J Popul Econ (2004) 17:703–727
DOI 10.1007/s00148-003-0176-8

Journal of
Population
Economics
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Labour supply effects of a cash-for-care subsidy

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Received: 27 January 2003/Accepted: 27 August 2003

Abstract. From 1999, all parents in Norway with children aged one to three, who did not attend publicly subsidised daycare, became eligible for a cash-for-care (CFC) subsidy. One effect of the CFC-subsidy was to increase in the relative price of external child care. This article analyses whether the CFC-subsidy has led to a reduction in the labour supply of mothers. A framework for evaluating policy reforms when reforms are equally and nation-wide accessible is put forward. The results show that the CFC-subsidy has reduced women's labour supply. The results are sustained after controlling for contemporaneous macroeconomic shocks, using a triple difference approach.

JEL classification: J13, J18, J22

Key words: Labour supply, child care, difference-in-differences-in-differences

1. Introduction

Norway has a tradition of having rather generous family policy programmes. Long parental leaves and subsidised child care facilities are two important examples of such generosity. Common for most of the family programmes is that they aim to improve work incentives for parents (see

The author thanks Hege Torp, Erling Barth and Harald Dale-Olsen at The Institute for Social Research, as well as participants at the European Society for Population Economics (ESPE) conference in Bilbao in June 2002, participants at the Lunch-seminar at Statistics Norway, and two anonymous referees for valuable comments. The work is financed by the Norwegian Research Council, grant #137230/530. The financial support is gratefully acknowledged.
Responsible editor: Deborah Cobb-Clark.

e.g., Rønsen and Sundstrøm 1996). The generous parental leave schemes have, for instance, payments tied to previous employment. Such a system gives young women incentives to start their labour market career before giving birth and starting a family. This, in turn, may give them a stronger attachment to the labour market and a specific job, and ease their later re-entry into the labour market. Partly as a result of these reforms, the Norwegian female workforce participation rate has risen steeply in recent decades, from 45% in 1972 to approximately 70% in 2002, which is almost as high as the percentage for men (SSB 2003).[1]

In this article, we shall exploit the introduction of a new family policy programme that has a somewhat different focus, and that creates somewhat different work incentives. From January 1999, all parents with one and two-year-old children who did not use publicly subsidised day care became entitled to a "cash-for-care" subsidy (from now on referred to as "CFC"). The CFC-subsidy is paid out monthly from the time the child is one until it is three years old. Unlike many of the other Norwegian family policy programmes, CFC-eligibility is not connected to previous employment, and it does not include a guaranteed return to one's old job.

Prior to the introduction of the reform, it was heavily debated. Opponents argued that it would have several negative effects related to both the labour supply of women and gender equality. Standard labour supply theory will predict that the CFC-reform introduces both substitution and income effects, both working in the same direction, i.e., towards reduced labour supply. The size of the effect will, among other things, depend on how the families consider the quality of different child care modes. This will be further discussed in Sect.3.

The effect of the CFC-reform on labour supply is studied by utilising potentially exogenous variations in the eligibility of the CFC-subsidy. This is a natural experiment approach.[2] The basic idea is to compare two groups, one which has experienced a specific policy change, and another with similar characteristics which has been unaffected by the policy change. Our approach is to compare the change in labour supply for mothers eligible for the CFC-subsidy with mothers of children not eligible for the CFC-subsidy.[3] The CFC-reform is equally and nation-wide accessible for all mothers with children the same age. Therefore, there is no natural comparison group. In this article, this problem is approached by putting forward a framework in which the treatment group differs from the control group along three dimensions. This implies that we employ a triple difference approach, i.e., a difference-in-differences-in-differences (DDD) approach.

As the reform is somewhat of an innovation also in an international context, there are not many comparable international studies to draw on. One exception is Finland, which introduced a similar reform in 1985 (fully established in 1990). Ilmakunnas (1997) studies the effect of the Finnish cash-for-care scheme on child care demand. She finds that increasing the benefit levels increases maternal care and decreases the use of public daycare. Other aspects of the scheme have not been analysed.

The article proceeds as follows: Sect.2 presents the structure of the CFC-reform; Sect.3 discusses the CFC-reform in relation to standard labour supply theory; Sect.4 presents the identification strategy, i.e., our strategy to find the causal effect of the CFC-subsidy on labour supply; Sect.5 presents the data, the variables and some statistics; Sect.6 presents the results; and Sect.7 contains the conclusions.

2. The cash-for-care reform

The CFC-reform contributes to a long list of family policy programmes in Norway. The two most important programmes in this respect have been parental leaves and subsidised daycare. From 1993, all working parents in Norway have been entitled to 52 weeks' leave with 80% wage compensation (alternatively 42 weeks with full compensation). To increase the involvement of fathers, an amendment in 1993 reserved four weeks of the leave for the fathers. These weeks are not transferable to the mother, and are lost if the father does not use them.

There are no eligibility criteria for subsidised day-care in Norway. But, subsidised day-care centres have always been rationed, mainly due to economic shortfalls in the local municipalities. However, the coverage rate has increased during the last two decades. In the year 2000, it was 62% among children aged one to five. In general, the coverage rate increases with the age of the child. The day-care centres are publicly or privately owned. As long as they are publicly approved, however, both types receive public subsidies. Roughly 50% of the market consists of private day-care centres. The costs of a publicly approved day-care centre are shared between the state, the municipality and the parents. In 1998, the average parental payment was approximately 3500 Norwegian kroner (NOK - approximately 430 Euros) per month in private centres and slightly less in public centres.

The CFC-reform was introduced in August 1998. First, only one-year-old children were eligible for the benefit, but from January 1999, all children between 12 and 36 months became eligible. All parents with children in this age group who do not use publicly subsidised daycare are entitled to the subsidy. To receive the full subsidy, the child must not attend a publicly funded day-care centre at all. Parents of children that attend publicly funded daycare on a part-time basis may receive a share of the full benefit (80, 60, 40, or 20%) depending on weekly attendance. The right to the CFC-subsidy also for part-time users was important to ensure flexibility in the parents' work and child care arrangements. In addition, for eligible parents, there is no obligation for parents who claim the benefit to stay at home and care for the children themselves. They may hire external daycare, as long as it is not publicly subsidised.

The subsidy is a flat, tax-free payment, paid out monthly from the month after the child is one year old (from month 13), until the month the child is maximum three years old (36 months). Therefore, parents may receive CFC-subsidy for one child for a maximum period of two years. Originally, the subsidy was set to 3000 NOK per month (approximately 370 Euros). In 1999 the subsidy was reduced to 2250 NOK per year. The subsidy is approximately equivalent to the state subsidy for a place in a day-care centre.

The purpose of the CFC-reform was threefold: First, to distribute public transfers more equally between parents that use and parents that do not use public daycare; second, to motivate the parents to spend more time with their children; and third, to give the parents more flexibility in their choice between work and care of children.

The CFC-subsidy has so far been a popular reform among parents with children in the eligible age group. Table 1 shows the percentage of children eligible for CFC-subsidy that receives the benefit. The share of all eligible children that receives the CFC-subsidy is high and stable, varying from 78.5

to 79.7%. The last three columns show that a large number of the receivers receive full benefit, meaning that a large share of the receivers does not use any publicly subsidised day-care services. Furthermore, other statistics show that it is the women who make use of the reform. In all three years, approximately 95% of the receivers have been women.

3. The CFC-reform and labour supply

To motivate the empirical analyses, the CFC-reform will be discussed somewhat more formally within a simple labour supply framework. Let us assume that we have a family consisting of a mother, a father, and a child eligible for CFC-subsidy. The child requires constant care. For the sake of simplicity, we shall assume that only the mother is involved in this time-use choice. According to standard theories of labour supply, the mother will adjust her labour supply such that she maximises the value of consumption (C) and leisure (L), subject to a budget constraint. Since we have assumed that the family has a child eligible for the CFC-subsidy, the budget constraint will be positively affected by the subsidy, *conditional* on the child not attending a publicly subsidised kindergarten on a full-time basis.

Within a simple leisure–consumption framework, Fig. 1 presents an illustration of the labour supply effect of the CFC-reform on working mothers initially using publicly subsidised *kindergarten services*. The bold line illustrates the budget set facing the mother before the CFC-reform.

Figure 1 illustrates that the effect of the CFC-subsidy will depend on the degree of kindergarten utilisation (whether the child attends on a full-time or part-time basis). We are assuming that the mother is working, and while she works the child attends a publicly subsidised kindergarten. Therefore, one hour of work implies one hour of external child care in the kindergarten. If the mother initially works full-time, the child attends kindergarten full-time. Consequently, the mother receives no CFC-subsidy.

As mentioned earlier, mothers of children that attend publicly subsidised kindergartens on a part-time basis may receive a share of the full benefit depending on weekly attendance. For mothers initially using kindergarten on a part-time basis, the CFC-reform shifts the budget set from B_0 to B_1. For this group, the CFC-subsidy creates both a substitution effect and an income effect. If leisure is a normal good, they both work in the same direction, i.e., towards more leisure and less work. This is illustrated by the change in the leisure-consumption combination from (L_0, C_0) to (L_1,C_1). The size of the reduction in market work will depend on the size of the subsidy, as well as the mother's preferences for leisure and consumption.

Table 1. Children with CFC-subsidy. % of all eligible children

Year	% of all eligible children			% that receives full benefit, as a percentage of children that receives benefit		
	All	1 year	2 years	All	1 year	2 years
1999	78.5	85.7	71.7	89.8	94.8	84.0
2000	79.7	84.9	74.4	87.9	93.4	81.6
2001	79.1	84.5	73.5	88.1	93.5	81.7

Source. The National Insurance Administration.

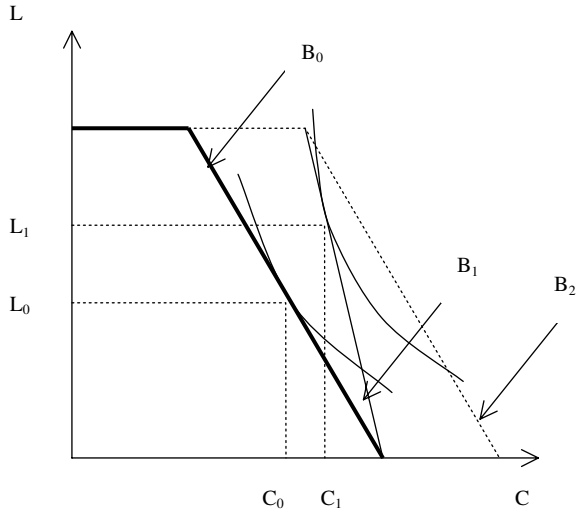

Fig. 1. Labour supply before and after the CFC-reform. For working mothers using Kindergarten services

The budget sets B_0 and B_1 are drawn for a given mode of child care (kindergarten). However, since the CFC-subsidy increases the relative price of kindergarten services, the mother may – due to the relative price increase of kindergarten services – switch from using kindergarten to using a childminder. If so, the new budget set will be given by B_2. For a given level of market work, the consumption possibilities increase. Again, if leisure is a normal good, this will reduce the labour supply further.

Figure 1 illustrates the situation for working mothers initially using publicly subsidised kindergarten services. For non-working mothers and working mothers using a childminder, the CFC-reform will only have an income effect. For mothers who were not working prior to the CFC-reform, the subsidy will have a negative impact on their incentives to participate in market work. For working mothers using a childminder the subsidy will – if leisure is a normal good – also have a negative effect on labour supply. The size of the reduction will depend on the size of the CFC-subsidy, and the mother's preferences for leisure and consumption. In the extreme case, the mother will choose to consume a maximum amount of leisure and withdraw completely from the labour market.

So far, we have assumed that the mother only has preferences for consumption and leisure; however, she will probably also have preferences with regard to the quality of the various modes of care (see e.g., Connelly 1992; Ribar 1992). One additional working hour does not only imply one hour less leisure. It will usually also imply one hour with external child care.

If the mother uses a kindergarten or a childminder prior to the reform, but considers own care as superior to both kindergarten and childminder, the CFC-reform may enable her to do more of the caretaking herself, and consequently spend less time in the labour market. Conversely, if users of kindergarten services consider this mode of care to be superior to both

childminder and own care, they may be willing to pay a ''premium'' for these types of services. If so, fewer mothers will withdraw from the labour market as a response to the CFC-reform. Moreover, if users of kindergarten services consider the use of childminders to be a satisfactory substitute for kindergarten, they will switch to this type of care as a response to the CFC-reform. As illustrated in Fig.1, this will lead to a larger decrease in market work compared to a situation in which the mother chooses to keep the child in kindergarten, but compared to a situation where the mother considers own care to be superior, this will have a less negative impact on the time the mother spends on market work.

In summary, standard theories on labour supply predict that the CFC-reform will have a negative impact on labour supply. However, whether this change in the economic implications of the various child care modes will lead to a large reduction in labour supply, will depend on the mothers' preferences for the different child care arrangements. In the end it is an empirical question; thus, we leave the answer to the empirical section.

4. Identification strategy

The aim of the empirical analysis is to measure the effect of the CFC-reform by identifying changes in labour supply for mothers affected by the reform, and to compare the change in labour supply with the change in labour supply of mothers not affected by the reform. However, the CFC-subsidy is accessible nation–wide to all parents with children of the same age. Therefore, we do not have a natural comparison group. Our strategy in this article is the following: We start by comparing the change in labour supply from 1997 to 2000 for mothers whose youngest child was born in 1998 (CFC-eligible mothers) with the change in labour supply from 1994 to 1997 for mothers whose youngest child was born in 1995 (mothers not eligible for CFC). This implies that we are comparing the change in labour supply from a before to an after-period for similar mothers (mothers with children of the same age) in different time periods (1994–1997 versus 1997–2000). This is a version of the standard difference-in-differences (DD) approach.[4]

However, if some contemporaneous macroeconomic shocks occurred during the period 1997–2000 – independent of the introduction of the CFC-reform – the DD-estimate will yield biased results for the effects of the CFC-reform on labour supply. To approach this problem we will compare the change in labour supply for the mothers presented above with the change in labour supply for the same two periods (1994–1997 and 1997–2000) for mothers with *older* children not eligible for CFC-subsidy. This latter group consists of mothers giving birth in 1992 and 1995. The children of these mothers will be between two and five years old in the periods of the labour supply evaluation.[5] If some macroeconomic shock occurred at the same time as the introduction of the CFC-reform, we expect this to affect mothers with older children as well. We will use the change in labour supply for mothers with older children to adjust the first estimate received for mothers with younger children.[6]

This approach takes into account that the CFC-reform (as we evaluate it) creates variation along three dimensions, (1) between mothers with children of different ages, (2) between pre- and post-periods, and (3) between periods

with CFC-subsidies and periods without CFC-subsidies (1997–2000 versus 1994-1997).[7] The identification assumption of this DDD-estimator is that there is no contemporaneous shock that affects the relative outcome of the treatment group (mothers with young children relative to mothers with older children) in the same treatment period as the introduction the CFC-subsidy.

The DDD approach may be illustrated as follows:

$$DDD-estimate = \underbrace{\{(Y_a^T - Y_b^T)^{97-00} - (Y_a^T - Y_b^T)^{94-97}\}}_{DD} - \underbrace{\{(Y_a^C - Y_b^C)^{97-00} - (Y_a^C - Y_b^C)^{94-97}\}}_{DD} \quad (1)$$

The first bracket shows DD-estimates for mothers with young children, called the *treatment group*. First, $(Y_a^T - Y_b^T)^{97-00}$ measures the change in labour supply of CFC-eligible mothers with young children from 1997– 2000. Y^T is a measure of labour supply for the treatment group *after* birth, and Y_b^T is the labour supply for the treatment group *before* birth. Similarly, $(Y_a^T - Y_b^T)^{94-97}$ measures the change in labour supply of mothers *not* eligible for CFC, having had young children in the period from 1994 - 1997. The difference between these two components is the DD-estimate.

The second bracket presents DD-estimates for mothers with older children, called the *control group*. First, $(Y_a^C - Y_b^C)^{97-00}$ measures the change in labour supply of mothers with older children from 1997 – 2000. Similarly, $(Y_a^C - Y_b^C)^{94-97}$ measures the change in labour supply of mothers with older children from 1994 - 1997. The difference between these two components is the DD-estimate. Finally, the difference between the two DD-estimates gives us the DDD-estimate. The hypothesis that the CFC-reform has reduced labour supply is a test of whether the DDD-estimate in Eq. (1) is negative. In our context, running a familiar DD-estimation would mean leaving out the effect of contemporaneous macroeconomic shocks, i.e., leaving out the contribution from the second bracket in (1).[8]

However, treatment and control groups may differ systematically with respect to important labour supply determinants such as education, age, place of residence, the presence of other children in the household, and marital status. Observed differences in outcomes may therefore reflect differences between the treatment and control group rather than a treatment effect. To deal with this problem, a multivariate regression analysis will also be employed. We have:

$$\begin{aligned} Y_{ijkt} = {} & \alpha_1 + \alpha_2 Z_{ijkt} + \alpha_3 CFC_{ijk} + \alpha_4 POST_{itk} + \alpha_5 TREAT_{ik} \\ & + \alpha_6 (CFC_{ijk} x POST_{itk}) \\ & + \alpha_7 (CFC_{ijk} x TREAT_{ik}) \\ & + \alpha_8 (POST_{itk} x TREAT_{ik}) \\ & + \alpha_9 (CFC_{ijk} x TREAT_{ik} x POST_{itk}) + \varepsilon_{ijkt} \end{aligned} \quad (2)$$

where i indexes individuals, t indexes time (1 = after, and 0 = before), k indexes group of mothers (1 if mother of young children, and 0 if mother of older children), and j indexes CFC-status (1 if the period is 1997-2000, 0 if the period is 1994–1997), Z is a vector with variables affecting labour supply. CFC is a dummy variable with value 1 if the period is 1997–2000 (CFC-period), and 0 if the period is 1994-1997 (not a CFC-period). POST is a dummy variable with value 1 if the year is 2000 (for the CFC-group) or 1997

(for the non-CFC-group), and 0 if the year is 1997 (for the CFC-group) or 1994 (for the non-CFC-group). TREAT is a dummy variable with value 1 if the mother's youngest child is two years old, and 0 if the mother's youngest child is five years old.

The interpretation of the coefficients are as follows; α_3 controls for effects of the CFC-period, α_4 controls for changes in labour supply between the before and after period, α_5 controls for effects of the treatment group (mothers with young children), α_6 controls for changes from the before to the after period in the CFC-period, α_7 controls for characteristics of the treatment group in the CFC-period, and α_8 controls for changes between the before and after period for the treatment group. Finally, α_9– the *DDD estimator* – measures the impact of the interaction term between CFC, POST, and TREAT. This coefficient measures all variation in labour supply for the CFC-group (1997-2000) relative to the non-CFC-group (1994-1997) for mothers with young children, relative to mothers with older children, between the before and after period.

When testing for the presence of second-order interactions, it is important to also include first-order interactions. If this is not done, the second-order interaction effect will be confounded with the omitted first-order interactions, and this will most likely lead to biased estimates. The key identifying assumption is that $\alpha_9 = 0$ in the absence of treatment, or $E[\varepsilon_{ijkt}|\text{CFCxTREATxPOST}] = 0$ This means that there is no correlation between the error term measuring unobservable individual-transitory shocks and the variables measuring the effect of the CFC-reform.

Controlled for observable differences between treatments and controls, the identifying assumption is as mentioned earlier, i.e., that there is no contemporaneous shock that affects the relative outcome of the treatment group (mothers with young children relative to mothers with older children) in the same treatment period as the introduction of the CFC-subsidy. The identifying assumption will be violated if the change in labour supply between treatments and controls evolve differently between periods with and without CFC-subsidy – independent of the introduction of the CFC-reform. There are various approaches to this problem. Firstly, we include explanatory variables that are supposed to control for such biases. The kindergarten coverage in the mothers' municipality is one such variable. If reduced supply of kindergarten services for young children is one consequence of the CFC-reform, this will have a negative effect on the mothers' labour supply. Moreover, if not controlled for, it will wrongly be assigned as an effect of the CFC-reform. Secondly, we look for differences in trend developments within the control group. If mothers eligible for the CFC-subsidy withdraw from the labour market for a period, mothers *not* eligible for the CFC-subsidy may experience an upward shift in the demand for their services. This substitution effect will lead us to overestimate a potential negative effect of the CFC-subsidy on labour supply. In the "Results" section, we shall look at trend development within the control groups in order to get an indication as to the magnitude of this problem.

5. Data and variables

The data set used is gathered from several different registers, collected by Statistics Norway. The starting point is a public demographic register with

information on all births during each year. This data set contains information on the child, as well as information on the mother and father. To this data set Statistics Norway has linked individual information on the mother and father, as well as information on the partner (husband or cohabitant) if the partner is not the father of the child. The data sample contains information on spells of employment, wages, non-labour income, the partner's income, age, educational attainment, place of residence, the presence of older children in the family, marital status, and kindergarten coverage in the municipality.

Our two measures of labour supply are labour market participation and annual working hours. *Labour market participation* is a dummy variable, measuring whether the mother was registered as an employee during the period of observation (12 months). *Annual working hours* is a continuous variable measuring the number of working hours during the same observation period.[9] Both variables are taken from The Register for Employers and Employees, administered by the National Insurance Administration.

Our three cohorts of mothers are those with children born in 1992, 1995 and 1998. The analyses are restricted to mothers who were between 20 and 45 years of age in the year they became mothers. Furthermore, for the three birth years (1992, 1995, and 1998) the sample is restricted to mothers who gave birth to their *youngest* child in these years. For all three cohorts of mothers, we have panel information for the whole period of observation. This is taken advantage of in the analyses by requiring that, to be included in the analyses, all mothers must be present in both the pre- and post-year periods. In the analyses of annual working hours, we additionally require that all mothers included must be present with positive working hours in both the pre- and post-year periods. By utilising the repeated observation structure of the panel data, we reduce problems related to composition effects, potentially present in repeated cross-sections samples.

Table 2 presents descriptive statistics for our two groups: the *treatment group*, consisting of mothers with young children (two years old in the post-year period), and the *control group*, consisting of mothers with older children (five years old in the post-year period). For both groups, the mean values are taken from the "before" years, i.e., from 1994 and 1997.[10] For the treatment group, mothers with children from the CFC-period (1997–2000) have somewhat larger shares in the upper educational groups, and they are to some extent more likely to be living as cohabitants compared to treatment group mothers with children born in 1995. The same differences apply to mothers in the control group.

Comparing the control and treatment groups, the control groups are on average three years older in the evaluation period than the treatment groups, they have somewhat lower percentages in the upper educational levels, they are more likely to have older children in the family, and they are more likely to be married and cohabitants.[11]

6. Results

This section presents the empirical results. First, the basic DD- and DDD-estimates are presented, followed by a presentation of the regression-adjusted estimates. Finally, alternative explanations for the reported findings will be discussed.

Table 2. Descriptive statistics. Treatment and control group. Mean values and standard deviations. Mean values are taken from the "before"- years (1994 for the not-CFC-period and 1997 for the CFC-period)

Variables	Treatment group Mothers with young children (Youngest child 2 years old)		Control group Mothers with older children (Youngest child 5 years old)	
	Birth year (observation year) 1995 (1994)	Birth year (observation year) 1998 (1997)	Birth year (observation year) 1992 (1994)	Birth year (observation year) 1995 (1997)
Age (years)	28.66 (4.94)	28.86 (4.82)	31.82 (5.02)	32.26 (4.97)
Compulsory school (share)	0.09 (0.29)	0.07 (0.25)	0.12 (0.32)	0.09 (0.29)
High school–I (share)	0.33 (0.47)	0.28 (0.44)	0.39 (0.48)	0.34 (0.47)
High school–II (share)	0.25 (0.43)	0.27 (0.44)	0.21 (0.40)	0.24 (0.42)
Higher education–I (share)	0.08 (0.28)	0.09 (0.29)	0.08 (0.27)	0.08 (0.27)
Higher education–II (share)	0.17 (0.38)	0.21 (0.40)	0.15 (0.36)	0.17 (0.37)
Higher education–III (share)	0.03 (0.17)	0.04 (0.20)	0.03 (0.16)	0.03 (0.18)
Older children in the family (share)	0.72 (0.45)	0.66 (0.47)	0.77 (0.42)	0.78 (0.41)
Married (share)	0.51 (0.50)	0.48 (0.50)	0.63 (0.48)	0.60 (0.49)
Cohabitant (share)	0.18 (0.38)	0.18 (0.38)	0.22 (0.41)	0.27 (0.44)
Non-labour income (share)	0.08 (0.27)	0.07 (0.26)	0.13 (0.33)	0.12 (0.32)
Male income (in 10000 NOK)	21.49 (16.03)	23.76 (21.71)	23.45 (26.12)	25.51 (21.54)
Place of residence, Oslo (share)	0.13 (0.33)	0.14 (0.33)	0.11 (0.31)	0.11 (0.31)
Kindergarten coverage in municipality (per cent)	27.9 (14.02)	40.45 (12.71)	27.3 (13.91)	40.00 (12.56)
N	39561	45239	31788	32621

Note: Mean values and standard deviations in parentheses. "High school–I" is one or two years of education after compulsory school. "High school–II" is three years of education after compulsory school. "Higher education-I" is up to six years of education after compulsory school. "Higher education-II" is seven years of education after compulsory school. "Higher education-III" is more than seven years of education after compulsory school. "Non-labour income" is a dummy variable taking the value 1 if the mother is eligible for transition subsidy (overgangsstønad), and 0 otherwise. "Place of residence" is a dummy variable taking the value 1 if the mother lives in Oslo, and 0 otherwise. "Kindergarten coverage in the municipality" measures the % of children 1–2 years of age that attend kindergarten.

6.1. Basic DD- and DDD-estimates

Table 3 presents DD- and DDD-estimates of the effects of CFC-subsidy on labour supply. Labour supply is measured by participation rates (top half) and annual working hours (bottom half). Each cell contains the mean level for the group specified, along with standard errors. We shall start by looking at the participation rates. First, we will compare the change in labour supply for the treatment group (mothers with young children). For CFC-eligible mothers (mothers from 1998) the average participation rate falls from 0.79 to 0.71 from the pre- to the post-birth period. This is a reduction of 8 percentage points, or approximately 10%. For mothers not eligible for CFC (mothers from 1995),

Table 3. DD- and DDD-estimates. Labour market participation and annual working hours, 1994–1997 and 1997–2000

	Participation rates				
	Treatment group				
	Mothers with young children (2 years of age in the post-period)				
Birth year	Evaluation period	Pre	Post	Change	DD-estimate
1998	1997–2000	0.79	0.71	−0.08	
		(0.002)	(0.002)	(0.003)	
1995	1994–1997	0.75	0.71	−0.04	−0.04
		(0.002)	(0.002)	(0.003)	(0.004)
	Control group				
	Mothers with older children (5 years of age in the post-period)				
Birth year	Evaluation period	Pre	Post	Change	DD-estimate
1995	1997–2000	0.70	0.78	+0.08	
		(0.003)	(0.002)	(0.003)	
1992	1994–1997	0.65	0.74	+0.09	−0.01
		(0.003)	(0.003)	(0.003)	(0.004)
DDD-estimate					−0.03
					(0.006)
	Annual working hours				
	Treatment group				
	Mothers with young children (2 years of age in the post-period)				
Birth year	Evaluation period	Pre	Post	Change	DD-estimate
1998	1997–2000	1376.5	1254.9	−121.6	
		(3.2)	(3.3)	(4.8)	
1995	1994–1997	1355.6	1273.9	−81.7	−39.9
		(3.5)	(3.6)	(4.7)	(6.4)
	Control group				
	Mothers with older children (5 years of age in the post-period)				
Birth year	Evaluation period	Pre	Post	Change	DD-estimate
1995	1997–2000	1233.2	1345.4	+112.2	
		(4.0)	(3.7)	(5.2)	
1992	1994–1997	1226.4	1331.0	+104.6	+7.6
		(4.2)	(3.9)	(5.6)	(7.6)
DDD-estimate					−47.5
					(9.9)

Note: Mean values and standard errors in parentheses.

the comparable reduction is from 0.75 to 0.71, i.e., a reduction of 4 percentage points, or approximately 5%. The DD-estimate equals -0.04, and is statistically significant. Measured as a percentage of the share of employed mothers in 1997 (0.79), this is a reduction of approximately 5%.

However, as mentioned earlier, if there was a contemporaneous labour market shock in the 1997–2000 period that generally affected labour market opportunities for all mothers, this would bias the DD-estimate and lead us to overstate the negative labour supply effect of CFC. Therefore, for the same periods, we run through the same exercise for *mothers with older children* (the control group). The DD-estimate for this group is equal to –0.01. Taking the difference between the two DD-estimates, we find that the reduction in labour supply is equal to 0.03, or 3 percentage points. This is the DDD-estimate. Measured as a percentage of the share of employed mothers in 1997 (0.79), this is a reduction of approximately 4%.

The results of the participation variable show that not controlling for macroeconomic effect by running a triple difference approach would lead us to overstate the effect of the CFC-reform on labour supply. The bottom half of the table presents similar analyses for *annual working hours*, given participation. As for participation rates, we start by presenting changes for mothers with young children. For CFC-eligible mothers there is a reduction of 121.6 hours. The comparable reduction for mothers not eligible for CFC is 81.7 hours. The difference between these measures gives us the DD-estimate, equal to -39.9 annual working hours. As a percentage of total annual working hours for the treatment group in 1997, this equals a reduction of approximately 3%. The last two rows correct for contemporaneous macro effects by running a similar exercise for mothers with older children. The DD-estimate for this group is equal to + 7.6, but not significant. Taking the difference between the two DD-estimates gives us the DDD-estimate, equal to 47.5 hours. The results for annual working hours show that controlling for macroeconomic effect does change the results. But the direction of the change is different from the participation results. Not applying a triple difference approach leads us to *understate* the effect of the CFC-reform on annual working hours. The difference between the two measures is further analysed in the next section.

6.2. DD- and DDD-regression results

This section presents the results from the regression analyses. We estimate maximum-likelihood versions of Eq. (2). In total, six estimations are presented. The first three include the key explanatory variables only. The latter three add control variables. For both groups we include three estimations. The first depicts DD-estimation results for the treatment group. The second shows DD-estimation results for the control group. The third reveals DDD-estimation results pooling the two groups. By using this stepwise procedure, we can compare the regression results directly with the simple DD- and DDD-estimates in Table 3.

6.2.1. Participation

The participation equation is estimated by binary logistic regression. The results are presented in Table 4. We will start by looking at the results for the

treatment group without control variables. The coefficient for the CFC-variable is positive, reflecting that the labour supply is higher in the CFC-period (1997-2000) than in the non-CFC-period (1994–1997). The POST-coefficient is negative, reflecting that labour supply is lower in the post-period than in the pre-period. The first-order interaction coefficient (the DD-coefficient) is negative, reflecting that the negative development of labour supply from the pre- to the post-period is stronger in the CFC-period than in the non-CFC-period. This is in line with the DD-estimate in Table 3. The logit model is non-linear; therefore, we cannot interpret the coefficients directly as marginal effects on the probability of participation. However, at the bottom of the table we have calculated the marginal effect of the DD-estimator, measured at the population mean.[12] According to the DD-marginal effect for the treatment group, the CFC-reform has reduced the labour supply by 4.8 percentage points. This estimate is slightly higher compared to the basic DD-estimate in Table 3 (4 percentage points). The DD-coefficient for the control group in column 2 is small and insignificant. This suggests that contemporary macroeconomic effects in the CFC-period are not a severe problem. This result is also in line with the result in Table 3. The small contribution from the control procedure implies that the DDD-coefficient in column 3 is not very different from the DD-coefficient in column 1. Taking the anti-log of the interaction coefficient in column 3, we find an odds ratio equal to 0.78. This means that for the CFC-group (1997-2000) of mothers with young children (two years old), the difference in the chance of being employed between the before and after period is 0.78 times the difference in the chance for the non-CFC-group (1994-1997) of mothers with older children (five years old), between the before and after period.

Columns 4 – 6 add control variables. The DDD-estimate does not change much, which is somewhat comforting, considering the experimental approach of the study. Taking the anti-log of the estimated DDD-coefficient in column 6 gives an odds-ratio equal to 0.75, which is slightly lower compared to the odds-ratio calculated from column 3. Regarding the effect and the direction of the control procedure, i.e., the effect of controlling for the change in labour supply of mothers with older children, there is a difference depending on whether or not we include control variables. By not including control variables, we find that the control procedure has a negative but small and negligible effect on the DDD-coefficient (the DD-coefficient in column 2 equals −0.004). However, when including control variables, we find that the control procedure has a positive and significant effect on the DDD-coefficient (the DD-coefficient in column 5 equals 0.065). The reason for this change is that the two cohorts of mothers with older children differ systematically with respect to observable characteristics affecting labour supply. Mothers with older children born in 1992 have – compared to mothers with older children born in 1995 – some observable characteristics that are positively correlated with the change in labour supply. Controlling for such differences leads to an increase in the DD-coefficient from column 2 to column 5.

Related to the impact of the control variables we find that older mothers are more likely to be working than younger mothers, and that mothers with a high education are more likely to be working than mothers with a low education. The presence of older children in the family reduces participation. Furthermore, mothers living in a municipality with high kindergarten coverage have higher labour supply compared to mothers living in a municipality with low

Table 4. The CFC-reform and labour market participation. Logit-coefficients

	Without control variables			With control variables		
	DD-Treatments	DD-Controls	DDD-Treatments and controls	DD-Treatments	DD-Controls	DDD-Treatments and controls
Intercept	1.089***	0.615***	0.616***	0.112**	−0.237***	−0.200***
	(0.012)	(0.011)	(0.011)	(0.049)	(0.059)	(0.040)
CFC	0.256***	0.218***	0.218***	0.082***	0.075***	0.084***
	(0.017)	(0.016)	(0.017)	(0.019)	(0.019)	(0.018)
POST	−0.177***	0.449***	0.449***	−0.372***	−0.382***	0.357***
	(0.016)	(0.017)	(0.017)	(0.019)	(0.020)	(0.019)
CFCxPOST	−0.248***	−0.004	−0.004	−0.207***	0.065**	0.086***
	(0.024)	(0.025)	(0.025)	(0.025)	(0.027)	(0.027)
TREAT			0.474***			0.472***
			(0.017)			(0.018)
POSTxTREAT			−0.627***			−0.720***
			(0.024)			(0.025)
CFCxTREAT			0.037			0.002
			(0.024)			(0.025)
CFCxTREATxPOST			−0.243***			−0.282***
			(0.034)			(0.035)
Age				0.023***	0.004***	0.014***
				(0.001)	(0.001)	(0.001)
High school – I				0.414***	0.452***	0.437***
				(0.021)	(0.021)	(0.015)
High school – II				0.747***	0.701***	0.735***
				(0.023)	(0.023)	(0.016)
Higher education – I				1.365***	1.367***	1.372***
				(0.030)	(0.033)	(0.023)
Higher education – II				1.114***	1.139***	1.129***
				(0.026)	(0.026)	(0.018)
Higher education – III				1.337***	1.434***	1.385***
				(0.041)	(0.050)	(0.032)

Older children in the family				−0.534***	−0.309***	−0.447***
				(0.015)	(0.018)	(0.011)
Married				−0.108***	0.164***	−0.016
				(0.019)	(0.024)	(0.015)
Cohabitant				0.233***	0.507***	0.319***
				(0.021)	(0.026)	(0.016)
Non-labour income (Yes/ No)				−0.957***	−0.683***	−0.874***
				(0.022)	(0.025)	(0.016)
Male income in 10000 NOK)				0.003***	−0.001***	0.001***
				(0.0004)	(0.0003)	(0.0003)
Place of residence (Oslo)				−0.265***	−0.322***	−0.314***
				(0.021)	(0.023)	(0.017)
Kindergarten coverage in Municipality				0.008***	0.008***	0.009***
				(0.0005)	(0.0006)	(0.0004)
Control for month of birth?				Yes	Yes	Yes
DDD marginal effect	−0.048	−0.001	−0.048	−0.040	0.021	−0.056
−2 Log L	192195.1	151562.6	343758.7	177419.6	142498.6	320357.0
N	169600	128818	298418	169600	128818	298418

Note: "High school–I" is one or two years of education after compulsory school. "High school–II" is three years of education after compulsory school. "Higher education-I" is up to six years of education after compulsory school. "Higher education-II" is seven years of education after compulsory school. "Higher education-III" is more than seven years of education after compulsory school. The reference category is mothers with compulsory school. "Non-labour income" is a dummy variable taking the value 1 if the mother is eligible for transition subsidy (overgangsstønad), and 0 otherwise. "Place of residence" is a dummy variable taking the value 1 if the mother lives in Oslo, and 0 otherwise.
Level of significance: *** 1 %, ** 5%, * 10 %.

kindergarten coverage. This result suggests that a family policy programme aimed at increasing the availability of public child care facilities has a positive impact on mothers' labour market participation. Finally, cohabitant mothers are more likely to be working than single mothers. For married mothers, we find no significant differences compared to single mothers.

Many studies in the labour supply literature analyse separately the behaviour of single and married mothers.[13] The argument is that the effect of a change in child care prices on labour supply may differ by marital status. External child care costs will on average represent a higher percentage of the total income for single mothers than for married and cohabitant mothers. As a consequence, single mothers face higher financial barriers to work compared to both married and cohabitant mothers. Therefore, it is reasonable to assume that single mothers – on the margin – will be more responsive to changes in child care costs. Although the empirical results are not conclusive, the majority of studies seem to report that the labour supply of single mothers are more sensitive to changes in child care costs than of married mothers (Blau and Robbins 1988; Connelly 1992; Averett et al. 1997; Connelly and Kimmel 2000). However, some studies report differently. Kimmel (1998) finds that single mothers exhibit less responsiveness in their labour force participation to child care cost prices than married mothers.

The introduction of the CFC-subsidy represents an increase in the relative price of publicly subsidised day-care services. Therefore, one might argue that this reform would have a larger negative effect on single mothers' labour supply than on both married and cohabitant mothers' labour supply. However, Norway has rather generous subsidy programs for single mothers. This will reduce the financial barrier to work, and may moderate negative impacts from the CFC-reform.

6.2.2. Annual working hours

Table 5 presents results for annual working hours, conditional on participation. We exploit the panel structure of the data sample and require that the included mothers must be present with positive working hours in both periods (pre and post). Due to the truncation of the dependent variable, all models are estimated using the Tobit maximum likelihood procedure (right tail censored).[14] The set of explanatory variables is the same as the one used in Table 4.[15]. The estimated coefficients in Table 5 measure the marginal impact on the underlying and unobserved dependent variable. In order to get an approximate measure of the average marginal effect on the observed variable, we must multiply the estimated coefficient with the share of non-censored observations in the material. Looking at column 1, this equals 0.53 (56611/107742 = 0.53). Then, from the DD-coefficient in column 1 we find that the CFC-reform has reduced labour supply among working mothers with approximately 42 annual working hours. This is slightly higher compared to the simple DD-estimate for the treatment group in table 3 (−39.9).

Again, we correct for contemporaneous macroeconomic effects by using mothers with older children as our control group. The DD-coefficient for the control group is positive but not significant. A positive effect for the control group is in line with the simple DD-estimate in Table 3. The positive effect for the control group leads the DDD-coefficient in column 3 to exceed the DD-

coefficient in column 1. The DDD-coefficient in column 3 shows that the CFC-reform has reduced labour supply among working mothers by approximately 46 annual working hours. This is almost identical to the simple DDD-estimate in Table 3 (−47.5 annual working hours).

Including explanatory variables does not alter the effects of the CFC-reform considerably. After adjusting for the share of non-censored observations, the results in column 6 show that the CFC-reform has reduced labour supply among working mothers with approximately 44 hours. This is slightly lower compared to the estimate reported in column 3. As in the participation estimation, we find that the effect of the control procedure is enhanced when we include explanatory variables. The DD-coefficient for the control group increases from 8.696 in column 2 to 49.016 in column 5.

One conclusion that can be drawn from the results in Table 4 and 5 is that the CFC-reform *has* affected mothers' labour supply, measured both by participation and annual working hours. Although the results are fairly modest in magnitude, they support the hypothesis that mothers react to changes in the relative prices of child care. If we compare the size of the effects, the simple DDD-estimates suggest that participation is reduced by approximately 4% and annual hours are reduced by approximately 3%. Although the difference is small, this result lends some support to the common assertion that participation responses are greater than working hour responses for employed workers (Mroz 1987; Triest 1990).

A second conclusion is that controlling for contemporaneous macroeconomic shocks by running a triple-difference approach does affect the results. Therefore, when evaluating policy reforms that are nation-wide and equally accessible, it is important to extend the familiar double-difference approach to a triple-difference approach.

6.2.3. Are there other explanations?

The DDD-results suggest that the CFC-reform has reduced labour supply among mothers. However, there are several other explanations that need to be addressed before we reach any final conclusions. The DDD-approach is subject to conventional sample selection bias. In standard evaluation literature the problem is related to unobservable differences between treatments and controls that are correlated with the outcome variable. This is a severe problem especially in the training literature. Selection into treatment may be driven by unobservable characteristics that are systematically correlated with the dependent variable. However, we will argue that this is probably less of a problem in our study. It will only be a problem if the introduction of the CFC-reform changes the assignment of individuals to treatment, for instance by changing the fertility rate of mothers in a systematic manner (see for instance Milligan 2002 for a study of the relationship between tax incentives and fertility). We are not able to check rigorously for the severity of this bias in the present article, but as a reassuring exercise, Figure 2 graphs historical fertility rates of women in different age groups in Norway from 1981 to 2000. The figure reveals a general trend of decreasing fertility rates among younger women (20–24 years of age), and a general trend of increasing fertility rates among older women (30–34 and 35–39 years of age). Besides that, there are no signs of any trend change after the introduction of the CFC-subsidy in 1998.

Table 5. The CFC-reform and annual hours worked. Tobit coefficients

	Without control variables			With control variables		
	DD-Treatments	DD-Controls	DDD-Treatments and controls	DD-Treatments	DD-Controls	DDD-Treatments and controls
Intercept	1733.200***	1488.700***	1495.901***	885.250***	1298.801***	908.369***
	(6.813)	(7.228)	(7.315)	(27.303)	(32.514)	(22.232)
CFC	31.522***	7.469	7.472	−47.385***	−39.530***	−39.014***
	(9.028)	(9.822)	(10.035)	(9.239)	(10.063)	(9.898)
POST	−157.692***	167.374***	168.846***	−250.880***	96.879***	70.027***
	(9.262)	(10.157)	(10.376)	(9.949)	(10.618)	(10.325)
CFCxPOST	−78.692***	8.696	8.690	−46.749***	49.016***	42.817***
	(12.585)	(14.034)	(14.339)	(12.659)	(14.088)	(14.003)
TREAT			230.001***			222.724***
			(9.762)			(9.591)
POSTxTREAT			−325.188***			−292.154***
			(13.813)			(13.355)
CFCxTREAT			23.895*			−13.271
			(13.402)			(12.817)
CFCxTREATxPOST			−86.685***			−82.667***
			(18.947)			(18.107)
Age				32.468***	13.553***	24.153***
				(0.734)	(0.782)	(0.535)
High school – I				−43.192***	−38.871***	−42.089***
				(13.691)	(13.461)	(9.636)
High school – II				136.164***	157.816***	146.524***
				(13.786)	(14.041)	(9.845)
Higher education – I				47.261***	42.129***	46.996***
				(15.475)	(16.029)	(11.141)
Higher education – II				296.785***	389.226***	334.689***
				(14.283)	(14.795)	(10.268)
Higher education – III				482.567***	570.831***	521.167***
				(19.552)	(22.803)	(14.741)

Older children in the family				−255.791***	252.697***	−242.535***
				(7.463)	(9.107)	(5.669)
Married				−184.852***	−236.244***	−201.103***
				(9.777)	(13.419)	(7.843)
Cohabitant				−63.829***	−119.773***	−79.473***
				(10.472)	(13.997)	(8.276)
Non−labour income (Yes/ No)				−474.478***	−564.536***	−496.889***
				(13.898)	(14.966)	(9.916)
Male income (in 10000 NOK)				0.972***	0.668***	0.236*
				(0.166)	(0.159)	(0.125)
Place of residence (Oslo)				227.475***	221.596***	226.861***
				(11.153)	(13.423)	(8.572)
Kindergarten coverage in Municipality				2.146***	2.933***	2.505***
				(0.262)	(0.288)	(0.195)
Control for month of birth?				Yes	Yes	Yes
Number of right censored values	51131	35389	86520	51131	35389	86520
− Log L	506564.4	383985.1	890574.9	501669.9	380421.3	882369.5
N	107742	78646	186388	107742	78646	186388

Note: "High school–I" is one or two years of education after compulsory school. "High school–II" is three years of education after compulsory school. "Higher education-I" is up to six years of education after compulsory school. "Higher education-II" is seven years of education after compulsory school. "Higher education-III" is more than seven years of education after compulsory school. The reference category is mothers with compulsory school. "Non-labour income" is a dummy variable taking the value 1 if the mother is eligible to transition subsidy (overgangsstønad), and 0 otherwise. "Place of residence" is a dummy variable taking the value 1 if the mother lives in Oslo, and 0 otherwise.
Level of significance: *** 1%, ** 5%, * 10%.

A second problem with DD- and DDD-estimates is related to biases in the standard errors. Bertrand et al. (2002) analyse the bias in the estimated standard errors due to serial correlation, and ask whether we can trust the standard errors from the difference-in-differences estimates. Although this is a serious problem, we reduce the time series problem by implementing their suggestion to operate with only two periods: pre- and post-. As their own analyses show, this reduces the serial correlation problem considerably.

A third potential problem is related to time trend differentials between the different groups of comparison in the analyses. Figures 3 and 4 present participation rates and working hours for the treatment group, i.e., mothers with young children. The period of observation is from two years prior to the birth until two years after the birth.[16] This means that the periods of observations are from 1993–1997 and from 1996–2000 respectively. The purpose of this exercise is to look for pre-existing trends. If the trends differ systematically prior to birth, then the change*s* we would like to interpret as an effect of CFC may only be pre-existing differences. The participation

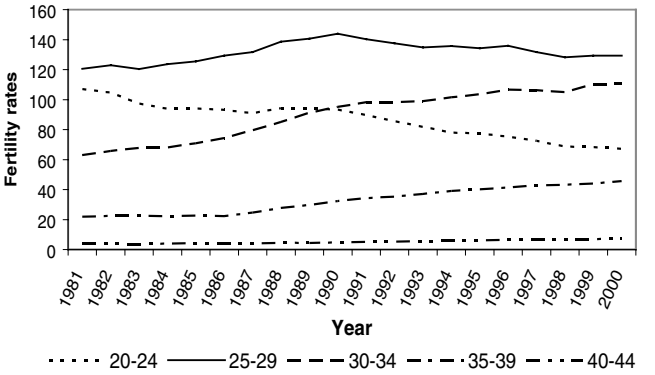

Fig. 2. Fertility rates of women in Norway, 1981–2000. *Note:* Fertility rates are measured as number of newborn children per 1000 women. Source: Statistics Norway

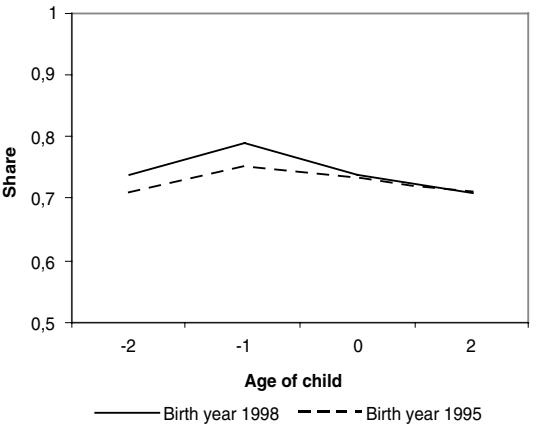

Fig. 3. Labour market participation rates. Treatment group (Mothers with young children)

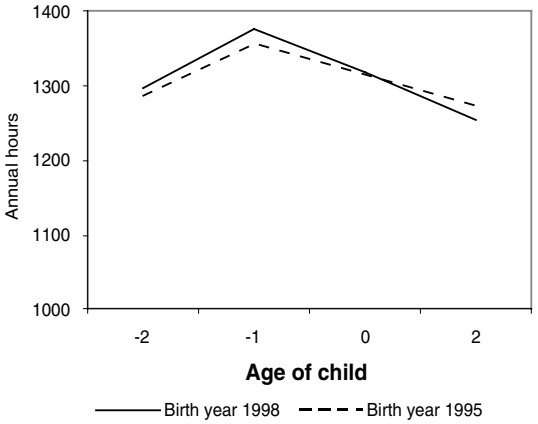

Fig. 4. Annual working hours. Treatment group (Mothers with young children)

rates for the treatment groups do not seem to be trending very differently prior to the year of birth. For both groups there is a general trend towards increased labour market participation. Thereafter, the CFC-eligible mothers from 1998 experience a larger dip in their participation rate. The same picture applies to annual working hours, conditional on participation. Prior to birth there is a common trend towards longer working hours for both groups.

Figures 5 and 6 present similar statistics for the control groups, i.e., mothers with older children. The two groups are mothers with children born in 1995, and mothers with children born in 1992. The periods of evaluation are from 1996-2000 and from 1993-1997 respectively.

As mentioned earlier, if any contemporaneous macroeconomic shocks occurred during the 1997–2000 period – irrespective of the CFC-reform – we expect this to affect the control group with mothers from 1995 as well; i.e., we expect to find a negative development in labour supply in this period for the control group, too. For both participation and annual working hours we find a trend towards increased labour supply. This trend applies both to mothers with children born in 1995 and mothers with children born in 1992. There-

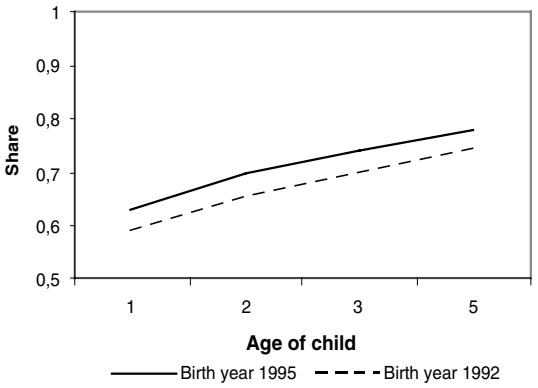

Fig. 5. Labour market participation rates. Control groups (Mothers with older children)

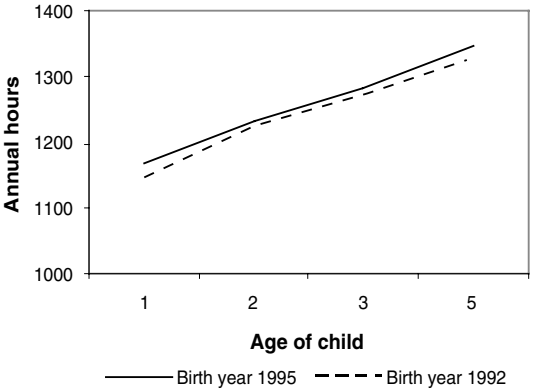

Fig. 6. Annual working hours. Control groups (Mothers with older children)

fore, based on descriptive statistics from these figures, we get no arguments for disturbing different time trends. A fourth potential problem is related to substitution effects. A critical assumption in all the analyses is that the control group is unaffected by the CFC-reform. One could think of reasons why this assumption could be violated. If CFC-eligible mothers withdraw from the labour market for a period, mothers with older children may experience an increased demand for their services. If so, this will tend to exaggerate the impact of the CFC-reform on labour supply. However, Fig. 5 and 6 do not support such a hypothesis. For both control groups, there is a parallel trend towards increased labour supply. If the substitution effect was important, we would expect the curve for mothers who gave birth in 1995 to experience an upward shift towards the end of the observation period. There is no evidence of such a shift, neither in Fig. 5 nor Fig. 6.

7. Conclusions

The purpose of this article has been to evaluate labour supply consequences of a Norwegian cash-for-care (CFC) reform. From January 1999, all parents in Norway with children aged one and two who do not use publicly subsidised daycare, are eligible for a cash-for-care (CFC) subsidy. Parents who use part-time care may receive a reduced amount proportional to the hours of attendance. Therefore, parents who do not use a specific service (subsidised daycare) are paid for not doing so.

The introduction of the CFC-reform alters the relative prices between different child care arrangements. For the sake of simplicity, assume that parents, when choosing a child care arrangement, are confronted with three alternatives: 1) they may do the caretaking themselves, 2) they may let a childminder take care of their child, or 3) they may use a kindergarten with a public subsidy. After the introduction of the CFC-reform, parents choosing alternatives 1 and 2 will receive a subsidy. For those parents choosing alternative 3 there is no change. The CFC-reform increases the relative price of alternative 3. Therefore, it is reasonable to assume that after the reform more parents will choose alternatives 1 and 2 and fewer will choose alternative 3. Switching from 3 to 1 implies a reduction in labour supply.

We study the impact of the CFC-reform on both mothers' labour market participation and hours worked – given participation. The basic idea is to compare the change in labour supply of CFC-eligible mothers with the change in labour supply of mothers not eligible for CFC. However, the CFC-reform is equally and nation-wide accessible for all mothers with children at the same age. Therefore, we have no natural comparison group. To approach this problem we have put forward a framework in which the treatment group differs from the control group along three dimensions. This means that we have employed a triple approach, i.e., a difference-in-differences-in-differences (DDD) approach.

The results show that the CFC-subsidy has reduced women's labour supply, measured both by privation and annual working hours. Although the size of the effects is fairly modest, the results support the hypothesis that mothers do react to changes in the relative prices of child care. The result is sustained after controlling for contemporaneous macroeconomic effects. In general, the results suggest that when evaluating policy programmes that are equally and nation-wide accessible, it is important to control for contemporaneous macroeconomics effects by extending the familiar DD-estimator to a DDD-estimator.

The results in this study lend some support to the opponents of the CFC-reform, arguing that the reform would have negative effects on mothers' labour supply by increasing the share of "stay-at-home mothers". If the increased share of "stay-at-home mothers" use the extra time to care for their children, this is in accordance with one of the main goals of the reform. There are both pros and cons of increasing the share of mothers staying at home, caring for their children. It can be argued that maternal care is superior to non-maternal care when the child is very young. Enabling the mothers who believe this to be true to provide for their children at home may be regarded as a beneficial aspect of the reform. The cons are mainly related to potentially negative long-term effects. As mentioned earlier, CFC-payments are not connected to previous employment, and for mothers who were employed prior to birth and who withdraw from the labour market in the CFC-period, it does not include a specific guaranteed return to their old jobs after the CFC-period. If a mother takes out the full CFC-subsidy and stays at home during the whole CFC-period, she will be out of the labour market for three years, and will no longer have a guaranteed return to old job. Such a long period of absence may – through lack of skill accumulation and depreciation of human capital – have a negative effect on the mother's future labour market participation.

A natural extension of this study would be to analyse potential long-term effects of the CFC-reform. An interesting exercise would be to extend the evaluation period, i.e., to include adjustments in the longer run, outside the CFC-period. Is the effect of the CFC-subsidy a permanent effect, or do mothers return to work when the CFC-period ends?

Endnotes

[1] Measured as employed individuals as a percentage of all individuals 16–74 years of age.

[2] From recent years there are several examples of studies that use different policy reforms to estimate labour supply changes (Gruber 1994; Yelowitz 1995; Eissa 1995, 1996; Eissa and

Liebman 1996; Graversen 1996; Ondrich et al. 1996; Klerman and Leibowitz 1997; Eissa and Hoynes 1998; Blundell et al. 1998; Waldfogel 1999; Meyer and Rosenbaum 2000). For an overview over labour supply studies, see for instance Blundell and MaCurdy (1999).

[3] Both mothers and fathers are eligible for the CFC-subsidy. However, earlier studies have shown that the fathers' labour supply is almost unaffected by the introduction of the subsidy. Therefore, we choose to limit our analyses to mothers.

[4] See Meyer (1995) or Hamermesh (2000) for an overview of pros and cons by using quasi-experiments in economics.

[5] Children born in 1992 will be two years old in 1994 and five years old in 1997, whereas children born in 1995 will be two years old in 1997 and five years old in 2000.

[6] Note that we do not have – and do not need – information on whether the CFC-eligible mothers from 1998 actually receive the subsidy.

[7] As mentioned earlier, the CFC-reform was introduced in August 1998. We still refer to 1997–2000 as a period with CFC-subsidies. The year 1997 is included as a "before" period.

[8] Examples of studies that use DDD-estimates to analyse labour supply effects of policy reforms include Gruber (1994), Klerman and Leibowitz (1997) and Waldfogel (1999). However, none of these studies analyse nation-wide and equally accessible reforms.

[9] Annual working hours is constructed from information on employment spell and working time. Annual full-time working hours is set to 1800 hours. Note that our measure of annual working hours do not tell us whether a change in working hours is operating through reduced working time (for a given spell), or through reduced employment spell (for a given working time).

[10] Table 2 contains descriptive statistics for the sample used in the participation analyses. This sample differs somewhat from the sample used in annual hours analyses. The reason is that we in the latter analyses require positive annual working hours to be included.

[11] The "1994-mothers" from the treatment group and the "1997-mothers" from the control group are of course from the same cohort, namely mothers giving birth in 1995. The numbers of observations differ, however. The reason is that we, for the control group, exclude women who gave birth later, i.e., in the period from 1996–2000. This is necessary; otherwise, the effect of giving birth in 1995 would be confounded with the effect of later birth in the CFC-period.

[12] The formula is: $\alpha_0 P(1-P)$, where P and (1-P) are probabilities of participation and non-participation, measured as population means.

[13] Our marital status reference category, single mothers, also contains some "non-single mothers". This is due to inaccuracy in the register data. Some mothers living with the father – most often as cohabitants– are not registered as such. This inaccuracy makes interpretation of coefficients from separate regression analyses somewhat difficult. Therefore, separate regressions are not presented.

[14] The dependent variable has a truncation point at 1800 hours (full-time annual working hours).

[15] Selection controls are not imposed in the analyses. This means that we have not controlled for the fact that we restrict the analyses to working mothers. The reason for not imposing control procedures is that our data sample does not include a useful identifying variable, i.e., a variable that affects participation but not hours of work.

[16] The participation rate for the last year before birth (−1) and the participation rate for the second year after birth (+2) are taken from Table 3.

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