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Childcare costs and the demand for children: Evidence from a nationwide reform

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Childcare Costs and the Demand for Children – Evidence from a Nationwide Reform

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Childcare Costs and the Demand for Children – Evidence from a Nationwide Reform

Abstract

Exploiting the exogenous variation in childcare costs caused by a Swedish childcare reform, we are able to identify the causal effect of childcare costs on fertility in a context in which childcare enrollment is almost universal, user fees are low, and the labor force participation of mothers is very high. Anticipation of a reduction in childcare costs increased the number of first births, but only seemed to affect the timing of second births. We find a negative income effect for families with children already enrolled in child care.

JEL-Code: H31, J13.

Keywords: childcare, cost of children, fertility, quasi-experiment, difference-in-differences.

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1 Introduction

Low fertility rates, aging populations, and the concern for long-term labor supply have inspired policy interest in how the availability and price of childcare services influence maternal labor supply and birth rates. Cross-country comparisons show that birth rates are indeed higher in OECD countries with high female labor force participation and wide access to childcare (D'Addio and Mira d'Ercole, 2005). However, the direction of causality is not well understood.

We aim to establish if, and how, childcare costs affect fertility. To this end, we use the quasi-experiment initiated by a Swedish childcare reform that standardized the fee schedules across Swedish municipalities and imposed a cap on childcare charges. Consequently, households with similar characteristics experienced different cost changes depending on where they lived, and households in a given municipality experienced different cost changes depending on characteristics such as household income and the number and age of the children. Hence, conditional on household characteristics, the reform introduced exogenous variation in childcare costs.

Theoretical models of fertility and maternal labor supply (e.g., Ermisch, 1989a, b; Apps and Rees, 2004) predict that reductions in childcare costs may affect both fertility and the labor supply of mothers. By increasing mothers' take-home wages, lower childcare costs make it more attractive to enter the labor market or to work longer hours. However, for working mothers, lower childcare costs imply a direct reduction in the cost of having children, which in turn should increase the demand for children. Hence, the effects of childcare costs on fertility are likely to depend on women's labor supply decisions. A recent study by Lundin et al. (2008) of the same reform that we investigate, using similar estimation techniques, finds no effects on maternal labor supply, suggesting that fertility may be the margin of adjustment.[1]

[1] Note that even though maternal labor force participation is high in Sweden, many mothers with small children work part-time, so that there was the potential for an increased labor supply. The argument that there are no labor supply effects is strengthened by Wikström (2007), who shows that hours of care for children already enrolled increased only marginally as a result of the reform.

Previous micro studies have found mixed support for the hypothesis that lower childcare charges increase fertility. Using American survey data, Blau and Robins (1989) conclude that higher childcare costs decrease the birth rates of unemployed women but have no effect on employed women. In a study of Italian data, Del Boca (2002) finds that both fertility and labor force participation are positively correlated with better access to childcare. These studies, however, suffer from endogeneity problems. Both the availability of childcare and the charges actually paid by families vary according to local governments' response to demand or families' individual choices about the quality and quantity of care.

In a recent study, Schlosser (2006) examines the introduction of free public pre-school for children aged 3 and 4 in Israel to estimate the effects of a reduction in childcare costs on Arab mothers' labor supply and fertility. She finds no effect on fertility but a positive effect on labor supply. Schlosser uses quasi-experimental data and is therefore more likely to capture causal effects rather than correlations. Given the context studied by Schlosser; a case where fertility was initially high, while maternal labor supply was very low, the results are perhaps not so surprising.

Two recent studies on US data examine the effects on labor supply and fertility using changes in household service sector wages caused by low-wage immigration. Cortes and Tessada (2009) find positive effects on the female labor supply, and especially on highly educated mothers who worked longer hours. Furtado and Hock (2010) show that lower wages in the childcare sector resulted in higher fertility for highly educated women.[2]

The US context is in many ways similar to that studied here: most Swedish women work, have children and use childcare. However, important differences exist, in particular regarding which groups were affected by the studied price changes. While low-skill immigration primarily lowered the price of flexible nanny services, making it easier for high-earning women to combine career and family, the present study examines changes in the already low cost of publicly subsidized childcare during regular work hours. Another important difference is that the type of childcare studied in this paper is used by the vast majority of Swedish families.

[2] In a related field, a number of studies investigate the impact of other financial incentives, such as child allowances and tax incentives, on fertility decisions (see e.g., Cohen et al, 2009, Kearney, 2004, Laroque and Salanié, 2004 and Milligan, 2005).

In 2004, the attendance rate for children aged 3–6 was 90 percent. Hence, as opposed to the American price reduction studied by Cortes and Tessada and Furtado and Hock, the Swedish price reduction is not targeted to any specific group of parents and was enjoyed by practically all Swedish families. However, given that publicly subsidized childcare is only available during regular working hours, there was limited possibility for families to demand more hours for childcare other than by enrolling more children.

An important advantage of the present study is that we can estimate the effect of cost changes on a majority of households as opposed to reviewing only on a small part of the population, which is a common weakness of studies using quasi-experiments. This significantly strengthens the external validity of our results (see discussion in Moffitt, 2005; and Angrist et al., 2007).

We find only limited effects of the price changes on the fertility behavior of Swedish families. The reduction in childcare cost had a positive effect on first births in the order of magnitude of 7.5 (9.8) percent for a 10000 US dollar (or Euro) reduction in the present value of the future marginal child care costs. For families with children, on the other hand, we only find some timing effects for second births. They seem to have reacted rather immediately by postponing the second child when the election promise to cap childcare fees was announces, perhaps to make sure the reform was actually launched before they went ahead and had their second child. For families with two or more children, we find no effect of the marginal change in childcare costs. However, in addition to marginal cost changes, families with children between the ages 1-10 also experienced changes to the child care costs of the children they already had. We find that the families reduced their fertility in response to the reduction in child care cost suggesting a negative income effect.

Before we present the data, discuss our identification strategy in some detail, and arrive at estimation results, we provide background information on Swedish childcare institutions and the design of the childcare reform of 2002. We also describe recent developments regarding birth rates for Swedish women.

2 Institutional background

2.1 Childcare in Sweden

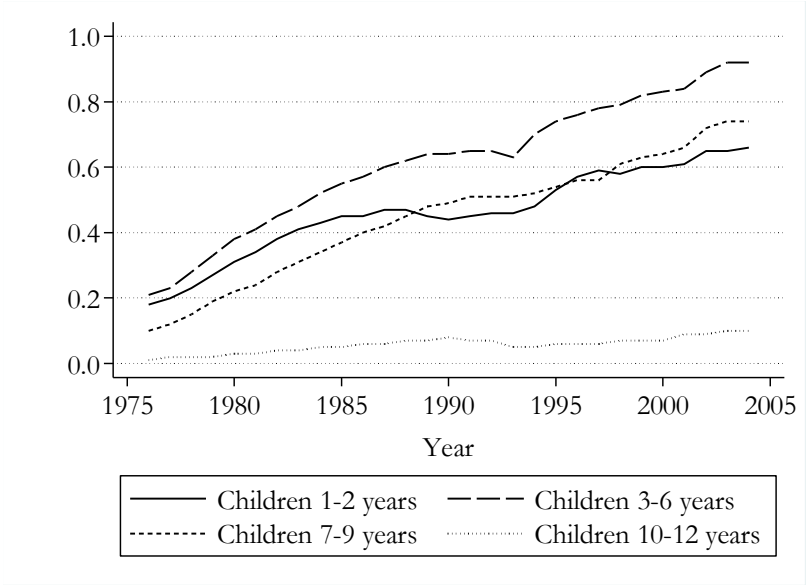
Sweden has a long tradition of publicly subsidized childcare for pre-school children and after-school care for young school-age children. Figure 1 shows the fraction of children attending some form of publicly subsidized childcare over time, by age. Enrollment rates have increased dramatically, and in 2004, 90 percent of all children in the 3–6 age group attended childcare.[3] The enrollment rate is also high for very young children (aged 1–2). One explanation for these high enrollment rates is thatlocal governments in Sweden are obliged by law to provide low-cost, high-quality childcare for children aged 1–12 whose parents either work or are full-time students; care is to be arranged within three to four months of the parents' request.[4] Subsidized childcare for infants is, however, restricted to families and children with special needs, and hence, enrollment for infants is negligible.[5]

[3] Publicly subsidized childcare comes in different forms, the most common being center-based care. Different forms of family daycare—e.g., care provided in a publicly-paid caretaker's home or in the child's home—also exist, although to a rather small extent (in 2001, only 5 percent of all enrolled children had this type of care). Although the financing of childcare is public, care providers can be public, cooperative or private. Until the early 1990s, childcare was almost exclusively publicly provided; since then, a growing proportion of municipalities have introduced voucher systems, paving the way for the private provision of services. These private child care centers still have to follow the nationally set curriculum.

[4] There are 290 local governments in Sweden. In addition to arranging childcare, they are responsible for primary and secondary education, care of the elderly and disabled, welfare and local infrastructure. Local governments finance their activities through (in order of their importance) proportional local income tax, grants from the central government, and user fees.

[5] Infants are instead cared for by their parents. Parents are entitled to a year's paid parental leave with an income replacement rate of 80 per cent up to a cap.

Figure 1 The proportion of children enrolled in subsidized childcare by age, 1976–2004



Source: National Board of Education (Skolverket)

Daycare centers offer services during regular work hours. Enrolled children spend on average 32 hours per week at daycare. Although mothers who work full-time have their children in daycare for longer hours than mothers working half-time (34 vs. 21 hours per week in 2005), very few children, even those with both parents working full-time, attend daycare more than 40 hours per week.[6] Anecdotal evidence also suggests that strong social norms regulate what parents view as adequate staying time. It is therefore interesting to note that attendance times did not change during the period of study (Skolverket, 2007), although childcare became cheaper.

Until 2002, the municipalities were free to set their own childcare charges as long as these were "reasonable". According to Government Bill 93/94:11, "child care charges must not be so high that parents, for economic reasons, refrain from letting their child attend a childcare activity that the child would benefit from". This definition clearly left room for different interpretations, and consequently, childcare fee schedules differed considerably between municipalities with respect to both levels and construction. In particular, charges varied with family income and the

[6] The father's work time has a much smaller impact on attendance time. Men are also much less likely to work part-time (Skolverket, 2007).

age and number of the children. Some municipalities applied a flat charge per child, but most municipalities used complicated fee schedules such that families with high incomes and few children, all young, paid the highest charges per child. However, childcare was heavily subsidized in all municipalities, and only about 15–20 percent of the municipalities' childcare costs were covered by user charges.

Quality of daycare, both before and after the reform, has remained relatively homogenous both within and across municipalities. According to Table 1 costs per child and personnel intensity has not changed over time. Also there is no reason to expect that wealthier families will have access to higher-quality daycare either within a particular municipality or between municipalities. For example, the correlation between the average child/teacher ratio and the average income across municipalities in 1999 was virtually zero. A reason for this absence of relationship is that childcare subsidies are financed through the municipal budget along with several other municipal responsibilities such as care for the elderly, education and social welfare.[7] Moreover, user fees are strictly regulated, and hence, childcare services can only be adapted to meet parental preferences for quality within a given budget. There is therefore no connection between fees paid by a particular parent and the quality of the daycare center that the child attends.

Table 1 Descriptive statistics of childcare quality

	1999	*2000*	*2001*	*2002*	*2003*	*2004*
Costs per enrolled child, SEK	83,000	86,900	90,200	93,700	95,900	96,600
Number of enrolled children per worker	5.3	5.4	5.3	5.3	5.4	5.4
Share of personnel with higher education	54 %	54 %	52 %	51 %	51 %	51%

Source: http://www.skolverket.se/sb/d/1663

[7] Also differences in income due to differences in the tax base are in principal equalized across municipalities.

2.2 The childcare reform

In the last months of the election campaign before the 1998 elections, the incumbent (Social Democratic) party proposed a large childcare reform designed to reduce user fees and further increase the accessibility of childcare.[8] The Social Democrats won the election, and the reform bill was passed by parliament in November 2000. The motivation for the reform was i) to give all children equal access to early education ii) to improve economic conditions for families with young children, and iii) to promote parental labor force participation.

The reform was implemented gradually and consisted of several parts. The most important component, and the one studied here, was an option for municipalities to impose a cap (set by the central government) on user fees for childcare beginning in January 2002.[9] Municipalities that chose to do so were granted compensation (at least partially) for lost revenues. As it turned out, all but two municipalities decided to implement the capped fee schedule already in January 2002. The decisions were in most cases made in the fall of 2001. The remaining two municipalities implemented the reform in the following year.[10]

The capped fee schedule, which has been in place since the reform, has two components. First, the charge per child is determined as a fixed percentage of household income. The rate varies with the age and birth order of the children, such that care for younger children and children with few siblings in childcare costs more.[11] Secondly, per-child fees are capped and are thus constant beyond a monthly income ceiling, which was SEK 38,000 (6,430 USD) in 2002. The maximum amount paid by any household was SEK 2,280 (385 USD) per household and per month in 2002.

Prior to the reform, there was substantial variation in childcare fees across household types and municipalities. Since the reform, comparable households have

[8] Elinder, et al. (2008) analyze the reform's impact on voter behavior and find that families with young children increased their propensity to vote for the incumbent government.

[9] The reform also introduced a right for children whose parents were unemployed or on parental leave to attend childcare for a minimum of 15 hours per week.

[10] These municipalities are not included in the study.

[11] The percentage rate for the first child in preschool is 3 percent; the rate is 2 percent for the second child and 1 percent for the third child. The corresponding figures for after-school care are 2, 1 and 1 percent. The household does not pay anything for child number four or for any children thereafter. The youngest child is defined as child number 1. Hence, families with one child in preschool and one in after-school care pay 4 percent of household income.

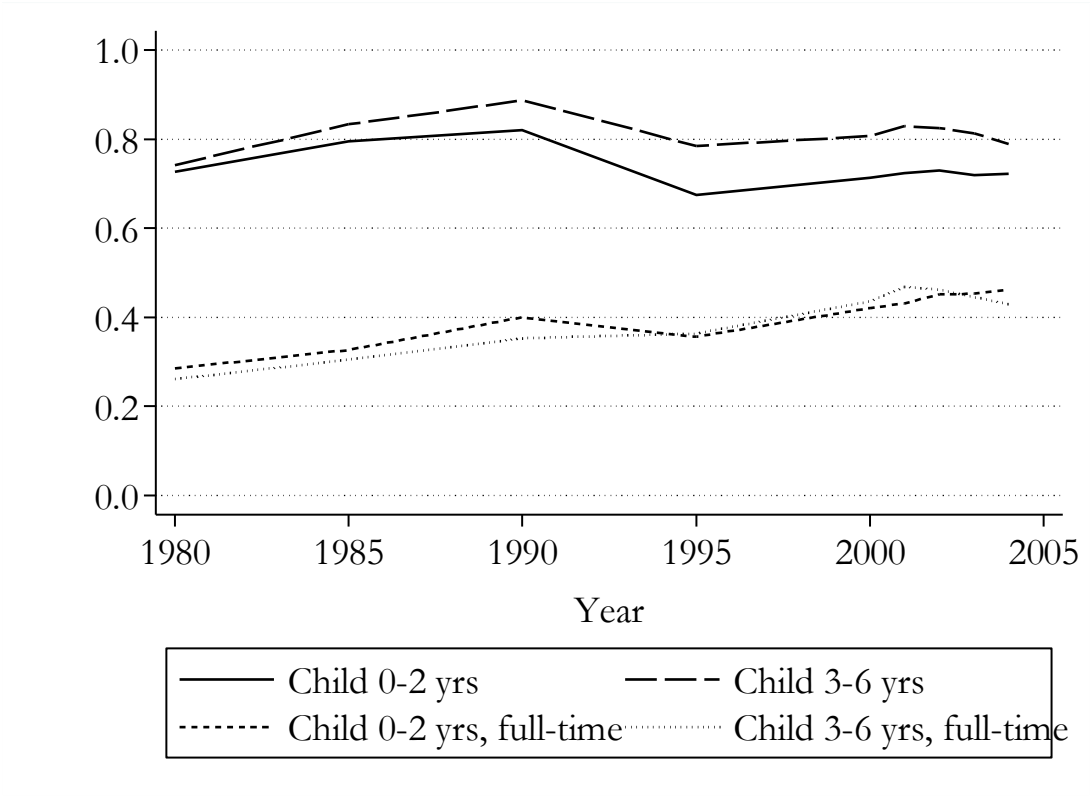
faced similar childcare charges regardless of where they live. Overall, childcare became cheaper as a result of the reform. In 1999, the median middle-income family with two adults and two children in pre-school paid SEK 2,660 (380 USD) per month, and childcare charges ranged from SEK 1,560 (260 USD) to SEK 3,940 (670 USD) depending on where the family lived (Skolverket, 1999). In 2002, after the implementation of the reform, a similar family paid SEK 1,900 (320 USD) on average for the care of their two children, and charges ranged between SEK 1,040 (175 USD) and SEK 1,900 (320 USD) (Skolverket, 2003). Hence, there was also some variation after the reform because municipalities were allowed to charge lower fees than indicated in the national schedule, a possibility that a tiny minority of the municipalities used.

2.3 Fertility and maternal labor supply in Sweden

From a European perspective, the labor force participation of Swedish women is high; it is about 88 percent of the male participation rate. Women are, however, more likely to work part-time than men. Part-time work is especially prominent among women with small children. One reason is that parents with small children have a legal right to work shorter hours (75 percent of full-time). As is shown in Figure 2, about 80 percent of women with small children are employed, and half of them work part-time. A closer examination of the work hours of women with small children shows that there are peaks at 100 and 75 percent, respectively (OECD, 2005).

In contrast to most OECD countries, where completed fertility rates have fallen considerable over the past few decades, completed fertility in Sweden has remained rather stable (see Björklund, 2006). The cohorts of women born 1926–59 had completed fertility rates around 2.0, with the highest rate (2.11) for the cohort born in 1943 and lowest rate (1.96) for the cohort born in 1945.

Figure 2 Fraction of women employed and working full-time for different ages of youngest child.

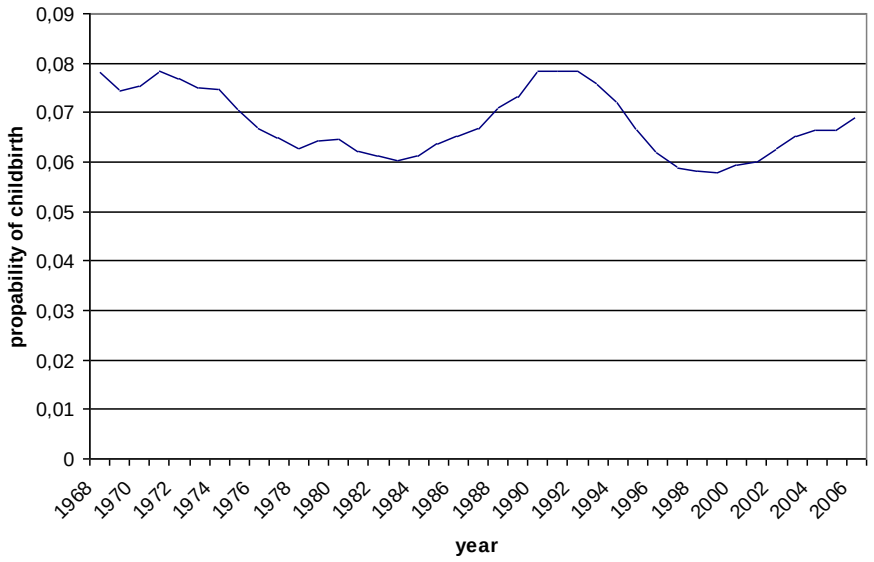


Source: OECD (2005)

Total fertility rates[12] of Swedish women, however, fluctuate substantially over time. Figure 3 shows the average number of children born per woman aged 20–45 in Sweden over the period 1968–2006. The figure demonstrates a recession in the late 1970s and early 1980s, followed by a boom in the late 1980s and early 1990s and lower levels again in the late 1990s. Total fertility rates have, however, picked up in recent years from an all-time low of 1.5 in 1999.

[12] Total fertility in a given year shows how many children a hypothetical woman would have in her lifetime if she had as many children at each age as women of a given age in that particular year.

Figure 3 The average number of children born per woman aged 20–45 in Sweden during the period 1968–2006.



Source: Statistics Sweden

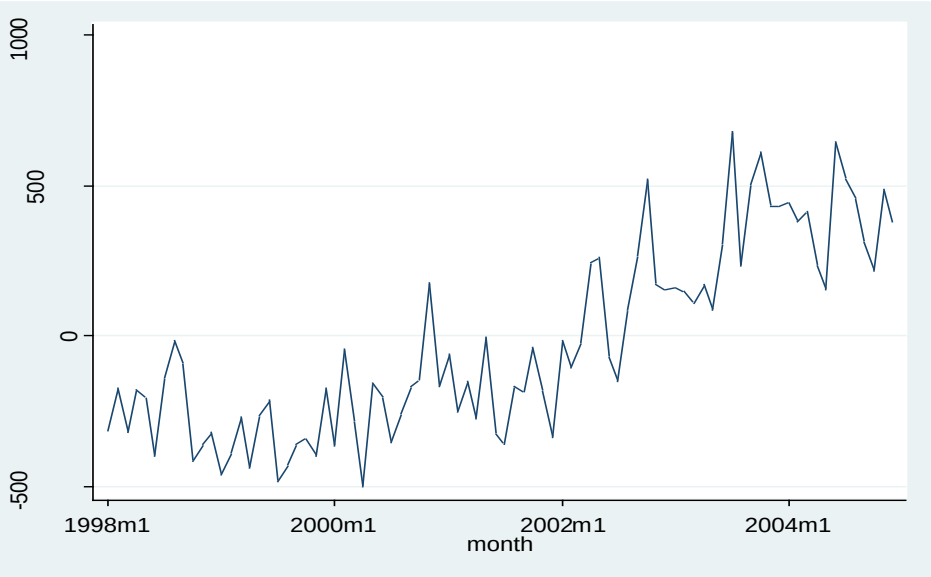
The fluctuations in total fertility largely mirror the development of the labor market with a lag of a few years, suggesting a link between the two. The correlation between total fertility and labor market opportunities is likely to depend on the design of the Swedish parental benefit system, which requires parents to qualify for income-related benefits by working prior to pregnancy and birth. The qualifying rules provide a strong incentive for women to postpone having children until they are established in the labor market (Björklund, 2006).[13]

Interestingly, these aggregate numbers show a slight increase in the number of children born after the Swedish childcare reform. Taking a closer look at the monthly number of births for the years around the reform, we see that the raw numbers do suggest that the increase in the birth rate is rather well timed in relation to the reform. Figure 4 shows the number of births in excess of the monthly average for the 1995–2004 time period by month from January 1998 through December 2004. The figure suggests that there is a take-off in births in spring of

[13] See Adsera (2004, 2005) for discussions of the link between unemployment and fertility in explaining cross-country differences in fertility.

2002. However, given the magnitude of the long-run cyclical fluctuations in fertility, we cannot readily interpret this increase as a causal effect of decreased childcare costs due to the reform. In order to establish a causal link, we need to show that the changes in fertility behavior across different types of households are, in fact, related to how these household types were affected by the reform. In the next section, we discuss the empirical methodology in detail and present the data used to investigate this link.

Figure 4 The monthly birth rate 1998–2004.



Source: Statistics Sweden.

3 Methodology and data

3.1 Econometric challenge

3.1.1 Empirical strategy

The problem that arises when one aims at estimating the effect of childcare costs on fertility is that observed childcare costs for a given household are typically determined by household characteristics that are also likely to directly influence fertility decisions. If the Swedish childcare reform had implied that changes in

childcare charges were truly random and thereby independent of household characteristics, it would be straightforward to estimate the effect of the cost changes on fertility. However, this was not the case. The fees were reduced more for some types of households than others. In order to achieve unbiased estimates indicating the causal effect of childcare costs on fertility, we therefore need to hold constant all household characteristics that determine both childcare charges and fertility decisions. In many applications, this means controlling for unobserved characteristics. However, a survey of childcare fees conducted by IFAU (for details, see Section 3.3) shows that fee schedules, both before and after the reform, are fully determined by a subset of observable household characteristics, which makes estimating causal effects possible.

We denote the subset of household characteristics[14] that determines childcare fees by Z and define J household types as households sharing the same characteristics Z_j where $j \in \{1,J\}$, such that in a given municipality *m* in a given time period, *t*, all households of type *j* have identical childcare costs. In other words, for households of type *j*, the household's childcare costs are a function $P_{mt}(Z_j)$. It follows that any variation in childcare costs within household type *j* in a given municipality is a result of changes in the fee schedule *P* over time. All possible direct effects of Z_j on fertility can be accounted for by including a fixed effect for each municipality-household type Z_{jm}. More formally, we estimate the following relationship:

$$Child_{ijmt}=\alpha+\beta P_{mt}(Z_j)+Z_{jm}+\tau_t+\varepsilon_{ijmt} \qquad (1)$$

where $Child_{ijmt}$ is the probability that the woman in household *i* of type *j*, in municipality *m* and in time period *t*, bears a child, and where τ_t is a time-fixed effect controlling for a common time variation in fertility. Including controls for household characteristics that influence fertility but do not influence childcare costs (e.g., maternal age and education) is not necessary for unbiased estimates of β,

[14] The variables that determine childcare charges are household income, the number of children and the age of each child. These are all available in Swedish register data, and it is therefore possible to compute each household's exact childcare fee both before and after the reform, on the assumption that all children of childcare-eligible age are enrolled in full-time childcare. We return to this issue in Section 3.4.

conditional on an assumption of homogenous responses to the price change. Including such controls may, however, increase efficiency, which is why we will do so in the analysis. See discussion in Smith and Todd (2005).

Our estimation strategy is to compare the probability that the women in households of a particular type, in a particular municipality, bear children during a time window of a given length prior to the reform to the probability that women in households of that same type in the same municipality have children in a time window of the same length after the reform.[15] The changes in fertility behavior are then related to the changes in childcare costs induced by the reform for the same household type across different municipalities and for other types of households in the same municipality. This strategy produces a difference-in-differences estimator, where households are matched and compared at the household type×municipality level. The resulting estimate of β, is the weighted-sum over all household types of the difference-in-differences estimates of fertility changes across municipalities and time within a given household type, where the weights are determined by the number of households grouped together for each household type j.

3.1.2 Potential challenges to identification

The identifying assumption behind equation (1) is that controlling for fixed time-effects and household type×municipality effect is enough to capture everything that varies at the household type level or at the municipality level and also correlates with the reform induced changes in childcare costs. One thing that the specification in equation (1) does not allow for is trends at the household type level or at the municipality level. If households with certain characteristics or households in some municipalities exhibit specific trends that are unrelated to the reform but co-varies with the price changes β can no longer be interpreted as a causal effect. This type of pattern may be due to underlying trends, unobserved changes in general policy or local reforms. Our strategy to avoid misinterpreting correlations as causations is to conduct placebo-experiments, where we estimate effects of the childcare reform already before the reform was announced. If we then find a statistically significant

[15] The reason that we compare household of the same type over time rather than to follow the same households over time is that the children in the households will be older after the reform than before and we believe that age of already born children is very likely to have a direct effect on the fertility behavior of mothers.

effect of the future reform, we will conclude that the model is not correctly specified and re-estimate the model allowing for different sets of trends and time-specific effects before interpreting the point estimates as causal effects.

Another issue of concern is whether the childcare reform had effects on the quality of the care provided and/or whether access to care was affected as a result of increased demand. Such effects could, potentially, confound the effects on fertility of a reduction in fees. As regards the provision of care services, the reform is not likely to have had any major impact on access to childcare because municipalities had been obliged by law to provide a child with childcare within 3 months of parental demand as early as 1993. This obligation did not change. The reform, however, implied guaranteed access to childcare for a minimum of 15 hours per week for the children of unemployed persons and parents on parental leave caring for new siblings of their older children. These are the reason for the increase in enrollment seen in Figure 1 above. However, as discussed earlier and shown inTable 1, the number of enrolled children per childcare employee, as well as the share of childcare employees with training in pedagogics, remained constant between 2001 and 2003. Furthermore, if anything, the total cost per enrolled child increased slightly between 2001 and 2003. Hence, there is no evidence that the reform implied lower-quality childcare.

Our identification strategy assumes that the reform induced cost changes for each household-municipality type are exogenous and do not depend on other characteristics affecting fertility decisions and fees. It is therefore problematic if families that were insensitive to the cost of childcare were more likely to reside in municipalities with high fees prior to the reform. In this case, the households receiving the largest reductions would be the least responsive to changes in childcare costs. Such a selection problem might lead us to underestimate the impact of the reform on fertility and may potentially bias our results against finding any effects. However, it is also possible that fees were high in some municipalities, prior to the reform, *in response* to an inflow of families demanding childcare for their children. It is not clear how such families bias the results. Another possibility is that the reform encouraged families planning more children to move to locations where they would receive large fee cuts. The method of reducing the biases

resulting from families' residence decisions due to the reform that we adopt in the analysis is to compute household childcare fees and register fertility in the municipality of residence prior to the reform. This implies that, if families move in response to the fee cuts we will register childbirths in the wrong municipality and, as a result, underestimate the magnitude of the effects. To make sure that our results are not driven by the, possibly endogenous, moving patterns of individuals, we also perform a robustness check where we exclude households that have recently moved into the municipality as well as households that move away from the municipality.

3.2 When do people react to the reform?

Several years passed after that the Social Democrats first launched the idea of a childcare fee reform in 1998 until the capped fees were actually implemented in 2002. Table 2 below presents different important dates for the reform.

Table 2 Timing of the reform

Year	***Event***	***First births potentially affected***
1998	Election promise and election victory of the Social Democrats	July 1999
1999	The fee reform bill is prepared in the government	July 2000
2000	Decision made at the central level	July 2001
2001	Decisions made at the local level	July 2002
2002	The capped fees implemented	July 2003

It is far from obvious when we should expect household to react to the reduced childcare fees. "True believers" with high trust in politicians election promises could potentially decide to have an additional child already when the Social Democrats won the election in the autumn in 1998. Taking the nine-month gestation period into account, July 1999 is in that case when we can expect to register births that are induced by the reform. If households on the other hand did not believe that the reform would be implemented until the reform bill was being

prepared,the first births affected by the reform would be in July 2000. In 2000 the decision was made at the central level to implement the reform, but it was still voluntary for municipalities to implement the capped fee-schedules and it was not until the end of 2001 that most local governments made the final decisions to implement the reform. Hence, it is possible that it was not until July 2002 that we can start to observe births affected by the reform. Most likely, some types of households reacted early whereas other types reacted late.

In order to account for the uncertainty about when households react, we estimate a reform effect for each year before and after the reform. Doing this, we are able to trace the dynamic response of household fertility to the reform process. Hence, we estimate a model where we first calculate the price change for each household type in year t, given the old and reformed fee schedule in each municipality and then interact this price change with a time dummy, τ_t, producing T-1 β-estimates, where T is the number of years of data. The equation we estimate is hence given by

$$\Delta Child_{jmt}=\alpha+\beta\tau_t\,\Delta P_m(Z_j)+\ \tau_t + \Delta X_{jmt} +\Delta\varepsilon_{jmt}, \qquad (2)$$

where $\Delta Child_{jmt}$ is the change in the probability that a household of type j in municipality m will have an additional child in a defined time window and ΔX_{jmt} is the change in mean characteristics that do not determine childcare fees, but are important for fertility decisions, in the household type – municipality cell. In particular, we include maternal age and education as a means to improve efficiency. In measuring $\Delta Child_{jmt}$ we define a set of 12-month time windows starting in July in each of the years after we observe households and ending in June the next year. Hence, household characteristics are measured in December of year t for $t=[1,\ldots,T]$ childcare fees are computed for January of year $t+1$ onwards, and fertility behavior is measures from July of year $t+1$ through June $t+2$.

3.3 Data

We use data from two sources. Information on fee schedules comes from a survey of municipal childcare charge tariffs conducted by The Institute for Labour Market

Policy Evaluation (IFAU).[16] Information on household characteristics and fertility comes from register data from Statistics Sweden.

We sample all couples in which the woman is 20–45 years old in each year 1996–2003, since these are the women "at risk" of being affected by the price change. Thus, we define household characteristics 1996 and births July 1998 to July 1999, characteristics 1997 and births July 1999 to July 2000, and so forth. Each year we exclude the women that gave birth in the previous 6 months, i.e. Jan_t–$June_t$ since these are not at risk of having another child. The selected time period implies that we have two years of data that are undoubtedly unaffected by the reform. This makes it possible to perform one true placebo-experiment, comparing changes in fertility for the sample of households 1996 to 1997 to changes in behavior for the 1997 and 1998 samples. The reason for not going further back in time is that the pre-reform fee schedules collected through the survey were those that were in place in 2001, and we do not have information about the schedules actually in place prior to this year. Therefore, the further back in time we go, the larger will the measurement error in our price measure be.

Because Swedish register data does not code cohabiting couples without common children as household units, our sample excludes unmarried women without children, single mothers, and cohabiting unmarried mothers whose partners are not the fathers of their children. For these women, we are unable to obtain a correct measure of household income because we cannot identify the potential father.[17] As a result, our analysis of first births is restricted to married couples. This is unfortunate because a high fraction of Swedish first-borns, more than two thirds, are born out of wedlock (www.SCB.se). The results we present for childless women are therefore not representative of the population of childless women because married couples are likely to differ from unmarried couples in several

[16] IFAU collected childcare fee data via an email request sent to all Swedish municipalities asking for exact formulas used to calculate prices in 2001–04. Information about the exact fee structure from 220 of Sweden's 290 municipalities was received. Comparing the pre-reform childcare costs for a number of type families in the municipalities that responded with those of the municipalities that did not respond (available in Skolverket, 1999), we conclude that the costs are very similar, which implies that we need not worry about selection based on a specific type of municipality.

[17] We have tried to impute household income for these unmarried childless women using predictions from the sample for which we observe both parents. Because we were unable to replicate our results for the married women using predicted household income, we judge that the results for unmarried childless women are too speculative and uncertain.

respects. It is, however, not clear if they should be expected to be more or less sensitive to changes in childcare fees than unmarried couples.

For the households in our sample, we obtain register-based information on the woman's age and education, the annual income for the woman and her partner, and the number of children living in the household and their respective ages. We also obtain register information on if and when the women give birth.

3.4 Computing childcare costs and birth rates

Childcare charges depend on a limited number of observable household characteristics. Given knowledge of these characteristics, we can compute the households' exact childcare costs. We compute the marginal cost of having one additional child by calculating the present value of total remaining cost of childcare assuming that the newborn will be enrolled in childcare at age 1 and continue in childcare until age ten.[18] We expect a negative effect of the marginal childcare cost on households' fertility decisions.

For households that already have children attending childcare, the reform also implied an income effect, since it became cheaper to have these children in childcare. We therefore also compute a measure of the present value of total remaining cost of childcare for the children already present in the household assuming that each child will be enrolled in full-time care until it reaches the age of ten (*cost of presently enrolled*).

Table 3 presents the present value of the remaining childcare costs according to the pre- and post-reform fee schedules for a marginal additional child (MC=marginal cost) and the children already present in households with children (SQ=status quo) (Columns 1 and 2) and for having a first child for households without children (MC=marginal cost) (Column 3) for the true reform year, 2002. When computing pre-reform costs, we apply the pre-reform fee schedules reported in survey responses. [19] Post-reform costs are computed using the reform fee

[18] Note that we do not observe whether children attend childcare or for how many hours they do so. The cost measure we calculate is based on the assumption that everyone attends childcare and after-school care full-time. We have further assumed that the families discount future costs exponentially with the discount rate 0.05. Within reasonable limits, the results are not sensitive to the choice of discount factor.

[19] The information collected by IFAU pertains to the fee schedules as they were in 2001. Information on prices scheduled prior to 2001 is not available, but the survey information suggests

schedule as it was stipulated by central government, thus assuming that the capped fees were implemented in the same way across the country.

As is clear from the table, comparing the pre-reform and post-reform costs for childcare, these decreased dramatically due to the reform. On average, the net present value of remaining childcare costs decreased by more than 50 percent. The drop in the standard deviation of childcare costs also shows that the variation in fees across households decreased radically when the reformed national fee schedule replaced local fee schedules.

Table 3 Pre-reform and post-reform remaining childcare costs in SEK 000s

	Households with children		*Households without children*
	Marginal cost of additional child, MC	Cost of presently enrolled children, SQ	Marginal cost of first child, MC
Pre-reform fee-schedules	107.113 (55.540)	109.015 (75.614)	150.132 (46.876)
Post-reform fee-schedules	47.408 (47.408)	53.936 (38.821)	62.123 (16.475)

Note: Average values. Standard deviations in parenthesis

The capping of childcare charges implied that the largest cost cuts occurred for households that initially had high childcare costs. In order to encourage a better understanding of which type of households experienced the largest cost reductions,

Table 4shows changes in total remaining childcare costs (marginal cost + cost for presently enrolled) at different parity and household income levels. Note that the largest cost changes occurred for well-off families that already had two children, while low-income households without children received a much smaller reduction

that there were no major changes in local fee schedules in the years prior to the reform. As a result, we use the fee schedule for 2001 to compute what the household pre-reform fee was in the years prior to 2001. Although inflation was minor during these years, we have denominated household incomes in 2001 prices using a consumer price index in order to achieve comparability across years.

in childcare cost. Although the within-family variation in childcare cost changes was smaller for families with low incomes or few children,

Table 4 also illustrates that the reform introduced substantial variation in costs for households with similar incomes and the same number of children.

Table 4 Change in present value of remaining childcare cost (*total cost*) for a household experiencing the birth of one additional child, SEK

Parity			*Household income*
	Low	Medium	High
No children	60.581	92.473	106.938
	(22.359)	(23.515)	(33.943)
One child	44.429	75.145	96.427
	(25.463)	(33.520)	(43.051)
Two or more	29.673	54.845	73.541
	(24.610)	(34.571)	(43.290)

Note: Average values. Standard deviations in parenthesis. Total remaining child cost =MC +SQ

3.5 Defining household types

The estimation strategy discussed in section 3.1.1. relies on comparisons of households that are identical with respect to all factors affecting both childcare fees and fertility but that experience different changes in childcare costs because they live in different municipalities. To achieve such a comparison, we need i) to define household types based on income, the number of children and the age of the children; and ii) to observe each household type in at least two municipalities, both before and after the reform. In defining household types, we therefore face a trade-off. The more narrowly we define household types, the more precisely is our measure of childcare costs, the smaller is the within-household variance in characteristics that determine childcare charges and, hence, the more truly random is the within-household variation in childcare costs. The drawback of defining

household types too narrowly is that we are less likely find matches over time for the same household type in at least two municipalities. Hence, the more precise are our household types, the less representative is the sample used for estimation.

This problem is fruitfully illustrated by the example of household income. Household income is a continuous variable, and it is therefore not possible to perform an unconstrained match. Doing so would prevent us from finding matches for most of our household types. Instead, we use monthly income spans of SEK 1,000 in 2002 prices. When attempting to match the exact age of each child, a similar problem arises. Instead, we choose to define household types by the number of children under the age of 10, the exact age of the youngest child and the age category of each of the next three youngest children, and the household's monthly income span. We consider the four youngest children in the household because only a few municipalities before the reform (and none after) charged fees for the fifth child or any thereafter. The age categories are defined in line with the typical age categories determining childcare charges: 1–3, 4–5 and 6–9.

4 Results: Effects of childcare costs on fertility

4.1 Baseline estimates

There are two different groups of potential parents that are likely to be affected by the reform differently; households with children and households with no previous children. For the former group the reform has both an income and a price effect, whereas for households with no previous children there is only a price effect. We will therefore estimate the model in equation (2) for each group separately.

Table 5 presents the result for families without children.[20] First we inspect the estimate on the first row, ΔMC_1997. Since the capped fee reform was first presented as an election promise in 1998 there could be no effect of the reform for the first year in our estimations. As expected the estimate for ΔMC_1997 is small

[20] This sample only includes married couples, since register data does not allow us to capture cohabiting couples without common children.

and insignificant, and suggests that there are no underlying trends in the specification. This specification will be our preferred one.

Variables	***ΔChild births per 1,000 women***

ΔMC_1997	-0.0214 *(0.0746)*
ΔMC_1998	-0.128 *(0.0911)*
ΔMC_1999	-0.0991 *(0.0807)*
ΔMC_2000	-0.171** *(0.0820)*
ΔMC_2001	-0.0463 *(0.0823)*
ΔMC_2002	-0.0477 *(0.0769)*
ΔMC_2003	-0.0596 *(0.0873)*
ΔWoman's age	-15.92*** *(0.315)*
ΔUniversity degree	53.29*** *(4.661)*
Year FE	Yes
Observations	44,917
R-squared	0.117

Note: Robust standard errors clustered at the municipal level in parenthesis. * indicates significance at the 10%-level, ** at the 5% level and *** at the 1% level. Household types are defined by household monthly income span of 1,000 SEK.

Table 5 Child care costs and fertility – Households without children

Turning to the other estimates we see that for the years 1998, 1999 and 2000 the point estimates are in the range -0.1– -0.17, indicating that higher marginal childcare costs do indeed decrease fertility. However, the only statistically significant point estimate is the one for 2000, suggesting that households reacted when the reform was passed in the parliament (see Table 2). At this time the households knew that children born July 2001- July 2002 would get the lower price when they turned one and thus where eligible for subsidized child care. The estimated effect is large, a household with an average reduction in fees

increased fertility with 9.0 percent. A back of the envelop calculation implies that a 10000 US dollar (or Euro) reduction in the present value of the future marginal child care costs would increase fertility rates with 7.5 (9.8) percent. The negative (but insignificant) estimates for 1998 and 1999 may suggest that a subgroup of the households anticipated the reform already when the Social Democrats won the election and reacted by having children.

Both control variables; the woman's age and education level are highly significant. Younger women are more likely to have children than older women and more highly educated women with a university degree are more likely to have a child than women with lower education.

Next we turn to the households who already have children in childcare age. The results are presented in

Table 6 below. Column (1) presents the result from the specification given by equation (2), i.e. a difference-in-difference specification at the household type × municipality level. Since the reform was first mentioned in the election campaign 1998 we should not expect to find any effect of the reform for the first year in our estimations (i.e. ΔMC_1997 and ΔSQ_1997). However, as is clear from the results, we do find statistically (and economically) significant coefficients on the variables capturing the future changes in prices (both for marginal cost and the "status quo"-costs). These estimates suggest a presence of preexisting time trends in the birth rates of household types that that correlate with future price changes. In column (2) we therefore estimate a model where we control for time-specific household type-effects.[21] Doing this, we find that the estimates for the pre-reform year 1997 are both statistically and economically insignificant. The specification in column (2) will therefore be our preferred specification.

Table 6 Childcare costs and fertility – Households with children

Variables	***ΔChild births per 1,000 women***

[21] We have also elaborated with a linear household-type trend, and a linear municipality trend respectively. Doing this, we still find an effect the first year, and we therefore reject those specifications. These results are available upon request.

ΔMC_1997	0.0484** *(0.0213)*	-0.0159 *(0.0234)*
ΔMC_1998	0.0503** *(0.0214)*	0.0437 *(0.0272)*
ΔMC_1999	-0.0408* *(0.0232)*	-0.0708* *(0.0400)*
ΔMC_2000	0.0413* *(0.0236)*	0.0345 *(0.0325)*
ΔMC_2001	-0.0125 *(0.0204)*	-0.0137 *(0.0249)*
ΔMC_2002	0.265*** *(0.0443)*	-0.0233 *(0.0220)*
ΔMC_2003	0.0238 *(0.0205)*	-0.000911 *(0.0265)*
ΔSQ_1997	-0.0744*** *(0.0194)*	-0.00914 *(0.0249)*
ΔSQ_1998	0.0291 *(0.0233)*	0.0788** *(0.0321)*
ΔSQ_1999	-0.0461*** *(0.0176)*	-0.0285 *(0.0307)*
ΔSQ_2000	0.00196 *(0.0215)*	0.0285 *(0.0324)*
ΔSQ_2001	-0.0531*** *(0.0202)*	-0.0388 *(0.0352)*
ΔSQ_2002	-0.244*** *(0.0369)*	0.0233 *(0.0345)*
ΔSQ_2003	0.00613 *(0.0192)*	-0.00185 *(0.0288)*
ΔWoman's age	-8.328*** *(0.112)*	-8.206*** *(0.113)*
ΔUniversity degree	25.77*** *(0.869)*	26.01*** *(0.867)*
Year FE	Yes	Yes

Household type×year FE	No	Yes
Observations	628,997	628,997
R-squared	0.022	0.069

Note: Robust standard errors clustered at the municipal level in parenthesis. * indicates significance at the 10%-level, ** at the 5% level and *** at the 1% level. Household types are defined by the number of children under the age of 10, the exact age of the youngest child, the age category (ages 0–3, 4–5, 6–9) of the next three youngest children and a household monthly income span of 1,000 SEK.

Turning to the parameter estimates for effects of a change in marginal cost on fertility in column (2) there is a weakly significant negative effect in 1999. This indicates that households with children reacted slightly earlier than households without children, i.e. when the proposal was prepared. The size of the parameter estimate is -0.071, which is a smaller effect than for households without children. Also, the estimates for the other years in which households could potentially have reacted, are not going in the same (negative) direction. Hence, the pattern for households with children is less clear than for childless households.

If we instead focus on the income-effect induced by the reform (the ΔSQ -estimates) we find a positive parameter estimate of 0.079 in 1998, indicating a *negative* income effect already when the Social Democrats won the election. A household with average reductions in childcare costs of about 56000, hence decreased their fertility with 4.4 children per thousand households, or 6 %.[22]

4.2 Robustness tests

In the analysis above, we have let "data talk" in the respect that we have accepted the specifications of the models if the placebo-results have shown zero-effects. For households without children, this implied accepting the DD-specification without additional trends. For households with children, zero-effects in the placebo tests required a specification with household-type time-specific effects. The identification hence relies on the assumption that such effects are lacking for households without children and that there are no underlying municipal trends in

[22] See appendix tables for average birth rates for different types of household types and average childcare cost reductions. 0.079*56.6)/74.37=0.06.

neither of the two household types. In order to test whether our results are sensitive to including these types of trends we conduct some robustness checks introducing different types of trends. However, one should be aware that including trends does not come without a cost; the more trends we allow for, less of the potentially identifying variation are used in the estimations.

According to the results in Table 5 households without children reacted to the price change by increasing fertility rates. The results presented in Table 7 columns (1) and (2) include household type×year fixed effects and municipality specific trends, respectively. Including household type and time fixed effects reduces the estimates somewhat and increases the standard errors substantially. Although the estimates are no longer statistically significant the general picture is the same as in the preferred baseline specification. When including municipality specific trends, the effect of marginal childcare costs fertility becomes stronger, and also the estimates for 1998 and 1999 are statistically significant on the 10 percent level.

Because one may worry that the result is driven by endogenous residence decisions we next re-estimate our preferred specifications excluding households that either recently moved to the municipality or moved from the municipality in the year of investigation. The result presented in column (3) shows parameter estimates that are slightly larger in magnitude

The robustness checks in Table 7 support our conclusion that the childcare fee reform induced married couples with no former children to increase fertility.

Table 7 Robustness check – Households without children

Variables	***ΔChild births per 1,000 women***		
ΔMC_1997	0.0109 *(0.117)*	-0.0519 *(0.0749)*	-0.0355 *(0.0766)*
ΔMC_1998	-0.0484 *(0.117)*	-0.158* *(0.0922)*	-0.102 *(0.0936)*
ΔMC_1999	-0.0624 *(0.107)*	-0.130* *(0.0781)*	-0.111 *(0.0849)*
ΔMC_2000	-0.102 *(0.102)*	-0.207** *(0.0863)*	-0.186** *(0.0872)*
ΔMC_2001	0.00426 *(0.110)*	-0.0814 *(0.0806)*	-0.0358 *(0.0861)*
ΔMC_2002	-0.00764 *(0.0964)*	-0.0823 *(0.0777)*	-0.0605 *(0.0822)*
ΔMC_2003	0.0115 *(0.117)*	-0.0911 *(0.0876)*	-0.0834 *(0.0863)*
Control variables	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Household type×year FE	Yes	No	No
Municipal trend	No	Yes	No
Excluding movers	No	No	Yes
Observations	44,917	44,917	43,442
R-squared	0.145	0.119	0.118

Note: Robust standard errors clustered at the municipal level in parenthesis. * indicates significance at the 10%-level, ** at the 5% level and *** at the 1% level. Household types are defined by the number of children under the age of 10, the exact age of the youngest child, the age category (ages 0–3, 4–5, 6–9) of the next three youngest children and a household monthly income span of 1,000 SEK.

Next, we turn to households that already have children in ages eligible for subsidized child care and test the robustness of the results in

Table 6. Column (1) in Table 8 presents the results when including municipality specific trends to the baseline specification. The borderline significant effect previously found now disappears although the point estimate is of similar magnitude as before. Column (2) shows the preferred specification from

Table 6 but excluding movers. This does not change the results found above; there is a price effect of the expected sign and a negative income effect.

Table 8 Robustness checks – Households with children

Variables	***ΔChild births per 1,000 women***	
ΔMC_1997	-0.0127 *(0.0232)*	-0.00700 *(0.0227)*
ΔMC_1998	0.0458 *(0.0294)*	0.0459 *(0.0278)*
ΔMC_1999	-0.0688 *(0.0419)*	-0.0641* *(0.0387)*
ΔMC_2000	0.0364 *(0.0327)*	0.0318 *(0.0306)*
ΔMC_2001	-0.0120 *(0.0264)*	-0.0138 *(0.0233)*
ΔMC_2002	-0.0217 *(0.0251)*	-0.0283 *(0.0216)*
ΔMC_2003	0.000634 *(0.0289)*	-0.0111 *(0.0278)*
ΔSQ_1997	-0.00232 *(0.0253)*	0.00569 *(0.0248)*
ΔSQ_1998	0.0850** *(0.0350)*	0.0726** *(0.0316)*
ΔSQ_1999	-0.0222 *(0.0322)*	-0.0386 *(0.0291)*
ΔSQ_2000	0.0341 *(0.0323)*	0.0316 *(0.0319)*

ΔSQ_2001	-0.0337 *(0.0366)*	-0.0415 *(0.0347)*
ΔSQ_2002	0.0286 *(0.0346)*	0.0145 *(0.0340)*
ΔSQ_2003	0.00271 *(0.0308)*	-0.00760 *(0.0303)*
Control variables	Yes	Yes
Year FE	Yes	Yes
Household type×year FE	Yes	Yes
Municipal trend	Yes	No
Excluding movers	No	Yes
Observations	628,997	614,025
R-squared	0.069	0.069

Note: Robust standard errors clustered at the municipal level in parenthesis. * indicates significance at the 10%-level, ** at the 5% level and *** at the 1% level. Household types are defined by the number of children under the age of 10, the exact age of the youngest child, the age category (ages 0–3, 4–5, 6–9) of the next three youngest children and a household monthly income span of 1,000 SEK.

4.2 Heterogeneous effects with respect to the number of children

From our preferred specification in

Table 6 we concluded that there is a marginally significant price effect and an income effect working in opposite directions; thus if anything, the change in marginal cost made families increase their demand for children, whereas the decline in the costs for the already present children decreased families' demand for children. However, in the group "families with children" households differ with respect to how many children they have before the reform and it is possible that effects differ by parity.

In

Table 9 we therefore allow the parameter estimates to differ for families with only one child and families with two or more children. Column (1) presents the results from the preferred baseline model, column (2) includes municipality specific trends and (3) excludes movers. The results confirm that households do in fact react differently to the reform depending on parity. Households with one child reacted to the lower marginal costs induced by the reform by postponing their births one year (there is positive effect in 1998 and a negative effect in 1999). Thus they postponed having children until the proposal was prepared in the government.

Households with two or more children, on the other hand, do not seem to react to reduced marginal costs; all the ΔMC2-estimates are statistically (and economically) insignificant. The negative income effect, however, is present at all parities. The results are not sensitive to the inclusion of municipality trends or to excluding movers.

Table 9 Childcare costs and fertility – heterogeneous effects with respect to parity

Variables	*ΔChild births per 1,000 women*		
ΔMC1_1997	0.000975	0.00605	0.0132
	(0.0363)	*(0.0362)*	*(0.0362)*
ΔMC1_1998	0.111**	0.116**	0.123**
	(0.0464)	*(0.0488)*	*(0.0487)*
ΔMC1_1999	-0.139**	-0.135**	-0.134**
	(0.0644)	*(0.0656)*	*(0.0620)*
ΔMC1_2000	0.0554	0.0588	0.0551
	(0.0547)	*(0.0550)*	*(0.0533)*
ΔMC1_2001	-0.0333	-0.0301	-0.0305
	(0.0414)	*(0.0433)*	*(0.0415)*
ΔMC1_2002	-0.0254	-0.0219	-0.0382
	(0.0337)	*(0.0361)*	*(0.0342)*
ΔMC1_2003	0.00347	0.00782	-0.00130
	(0.0346)	*(0.0366)*	*(0.0345)*

ΔSQ1_1997	0.0402 *(0.0528)*	0.0478 *(0.0536)*	0.0691 *(0.0553)*
ΔSQ1_1998	0.123* *(0.0697)*	0.131* *(0.0733)*	0.120* *(0.0713)*
ΔSQ1_1999	-0.0927 *(0.0655)*	-0.0852 *(0.0662)*	-0.102 *(0.0633)*
ΔSQ1_2000	0.0777 *(0.0663)*	0.0837 *(0.0662)*	0.0954 *(0.0661)*
ΔSQ1_2001	-0.0466 *(0.0693)*	-0.0410 *(0.0705)*	-0.0433 *(0.0677)*
ΔSQ1_2002	0.0573 *(0.0598)*	0.0631 *(0.0611)*	0.0298 *(0.0601)*
ΔSQ1_2003	-0.0529 *(0.0677)*	-0.0466 *(0.0695)*	-0.0527 *(0.0683)*
ΔMC2_1997	-0.0188 *(0.0260)*	-0.0171 *(0.0260)*	-0.00833 *(0.0263)*
ΔMC2_1998	-0.0328 *(0.0250)*	-0.0330 *(0.0262)*	-0.0409 *(0.0261)*
ΔMC2_1999	0.00188 *(0.0366)*	0.00206 *(0.0386)*	0.0114 *(0.0364)*
ΔMC2_2000	0.0242 *(0.0240)*	0.0248 *(0.0240)*	0.0248 *(0.0250)*
ΔMC2_2001	0.0136 *(0.0291)*	0.0139 *(0.0305)*	0.0113 *(0.0314)*
ΔMC2_2002	-0.00694 *(0.0388)*	-0.00739 *(0.0402)*	-0.00733 *(0.0361)*
ΔMC2_2003	-0.0258 *(0.0549)*	-0.0272 *(0.0563)*	-0.0422 *(0.0588)*
ΔSQ2_1997	-0.0373 *(0.0233)*	-0.0299 *(0.0237)*	-0.0314 *(0.0236)*
ΔSQ2_1998	0.0752** *(0.0326)*	0.0817** *(0.0347)*	0.0699** *(0.0321)*
ΔSQ2_1999	-0.00899 *(0.0353)*	-0.00225 *(0.0370)*	-0.0204 *(0.0348)*

ΔSQ2_2000	-0.00347 *(0.0290)*	0.00277 *(0.0285)*	-0.0119 *(0.0307)*
ΔSQ2_2001	-0.0409 *(0.0277)*	-0.0350 *(0.0311)*	-0.0474 *(0.0307)*
ΔSQ2_2002	0.000575 *(0.0460)*	0.00672 *(0.0454)*	-0.000150 *(0.0439)*
ΔSQ2_2003	0.0239 *(0.0378)*	0.0291 *(0.0394)*	0.0181 *(0.0391)*
Control variables	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Household type×year FE	Yes	Yes	Yes
Municipal trend	No	Yes	No
Excluding movers	No	No	Yes
Observations	628,997	628,997	614,025
R-squared	0.069	0.069	0.069

Note: Robust standard errors clustered at the municipal level in parenthesis. * indicates significance at the 10%-level, ** at the 5% level and *** at the 1% level. Household types are defined by the number of children under the age of 10, the exact age of the youngest child, the age category (ages 0–3, 4–5, 6–9) of the next three youngest children and a household monthly income span of 1,000 SEK.

Conclusions

We have explored the effect of reducing childcare costs on the fertility behavior of Swedish families. We explore the variation in costs induced by a childcare fee reform which was announced as a Social Democratic election promise in 1998 and was implemented in 2002. The reform lowered the marginal cost of having additional children, but also implied a positive income shock for families that already had children enrolled in childcare. Our analysis of the dynamics of

childbirth for the years around the reform suggests that married couples without children reacted already to the election victory of the Social Democrats in 1998 by having children. Households with one child did not increase their total demand for children, but appear to have postponed second births until they were more certain that the reform would indeed take place. However, families with two or more children did not react at all to the reduction in the marginal cost. We find a negative income effect of reduced childcare costs for families that already had children.

Married couples without previous children was the only group, of those analysed that increased fertility as a response to the reform. The reform implied a reduction of child care costs of on average 86 200 SEK (11 900 USD). The effect was to increase fertility rates with 9 percent. Given that couples that marry prior to having children is a select group in Sweden and make up only about a third of first births, it is not possible to generalize the result to the first birth in general. Yet, we can compare the magnitude of the estimated effect with the findings of other studies that investigate the effect of other economic incentives on fertility. Milligan (2005) investigates the effects of a pro-natalist transfer policy implemented in Quebec, in which mothers received a cash bonus for giving birth. Using the exogenous variation created by the reform, he finds that there is a substantial impact of childcare allowances on fertility rates. Milligan finds that a cash bonus of 1,000 Canadian Dollars (USD 950) increased fertility by 16 percent. Laroque and Salanié (2004), instead, apply a structural model of maternal labor supply and fertility to French data and family policies (although ignoring the effects of childcare). In simulations, they find that increasing mothers' earnings reduces fertility but that increasing child support during the first three years, with what would correspond to a present value cash transfer of some USD 20,000, would increase fertility by a quarter. Finally, Cohen et. al. (2009) find, investigating the effects of Israeli child subsidies, that a reduction of USD 34 in monthly subsidies for a marginal child decreases fertility by 8 percent. The effects found in this study for childless households are somewhat smaller in magnitude.

How can we understand the effects? Elinder et al (2008) shows that the election promise indeed had an impact on voting behavior. It hence appears that the promise was regarded as credible, which makes it more comprehensible that young married

couples went ahead and had children, knowing that they would benefit from lower child care costs. It is, however, hard to assess if the effect on first births have any impact on cohort fertility. The timing effect on families with one child, suggests however that the reform did not increase the demand for children beyond the strong two child norm present in Sweden. Instead, this group of households may have postponed the second child to make sure they benefitted from the low cost for a maximal time period.

The reduction in fertility in response to lower childcare costs for the children already in enrolled childcare is suggestive of a negative income effect for families with children, in line what is found for some groups of households in Cohen et al (2009). Although speculative, it is possible that the reduction in child care costs may have increased parents investments in the quality of the children they already had rather than having more children. It is also possible that this group of parents feared childcare quality would decline as a result of lower childcare fees. The fact that Lundin et al (2008) finds zero-effects on labor supply of mothers with young children, is compatible with the idea that these mothers chose to continue to work part time rather than having children. Fewer children implies an increase in average labor supply for the group as a whole (because fewer parents go on leave), but this effect may have been off-set by a reduction in hours to spend time with the children they already had.

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Appendix

Table A.1 Variable definitions

Child: Dummy that takes the value 1 if the household had a child in an 18-month period
Marginal cost: The present value of the cost of an additional child enrolled in full-time child care until the age of 10. **Status quo childcare cost:** The present value of the child care costs associated with having the family's existing children enrolled in full-time childcare until the age of 10. **Age:** Age of the women in the households minus the median age (34) **University:** Dummy that takes the value 1 if the woman in the household has some university education The data is collapsed at the household-municipal level, and therefore one observation will be the household type × municipality average×year **Age 35+:** Dummy variable taking the value 1 if the woman in the household is 35 or older. **Childless couple:** Dummy variable taking the value 1 if the household has no children **One child:** Dummy variable taking the value 1 if the household has one child **Two children:** Dummy variable taking the value 1 if the household has two children **Three or more children:** Dummy variable taking the value 1 if the household has three or more children.

Table A.2 Birth rates per 1000 women 1997-2001 and mean characteristics in 2000

	Childless households	Households with children		
Variable		all	one child	at least two children
Births per 1000 1997: July1998-June 1999	142.66 (138.49)	74.37 (163.97)	118.98 (198.17)	34.31 (111.23)
Births per 1000 1998: July1999-June 2000	146.64 (155.10)	71.83 (169.56)	114.38 (204.24)	34.59 (120.12)
Births per 1000 1999: July2000-June 2001	154. 12 (162.12)	71.75 (173.15)	113.02 (206.25)	35.18 (126.53)
Births per 1000 2000: July2001-June 2002	164.62 (171.25)	73.68 (177.20)	114.46 (208.90)	35.95 (130.83)
Births per 1000 2001: July2002-June 2003	172.82 (176.63)	78.39 (183.53)	119.18 (213.90)	38.84 (137.13)
ΔMC 2000, SEK 1000	-86.62 (32.98)	-57.58 (39.24)	-62.81 (41.25)	-52.74 (36.63)
ΔSQ 2000, SEK 1000		-56.62 (44.55)	-45.31 (42.85)	-67.08 (43.52)
age of woman 2000	33.88 (3.79)	34.70 (4.33)	35.33 (4.95)	34.11 (3.56)
University educated 2000	0.37 (0.26)	0.29 (0.31)	0.29 (0.29)	0.29 (0.33)
Monthly household income 2000, SEK	36954 (17840)	33120 (13738)	33235 (13819)	33014 (13661)
Number of household types Number of households	8055 36732	136468 323795	55613 155580	80855 168215

Note: Standard deviation in parenthesis

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