The Cash-for-Care Benefit and Daycare Use

-A Quasi-Experimental Approach

Leroy Egbeocha Andersland

Thesis Supervisor: Øivind Anti Nilsen

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NORWEGIAN SCHOOL OF ECONOMICS AND BUSINESS ADMINISTRATION

Abstract

This paper sets out to explore the effects of a cash incentive on parents' choice of daytime care for children in the age group 1-3 years. By studying the Norwegian Cash-for-Care reform from 1998/1999 we are able to able to examine this through a natural experiment. The results show a statistical significant decrease in use of daycare for the total population, an effect that is stronger for families of low socioeconomic status. This may work against stated long-term national goals. We are not able to identify any changes in demand for the immigrant families in the sample.

Preface

This was written as part of the Master in Science degree in Economic analysis at the Norwegian School of Economics And Business Administration in the spring of 2011. The topic was inspired by an exchange stay in Washington D.C. The U.S. capital is home several organizations and institutions that has a sole purpose of studying the effects of government interventions. By doing this, they provide the policymakers with thorough information which they can base arguments and decisions on. Fascinated by the dynamic discussion climate in the U.S., I identified a lack equivalent discussions and evaluations to the same extent of some Norwegian reforms. This is what led me to write my thesis about the Cash-for-Care reform.

I would like to thank:

Thesis supervisor and Professor Øivind Anti Nilsen who provided me with everything I wanted from a supervisor, and more. His lecture series has proved to be indispensable for the completion of this thesis, and his enthusiasm for econometrics was highly contagious.

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Advisor Trond Pedersen at NSD for taking the time to provide the data needed to conduct the empirical analysis. For being considerate in formatting the data to make it easy to handle.

Professor and self declared "policy-wonk" Ian Fried at American University, for his enlightening comparison of U.S. and Norwegian public policy, that led my focus towards the Cash-for-Care reform.

As this thesis will complete my studies, I would like to thank everybody that has made my five years as a student memorable.

Leroy Egbeocha Andersland

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1 Introduction

For most parents, the form of care their children receive is essential. Parents instinctively know the significance of proper care for their young children. A large part of the care happens outside of the family/home, even for the youngest children. This thesis will look at how the Cash-for-Care (CFC) benefit has changed parents' use of daycare in Norway.

From August 1st 1998 the Cash-for-Care benefit was available for one-year-old children, and from January 1st 1999 it was expanded to also apply for two-year olds. The reform would provide 3000 NOK per month to parents who chose not to send their child to a daycare that received public funds[1]. There were three main purposes of this reform: give more freedom of choice to parents of form of care, provide parents more time to be with their children and to redistribute to families that do not benefit from public funded daycare (Kontantstøtteloven §1 1998).

There are many ways to study the effect of the CFC reform. This thesis will try to use an approach inspired by the experimental methods often used in other fields. In the medical sciences, controlled experiments are often used to randomly assign a treatment to a randomly drawn sample of a population. In social science and economics, this approach is most often not feasible out of ethical or other considerations. Therefore this thesis will explore the possibility of using the introduction of the benefit as a quasi- or natural experiment in finding the causal effect of the CFC on daycare use. The reform work as an external intervention that can make the benefit appear "as if" randomly assigned.

The method we end up using is comparing the change in usage of daycare between children eligible and children not eligible for the benefit before and after the reform. If this change differs, this thesis will argue that it is due to the reform. This is the Difference-in-Difference (DD) approach. The results show that the reform reduced usage among eligible children to 34% on average from an alternative scenario of 46% in 2002 if the reform had not been implemented. They indicate a bigger impact among households of low socioeconomic status. There is also a significant increase in usage of nannies because of the reform. We are not able to find any significant changes in use of daycare among immigrant families.

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[1] It is possible to recieve partial CFC benefit. See Table E in the appendix for rates

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Chapter 2 gives a quick review of the policy discussion on the CFC benefit. Female labor market participation, immigrant integration and freedom of choice are keywords for this debate. Chapter 3 goes through important aspects when discussing daycare, children's development and the role of the welfare state. These are all factors that come into play when considering the CFC benefit. Chapter 4 gives a literature review on previous research that is related to how the CFC benefit may change use of daycare. In order to have a orientation frame for studying the CFC benefits effect on daycare, Chapter 5 is devoted to give general background information and an account of the historical development of the daycare sector in Norway. Next, Chapter 6 goes through the methodical framework of quasi experiments. We explore which approach are possible, in order to have a menu of feasible methods to select from. Chapter 7 explains the choice of method and how we proceed to estimate parameters. Collecting data is often a challenge when conducting microeconometric studies. Chapter 8 therefore gives a description of the dataset used and some possible complications with it. In Chapter 9 the results are reported and commented. Separate estimations are done for the total population and immigrant population. Estimations on subsamples based on household wage levels and mothers' education level are also done. Lastly estimation is done to find the effect of the CFC benefit on different forms of care. In Chapter 10 I summarize the findings and give some concluding remarks. A section is also devoted to how I would proceed in studying this subject.

2 Policy Debate

The CFC subsidy clearly divides the political landscape. Generally, the right of center parties is more in favor of a traditional mode of family organization. They believe to a greater degree that the family should be the principal caregiver, and therefore supports the CFC. The left of center parties have been backing the increase the outside care for children, thereby supporting increased female labor participation. It is also seen as a way of "leveling the playing field", giving each child equal rights to the opportunities they feel daycare in part provides. They have therefore not been in favor of the CFC. The disagreement about the reform is still strong, 12 years after implementation. The current government dominated by the social democratic party has plans to abolish the reform for two year olds, while some in the opposition wants to significantly increase it (Aftenposten November 7th 2010, Aftenposten April 30th 2011). The next parliament election may prove to be decisive for the future of the reform in Norway.

2.1 Shifting Focus – New Questions

In recent years the focus of discussion about the benefit has shifted. Earlier debates emphasized the effects on female labor participation. People were concerned that mainly more mothers would stay at home with the child as a consequence of the CFC benefit, thereby being an obstacle to the integration of females into the labor market. Lately however, the discussion has moved toward the effect of the benefit on demand for daycare. Especially, the realization has come that the benefit could affect separate groups differently. This realization, coupled with updated research on child development and daycare, has led to new questions being relevant that this thesis will try to answer.

- Which families to a greater extent changed daycare usage?

Children of households of low socioeconomic status in CFC eligible age to a lesser extend use daycare. The reasons for this could be manifold, but one explanations is that the CFC benefit has more effect for low-income households because the its relative size is larger. Data presented by Bakken and Myklebø (2010) show that children of families of lower incomes are more likely to receive the CFC benefit. An important note is that this data does not imply that CFC benefit causes more children of low-income households to stay home from daycare. To see this, it is important to make the distinction between the families that *actively use,* and the families that

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passively receives the cash for care benefit. Those who actively use the CFC benefit change their decision about using daycare because of the CFC benefit. The families passively receiving would not use daycare anyway. There could be that families of low-socioeconomic status is more likely to receive the CFC benefit because of other reasons that a parent in the family is willing to stay at home.

- Does the CFC benefit function as an obstacle to immigrant integration in Norway?

In 2009 30% of one year olds, and 24% of two year olds received CFC benefit in Norway (Hirsch 2008). For the subpopulation of immigrant children with origins from Africa, Asia etc., the same number show that 55% of one year olds, and 51% of two year olds receive the CFC benefit[2]. The difference is frequently referred to in policy discussions, and used as an argument for that the CFC benefit is an obstacle to immigrant immigration. Some argue that if immigrant children don't get to practice their Norwegian skills before the age of three in settings provided by daycares, they will be significantly disadvantaged in the later preschool and school years. They believe the CFC prevents many immigrant children from having this possibility by keeping them out of daycare. However, we need to make a distinction between the immigrant families that actively use, and the families that passively receives the CFC benefit. There could be other reasons to why immigrant families to a greater extent than native families passively receive the CFC benefit. Cultural differences that convene a certain way of child rearing could be a cause. If this is the case, it is not certain that immigrant families per se are more actively using the CFC benefit.

- What is the size impact of the benefit on usage rates for daycare?

Since the public funding of daycare pr. child greatly exceeds the size of the CFC benefit, the removal of it is expected to increase yearly public spending. This increase in public spending depends on how many families actively use the CFC benefit.

The next chapter moves us from the political debate about the CFC benefit to the academic discussion about daycare, children's development and the role of the

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[2] Africa, Asia etc. denotes Africa, Asia, Latin-America, Oceania without Australia and New Zealand, and Europe outside EU/EØS

welfare state. The discussions about these subjects will then be related to the CFC benefit.

3 Daycare, Child Development and the Welfare State

"If the race is already halfway run even before children begin school, then we clearly need to examine what happens in the earliest years."

Gøsta Esping-Andersen (Esping-Andersen 2004)

"Like it or not, the most important mental and behavioral patterns, once established, are difficult to change once children enter school."

James J. Heckman (Heckman & Wax 2004)

Reflected in these two statements from the well-known social scientists is an increasing emphasis on the early childhood as an important determinant of later life outcomes. This view comes from the increasing literature on child development. See Almond & Curry (2010) for a review of international research on this field. Carneiro and Heckman (2004) is exploring the fact that early investment in children can have dynamic effects on the child's development. The basic idea is that learning begets learning, and this is what makes the earliest year so important. Daycare has therefore received attention as an important platform for pedagogical, social and emotional development. This chapter will explore the consequences for the Norwegian Welfare State of some of this research, and where the CFC benefit fits in.

3.1 Increasing Demand for High-skilled Labor

In spite of being among the countries with highest living standards in the world, Norway has experienced an increase in people falling outside of the labor force. A changing labor market with a demand for more high-skilled labor has been suggested to be a driver for this trend. In the report "Demand and supply of labor towards 2030" by Statistics Norway, projections of future demand and supply for labor has been made. These indicate imbalances in future demand and supply of labor with regards to education level. The models predict that there will be a surplus demand for high-skilled labor, while the demand for low-skilled labor will continue to fall.

Havnes og Mogstad (2009) investigated how a large scaled increase of subsidized daycare changed children's long term outcomes. They found that daycare had significant positive long-term effects related to education level and labor market participation, with largest effect for children of low-income mothers. If the cash for care decreases daycare participation it may be in conflict with the long-term goal of increasing supply for high-skilled labor in a changing labor market.

3.2 Equality in Opportunity

Daycare as part of the child´s education is increasingly viewed as an important catalyst for social mobility. NOU 2009: 10 by "Fordelingsutvalget" makes the point that daycare is the first step for most children in the course of their education. It is the first step in the child's learning process that gives the basis for language development, academic achievement and social and emotional development. Schølberg et al (2008) shows with Norwegian data that three-year-olds that don't use daycare have a doubling of the probability of having delayed language development. They found the disadvantage of not participating in daycare were particular large for children from families with low educated mothers, low income and immigrant families. The Cash for Care benefits effect on usage of daycare should be evaluated with respect to how it changed usage of daycare for those that may have the largest benefit in attending daycare.

3.3 Integration of Immigrants

Immigrants are becoming a large share of the Norwegian population. Statistics Norway reports that as of January 1st 2011, 12.2% of the population was immigrants. At the same time the integration process is showing signs of weakness. The unemployment rate and welfare dependency is higher among immigrants. This is related to the existence of an achievement gap in educational attainment and labor market participation between natives and immigrants across Europe. Schnepf (2008) show this pattern to be consistent across ten OECD countries.

Daycare participation among children of immigrant families could have positive effect on educational outcomes and labor market participation. Drange & Telle (2010) found that immigrant girls in districts that offered free preschool performed better at school in the age of sixteen than in districts that did not offer this service. If the CFC

benefit causes immigrant families to not send their children to daycare, it could be adversely affecting the integration of immigrants in Norway.

3.4 Negative Effects of Daycare

A branch of research suggests that non-maternal childcare could have negative effects for the child's development. See Bates et al. (1994); Belsky (1990, 2001); Vandell & Corasaniti (1990). The focus is especially on the social and emotional development of the child. The theory is that the child's early attachment to the mother is critical in its future social and emotional development. Proponents of the traditional mode of family organization rely on this branch of research to strengthen the arguments behind the CFC.

When evaluating the effects of daycare, a separation is often made between children aged 0-3 and children aged 3-6. Melhuish (2004) reports that results for the children aged 0-3 tend to be more mixed than the results for the older children. The different results could be related to different ages, different populations ad different levels of quality in the care the children received. This research is especially relevant for the discussion about the CFC benefit, because it mostly affects children aged 1-3.

We have now gone through some aspects that should be considered when discussion daycare in Norway. The next chapter will go through how the daycare sector developed in Norway.

4 The Norwegian Childcare Sector

The purpose of this section is to give an overview of the development of the daycare sector in Norway from 1960 to 2000. It will provide background information that will be relevant to the later analysis. A special focus will be directed towards the state of the sector around the time of the introduction of the CFC reform.

4.1 Historical Development

4.1.1 Increased Female Labor Participation - Increased Demand for Daycare

The development of a daycare sector in Norway is closely interweaved with increased female labor market participation. During the mid 1960s, few mothers of young children were active labor market participants, and correspondingly there were few daycare centers[3]. As female labor participation accelerated throughout the 1970s, it increased the demand for childcare outside of the family. In the early days of daycare in Norway, the focus where on giving alternatives to the older children, aged 3-7 years. Over the years, this has changed, and from 1972 until 1991 labor market participation by mothers of children aged 0-3 increased from 29% to 70%[4]. Ellingsæter & Guldbrandsen (2003) notes that the rapid trend of increasing female labor market participation caused there to be capacity constraints in the daycare market, especially for the youngest children.

4.1.2 The 1990s - Reforms and Capacity Constraints

The 1990s were subject to two reforms other than the Cash-for-Care reform that would have large consequences for the daycare market. In 1993 we saw the expansion of maternity leave until the age of one, and in 1997 a process of including 6 year olds in the school system was finalized (Reform97). This was in effect excluding two cohorts of children from daycare. Between 1996 and 1997 there was a decrease in total number of children in daycare. This stands in contrast with the constant increase since the early 60s[5].

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[3] See Table A in the appendix
[4] See Table B in the appendix
[5] See Table A in the appendix

Table 1

Official statistics on total number of children in daycare

| | | Aged 1-3 | | Aged 3-6 | | |
| | | | | | | Number of |
Year	Total	Total	Change	Total	Change	Daycare centers
1997	184 514	48 499		133 497		6 260
1998	187 869	47 297	-1202	138 478	4981	6 178
1999	187 612	44 163	-3134	141 575	3097	5 942
2000	189 837	44 082	-81	143 977	2402	5 833
2001	192 649	45 070	988	145 908	1931	5 776
2002	198 262	47 435	2365	149 117	3209	5 845
2003	205 172	49 962	2527	153 241	4124	5 924

Source: Statistics Norway

The figures in Table 1 make us able to compare the development of children in daycare of different ages across time. Between 1997 and 1998, the time one-year-olds got eligible for CFC, the number of 1-3 year olds in daycare decreased. The decrease was larger next year when the benefit was made eligible for 2 year olds as well. The number continued to decrease slightly further between 1999 and 2000 when the size of the benefit increased by 737 NOK[6]. Meanwhile the number of children aged 3-6 years of age in daycare increases during this period. The difference in change of number of children in daycare between the two groups points to that the decrease is due to the CFC reform, since it is only available for the children aged 1-3 years.

4.2 Daycare and Funding

Outside the family, children in Norway are normally taken care of by ordinary daycare centers, family daycares, open daycares, parks or nannies. The alternatives are either private or public owned, and nearly all receive operating funds from the public except nannies. The funds are mainly channeled trough either the central

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[6] See Table D in the appendix for the development of the size of the CFC benefit

government or the municipality. All daycares receive funding from the central government, while not all the private owned receive funding from the municipality. It is only when the child attends daycare that receive funding from the central government that it is not eligible for CFC benefit (Bakelien et. al 2001).

4.3 Family Daycare

Family daycare is characterized by care happening in private homes with a small group of children. The care is given by a family daycare assistant, which receives guidance by a preschool teacher. These types of care absorbed up much of the increase in daycare demand for young children during the 1990s[7]. The growth of homes stagnated around 1996 and the year after the CFC reform the decline in family daycare homes accelerated.

4.4 Nannies

Since the start of the integration of mothers into the labor market, there has been a significant informal childcare sector. The peak is considered to be around 1989 when 22% of all parents reported use of nannies (Blix & Guldbrandsen 1992). Nanny use decreased during the 1990s and was estimated to be 12 % by 1992. (Blix & Guldbransen 1993). Nanny usage is a part of the non-formal childcare sector and it is difficult to control the quality of the care that is provided. It was expected that nanny use would increase after the CFC reform since parents could collected the benefit and at the same time use nannies. This was a source of early criticism of the reform (Guldrandsen & Hellevik 2000).

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[7] See Table C in appendix

5 Literature Review

Cash-for-care-programs for young children are not widely used internationally. Academic research on its consequences for demand for childcare is therefore not abundant. There exists a wide literature on the relationship between childcare costs and parents labor supply. This can in some ways illuminate the study effects of the cash-for-car subsidy on daycare use, because a change in labor supply can be seen as change in demand for daycare. (Leibowitz et al 1992, Lundholm & Olsson (1998), Powell (1997), Ribar (1992), Blau & Robbins 1988) are treating this subject. Most of the studies come to the conclusion that reducing childcare costs do increase labor supply of mothers. Studies that have specifically looked at the Norwegian Cash-for-Care reform come up with the same results. Schøne (2004) finds a modest reduction in women's labor supply. Naz (2004) also finds that the reduction of labor participation of higher educated mothers is larger. Hardoy & Scøne (2008) directed the focus towards the labor supply of non-western females. They found that the CFC reform reduced nonwestern female labor supply by more than what it did for native females. This suggest that nonwestern immigrants were more responsive the reform. Finland has had a similar program since 1985. Ilmakunnas (1997) finds that in the Finnish version of the program, introducing the benefit decreases mothers labor market participation for children in the eligible age group.

Several working papers studying the Cash-for-Care reform in general were produced around the time of the reform. These papers looked into the effects on demand for childcare in Norway of the reform. Bakelien et. al (2001) gives a summation of this evaluation process. It concludes that the research found only modest reduction in demand for daycare in Norway as a result of the reform. Guldbransen & Hellevik (2000) notes that between December 1998 and December 1999, the usage rate of one- and two-year-olds fell by 3.5 percentage points. Conclusions in these papers were drawn from correlations and qualitative studies. Although correlations may be informing, they are not strong evidence of causal effects, and should be handled with care.

Results from effects on labor market participation can be illuminating, but not sufficient to study demand effects for different groups. The working papers provide signs, but not convincing evidence of the effect of the cash for care benefit on demand

for daycare. Until this date, not much is really known about the effects of CFC on use of daycare in Norway. This information shortage motivated this thesis.

6 Identification

The modern approach to analyzing policy effects is through a potential outcomes framework. This method was first conceptualized by Rubin (1974), and has since found widespread use. The following section gives a basic introduction to the framework that will provide the groundwork for how we estimate the effect of the CFC on demand for daycare.

6.1 Potential Outcomes Framework

6.1.1 Potential Outcomes

A basic concept that has been developed to understand causality is that of potential outcomes. This concept would state that a certain family has two potential outcomes. One in which it has receive a certain treatment, and one in which it has not. In the case of analyzing the CFC benefit, treatment would be that a family has access to the CFC benefit, and the potential outcomes would be the level of daycare usage. The treatment effect would then be the difference between these two potential outcomes. The challenge arises because we newer observe the both potential outcomes for the same family at the same time.

6.1.2 Randomized Controlled Experiment

Conduction a randomized controlled experiment would partially solve this[8]. Optimally we would have randomly selected a sample of families from the population we wanted to study. Since the families are randomly selected, mean treatment effect of the families in the sample are expected to be the same as in the population. We would then randomly assign treatment (option of receiving a CFC benefit or using daycare) to a treatment group of families in the sample. Those families not randomly assigned would then be a control group. Since the treatment is randomly assigned, it is independent of the individual families potential outcomes. The expected outcome of those treated, minus those not treated would therefore equal the mean treatment effect of the CFC benefit on the population we are studying.

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[8] Ramdomized cotrolled experiments find mean treatment effects, not individual treamtent effects.

6.1.3 Quasi Experiments

Performing a randomized controlled experiment on families' response of a CFC benefit is difficult since the CFC reform is already enacted. The required effort and cost makes it outside the scope of this thesis. We therefore move on to consider methods of studying the CFC by using a quasi-experimental approach. Quasi experiments uses the fact that some families will find themselves treated "as if" randomly. In the next section, three ways of estimating the causal effect of the CFC benefit on daycare attendance is explored.

6.2 Quasi Experimental Designs

6.2.1 Regression Discontinuity

An approach to analyze the CFC is using a Regression Discontinuity estimator. See Lee & Lemieux (2010) for an introduction to theory and examples, and Nichols (2007) for a guide to application. This method requires that a "forcing" variable X decide treatment. If the forcing variable is passes a cutoff value, the individual family will receive treatment (option of CFC). Comparing the outcome (daycare attendance) in the proximity of the cutoff value for the treated and not treated would then be an estimate of the average treatment effect. The basic idea is that the individual families in proximity to the threshold value do not systematically differ significantly on other characteristics that would affect daycare attendance. An estimated difference would then be attributed to treatment.

The rules of the CFC benefit states that the child has to be under (or above) a certain age to be eligible for the benefit. Age could therefore be used as a forcing variable. The quasi experiments idea shows up here because treatment status (CFC eligibility) given to families with children just above and right under the age of three year is viewed as randomly assigned to families making decisions about (almost) identical aged children.

Figure 1 – Regression Discontinuity design using age as a forcing variable

*Daycare use could be:
* Usage rate of fulltime daycare
* average number of hours per child in daycare
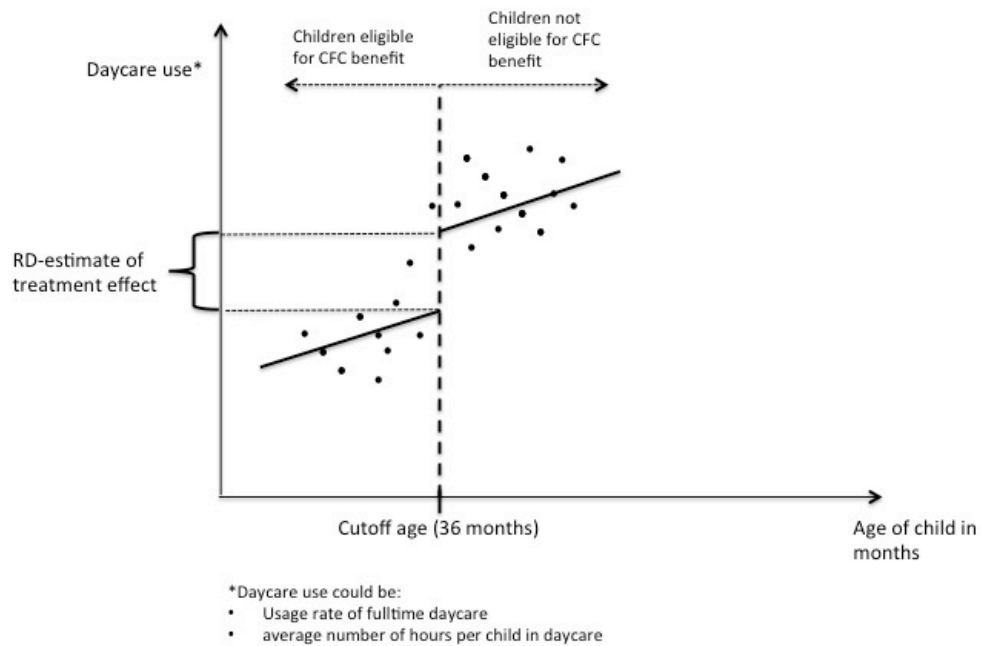
The method is illustrated in Figure 1. There are three important criteria that have to be met to use this method. First, one have to be sure that the threshold value determines treatment discontinuously. Proper exercise of the regulation ensures that this assumption holds. Children a month younger than three will always be eligible, while children a month older than three will never be eligible. Second, no other variable that affects daycare attendance should also make a discontinuous jump at the same threshold value. That means that no other factor that influences parent's choice of sending their child to daycare can change at the cutoff age. This is why we cannot use the age of one as cutoff value. The existence of paternity/maternity leave for twelve months in Norway could be a confounding factor for using the age of one as a cutoff value. When the child turns one, the caregiving parent is no longer eligible to paternity/maternity leave, and are more likely to return to work. This in turn increases the chance of them using daycare when the child passes the age of one. One is therefore not a suitable cutoff value of age. If daycare costs makes a discontinuously increase from the children are two to three, this would threat the use of the age of three as a cutoff value.

The third criteria that must hold is that we know the functional form on the relationship between the forcing variable and the outcome variable. In Figure 1, a linear relationship is assumed. If this is the case, the treatment effect can easily be found by estimating a linear regression model:

$$Y_i = \beta_0 + \beta_1 X_i + \beta_2 W_i + u_i \tag{1}$$

Let W_i determine the age of child i in months. We only consider children older than one or younger than six years. We set the threshold value at 36 months (the child turns three). Let X_i be a binary variable equal to one if the child is under 36 months, and zero if it is above 36 months. $\hat{\beta}_1$ would then be the estimated average treatment effect of the CFC.

It is often a far stretch to assume a linear relationship between the outcome and treatment variable. If the true relationship is not linear, using equation (1) to find treatment effect could be misleading. The estimated effect could then be reflecting a non-linearity in the relationship that has nothing to do with the treatment. A solution can then be to try to estimate a nonlinear relationship using polynomials in the regression equation. We seldom can be certain that we have specified the correct nonlinear relationship. Because of this, nonparametric methods are often used in finding treatment effects using RD. An example that uses a local linear regression approach is Hahn, Todd, and vaan der Klaauw (2001).

6.2.2 Difference-in-Difference

Another way of looking at the CFC as a quasi experiment could be to compare 1-3 year olds before the reform with 1-3 year olds after the reform. In this case, treatment is not randomly assigned, but given to families in different time periods. Because of this, there may be some differences in potential outcomes between the groups of families we compare. For example, in an alternative scenario where the CFC reform had not been enacted, one would expect that the potential outcome of those in the treatment group and those in the control group to differ. To correct for any differences in daycare usage over time, we can compare the difference between daycare attendance of 1-3 year olds before and after the reform, with the difference in daycare attendance of 3-6 year olds before and after the reform. Any difference in the change in daycare attendance between the two groups can then be attributed to the fact that

the 1-3 year olds have been treated with the CFC benefit. The treatment group will now be 1-3 year olds before and after the reform.

$$DD-estimate = (\underbrace{\overline{Y}_{after}^{1-3} - \overline{Y}_{before}^{1-3}}_{\text{Treatment group}}) - (\underbrace{\overline{Y}_{after}^{3-6} - \overline{Y}_{before}^{3-6}}_{\text{Comparison group}})$$ (2)

$\overline{Y}_{after}^{1-3}$ average daycare attendance 1-3 year olds after the CFC-reform

$\overline{Y}_{before}^{1-3}$ average daycare attendance 1-3 year olds before the CFC-reform

$\overline{Y}_{after}^{3-6}$ average daycare attendance 3-6 year olds after the CFC-reform

$\overline{Y}_{before}^{3-6}$ average daycare attendance 3-6 year olds before the CFC-reform

When using the Difference in Difference estimator to measure the causal effect of the CFC reform we are attributing the difference in change in daycare usage between eligible and non-eligible to the CFC benefit. This implies that in a counterfactual case were the CFC reform had not taken place, we assume that the change in average daycare participation among 1-3 year olds and 3-6 year olds would be the same. This assumption of a *common trend* is crucial if we want to claim that the DD-estimate is the causal effect of the CFC on daycare attendance among 1-3 year olds.

6.2.3 Difference-in-Difference-in-Difference

There could be situations where we do not believe that the common trend assumption mentioned in the last section holds. If we have reason to believe that in a counterfactual case, the change in daycare attendance among 1-3 and 3-6 year olds would not be the same, the DD estimate will be false. A way to correct for this would be to use a Difference-in-Difference-in Difference estimator. To compute this, we could first find the DD-estimate in equation (2). This would be the treatment group. We could then find the same DD estimate conducted entirely before (or after) the reform. The difference between these two DD estimates is the Difference-in-Difference-in-Difference estimate. It then cancels out the different "growth rates" between 1-3 year olds and 3-6 year olds. Any difference that is left is du to the fact that the treatment group is subject to a CFC benefit.

$$DDD - estimate = \underbrace{(\bar{Y}_{2000}^{1-3} - \bar{Y}_{1997}^{1-3}) - (\bar{Y}_{2000}^{3-6} - \bar{Y}_{1997}^{3-6})}_{\text{Treatment group}} - \underbrace{(\bar{Y}_{1997}^{1-3} - \bar{Y}_{1994}^{1-3}) - (\bar{Y}_{1997}^{3-6} - \bar{Y}_{1994}^{3-6})}_{\text{Comparison group}} \qquad (3)$$

$$= (\bar{Y}_{2000}^{1-3} - \bar{Y}_{1997}^{1-3}) - (\bar{Y}_{2000}^{3-6} - \bar{Y}_{1997}^{1-3}) - (\bar{Y}_{1994}^{3-6} - \bar{Y}_{1994}^{1-3})$$

This estimate would be robust a confounding trend that for example causes daycare usage to increased more for 1-3 year olds than 3-6 year olds in a counterfactual case.

We have now gone through three methods of finding the causal effect of the CFC on use of daycare. The next section will use the same conceptual framework to explain why some naïve methods of finding the effect are wrong.

6.3 Using the Potential Outcomes Framework to Analyze Naïve Methods of Finding the Effect of the CFC Benefit

Naïve methods have been used to analyze the effect of the CFC benefit on demand for daycare. This section will explain why the results of these methods may be false using the potential outcomes framework.

First, we could compare daycare participation among CFC eligible children before and after the reform. You then assume that the change of daycare participation among 1-3 year olds before and after the reform is due to CFC- benefit. Table 1 reports total number of children aged 1-3 using daycare decreased from 48 499 to 44 082 from 1997 to 2000. Could we attribute this decline to the CFC reform? To do this we would have to be able to claim that in an alternative scenario where the CFC reform would not have been implemented, the daycare participation would have been the same in 1997 and 2000 for this group of children. The observed decline could then solely be credited to the reform. This claim is hard to defend, because there are many factors that affect daycare usage that change over time. One such confounding factor is number of working mothers. A trend of increasing female labor market participation would make us believe that daycare participation in 2000 would be higher than in 1997 in a counterfactual case[9]. If we assume no more confounders, comparing the number of children in daycare before and after the reform would understate the causal effect of the reform.

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[9] Extrapolating the trend in Table A in the appendix show why there is a confounder.

Table 2

Total number of children
in daycare by age in 2000

Age (years)	Number of children
0	1 150
1	15 995
2	28 087
3	43 513
4	49 711
5	50 753
6	628

Source: Statistics Norway

A second naïve way to examine the effect of CFC benefit on daycare participation is to compare CFC eligible children to non-CFC eligible children after the reform. Table 2 shows official data on number of children in daycare by age. Comparing the number of non-CFC eligible 3 year olds to CFC eligible 2 year olds we get a difference of 15 426. Can we attribute this to the fact that families of 2 year olds receive the CFC benefit if they re not sent to daycare? This depends whether it is possible to claim that in a counterfactual case with no CFC benefit the daycare participation of 2- and 3 year olds would have been the same. This seems highly unlikely, because there are obvious confounding factors here. Parents may feel that older children are more suitable for daycare[10]. In the counterfactual case we would therefore expect more 3 year olds to attend daycare. This confounder causes this method to overestimate the effect of the CFC benefit.

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[10] Table A in the appendix show that labor market participation of mothers increase by the age of the child before the reform.

6.4 Selection of Method

This thesis set out to find the causal effect of the CFC benefit on usage of daycare by utilizing a quasi-experimental approach. Availability of data put some limitations on the methods possible to find a effect of the CFC benefit on demand for daycare. For this thesis, two types of datamaterial have been availabe to use. Before and after the reform there were conducted living standard surveys of families to measure attidudes and behaviour related to the CFC benefit. These data were easily made available by the NSD within weeks. The other source of data that has been considered is the "Kontantstøttedatabasen" which is based on regristry data on users of CFC benefit since its implementation. To use the Regression Discontinuity design, this data were required, because it would provide accurate age on the children reciveing CFC. This is crucial to get the cutoff value correct. Kontantstøttedatabasen was made available by NSD, but to serve the purpose of this thesis, it would have to be coupled with another dataset. This is because it did not include any interesting background variables. Having backgroud variables makes it possible to compare the effect for different subopulations. Coupling this dataset would include a costs and time that is outside the capacity frame of this thesis project.

To have conduced a Difference-in-Difference-in-Difference, we would have needed the same living standard survey to have been conducted at three different points in time. Only two of the living standard surveys contained the datatype needed for the purpose of this thesis. This was living standard surveys conducted before the reform in he spring of 1998, and after the reform in the spring of 2002. A Difference-in-Difference approach has therefore been used. The DDD method is generally thought to be more robust than the DD method. This is beacause it is easier to question the strength of the common trend assumption of the DD-estimator. Since this is what is used in this thesis, the next section is devoted to considering threats to the common trend assumption.

6.5 Treaths to Identification Using a Difference-in-Difference Estimator

The common trend assumption is crucial to interpret the DD-estimator as a mean treatment effect. Figure 2 illustrates when the assumption holds. It means believing growth in average daycare usage of 1-3 year olds and 3-6 year olds between 1998 and 2002 would have been exactly the same, had there not occurred an exogenous event in the form of a new government policy. Figure 3 shows when the assumption does not hold; the growth in usage rate differs between treatment and control group in the counterfactual case.

Figure 2

Difference-in-Difference method when the common trend assumption holds
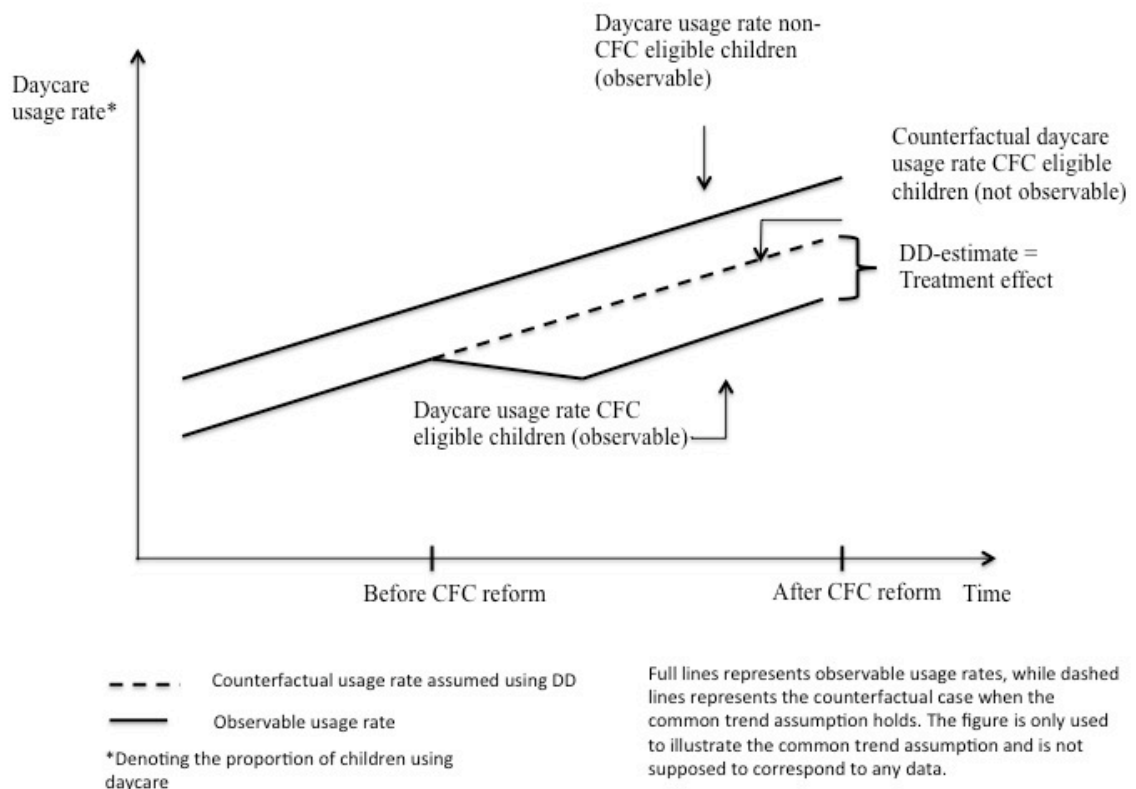
Figure 3

Difference-in-Difference method when the common trend assumption does not hold
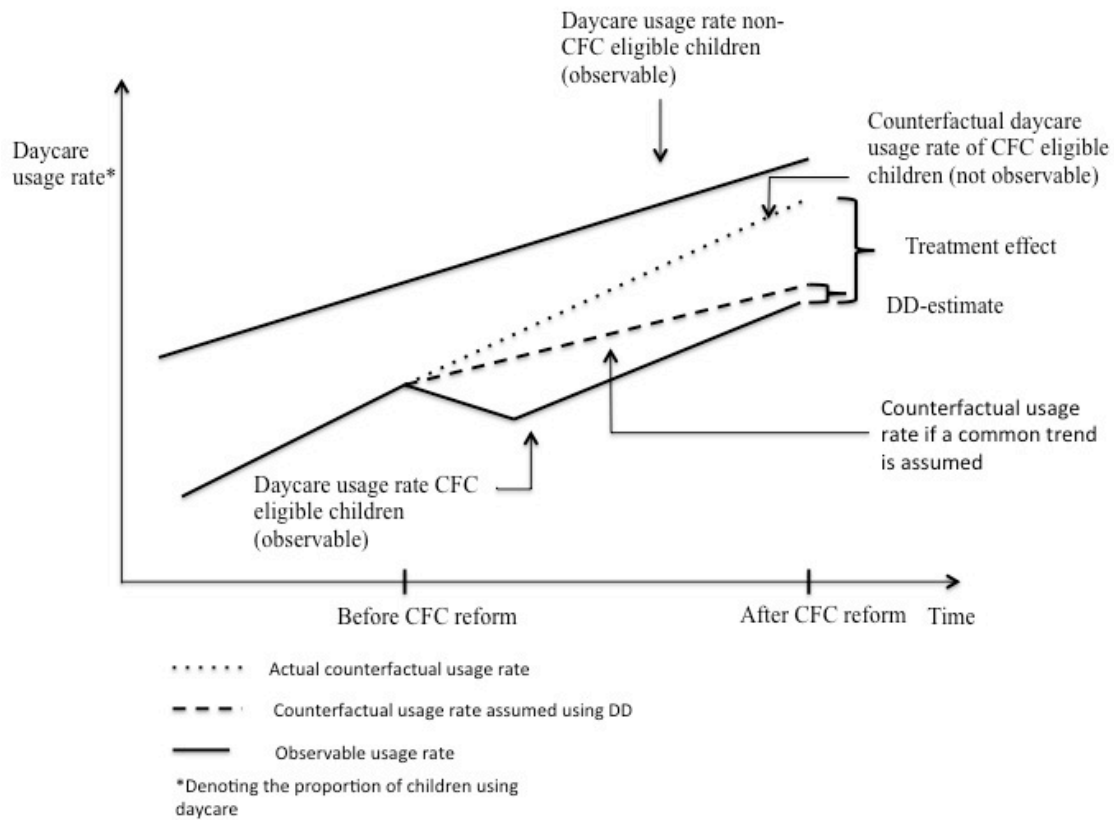
To have confidence in the common trend assumption, we must ensure that there is no confounding factors that would make the trends differ in a counterfactual case.

6.6.1 Threat I

The gradual integration of women into the labor market could challenge the assumption. This could push mothers to re-enter the labor market earlier after giving birth. This would cause the growth in probability of daycare attendance among 1-3 year olds to grow faster than 3-6 year olds. This effect would be expected to work in the opposite direction as an effect from the CFC would, biasing the DD - estimator of treatment effect downwards. The case would look like what is illustrated in Figure 3.

Table 3 reports official statistics on daycare coverage ratios between 1975 and 2000. Coverage ratios have been calculated for 1-6 year olds, and 1-3 year olds. There is a

slightly larger percentage growth in coverage ratios for 1-3 year olds compared to 1-6 year olds as a total in the period leading up to the reform. This indicates that in a counterfactual case with no CFC reform, the growth in probability of daycare attendance would not be the same for both eligible and non-eligible children in the period 1998-2002. However, the difference in yearly increase in coverage ratio was not remarkable. We therefore expect the downward bias to be small.

Table 3

Official historical coverage rates 1975 – 2000

Year	Coverage rate 1-7*	Coverage rate 1-3	Change 1-7**	Change 1-3**
1975	6.8	3.1		
1980	19.3	6.8	12.5	3.7
1985	26.6	9.3	7.3	2.5
1990	36.3	15.4		
1991	39.5	18.3	3.2	2.9
1992	43.3	21.7	3.8	3.4
1993	46.7	25.1	3.4	3.4
1994	49.8	28.6	3.1	3.5
1995	52.4	31.3	2.6	2.7
1996	54.9	33.9	2.5	2.6
1997	59.8	39.8	4.9	5.9
1998	61.1	38.8	1.3	-1
1999	61.1	36.9	0	-1.9
2000	62	37.1	0.9	0.2

*From 1997 usage rates are for 1-6 year olds
**Percentage point change in usage rate from the year before
Source: Statistics Norway

6.6.2 Threat II

Another threat could come from the capacity constraints that affected the market at the time. If growth in daycare capacity differed between 1-3 year-olds and 3-6 year olds, it could threat the assumption of a common trend. We know that a reform in the school system caused 6 year olds to start school from 1997. This was right before the reform, and could lead us to believe that capacity for the older children were better at

the time of the reform. There are two alternative ways this could cause different growth trend in a counterfactual case. A better capacity for only 3-6 year olds could cause a larger growth of usage of these children in the subsequent years since more capacity is available specifically for them. The alternative interpretation is that this caused there to be an instant saturation of the market demand for daycare for 3-6 year-olds before the reform. In the following years, you could then expect daycare centers to take account to differences in unmet demand between the two groups, and adjust their supply accordingly. This hypothesis would suggest that the growth in the participation rate between 1998 and 2002 would be higher for 1-3 year olds than for 3-6 year olds in the counterfactual case, causing a "not-common trend".

Reform97 caused the total number of children in daycare to decrease for the first time since 1963 between 1996 and 1997[11]. In Table 3 we detect a large increase in coverage ratios for both 1-3 year olds and 1-6 year olds between 1996 and 1997. There is in fact see a larger percentage point increase in coverage ratio for 1-3 year olds. This is a strong signal that the exit of 6 year olds from daycares permitted both more 1-3 year olds and more 3-6 year olds to enter daycare, and suggests that daycare centers are able to adjust their supply to market demand. It is therefore not expected that different capacity constraints for the two groups is a problem for identification.

6.6.3 Threat III

A third factor that could contest the assumption of a common trend is if macroeconomic fluctuations affect parents of 1-3 year olds different than 3-6 year olds. This is particular important to be aware of because 1998 was a year the Norwegian economy experienced above average economic growth. The bursting of the "dot.com bubble" in 2001 caused below average economic growth in 2002 when our second survey dataset was collected (Eika 2008). A change in labor market situation could affect the treatment and comparison groups differently. The economic stagnation could have caused more women to stay home for longer than the maturity leave period. This effect should be stronger for the mothers of 1-3 year olds, since it is more likely that these are temporary housewives, with a more recent connection to an employer. The mothers of 3-6 year olds staying at home are more likely to be permanent housewives, and are not as affected by changes in labor market conditions.

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[11] See Table A in the appendix

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This effect would work in the same direction as we expect the CFC benefit would do, thereby biasing the estimator upwards.

Table B in the appendix show the mothers labor market participation by the age of the youngest child. Eika (2008) reports that 1988 the ending of a high growth period, and had a doubling of the general unemployment rate from the year before. Table B show no decrease in labor market participation of mothers of 0-2 year olds, but a 2-percentage point decrease of mothers of 3-6 year olds. This does not support a theory that labor market participation of mothers of younger children is more sensitive to macroeconomic fluctuations. Results from Scøne (2004) discussed in section 9.7 support this claim.

6.6.4 Threat IV

Proper identification rests on the assumption that the control group is unaffected by the treatment. There is a possibility that families actively using the CFC benefit, thereby having a parent home, also take their 3-6 year olds out of daycare. This would mean that the control group is also affected by the reform, and a DD approach would underestimate the mean treatment effect.

Table 1 show a tendency of lower increase of 3-6 year olds children in daycare during the implementation of the reform. Interpreting this a causal effect of the CFC benefit is however not obvious. It is likely that there are other factors that contribute to this lower increase, that also affect the daycare usage of 1-3 year olds. The primary suspect is the macroeconomic fluctuations in this period, causing more parents of both 1-3 year olds, and 3-6 year olds to stay at home with their child. If they did this at the same rate, it would not bias the DD estimate.

7 Estimation

Household living standards surveys collected before and after the reform are used in estimation. A linear model for each household can be written as:

$$D_{it} = \beta_0 + \beta_1 d02_t + \beta_2 CFC_i + \beta_3 X_{it} + \beta_4 Z_{it} + \varepsilon_{ti} \qquad (4)$$

where $\quad X_{it} = d02_t \times CFC_i$

The subscript i indexes individual family and t indexes time. D_{it} is a binary variable equal to one if the household responds that the primary daytime caregiver for their child is a daycare center. $d02_{it}$ is a dummy variable that is equal to one after the reform (spring 2002), and zero before (spring 1998). CFC_{it} is a dummy indicating one if the child is CFC eligible, and zero if not. Z_{it} is a vector of variables consisting of determinants that could have an effect of daycare usage. This vector is included because there can be systematic differences between the families sampled in each cross section. For example, if mothers of non-eligible children were wealthier in 2002 than non-eligible in 1998, a bias could arise. It also helps decreasing the unexplained variation in the model, making the standard error smaller.

Using an econometric specification with a binary dependent variable means that the correct interpretation of the estimated parameters relates the response probability of the dependent variable. The response probability is the probability of one outcome, or the probability of the family using daycare as primary daytime caregiver of the child. The DD effect estimated with this model really measures the average treatment effect on a family's response probability. For OLS, this would be the same for all of the families, and we can interpret it as changes in total usage rates.

Excluding the vector Z_{it}, β_0 would show the probability of attending public daycare before the reform for 3-6 year old children. β_1 show the change in probability of sending children of age 3-6 to daycare between 1998 and 2002. It will capture the time trending increase in daycare participation. β_2 show the difference in probability of daycare usage between children aged 1-3 and 3-6 in 1998. It reflects that daycare is

more widely used by parents of older children. The coefficient that will be of most interest to us is β_3, which will show the change in probability of sending a CFC-eligible child to a daycare due to the reform, if the common trend assumption holds. The vector β_4 reflects differences in probability of attending daycare for different characteristics of a family.

7.1 Probit Estimation

Since the dependent variable is binary, we have to compute heteroscedasticity robust standard errors to do inference using OLS. Using OLS means we are assuming that the response probability is linear in parameters. There is also a chance that a linear model ends up predicting response probabilities above one or below zero. This can be discrediting to the results. A nonlinear Probit model has also been estimated to weight in for the weaknesses of the linear OLS model.

$$P(D_{it}|d02_{it},CFC_{it},Z_{it}) = G\left[\alpha_0 + \alpha_1 d02_{it} + \alpha_2 CFC_{it} + \alpha_3(d02_{it} \times CFC_{it}) + \alpha_4 Z_{it}\right] \tag{5}$$

$$G(x) = \int_{-\infty}^{x} \frac{1}{\sqrt{2\pi}} e^{\frac{-s^2}{2}} ds$$

The Probit model imposes a standard normal distribution on the response probability of the dependent variable. We estimate it by finding the parameters that is most likely given the observations in the sample. This is called the Maximum Likelihood estimation technique. A Probit model will only predict values between zero and one, because that is the only values allowed by the distribution function imposed on the response probabilities. The Probit model does not need to assume that the dependent variable is linear in parameters, and it directly gives correct standard errors. However, we cannot directly interpret the coefficients the same way. For the coefficients to have the same interpretation as in the OLS estimation, we have to calculate the marginal effects. These marginal effects that are reported in the result tables, evaluated at the sample mean. Since the DD estimate of the Probit may be different for different families, it's not strictly correct to interpret it as changes in total usage rates. Estimating the DD effect outside the sample mean does not change the estimate by

much. The CFC benefits effect on response probability of a family at sample mean is therefore used as a good approximation of total change in usage rate.

8 Data

The sources of data are living standards surveys collected in the spring of 1998 and 2002 – before and after the reform[12]. These surveys collected data about the preferences and demand for daycare, as well as background characteristics of the families surveyed. The data were collected by Statistics Norway in the purpose of evaluating the effects of the reform.

Table 4

Descriptive statistics - Daycare usage rate by group

	1-3 year olds		3-6 year olds	
	Spring 1998	Spring 2002	Spring 1998	Spring 2002
Total population	0.36	0.34	0.68	0.74
Immigrants[1]	0.28	0.21	0.64	0.61
Low-Income[2]	0.29	0.27	0.58	0.65
High-Income[3]	0.34	0.37	0.65	0.76
Low-Education[4]	0.30	0.26	0.60	0.66
High-Education[5]	0.45	0.44	0.79	0.85

Usage rates are calculated by proportion of respondents answering that their child was
taken care of by a daycare during daytime/working hours. We are assuming this
to be approximately full time daycare use.
1 Defined by the mother being a first generation immigrant
2 Families with a household work income in the 1 quartile of all the households in the sample
3 Families with a household work income in the 4 quartile of all the households in the sample
4 Families where the mother has not studied at the university level
5 Families where the mother has studied at the university level

Data from 1998 was collected by randomly drawing 3500 of a population of mothers with children under school age. 84.9% of the drawn mothers chose to respond. For the 2002 survey 3886 mothers with children under school age were randomly drawn, out of which 86.8% chose to respond. After excluding families with only one child under one year and single parent households we are left with 2291 households from 1998 and 3180 households from 2002.

In Table 4, the usage rate is reported by population group, age group of the child and year. The statistics is calculated from the survey question asking the parent what kind

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[12] Barnefamiliers tilsynsordninger, yrkesdeltakelse og økonomi 1998
Barnefamiliers tilsynsordninger, yrkesdeltakelse og og bruk av kontantstøtte 2002

of childcare the child receives during the daytime. Comparing these numbers with official statistics from "Statistikkbanken" on usage rates, they correspond well, but are slightly lower. We interpret this small discrepancy as a result of the survey question being directed at those using fulltime daycare, while the official statistic reflects all daycare use, including part-time.

8.1 Respond Ratio, Missing Values and Sample Selection

The consequence of not all the randomly drawn mothers responding to the survey is that we risk having sample selection bias. This would occur if the reason for not responding is related to the degree families were affected by the reform. For example, if mothers more concerned with their children's upbringing is more likely to respond to the survey, and these mothers are less concerned about the costs of different methods of childcare, it could bias the estimated effect of the CFC benefit downwards. Another case would be if immigrant mothers more proficient in Norwegian were more likely to respond to the survey. If immigrant mothers with high Norwegian proficiency were less likely to be affected by the CFC subsidy, this would also weaken the results for this sub population.

Table 7

Comparing average education levels between mothers in the sample and official statistics on females aged 30 – 44 in 2000

Highest Completed Education (Share of mothers)	All females		Immigrant females	
	Education Statistics*	Sample**	Education Statistics*	Sample**
University	0.33	0.40	0.27	0.57
Upper secondary	0.56	0.53	0.40	0.33
Lower Secondary/Unknown	0.11	0.07	0.33	0.10

* Official education statistics from Statistics Norway
**Mothers in the sample of any age

Table 7 compares education level of the mothers in the sample to official statistics of education level among females aged 30 - 44 in 2001. First note that the comparison suggests that the mothers that responded to the survey are slightly more educated than the average female. Immigrant mothers in the sample are however much more likely to have studied at the university level, than what the average immigrant female in

Norway. Sample selection appears not to be a big problem looking at the total population of mothers, but for immigrant mothers there could be a problem of sample selection. This will be discussed with the results.

Missing values reduce the sample size by 20%. This could be a second source of sample selection bias. If the respondents that provided missing values somehow reacted differently to the CFC reform than the total population, this would skew the result. Nearly all the missing values comes from the wage variables. Because of this, robustness checks have been included in the appendix, and are discussed with the results.

9 Results

The interpretation of the estimated DD-treatment effect is the percentage point change in the probability of families with children aged 1-3 using daycare *because* of the CFC benefit. For example, if the probability of a family sending their 1-3 year old child to daycare in 2002 is 34 percent, an DD-estimate of -0.12 means that because of the reform, there would be a 46 percentage probability of that family sending their 1-3 year old child to daycare in a counterfactual case with no CFC benefit.

Treatment effects from OLS and Probit estimation are reported. Marginal effects are reported from Probit estimation. Effects are reported with and without controls. A list of the control variables is included in the appendix. For consistency, effects are reported and discussed in percentage points. Switching between the two could have confused the reader. Sample daycare usage rates are reported in the far most right column to easily see relative effects.

9.1 Total Population

Table 8

Difference-in-Difference estimates for the total population

	OLS[1]		Probit[2]		Daycare usage rate 1-3 year 2002
	Without Controls	With controls	Without Controls	With controls[3]	
DD-estimate	-0.070* (0.028)	-0.093*** (0.028)	-0.078* (0.023)	-0.117*** (0.033)	34%
R2	0.1472	0.201			
Pseudo R2			0.111	0.159	
Loglikelihood			-2639	-2493	
Percent correctly Predicted[4]	68.93%	69.67%	68.93%	69.76%	
#Observations		4332			

Standard error in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Control variables used are: logarithm of mothers wage, logarithm of fathers wage, mothers education level, fathers education level, geographical area
1 Heteroscedasticiy robust standard errors are reported.
2 Marginal effects are reported
3 Marginal effects are measured at the sample mean
4 Percent correctly predicted based on a threshold value of 53

The estimation results for the total population are fairly consistent. In the full sample, 34% of the children eligible for CFC attended some form of daycare in 2002. Estimating the DD-effect without controls gives 7 and 7.8 percentage point reduction in response probability. This implies that the model estimates that daycare rates among CFC eligible children would have been 41% and 41.8% in the counterfactual case where the reform is not implemented. These effects are significant at a five-percentage significance level. There is however reason to suspect a bias in these estimates, because including control variables increases the estimates from OLS and Probit to 9.3 and 11.7 percentage points respectively. These results are highly significant. This suggests that including controls are important to correct for systematic differences between the two cross sections.

There is a 2.4 percentage point difference between the OLS and Probit with controls. This difference is not large enough to make us distrust the estimation, but it would be preferable to have an idea of which estimation model performs best. Comparing R-squared is not useful, but we can compare percent correctly predicted of the two models. This measure compares the models by setting a threshold value for the response probability. If the model predicts a response probability above the threshold, it will be registered as a predicted "one" outcome. Comparing percent correctly predicted outcomes would then be a measure of goodness-of-fit. The weakness of this measure is that it doesn't say anything about what the threshold value should be. Setting the threshold value at 0.53 is motivated by the fact that 53% of the families in the sample uses some form of daycare. This goodness of fit measure shows that Probit estimation performs marginally better with controls. *Focus will therefore be given to the Probit estimates with controls.*

9.2 Immigrant Families

Table 9

Difference-in-Difference estimates for the immigrant families[1]

	OLS[2]		Probit[3]		Daycare usage rate 1-3 year old immigrants 2002
	Without Controls	With controls	Without Controls	With controls[4]	
DD estimate	-0.043 (0.138)	-0.072 (0.141)	-0.049 (0.153)	-0.110 (0.164)	21%
#Observations		221			

Standard error in parentheses
[*] $p < 0.05$, [**] $p < 0.01$, [***] $p < 0.001$

Control variables used are: logarithm of mothers wage, logarithm of fathers wage, mothers education level, fathers education level, geographical area
1 Immigrant families defined as having a first generation immigrant mother
2 Heteroscedasticiy robust standard errors are reported.
3 Marginal effects are reported
4 Marginal effects are measured at the sample mean

Table 9 show the effect estimate for the immigrant population[13], alongside with the estimated standard errors. The size of the coefficients when including control variables does not deviate substantially from the estimate for the total population. The results are however not significant.

Not getting significant results for the immigrant population means we cannot reject the hypothesis that immigrants have not changed their behavior because of the CFC reform. Another way of saying this is that immigrants are not active users of the CFC benefit. One explanation for this is that more of these mothers are not in the workforce, making them more likely that they are housewives anyway. Registry data from Statistics Norway show that Labor market participation of adult immigrant females was 54% compared to 67% of the total female population in 2001.

They may also have a stronger traditional and cultural set of norms saying that small children should be cared for by their parents. Those immigrant parents that do send their young children to daycare may therefore not be representative for the immigrant

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[13] Immigrant population is defined by the mother being a first generation immigrant.

population as a whole, and they may have specific purpose of sending their young child to daycare. One example of this is that those immigrant parents that send their young child to daycare do it specifically to secure their child's development of Norwegian language skills and cultural integration from an early age. The cash benefit matters less to them.

However, the sample size is relatively small compared to the other estimations, and that could explain why we get large standard errors. As noted earlier, there is also a possibility of a sample selection bias for this population. We saw that the immigrant mothers that responded to the survey were more educated than the average immigrant female in the population. If these mothers were less likely to actively use the CFC benefit, this could explain why we do not get significant effect estimates for the immigrant families in the sample.

9.3 Household Income Level

Table 10

Difference-in-Difference estimates by household wage income

| | OLS[1] | | Probit[2] | | Daycare usage rate 1-3 |
	Without Controls	With controls	Without Controls	With controls[3]	year old by household wage level 2002
DD-estimate Low-Income[4]	-0.087	-0.119*	0.090	-0.142*	27%
	(0.058)	(0.056)	(0.061)	(0.061)	
DD-estimate High-Income[5]	-0.112	-.120*	-0.092	-0.109	37%
	(0.057)	(0.057)	(0.067)	(0.068)	
# Observations			1095		

Standard error in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Control variables used are: logarithm of mothers wage, logarithm of fathers wage, mothers education level, fathers education level, geographical area
1 Heteroscedasticiy robust standard errors are reported.
2 Marginal effects are reported
3 Marginal effects are measured at the sample mean
4 Consisting of families with a household income in the 1st quartile of all families in the sample
5 Consisting of families with a household income in the 4st quartile of all families in the sample

In Table 10 the households are separated into two groups. Those that have a combined household work income in the top quartile of the population (High Income), and those who have a household work income in the 1st quartile (Low Income). This is a way to compare two socioeconomic groups against each other to detect any differences in behavior between them. For the High-Income households, the get a significant effect using OLS, but not a significant effect using Probit. The estimate for the Low-Income population gives significant estimates for both OLS and Probit estimates. The Probit estimate also suggests a stronger effect for this demographic group than for the total population. This is something that could be expected, since the CFC benefit is larger relative to wage for Low-Income households. Weaker effect estimates for high-income households may suggest that high-income households did not change behaviors as much as a response to the CFC reform.

9.4 Mothers Education Level

Table 11

Difference-in-Difference estimates by mothers education level

	OLS[1]		Probit[2]		Daycare usage rate 1-3 year old by education level 2002
	Without Controls	With controls	Without Controls	With controls[3]	
DD-estimate Low-Education[4]	-0.078*	-0.101**	-0.087*	-0.126**	26%
	(0.039)	(0.038)	(0.043)	(0.043)	
#Observations		2340			
DD-estimate High-Education[5]	-0.076	-0.089*	-0.101*	-0.119*	44%
	(0.039)	(0.039)	(0.047)	(0.048)	
#Observations		1992			

Standard error in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Control variables used are: logarithm of mothers wage, logarithm of fathers wage, fathers education level, geographical area
1 Heteroscedasticiy robust standard errors are reported
2 Marginal effects are reported
3 Marginal effects are measured at the sample mean
4 Consisting of families where the mother has not studied at the university level
5 Consisting of families where the mother has studied at the university level

The mothers' education level is a marker of socioeconomic status in addition to being a signal of the emphasis the mother has on a job career. The Low-Education group consists of families with mothers that have maximum upper secondary education, and the High-Education sample consists of mothers with university level education. For the OLS estimate we see that we more easily get significant effects for the low educated mothers, and by including controls we see that the effect is slightly larger for families with lower educated mothers. The Probit estimates with controls also show a stronger effect for low educated mothers, although a difference of 0.7 percentage points is not as large as could be expected.

9.5 Differences Between Daycare Forms

Table 12

Difference-in-Difference estimates for different forms of childcare

| | OLS[1] | | Probit[2] | | Usage rates 1-3 year old year 2002 |
	Without Controls	With controls	Without Controls	With controls[3]	
Public Daycare	-0.007 (0.027)	-0.018 (0.027)	-0.007 (0.029)	-0.019 (0.029)	17%
Privatel Daycare	-0.039 (0.025)	-0.050* (0.025)	-0.041 (0.024)	-0.051* (0.023)	11%
Family Daycare[4]	-0.029 (0.015)	-0.030* (0.015)	-0.021 (0.012)	-0.021 (0.012)	5%
Nanny	0.049* (0.020)	0.048* (0.020)	0.077*** (0.024)	0.074*** (0.024)	17%
Relatives	-0.012 (0.020)	-0.010 (0.020)	0.013 (0.020)	0.018 (0.020)	13%
Mother/Father	0.023 (0.028)	0.045 (0.027)	0.100*** (0.030)	0.142*** (0.031)	33%
#Observations		4332			

Standard error in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Control variables used are: logarithm of mothers wage, logarithm of fathers wage, mothers education level, fathers education level, geographical area
1 Heteroscedasticiy robust standard errors are reported.
2 Marginal effects are reported
3 Marginal effects are measured at the sample mean
4 Both private and public

Table 12 shows the effect estimate for different forms of care for the child. The results suggest stronger reduction use of private daycare compared to public daycare for 1-3 year old children. Hellevik & Guldbrandsen (2000) suggests that since around 55% of privately owned daycare centers do not receive funding from the municipality (though they may still receive from the central government) this makes them more expensive, and is more exposed to a reduction in total demand for daycare. We get a significant negative effect for demand for family-daycare using OLS, but not as strong as private daycare.

The results show a significant positive effect for change in usage of nannies as a consequence of the reform. Using nannies make both parents able to work and at the same time receive the CFC benefit. The Probit estimate with controls suggest a 7.4 percentage point increase in nanny usage among 1-3 year olds because of the reform.

OLS and Probit does not give the same results for the effect estimate of change of care by parents. OLS give a statistical insignificant percentage point change of 2.3 and 4.5. Probit gives significant percentage point changes of 10 and 14.2. In light of previous results, I find the Probit estimates more reliable, since we have identified large reduction in use for daycare.

9. 6 Missing Values Problem

As noted earlier, a 20% of the sample has been excluded because of missing values. The main variables with missing values are the income variables. Reported in the appendix is effect estimates for the portion of the sample with wage value compared to the effect estimate for the portion of the sample with missing values in the wage variables. The difference between the effect estimates is not significant. Only a 0.5 percentage point difference gives confidence that the exclusion of the data points with missing values do not bias the results.

9.7 Comparing Results

Schøne (2004) finds using a DD estimate a reduction of share employed mothers of two year olds by 4.8 percentage points as a consequence of the reform. He makes a interesting note about macroeconomic circumstances in the 1997-2000 period that could change labor market conditions and bias the results. He therefore calculates the DDD estimate, but finds it to be insignificantly different. We have in section 6.6.3 noted that macroeconomic shocks have to affect mothers with children eligible and not eligible differently for it to bias the estimate. The results of this paper strengthen our belief that conduction a DDD would not change the results in this thesis by much. We note that the percentage point change in share of working mothers is smaller than the effect estimates in this thesis. There could be many explanations for this discrepancy. One reason could be the increased use of nannies, which would make parents still able to work while not using daycare. Subtracting the 7.4 percentage point increase in nanny usage off the 11.7 percentage point, you get a decrease of 4.3 percentage points. A second reason could be that fathers took some of the

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responsibility. A third reason could be that the mothers staying at home but still sent their child to daycare, did not use daycare to the same degree after the reform. Lastly, different definitions could make the results incomparable.

Schøne Hardoy (2008) finds that the CFC benefit reduced immigrant mothers (with eligible children) labor supply by 9 percentage points. We are not able to find any such evidence of active usage of the CFC benefit among immigrants using this sample.

 Ghazala Naz (2004) finds that mothers reduced their working hours by 2.42 hours per week. It also reports that working hours for high-educated mothers fell by more than low educated mothers. This is not in in line with the results of this thesis.

The working papers issued right after the reform focused on effect on daycare use as this thesis does. The researchers noted what they believed to be a much more modest reduction than was expected. Hellevik (2000) notes a reduction of 3 percentage points for one year olds and 6 percentage points for two year olds by comparing rates before and one year after the reform based on surveys. Gudbrandsen & Hellevik (2000) finds a 3.5 percentage point reduction in daycare by using registry data from SSB and Rikstrygdeverket. See chapter 6.3 for discussion about methods comparing usage rates before and after the reform.

9.8 Relevance Today

This thesis has studied the CFC benefit by examining how the reform changed daycare demand. The results are effect estimates of the CFC benefit in 2002. To relate the results to today, we need to make some assumptions.

Table D In the appendix show the development of the size of the CFC benefit as a fraction of the "Basic amount of the National Insurance Scheme". The "Basic amount" is used to calculate pensions and other benefits. It is adjusted so that it increases with the wage rate. We see that the fraction has fallen from 0.66 in 2002 to 0.52 in 2010. This means that the value of the CFC benefit has fallen relative to the general wage level with ca. 21%. To simplify, we could make the assumption that the effect of the CFC benefit has today on the daycare usage rate, would be 21% less than it was in 2002. For the total population that would mean the effect would be 9.25 percentage points instead of the 11.7 percentage points reported in the table. Using "Statistikkbanken" from Statistics Norway show that the daycare usage rate among 1-

3 year olds in 2010 was 78.8%. Assuming the CFC benefit effect is constant across any usage rate would mean that had the CFC benefit been abolished in 2010, usage rate would have increased to 88.1% for 1-3 year olds. In 2010 there were 98 725 1-3 year olds attending daycare. The results imply that the total use of daycare would have increased with ca. 12 000 1-3 year olds.

10 Summary, Conclusion and Further Study

10.1 Summary

Chapter 2 went through the policy discussion about the reform. The main focus of the policy discussion was early on the effect the benefit had on female labor market participation. A shift in focus towards the effects it had on matters of education, social equality and integration was identified. This led to new questions about the benefit. Especially how it affected daycare use for those who would benefit the most from it.

The next chapter looked into the subject of child development and daycare in Norway. A focus was on recent research based on Norwegian data that showed positive effects of daycare on child development. However, international research is mixed when it comes to the effects of daycare for the youngest children aged 0-3.

Chapter 4 quickly went through the basics of the daycare sector in Norway. Historical statistics showed that the development of daycare is closely related to female labor participation. The 1990s were a period of reforms that affected children aged 0-7. This could have consequences for how to evaluated the effect of the reform.

Next chapter looked into the excising literature on the effects of the cash for care reform. Most of the research conducted was on the effects on female labor market participation. The working papers issued right after the reform used only naïve methods to estimate the effect of the CFC benefit on daycare use.

In Chapter 7, a conceptual framework was developed to find the causal effect of the CFC benefit on use of daycare. It identified three different quasi-experimental methods that could find the causal effect, and ended up choosing the Difference-in-Difference estimator. The threats to identification thoroughly were explored so that it is possible to use this estimator with confidence. A slight downward bias of the estimator, due to different rates of growth in labor market participation of mothers with children eligible and not eligible could be assumed, but this bias was likely to be very small.

Chapter 8 has a discussion about the data used to find the effect. Focus was on whether the sample used correctly represents the underlying population under study.

A concerned was raised when the immigrant mothers in the sample were notably more educated that what official statistics show that immigrant females in a comparable age group on average is.

The results are reported in Chapter 9. They show that for the total population a 12-percentage point lower daycare participation in 2002 than it would have been without the benefit. The estimated effects are stronger for families of low socioeconomic status. We do not find any effect for the immigrant population, but that could be related to sample selection problems. We also found a significant positive effect in nanny use.

10.2 Concluding Remarks

The purpose of this thesis has been to study the causal effect the Cash-for-Care benefit has on families' use of daycare as a form of care for their 1-3 year olds child. This question is important today because the benefit still is a disputed issue. We found that the daycare usage rate for the total population would be 11.7 percentage points lower in 2002 had the benefit not existed. Converting this effect to 2010 would mean that if the benefit were removed in 2010, ca. 12 000 more children would attend daycare.

The results suggest that low-income households decreased their usage of daycare to a larger extent that high-income households. Lower educated mothers are also slightly more active users of the CFC benefit than higher educated mothers. Thus, there are signs that the CFC benefit is to a larger extent affecting the children that could benefit the most from daycare. This do not "level the playing field", or help accomplish the long-term goals of supply for high skilled labor in Norway.

For the immigrant population, we are not able to identify any effect of the CFC reform. We therefore do not find any evidence that the CFC benefit causes immigrants not to send their young children to daycare. There are however some methodological problems with this effect estimate, which makes us inconclusive about the results for this population. Other studies have found large decreases in immigrant female labor market participation.

Studying the consequence of the reform for different types of care, we find that private- and family daycares were most affected. We also find a significant increase

of nanny usage. Nanny usage is a part of the non-formal childcare sector and it is difficult to control the quality of the care the children receives. This was a source of early criticism of the reform. These results strengthen that criticism.

Research showing that much of a child's outcome later in life can be predicted by the time it enters school, has shifted much focus towards this period. The CFC benefit is a policy affecting the early part of this period. Children are endowed with different levels of innate abilities and environmental factors. How much each counts is hard to identify, but research suggest that both do. The CFC benefit should be evaluated by how it changes the environmental factors for some, against the consideration of facilitating parents' natural paternal instinct of caring for ones own young child.

10.3 Further Study

This thesis has studied the effects of the CFC benefit by using the introduction of it as a quasi experiment. This was possible to do because data before and after the reform was available. There are other possibilities to study the effects of the CFC benefit that could circumvent some of the weaknesses of the method used in this thesis. There exists a Cash-for-Care database (Kontantstøttedatabasen) that has data on CFC usage. In contrast with the survey data used in this thesis, the CFC database is based on registry data and is therefore more extensive. However, data is only available after the reform, so the same methodological approach as used in this thesis would not be possible. To be able to identify a causal effect using this data I have explored the possibility of using the Regression Discontinuity (RD) framework as described in chapter 6.2.1. This method uses a discontinuous change in a "forcing" variable to measure causal effects. We could use age as the forcing variable, comparing daycare use for those just under and slightly above the eligibility threshold. An alternative approach would be using discrete changes in the size of the CFC benefit, comparing daycare use just before and after the change. To make an examination interesting using these data, a coupling of this dataset with other variables would have to be made by Statistics Norway. This process would have taken several months, and would be more appropriate for a research project with more resources.

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Appendix

Robustness Check – Missing Values

Comparing DD-estimate for families reported wage with those that did not

	OLS		Probit	
	Without Controls	With controls	Without Controls	With controls
DD-estimate (reported wage)	-0.070*	-0.093***	-0.078*	-0.117***
	0.028	0.028	0.023	0.033
#Observations			4332	
DD-estimate (not reported wage)	-0.136*	-0.116*	-0.116*	-0.112
	(0.054)	(0.053)	(0.057)	(0.059)
DD-estimate			1139	

Standard error in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A – Historic Development

Official statistics on daycares, employees and
number of children 1963-1999

Year	Number of Daycares	Employees	Children
1963	259	1 177	8 516
1964	265	1 293	8 881
1965	273	1 335	9 053
1966	289	1 438	9 509
1967	313	1 579	10 214
1968	341	1 741	10 983
1969	369	1 981	11 686
1970	402	2 292	12 711
1971	471	2 846	14 830
1972	572	3 781	19 103
1973	685	4 452	22 699
1974	753	5 310	25 529
1975	884	6 599	30 479
1976	1 069	8 296	36 529
1977	1 472	9 875	49 762
1978	1 866	12 761	61 372
1979	2 295	14 733	71 483
1980	2 554	16 866	78 189
1981	2 756	18 115	82 933
1982	2 886	19 343	86 315
1983	2 984	20 662	89 898
1984	3 149	21 791	94 443
1985	3 281	23 593	98 454
1986	3 487	25 578	104 302
1987	3 779	27 911	110 981
1988	4 044	30 628	118 852
1989	4 310	33 075	128 237
1990	4 649	35 891	139 350
1991	4 961	40 061	150 566
1992	5 266	43 071	162 720
1993	5 631	46 394	173 386
1994	6 003	49 394	182 713
1995	6 261	51 832	188 213
1996	6 409	52 084	192 446
1997	6 260	51 793	184 514
1998	6 178	52 643	187 869
1999	5 991	52 898	189 382

Source: Statistics Norway http://www.ssb.no/histstat/aarbok/ht-040210-193.html
accessed June 7th 2010

Table B – Mothers Labor Market Participation

Labor market participation of mothers with children younger than 16 years

In percent of all mothers in group

Year	Total	Age of youngest child				
		0-2	3-6	7-10	11-15	
1972		43	29	41	54	55
1973		44	30	43	53	59
1974		44	31	41	51	59
1975		48	35	46	57	60
1976		53	40	48	64	67
1977		55	40	52	64	69
1978		58	42	53	67	71
1979		60	45	56	67	75
1980		62	46	57	70	75
1981		64	49	59	73	78
1982		65	49	60	72	80
1983		66	53	62	71	80
1984		68	55	64	75	79
1985		70	58	69	75	80
1986		75	65	73	78	84
1987		77	66	76	80	85
1988		77	68	74	82	85
1989		76	68	75	82	83
1990		77	69	74	82	86
1991		77	70	75	81	85

Source: Statistics Norway. http://www.ssb.no/histstat/tabeller/9-10.html accessed June 7th 2010

Table C – Family Daycare

		Public family daycare		Private family daycare		Average number of children pr home
Year	Total homes	Homes	Children	Homes	Children	
1990	968	746	2 680	222	870	3.7
1991	1 259	841	2 967	418	1 636	3.7
1992	1 644	914	3 516	730	3 328	4.2
1993	2 085	987	3 841	1 098	5 225	4.3
1994	2 571	999	3 897	1 572	7 698	4.5
1995	2 830	955	3 811	1 875	9 711	4.8
1996	2 927	915	3 632	2 012	10 661	4.9
1997	2 794	819	3 181	1 975	10 610	4.9
1998	2 495	726	2 955	1 769	9 978	5.2
1999	2 094	618	2 561	1 476	9 061	5.6
2000	1 809	524	2 114	1 285	8 358	5.8
2001	1 852	499	2 006	1 353	8 248	5.5
2002	1 841	437	1 842	1 404	8 344	5.5

The development of a Family Daycare sector in the 1990s

Source: Statistics Norway.
http://www.ssb.no/emner/04/02/10/nos_barnehager/nos_d328/tab/tab-8.html accessed June 7th 2010

List of Control Variables Used
- Natural logarithm of mothers income
- Natural logarithm of fathers income
- Immigrant/Non immigrant
- Education level mother
  - University
  - Upper secondary
  - Lower than upper secondary
- Education level father
  - University
  - Upper secondary
  - Lower than upper secondary
- Geographical area
  - Oslo/Akershus
  - Other parts of easter Norway
  - Agder/Rogaland
  - Wester Norway
  - Trøndelag
  - Nortern Norway

Table D - Size of CFC Benefit Payment 1998 - 2010

Development of he value of the CFC benifit, abolute and relative

From Date	Monthly payment	Yearly payment	Proportion of Basic amount[1]
01.08.98	3 000 NOK	36 000 NOK	0.79
01.01.99	2 263 NOK	27 156 NOK	0.6
01.05.99	2 263 NOK	27 156 NOK	0.58
01.01.00	3 000 NOK	36 000 NOK	0.77
01.05.00	3 000 NOK	36 000 NOK	0.73
01.05.01	3 000 NOK	36 000 NOK	0.7
01.05.02	3 000 NOK	36 000 NOK	0.66
01.05.03	3 000 NOK	36 000 NOK	0.63
01.08.03	3 657 NOK	43 884 NOK	0.77
01.05.04	3 657 NOK	43 884 NOK	0.75
01.05.05	3 657 NOK	43 884 NOK	0.72
01.01.06	3 303 NOK	39 636 NOK	0.65
01.05.06	3 303 NOK	39 636 NOK	0.63
01.05.07	3 303 NOK	39 636 NOK	0.59
01.05.08	3 303 NOK	39 636 NOK	0.56
01.05.09	3 303 NOK	39 636 NOK	0.54
01.05.10	3 303 NOK	39 636 NOK	0.52

[1] The CFC as a proportion of the Basic amount of the National Insurance Scheme, which is used as a basis to calculate pensions and other benifits. An objective is for it to grow at the same rate as the general wage level.

Source: Bakken, Frøydis, Myklebø, Sigrid (2010); Kontantstøttens utbredelse og foreldres preferanser for barnetilsyn - en studie av årskullene 1998-2008 og deres foreldre, NAV-rapport 1/20

Table E – Size of Benefit Eligible by Hours a Week in Daycare

Elegible beneft for different hours of daycare per week 2011

Weekly hours	Elegible benefit
0	3 303 NOK
1-8	2 642 NOK
9-16	1 982 NOK
17-24	1 321 NOK
25-32	661 NOK
33 and more	0 NOK

Source: NAV.
http://www.nav.no/Om+NAV/Satser+og+datoer/Satser%2C+familieomr%C3%A5det
/Kontantst%C3%B8tte.1073749633.cms, Accessed 17th june 2011