992; Gustafsson and Stafford, 1992; Michalopoulos et al., 1992; Powell, 1992; Leibowitz et al., 1992; Ribar, 1995; Kimmel, 1998; Kimmel and Connelly, 2007; Powell, 2002; Lokshin, 2004; Tekin, 2007). Since then, this has been confirmed by quasi-experimental evidence using exogenous changes in child care policies (Eissa and Liebman, 1996; Eissa and Hoynes, 2004; Averett et al., 1997; Meyer, 2002; Lefebvre and Merrigan, 2008; Cascio, 2009; Herbst, 2010; Bettendorf et al., 2015).

Recent empirical work uses quasi-experimental techniques to study the effect of taxes and subsidies on both formal production and informal production, and time use more generally. Following the seminal paper of Becker (1965), Gelber and Mitchell (2012) study the effects of changes in taxes on time spent on market work and household work, and find that a one-hour increase in market work is accompanied by a reduction in household work of 40 minutes.<sup>1</sup> Hence, the interaction between formal and informal production seems an important dimension to consider when it comes to taxes and subsidies.<sup>2</sup>

Following the recent empirical literature, we study the impact of a cut in child care subsidies on the time allocation of parents over market work and household

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<sup>1</sup>A similar relation between market work and household work is found in Aguiar et al. (2013), who focus on the consequences of the Great Recession. They find that a one-hour decrease in market work is accompanied by an increase in household work of 20 minutes.

<sup>2</sup>There is a related empirical literature that considers home production as additional insurance against income shocks (Gronau, 1977, 1980; Aguiar and Hurst, 2005; Aguiar et al., 2013; Been et al., 2016; Burda and Hamermesh, 2010; Krueger and Mueller, 2012; Stancanelli and Van Soest, 2012; Guler and Taskin, 2013; Hicks, 2015; Kuehn, 2015).

work. Specifically, we study the effect of the 2012 cut in child care subsidies in the Netherlands on the hours spent on paid work, household work and leisure by mothers and fathers of children up to 12 years of age. Furthermore, we also consider how the cut in child care subsidies combined with the possibility to reallocate time affects the well-being of mothers and fathers.

We estimate the effect of the reform using panel data from the LISS panel of CentERdata. We use data from the pre-reform waves 2009 and 2010 and the post-reform wave 2012.<sup>3</sup> These waves contain retrospective survey data on hours of paid work and hours spent on household production over the past 7 days. We employ a differences-in-differences strategy. The treatment group consists of parents with a youngest child up to 12 years of age. Our preferred control group consists of parents with a youngest child 12 years of age or older. For our preferred control group, pre-reform placebo treatment dummies are insignificant.

Our main findings are as follows. First, we do not find a statistically significant effect of the cut in formal child care subsidies on hours spent on market work by mothers or fathers. The point estimate is negative but small for mothers, and also negative but larger in absolute terms for fathers. Hence, if anything, the reform seems to have reduced market work by fathers. Second, we do find a statistically significant effect on the hours spent on household work, including informal child care, by mothers, though not by fathers. The mothers increase their hours on household work by 5.2 hours per week, an increase of 12% relative to the pre-reform average. The increase in household work by mothers goes at the expense of their leisure time. Third, however, the effect on the well-being (and happiness) of mothers, although negative, is small and insignificant (the effect on the well-being of fathers is also small and insignificant). Hence, our results indicate that the main effect of child care subsidies is to substitute formal care by informal care by mothers, which goes at the expense of the leisure time of the mothers but has no substantial effect on their well-being. Hence, the cut in child care subsidies seems to have improved public finances while leaving the well-being of parents largely unaffected.

We make three contributions to the literature. First, we are the first to present quasi-experimental evidence on the effects of child care subsidies on the time allocation of parents. Previous studies used cross-sectional data, without exogenous

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<sup>3</sup>Unfortunately, the wave 2011 of the LISS panel did not contain the questions for the time use data we use in the empirical analysis.

variation provided by a reform, to study the time allocation of parents (e.g. Bloemen et al., 2010; Bloemen and Stancaelli, 2014). Furthermore, because we use panel data, we can also account for unobserved fixed effects. Second, Gelber and Mitchell (2012) identify their causal effects from relatively small changes in marginal tax rates. Instead, we use a quasi-experimental setting with one relatively large exogenous shock. Hence, frictions are less likely to attenuate the behavioral responses (Chetty, 2012). Third, we are also able to study the effect on well-being of parents. Indeed, we show that parents can deal with a reduction in child care subsidies by reallocating their time, and in this way mitigate the negative effects of the price shock on their well-being. This echoes the finding of Gelber and Mitchell (2012) who show that households can partly insulate themselves from an increase in tax rates on market work by reducing time spent on market work and increasing time spent on household work.

The outline of the paper is as follows. In Section 2 we discuss the child care reform that we use as exogenous variation. Section 3 then outlines the empirical methodology. In Section 4 we discuss the data set, and give descriptive statistics. Section 5 presents the empirical results, including a number of robustness checks. Section 6 discusses our findings and concludes.

## 2 The reform

Children in the Netherlands go to primary school when they turn 4, and typically go to secondary school after they turn 12.<sup>4</sup> Before the age of 4, children can go to centre-based daycare, centre-based playgroups (*peuterspeelzalen* in Dutch) and informal care (part of which is also subsidized, the so-called guestparents or *gastouders* in Dutch). Children that are in primary school (4–12 years of age) can go to centre-based out-of-school care or informal care (part of which, the guestparents, is again subsidized).

Parents are free to choose the care they prefer, and the child care market has been a private market since 2005. Child care subsidies are paid to parents by the central government. Subsidies are paid per hour of care, up to a maximum price per hour beyond which parents receive no additional subsidy. The subsidy depends

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<sup>4</sup>This section draws heavily on Akgunduz et al. (2015) and Jongen et al. (2016).

Table 1: Child care costs for selected households in 2011 and 2012 (in euro)

	2011		2012		Percentage change in net cost
	Income	Net cost	Income	Net cost	
Single parent, median income					
One child	32,500	120	33,150	152	+26
Two children	32,500	155	33,150	226	+46
Three children	32,500	190	49,725	301	+58
Couple, 1.5x median income					
One child	48,750	183	49,725	225	+23
Two children	48,750	227	49,725	323	+42
Three children	48,750	271	49,725	422	+52
Couple, 2x median income					
One child	65,000	278	66,300	336	+21
Two children	65,000	332	66,300	461	+39
Three children	65,000	385	66,300	586	+52

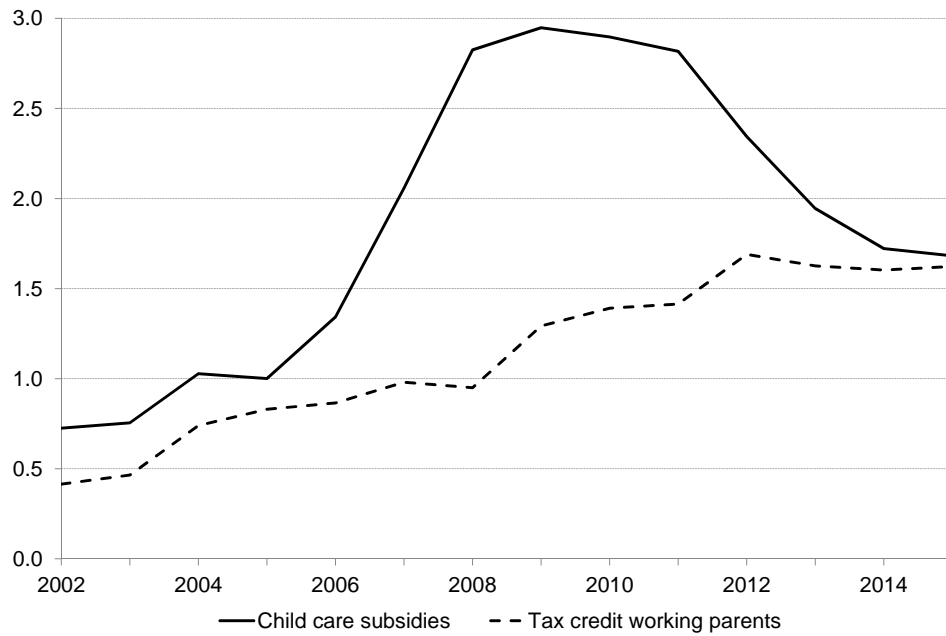
*Notes:* Median income refers to the median individual income in the Netherlands. Source Akgunduz et al. (2015).

on income; low incomes receive a larger subsidy per hour than high incomes. The subsidy per child per hour also depends on the number of children in child care per household; the subsidy is higher for the second (third etc.) child in child care.

In the period 2005–2008 there was a boost in the daycare sector, as subsidies for parents were increased substantially, cutting the effective parental fee for formal child care in half (Bettendorf et al., 2015). However, the reform was so successful in terms of the use of formal child care that it increased public spending on formal child care from 1 billion euro in 2004 to 3 billion euro in 2009, see Figure 1. In response to the (larger than expected) rise in public spending on child care, and the perceived need for budget cuts following the financial crisis, the government subsequently tried to curb the rise in public spending on child care.

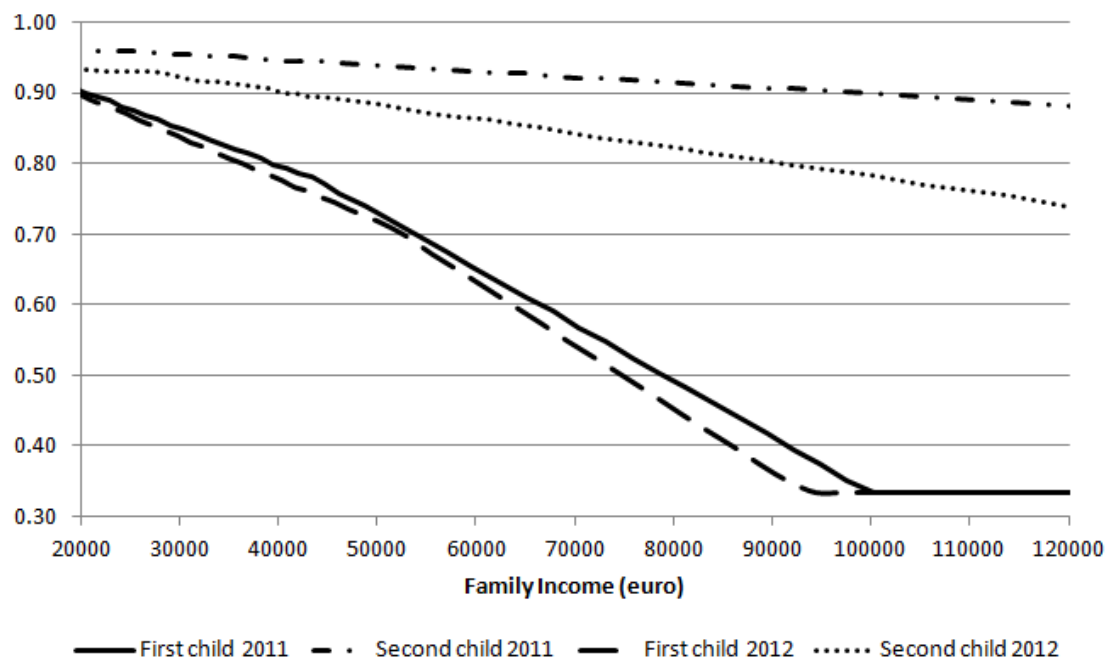
In 2011 the government announced a substantial reduction in child care subsidies, which came into effect in 2012 (Ministry of Social Affairs and Employment, 2011). The subsidy cut for parents in 2012 is illustrated in Figure 2. Subsidy rates were cut across the board for the first child by between 2 to 5 percentage points, while subsidy rates for the second (third etc.) child were reduced by more than 10 percentage

Figure 1: Public expenditures on child care and the tax credit for working parents in the Netherlands: 2002–2015 (in billions of euro)



Source: Jongen et al. (2016).

Figure 2: Subsidy rates for the ‘first’ and ‘second’ child in daycare centers



Source: Akgunduz et al. (2015).

points, depending on income.<sup>5</sup> To illustrate the impact on of the subsidy cut on expenditures by parents, Table 1 shows the increase in child care costs for selected households with one, two or three children in daycare. We calculate child care costs for single parents and couples using three days of daycare per week. For single parents we calculate child care costs at median income. For couples we calculate child care costs at 150% and 200% of median income (to account for the income of the secondary earner). Table 1 shows that child care costs increased by 26% for single parent families with one child, and the increase rises to 46% for two and 58% for three children. Child care costs rose more for higher income families, even though the percentage change is lower, due to the higher base costs in 2011. For couples with 150% of median income, the percentage change is between 23% and 52% depending on the number of children. The increases are similar for couples with 200% of the median income with an increase of 21% for parents with one child in daycare and 52% for those with three children in daycare.

The subsidy reduction led to a negative demand shock for daycare. Indeed, 2012 is the first year since the introduction of the Law on Childcare (*Wet kinderopvang*) in 2005, in which hourly daycare prices rose less than core inflation. Furthermore, after a steady rise up to 2011, following the reform, the number of children in daycare declined (Akgunduz et al., 2015). The reform led to a pronounced drop in public expenditures on child care, due to the reduction in the subsidy and the corresponding drop in the participation rate of children in subsidized care, see again Figure 1. Indeed, public expenditures dropped from 2.9 billion euro in 2010, to 2.3 billion euro in 2012, and then to 1.9 billion euro in 2013.

At the same time that the subsidies on child care were reduced there was also an increase in the tax credit for secondary earners and single parents with a youngest child up to 12 years of age (the *Inkomensafhankelijke combinatiekorting* in Dutch). The budgetary costs of this tax credit are also shown in Figure 1 ('Tax credit working parents'). The increase in this tax credit in terms of the budgetary costs was smaller though, rising from 1.4 billion euro in 2010 to 1.6 billion euro in 2013. However, the

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<sup>5</sup>In addition to the reduction in subsidies up to the maximum hourly price, the maximum hourly price was also kept constant (was not indexed with inflation) at €6.36 from 2011 to 2012. The average hourly price of formal child care rose from €6.32 in 2011 to €6.45 in 2012 (Ministry of Social Affairs and Employment, 2013). This further increased the effective costs of child care for parents from 2011 to 2012.

increase in this tax credit is likely to have mitigated the effect of the cut in child care subsidies on the labor supply of secondary earners and single parents to some extent.

### 3 Empirical methodology

We use differences-in-differences (DD) to estimate the effects of the child care reform on the time use of parents.<sup>6</sup> In the DD approach we estimate the impact of a reform by taking a double difference in the outcome variable for the treatment group and the control group. First, we take the difference in the outcome variable between the treatment group and the control group after the reform. Second, we subtract the difference in the outcome variable between the treatment group and the control group before the reform. In this way we control for the time-invariant difference between the treatment and control group and for common time effects in the outcome variable. The reform targets parents with a youngest child 0 to 12 years of age. Hence, the treatment group consists of parents with a youngest child 0 to 12 years of age. Our preferred control group consists of parents with a youngest child 12 years of age or older. For our preferred control group, pre-reform placebo treatment dummies are insignificant.

We consider five outcome variables: i) hours spent on paid work, ii) hours spent on household work, including (own) informal child care, iii) hours spent on leisure, iv) subjective well-being and v) subjective happiness. For all outcome variables we estimate a linear model, including the zeros for the time use specifications (see Angrist and Pischke, 2009). Let  $h_{igt}$  be the hours spent on a particular activity by parent  $i$ , or the well-being indicator of parent  $i$ , with a youngest child in age group  $g$  in period  $t$ . In our preferred specification, we regress the outcome variable on a set of year fixed effects  $\alpha_t$ , a group dummy  $\beta_g$  which equals 1 for parents with a youngest child 0 to 12 years of age, a set of demographic control variables  $X_{it}$  with coefficients  $\mu_x$ , a treatment dummy  $DD_{igt}$  which equals 1 for parents with a youngest child 0 to 12 years of age in the post-reform period with coefficient  $\delta_g$ , an

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<sup>6</sup>For a general introduction to the differences-in-differences methodology see e.g. Angrist and Pischke (2009).



individual fixed effect  $\epsilon_i$ <sup>7</sup> and an error term  $\epsilon_{igt}$ :

$$h_{igt} = \alpha_t + \beta_g + X'_{it}\mu_x + \delta_g DD_{igt} + \epsilon_i + \epsilon_{igt}. \quad (1)$$

The coefficient of primary interest is the treatment coefficient  $\delta_g$ . In an extension we further include a placebo treatment dummy for the pre-reform period 2010. The coefficient on this placebo treatment dummy is informative about potential differential time effects between the treatment and control groups, for example because of differences in group specific trends or differences in business cycle responses, and also about potential anticipation effects of the reform. We use robust standard errors to allow for heteroscedasticity and serial correlation in the error term  $\epsilon_{igt}$ .

## 4 Data

We use data from the LISS panel (Longitudinal Internet Studies for the Social sciences) of CentERdata. The annual core waves (LISS Core Study) consist of 5,000 representative households (about 8,000 individuals) in the Netherlands. The LISS Core Study was supplemented with an additional module on time use in the 2009, 2010, and 2012 waves.<sup>8</sup> We use these three waves in our empirical analysis.<sup>9</sup> The merged data set has 18,433 observations. For our base specification we then make the following selections: we keep individuals with a (dependent) child, 21 to 50 years of age<sup>10</sup>, for whom the time use categories and well-being indicators are observed and that do not change from being single to being part of a couple or vice versa (to reduce the noise from changes in time use for other reasons than the reform). After these selections are made we are left with 1,083 observations for 361 mothers and 645 observations for 215 fathers.

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<sup>7</sup>We include individual fixed effects, but the group dummy is still identified of the group of parents that move from the treatment to the control group, as their youngest child ages in the sample period (an exogenous process). In a robustness analysis we drop parents from the control group that were in the treatment group before, in this specification the group dummy is absorbed in the individual fixed effect.

<sup>8</sup>Unfortunately, the questionnaire for the 2011 wave did not contain the relevant questions we use in our analysis.

<sup>9</sup>The time use data from these waves have previously been used in e.g. Cherchye et al. (2012).

<sup>10</sup>We limit the age range of parents to make the treatment and control groups more homogeneous. However, the results are robust to different age-boundaries, e.g. 5 years older or younger.

The data on time use consist of retrospective questions about the time spent on a number of time use categories during the past 7 days. Individuals are made aware of the maximum 168 hours per week, but they can report more than 168 hours (multi-tasking).<sup>11</sup> For paid work we use the reported hours to the following question:

How much time did you spent in the last seven days on paid work (in employment or as self-employed; do NOT include the time spent traveling to and from work, but DO count overtime)?

For household work including (own) informal child care we use the sum of hours reported for:

How much time did you spent in the last seven days on household chores (such as cleaning, laundry, shopping, cooking, gardening, odd jobs, etc; but NOT personal care or care for children or parents, for example)?

and

How much time did you spent in the last seven days on activities with children (such as washing, dressing, playing, reading, taking child to see the doctor, taking child to school/hobby activities, etc.)?

We choose to sum these categories because parents may interpret informal child care as household work and vice versa, or may be ‘multitasking’.

To define total leisure time we sum the time use categories leisure time, sleeping, and ‘other’. These categories are based on the following questions respectively:

How much time did you spent in the last seven days on leisure time activities (such as watching TV, reading, sports activities, hobbies, computer as hobby, visiting friends or family, traveling, going out, etc.)?

How much time did you spent in the last seven days on sleeping and resting (sleeping, lazing, thinking, meditating, etc.)?

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<sup>11</sup>In the questionnaire it reads: "Note: the total number of hours should equal 168 (= 7 times 24, the total number of hours in one week)."

and

How much time did you spent in the last seven days on other activities not named above?

People are asked to specify the other activities in a followup question. Eye-balling through the answers given suggests that most of the answers can be interpreted as leisure time activities.<sup>12</sup>

Regarding well-being we use two different 10-point-scale measures asked to the respondents in the LISS panel. For this purpose, we merged our original data with the *Economic Situation: Income* component of the LISS panel. We use the following two questions and define these as 'well-being' and 'happiness' respectively:

If you imagine a ladder of life, where the first step represents the worst possible life, and the tenth (top) step the best possible life, on what step would you place yourself? (0..10)

and

Can you indicate, on a scale from 0 to 10, to what degree you consider yourself happy? 0 means that you are not at all happy, and 10 means that you are extremely happy.

As control variables we use the age of the parent, the age of the youngest child (pre school age 0–4, primary school age 5–12, secondary school age 12–17), the level of education of the parent (low/middle/high) and household type (single parent/couple). The latter two variables drop out in the specifications where we include individual fixed effects, to control for unobserved fixed heterogeneity across individuals, and because we have dropped individuals that change household type from the sample.

Descriptive statistics for the treatment group and the control group in the pre-reform period (2009, 2010) and post-reform period (2012) are given in Table 2. First consider the mothers. Mothers in the treatment group spent less hours in paid work than the control group. Both groups show a decline in hours of paid

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<sup>12</sup>Examples are 'walking (the dog)', 'watching TV/a film/cinema', 'going for drinks/dinner', 'hobby', '(motorcycle) vacation', 'attending birthdays', 'sports', 'intimacy', 'going to church', etc.

work from the pre- to the post-reform period, probably due to the Great Recession, but the decline is somewhat bigger for the treatment group, resulting in a ‘simple’ DD treatment effect, not controlling for differential changes in the observable and unobservable characteristics, of  $-0.1$  hours per week. On the other hand, mothers in the treatment group spent more hours on household production than the control group, and taking a double difference we find a substantial positive treatment effect of  $+3.7$  hours per week. The increase in home production mostly goes at the cost of leisure time. The double differences indicate that leisure drops by about 2.1 hours per week among mothers. The subjective well-being indicator is quite similar between mothers in the treatment group and mothers in the control group, and drops somewhat less after the reform, leading to a small positive simple DD coefficient. The happiness indicator, however, shows a minor negative effect of the treatment because this indicator decreases relatively more among the treated mothers. Regarding the observable characteristics, mothers in the treatment group are on average younger than mothers in the control group (unsurprising, given the age of the youngest child), and the age differential becomes somewhat larger in the post-reform period. Mothers in the treatment group are about equally likely to be single as mothers in the control group, with some increase in the share of single mothers in the control group relative to the treatment group in the post-reform period. Finally, mothers in the treatment group are more likely to be higher educated, which may reflect a cohort effect in education.

Next, consider the descriptive statistics for fathers. Fathers in the treatment group work slightly less hours than fathers in the control group, and the difference becomes more pronounced in the post-reform period, suggesting a negative treatment effect of  $-2.0$  hours per week for a simple DD. Fathers in the treatment group spent substantially more hours on household work than fathers in the control group, and the difference increases somewhat after the reform, suggesting a positive treatment effect of 0.8 hours per week. The simple DD also shows that leisure time drops substantially with about 2.9 hours per week. Fathers in the treatment group have a slightly higher well-being and happiness score than fathers in the control group, and the difference becomes somewhat larger for well-being and somewhat smaller for happiness after the reform. Turning to the demographic control variables, like the mothers, fathers in the treatment group are also younger than the control group on average, and the difference becomes bigger in the post-reform period. Fathers in

Table 2: Descriptive statistics treatment group and control group

	Treatment group		Control group		Simple DD	
	Pre-reform	Post-reform	Pre-reform	Post-reform		
	Mean	SD	Mean	Mean		
<i>Panel A: Mothers</i>						
Dependent variables						
Paid work (hours/week)	18.091	14.555	16.651	21.300	20.278	-0.418
Household work (hours/week)	41.730	20.684	41.854	31.033	27.418	3.740
Leisure (hours/week) <sup>a</sup>	89.367	21.888	90.356	95.175	98.911	-2.094
Well-being <sup>b</sup>	7.357	1.310	7.292	7.273	7.037	0.171
Happiness <sup>c</sup>	7.379	1.349	7.231	7.278	7.201	-0.071
Control variables <sup>d</sup>						
Age	38.400	5.054	39.900	43.521	46.119	-1.098
Middle educated	0.459	0.499	0.461	0.502	0.510	-0.006
Higher educated	0.350	0.477	0.346	0.185	0.238	-0.057
Single	0.093	0.290	0.095	0.081	0.119	-0.036
Observations <sup>d</sup>	497		211	211	143	
<i>Panel B: Fathers</i>						
Dependent variables						
Paid work (hours/week)	37.697	14.308	37.697	39.506	38.978	-1.981
Household work (hours/week)	22.182	14.099	21.994	16.063	15.072	0.802
Leisure (hours/week) <sup>a</sup>	88.099	19.908	87.475	93.632	95.915	-2.907
Well-being <sup>b</sup>	7.264	1.146	7.252	7.233	7.321	-0.102
Happiness <sup>c</sup>	7.298	1.240	7.275	7.153	7.260	-0.129
Control variables <sup>d</sup>						
Age	39.594	4.419	41.367	43.920	46.887	-1.194
Middle educated	0.429	0.496	0.432	0.536	0.507	0.032
Higher educated	0.347	0.477	0.353	0.304	0.338	-0.028
Single	0.023	0.149	0.050	0.071	0.070	0.028
Observations <sup>d</sup>	308		139	112	71	

Notes: <sup>a</sup>'Leisure' is defined as the sum of hours spent on leisure, sleeping, and 'other'. <sup>b</sup>"If you imagine a ladder of life, where the first step represents the worst possible life, and the tenth (top) step the best possible life, on what step would you place yourself?" <sup>c</sup>"Can you indicate, on a scale from 0 to 10, to what degree you consider yourself happy?" <sup>d</sup> For the sample for whom home production is observed in the data.

the treatment group are less likely to be single than in the control group. Finally, fathers in the treatment control group are more likely to be higher educated than fathers in the control group, which again may reflect a cohort effect.

Although the simple DD calculations are already informative, they do not control for differential changes in observed and unobserved characteristics. Furthermore, we do not know whether the treatment effects are statistically significantly different from zero. That is why we turn to regression analysis next.

## 5 Results

### 5.1 Time use

Table 3 gives the results for the time allocation of mothers.<sup>13</sup> In column (1) we present the results for the basic DD setup, where we only include a group dummy, a post-reform period dummy, and the treatment dummy. The treatment effects are the same as the ‘Simple DD’ column in the descriptive statistics table. The treatment effect on hours of paid work in Panel A is negative, but relatively small and not statistically significantly different from zero. The treatment effect on hours of household work in Panel B is positive, much larger, but also not statistically significant. The treatment effect on leisure in Panel C is negative, also large, but also not statistically significant. When we include demographic controls, column (2), we find qualitatively similar results. The effect on paid work is close to zero, and statistically insignificant. The effect on household work is similar as in column (1), but still not statistically significantly different from zero. The effect on leisure becomes more negative, but remains statistically insignificant. In column (3) we then also include individual fixed effects, our preferred specification. The treatment effect for hours of paid work is still negative and insignificant, but the treatment effect for hours spent on household work becomes larger and is now also significantly different from zero.<sup>14</sup> Indeed, hours spent on household production rise by 5.2 hours

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<sup>13</sup>Full regression results for the preferred specification are given in Table A.1 in the appendix.

<sup>14</sup>The result indicates that the individual fixed effects of the treatment group are negatively correlated with the treatment. Hence, *ceteris paribus*, mothers with a youngest child 0 to 12 years of age in the post-reform period would spend less hours on household production than mothers with a youngest child 0 to 12 years of age in the pre-reform period.

per week, which is an increase of 12% relative to the pre-reform average. The treatment effect on leisure becomes more negative, and is quite similar in absolute terms to the effect on household work, hence the increase in household work seems to be coming from a reduction in leisure time. Column (4) presents a robustness check, where we include a placebo treatment dummy which is 1 for mothers with a youngest child 0 to 12 years of age in the pre-reform year 2010. Since there was no reform in 2010, we expect this coefficient to be statistically insignificantly different from zero. The placebo treatment effects are not significantly different from zero for all time use variables, though the treatment effect for household work becomes somewhat larger. In column (5) we present another robustness check where we drop mothers that switch from the treatment group to the control because of the ageing of their youngest child. The treatment effects for paid work and leisure are quite similar to the treatment effects in our preferred specification. The treatment effect for household work is smaller though, and becomes statistically insignificant, but also note the substantial drop in number of observations.

Table 4 gives the results for the time allocation of fathers.<sup>15</sup> In column (1) we again present the results for the basic DD setup without demographic controls and individual fixed effects. The treatment effect on hours of paid work is negative and perhaps surprisingly larger than for mothers, but perhaps we should not read too much into this since the coefficient is not statistically significantly different from zero. The treatment effect on hours of household work is negative, but small and not statistically significantly different from zero. The treatment effect for leisure is negative but insignificant. A more detailed analysis (not reported here) shows a substantial drop in hours spend sleeping and not in 'true' leisure time activities. When we include demographic controls, column (2), we again find results that are quantitatively similar, though the effects become larger in absolute size. In column (3) we then again include the individual fixed effects, our preferred specification. The treatment effects remain statistically insignificant. But if anything, they suggest a negative effect on hours worked and leisure by fathers and a positive effect on household work by fathers (though smaller than for mothers). Column (4) again presents results for the robustness check where we include a placebo reform dummy, which is 1 for fathers with a youngest child 0 to 12 years of age in the pre-reform year 2010. The placebo treatment effects are not statistically significantly different from

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<sup>15</sup>Full regression results for the preferred specification are given in Table A.2 in the appendix.

Table 3: Time use mothers

	(1)	(2)	(3)	(4)	(5)
<i>Panel A: Paid work (hours/week)</i>					
Treatment	-0.418 (1.985)	-0.247 (2.000)	-0.538 (1.730)	-0.121 (2.095)	-0.393 (2.053)
Placebo				0.699 (1.521)	
Observations	1,083	1,083	1,083	1,083	825
Individuals	361	361	361	361	275
<i>Panel B: Household work (hours/week)</i>					
Treatment	3.740 (2.485)	3.893 (2.451)	5.206** (2.641)	7.218** (2.816)	2.270 (2.829)
Placebo				3.319 (2.024)	
Observations	1,062	1,062	1,062	1,062	816
Individuals	354	354	354	354	272
<i>Panel C: Leisure (hours/week)<sup>a</sup></i>					
Treatment	-2.447 (3.492)	-3.247 (3.544)	-4.587 (3.191)	-3.850 (3.667)	-4.771 (3.995)
Placebo				1.236 (4.151)	
Observations	834	834	834	834	630
Individuals	278	278	278	278	210
Demographic controls	No	Yes	Yes	Yes	Yes
Fixed effects	No	No	Yes	Yes	Yes
Placebo	No	No	No	Yes	No
No transitions treatment group to control group <sup>b</sup>	No	No	No	No	Yes

*Notes:* Robust standard errors in parentheses, \* denotes significant at the 10% level, \*\* at the 5% level and \*\*\* at the 1% level. See the Appendix for full regression results. <sup>a</sup>'Leisure' is defined as the sum of hours spent on leisure, sleeping, and 'other'. <sup>b</sup>Without mothers in the control group that were in the treatment group before.



Table 4: Time use fathers

	(1)	(2)	(3)	(4)	(5)
<i>Panel A: Paid work (hours/week)</i>					
Treatment	-1.981 (2.838)	-2.974 (2.828)	-2.486 (2.373)	-2.959 (2.693)	-2.216 (2.995)
Placebo				-0.839 (2.189)	
Observations	645	645	645	645	495
Individuals	215	215	215	215	165
<i>Panel B: Household work (hours/week)</i>					
Treatment	0.802 (2.413)	1.645 (2.523)	2.617 (2.664)	4.430 (3.200)	3.009 (3.186)
Placebo				3.030 (2.787)	
Observations	630	630	630	630	492
Individuals	210	210	210	210	164
<i>Panel C: Leisure (hours/week)<sup>d</sup></i>					
Treatment	-2.907 (4.400)	-3.845 (4.581)	-5.826 (5.238)	-4.513 (6.191)	-4.951 (7.227)
Placebo				1.558 (4.915)	
Observations	483	483	483	483	366
Individuals	161	161	161	161	122
Demographic controls	No	Yes	Yes	Yes	Yes
Fixed effects	No	No	Yes	Yes	Yes
Placebo	No	No	No	Yes	No
No transitions treatment group to control group <sup>b</sup>	No	No	No	No	Yes

*Notes:* Robust standard errors in parentheses, \* denotes significant at the 10% level, \*\* at the 5% level and \*\*\* at the 1% level. See the Appendix for full regression results. <sup>a</sup>'Leisure' is defined as the sum of hours spent on leisure, sleeping, and 'other'. <sup>b</sup>Without fathers in the control group that were in the treatment group before.

zero. However, the coefficient on the placebo for hours spent on household work is rather large relative to the treatment coefficient and also has a substantial effect on the treatment coefficient. This casts some doubt on the common trend assumption for hours spent on household work for fathers. Column (5) again presents results for the robustness check where we exclude fathers that were in the treatment group before from the control group. The results are very similar to the baseline results.

**PM Brief discussion of other robustness checks: paid work including commuting time, unbalanced panel, longer period.**<sup>16</sup>

**PM Brief discussion of heterogeneity analysis using interaction terms (e.g. high-educated, more than 1 kid, single, age category child 0-4 and 5-12).**

**PM Integrate Table A.3.**

## 5.2 Well-being

Recent studies have found that the elasticity of home production hours to market hours is about one-third (Aguiar et al., 2013) to two-thirds (Gelber and Mitchell, 2012). Regarding the substitutability between consumption spending and home production, elasticities have been found ranging from 0 to 5 (Baxter and Jermann, 1999) with most elasticities estimated from micro data around 2 (Aguiar et al., 2012). These elasticities suggest that people are, at least partially, able to insulate themselves from shocks to well-being by reallocating their time. We are the first to analyze whether increases in home production following a negative price shock have consequences for subjective well-being. Different concepts of subjective well-being are useful in measuring individuals' perceptions to experiences as an approximation of economic utility (Frey and Stutzer, 2002; Kahneman and Krueger, 2006). Hence, such measures may provide a better way to identify the costs and benefits of policy changes (Layard, 2010).

To analyze the effect of the child care reform on subjective well-being, we estimate the effect of the cut in child care benefits on two different measures of subjective well-being: i) well-being and ii) happiness (see the data section for the definition of

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<sup>16</sup>Here we use the question "How many hours per week do you work on average?" (asked to persons who "perform paid work") from the Work and Schooling component which has been yearly available since 2008.

these variables). Estimation results for mothers and fathers are reported in Table 5 and Table 6, respectively. The regressions in these tables are not restricted to the same sample as the time use regressions, but estimation results are highly similar when we do restrict the sample to be the same (not reported here).

We run the same specifications as for the time use categories. Across all specifications we find a small, statistically insignificant effect on well-being and happiness of mothers. In the preferred specification (3), well-being rises by 0.011, an increase of 0.1% relative to the pre-reform average. The placebo pre-reform dummy is insignificant and dropping mothers that move from the treatment to the control group still results in a small treatment effect, see columns (4) and (5), respectively. In the preferred specification, happiness falls by  $-0.234$ , a decrease of 3.1% relative to the pre-reform average. Again, results are quite similar for the robustness checks in columns (4) and (5), where the placebo treatment dummy is insignificant.

Turning to the results for fathers, again we find small and statistically insignificant effects. For our preferred specification (3), the treatment effect on the well-being and happiness of fathers is respectively a positive 0.192 and 0.137, or an increase of 2.7% and 1.9% relative to the pre-reform average. And again, results are quite similar for the robustness checks in columns (4) and (5), where the placebo treatment dummy is insignificant.

Summarizing, our results suggest that the main effect of child care subsidies is to substitute formal care by informal care by mothers, which goes at the expense of the leisure time of the mothers but has no substantial effect on the well-being of mothers (or fathers).

## 6 Discussion and conclusion

In this paper we have studied the impact of a substantial cut in child care subsidies on the time allocation and well-being of parents in the Netherlands, employing a differences-in-differences strategy. Our results show that the reform did not significantly affect the number of hours worked by mothers or fathers. Here we should note though that there was also a (less pronounced) increase in the tax credit for secondary earners and single parents with children up to 12 years of age, which may have mitigated the adverse effect on the participation of mothers in particular. However, the reform led to a statistically and quantitatively significant increase in

Table 5: Indicators well-being mothers

	(1)	(2)	(3)	(4)	(5)
<i>Panel A: Well-being<sup>a</sup></i>					
Treatment	0.171 (0.182)	0.148 (0.181)	0.011 (0.194)	-0.068 (0.229)	-0.112 (0.241)
Placebo				-0.127 (0.161)	
Observations	1,131	1,131	1,131	1,131	888
Individuals	377	377	377	377	296
<i>Panel B: Happiness<sup>b</sup></i>					
Treatment	-0.071 (0.199)	-0.027 (0.201)	-0.234 (0.193)	-0.165 (0.218)	-0.305 (0.232)
Placebo				0.111 (0.139)	
Observations	1,044	1,044	1,044	1,044	837
Individuals	348	348	348	348	279
Demographic controls	No	Yes	Yes	Yes	Yes
Fixed effects	No	No	Yes	Yes	Yes
Placebo	No	No	No	Yes	No
No transitions treatment group to control group <sup>c</sup>	No	No	No	No	Yes

*Notes:* Robust standard errors in parentheses, \* denotes significant at the 10% level, \*\* at the 5% level and \*\*\* at the 1% level. <sup>a</sup> "If you imagine a ladder of life, where the first step represents the worst possible life, and the tenth (top) step the best possible life, on what step would you place yourself?" <sup>b</sup> "Can you indicate, on a scale from 0 to 10, to what degree you consider yourself happy?" <sup>c</sup> Without transitions between treatment and control groups.

Table 6: Indicators well-being fathers

	(1)	(2)	(3)	(4)	(5)
<i>Panel A: Well-being<sup>a</sup></i>					
Treatment	-0.102 (0.172)	-0.118 (0.174)	0.192 (0.131)	0.098 (0.160)	0.229 (0.169)
Placebo				-0.145 (0.135)	
Observations	672	672	672	672	522
Individuals	224	224	224	224	174
<i>Panel B: Happiness<sup>b</sup></i>					
Treatment	-0.129 (0.233)	-0.170 (0.238)	0.137 (0.185)	0.140 (0.212)	0.130 (0.234)
Placebo				0.006 (0.173)	
Observations	645	645	645	645	501
Individuals	215	215	215	215	167
Demographic controls	No	Yes	Yes	Yes	Yes
Fixed effects	No	No	Yes	Yes	Yes
Placebo	No	No	No	Yes	No
No transitions treatment group to control group <sup>c</sup>	No	No	No	No	Yes

*Notes:* Robust standard errors in parentheses, \* denotes significant at the 10% level, \*\* at the 5% level and \*\*\* at the 1% level. <sup>a</sup> "If you imagine a ladder of life, where the first step represents the worst possible life, and the tenth (top) step the best possible life, on what step would you place yourself?" <sup>b</sup> "Can you indicate, on a scale from 0 to 10, to what degree you consider yourself happy?" <sup>c</sup> Without transitions between treatment and control groups.

household work, including informal care, by mothers of 12%. We do not find a statistically significant effect on household work by fathers. Hence, regarding the time allocation of parents, the main effect of changes in child care subsidies appears to be a substitution of formal care by informal care by mothers. We then also considered the effect on the well-being of mothers (and fathers). Despite the fact that mothers had to give up leisure time to spend more time on household work and informal child care, we estimate a small and statistically insignificant effect on the well-being of mothers (and fathers). Hence, by reallocating their time, families seem to be able to insulate themselves to a large extent from the price shock in the formal child care market.

Since the main effect of subsidies for formal child care appears to be on the allocation over formal and informal care, an important topic for future research is how participation in formal child care affects the well-being and development of children (Blau, 1999; Ruhm, 2004; Baker et al., 2005; Baker and Milligan, 2010; Del Bono et al., 2016). Unfortunately, little is known on the impact of participation in formal child care in the Netherlands on the well-being and development of children.<sup>17</sup> Research results for Canada, Norway and the US indicate that participation in formal child care does not always promote the development of the child and that the effect is quite heterogeneous, e.g. beneficial for children from families with a lower socioeconomic status but perhaps detrimental for children from families with a higher socioeconomic status (Mogstad and Havnes, 2015).

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<sup>17</sup>A recent study by Akgunduz et al. (2015) finds that the subsidy cut in 2011 reduced the quality in daycare centers. However, the quality of formal care vs. informal care, and how this affects children, remains largely unknown in the Netherlands.

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# Appendix

Table A.1: Full regression results mothers

	Paid work	Household work	Leisure <sup>a</sup>	Well-being <sup>b</sup>	Happiness <sup>c</sup>
Treatment	-0.538 (1.730)	5.206** (2.451)	-4.587 (3.191)	0.011 (0.194)	-0.234 (0.609)
Period 2012	-10.930 (19.560)	7.197 (28.120)	-28.330 (28.590)	-0.335 (0.714)	0.390 (0.609)
Period 2010	-2.863 (6.553)	4.093 (9.386)	-13.650 (9.745)	-0.168 (0.243)	0.017 (0.205)
Mother (child $\leq$ 12)	1.050 (1.829)	-2.849 (2.198)	1.073 (2.722)	-0.115 (0.141)	-0.114 (0.195)
Age	4.402 (6.907)	-7.794 (11.040)	15.480 (0.343)	0.259 (0.375)	-0.112 (0.343)
Age <sup>2</sup> /1000	-9.804 (25.700)	41.44 (60.030)	-56.950 (69.400)	-2.720 (3.267)	-0.520 (3.264)
Single	3.860 (4.069)	-12.030** (5.125)	15.380 (11.970)	-0.612 (0.484)	-0.566* (0.291)
Constant	-140.200 (261.600)	283.400 (393.800)	-430.100 (398.600)	1.640 (11.270)	12.800 (9.843)
Observations	1,083	1,062	834	1,131	1,044
Individuals	361	354	278	377	348
Demographic controls	Yes	Yes	Yes	Yes	Yes
Fixed effects	Yes	Yes	Yes	Yes	Yes

Notes: Robust standard errors in parentheses, \* denotes significant at the 10% level, \*\* at the 5% level and \*\*\* at the 1% level. See the Appendix for full regression results. <sup>a</sup>‘Leisure’ is defined as the sum of hours spent on leisure, sleeping, and ‘other’. <sup>b</sup> “If you imagine a ladder of life, where the first step represents the worst possible life, and the tenth (top) step the best possible life, on what step would you place yourself?” <sup>c</sup> “Can you indicate, on a scale from 0 to 10, to what degree you consider yourself happy?”

Table A.2: Full regression results fathers

	Paid work	Household work	Leisure <sup>a</sup>	Well-being <sup>b</sup>	Happiness <sup>c</sup>
Treatment	-2.486 (2.373)	2.617 (2.664)	-5.826 (5.238)	0.192 (0.131)	0.137 (0.185)
Period 2012	3.527 (6.114)	-9.688 (11.690)	0.367 (14.630)	-0.432 (1.124)	0.881** (0.446)
Period 2010	1.050 (2.166)	-1.097 (3.824)	-3.885 (5.036)	-0.196 (0.371)	0.203 (0.138)
Father (child $\leq$ 12)	-0.830 (1.989)	1.331 (1.813)	0.124 (3.032)	-0.185* (0.102)	-0.426** (0.169)
Age	-2.071 (4.069)	-5.835 (5.955)	17.570* (10.150)	-0.222 (0.432)	-0.573** (0.265)
Age <sup>2</sup> /1000	8.717 (40.050)	100.500* (57.960)	-201.500* (110.300)	3.6730 (2.580)	2.509 (2.869)
Single	1.617 (2.157)	7.571 (11.520)	17.440 (13.610)	0.064 (0.238)	0.380 (0.278)
Constant	-109.700 (115.400)	88.460 (181.400)	-285.500 (266.900)	10.360 (15.670)	26.530*** (7.249)
Observations	645	630	483	672	645
Individuals	215	210	161	224	215
Demographic controls	Yes	Yes	Yes	Yes	Yes
Fixed effects	Yes	Yes	Yes	Yes	Yes

Notes: Robust standard errors in parentheses, \* denotes significant at the 10% level, \*\* at the 5% level and \*\*\* at the 1% level. See the Appendix for full regression results. <sup>a</sup> 'Leisure' is defined as the sum of hours spent on leisure, sleeping, and 'other'. <sup>b</sup> "If you imagine a ladder of life, where the first step represents the worst possible life, and the tenth (top) step the best possible life, on what step would you place yourself?" <sup>c</sup> "Can you indicate, on a scale from 0 to 10, to what degree you consider yourself happy?"

Table A.3: Child care use (2009-2014)

	<i>P</i> (Daycare)	Daycare (h/w)	<i>P</i> (Unpaid daycare)
Treatment	0.034 (0.078)	-3.455** (1.672)	-0.002 (0.076)
Observations	2,399	2,399	2,399
Individuals	643	643	643
Demographic controls	Yes	Yes	Yes
Fixed effects	Yes	Yes	Yes

Robust standard errors in parentheses, \* denotes significant at the 10% level, \*\* at the 5% level and \*\*\* at the 1% level. See the online appendix for full regression results.