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A LONGITUDINAL STUDY OF THE EFFECT OF SUBSIDIZED CHILD CARE ON MATERNAL EARNINGS[1,2,3]

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Abstract

The effect of subsidized child care on maternal employment has been widely studied. Although the focus has been primarily on the extensive margin response, the subsidy can also have an important effect on the intensive margin, i.e., on the earnings of mothers who do return to work after giving birth. To reconcile work with child care, a mother can reduce working hours or choose "mother-friendly" work in response to high child care costs. This adjustment can decrease maternal earnings directly in the short term and indirectly in the long term by reducing the accumulation of human capital and labor market experience. Using a unique panel database on subsidy recipients in Israel, this paper adopts a difference-in-differences strategy and estimates that subsidized care for working mothers with children up to age 3 increases their earnings in the short run (during subsidy receipt), but has no significant effect on their earnings in the long run. The results suggest that, at least for the margin studied, reducing hours worked or choosing "mother-friendly" work in the treatment years does not impede the accumulation of human capital to such an extent that it affects later earnings.

Keywords: Child-Care Subsidies, Maternal Employment, Difference-in-Differences

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1. INTRODUCTION

Mothers with young children are less involved in the labor market, and earn less than other women. One of the explanations for this in the literature is the cost of child care, which increases the cost of working for mothers. The effect of child care cost on the maternal employment decision has been widely studied. There is a high variation in magnitudes of estimated elasticity across the studies. However, most of the studies find that child care cost has a significant negative effect on female labor supply and hours worked (Connelly, 1992; Ribar, 1995; Anderson and Levin, 2000).[4] Estimates for Israel show that child care cost has a significant negative effect on maternal labor supply with an elasticity of 0.14, which means that a 1 percent increase in spending on child care reduces the likelihood of a mother to work by 0.14 percent (Shachar 2012).

In order to support maternal employment, there has been an increase in the implementation of policies designed to reduce the negative effect of child care. Many countries subsidize child care in order to lower its cost and improve child care provision (Germany, Norway, Netherlands, Spain, US, Israel, France, and others). To evaluate the impact of this policy, a rich literature of the effect of child care subsidies on maternal employment has been developed. The results in this literature are mixed. In some countries, like Germany and Spain, subsidized child care was found to have a strong positive effect on maternal employment. In other countries, like Norway and Sweden, the subsidy does not have a significant impact on female labor supply. The vast majority of the studies evaluate the effect of public reforms that primarily provide subsidized child care countrywide. Only a few studies evaluate the employment effect of limited means-tested programs on the employment decisions of eligible mothers who actually receive the subsidy in comparison to eligible non-recipients.

This study supplements the limited existing literature on subsidized child care for actual subsidy recipients, using data from Israel, where child care up to age 3 is subsidized for low-income families only. The study exploits the fact that slots in subsidized child care centers in Israel are severely rationed—approximately one quarter of eligible mothers are given a slot for their children. This is a result of the existing policy regarding construction of subsidized child care centers in Israel, which is primarily exogenous to the regional employment situation. Using the difference-in-differences approach, the study compares the outcome for actual subsidy recipients with children up to age 3 (treatment group) to eligible mothers with children of the same age who do not receive a subsidy (control group), assuming that the primary reason for not receiving the subsidy is the severe shortage of slots in the area of maternal residence. These two groups are of the same age and have similar work characteristics such as mothers' and spouses' earnings. However, the average number of

[4] For a broad literature survey of the effect of child care on female labor supply, see Gong et al. (2010).

children in a family is different between the groups, which is a result of prioritizing subsidized care for families with more children when other eligibility criteria are similar.

This study contributes three main elements to the existing literature. First, the effect is evaluated for mothers with very young children—from 4 months up to age 3 (ages of treatment in subsidized child care in Israel), while the existing literature focuses primarily on children aged 3–5 years. The cost of care is the highest, and its negative effect on maternal employment is stronger, during the first years of childhood. Therefore, understanding the effectiveness of the subsidies is important. Second, the unique panel data make it possible to evaluate the effect separately for each treatment year (during three years of the subsidized childcare) in order to ascertain which treatment year has the greatest effect on maternal earnings. Third, the long period covered by the panel data—11 years—allows us to estimate the long-term subsidy effect in order to understand whether this effect continues in the post-treatment years. A few previous studies estimate the persistence of the effect of the public child care reform for children aged 1–5 years. They primarily use cross-sectional datasets (Nollenberger and Rodriguez-Planas, 2011), without identifying actual recipients (Lefebvre et al., 2009), and they focus primarily on the participation effect or hours worked.

Estimation of the long-term effect of the child care subsidy is based on unique longitudinal data of actual recipients in Israel. The administrative dataset of the Israel Tax Authority includes a panel of earning records of a representative 10 percent sample of employed women between 2003 and 2013. The data contain a rich set of socioeconomic characteristics, including information on spouses and children, and indicate the use of subsidized child care. Using the data, the study focuses on working mothers only, and analyzes how child care cost affects maternal earnings in the short and long term.

In the short term, a working mother earns less after giving birth than before. One of the reasons for this is a change in employment behavior in order to deal with the potentially high cost of child care. The employment adjustment occurs in several ways that decrease maternal earnings: a working mother can reduce working hours or move to a job that is more "mother-friendly", offering flexible hours, on-site care, or close proximity to child care (Felfe, 2012). The negative effect of the child care cost on maternal earnings may be reduced by the child care subsidy. Consequently, the earnings of those mothers who benefit from this would have more positive dynamic in the years during which they receive the subsidy.

In the long term, the subsidy may have a positive effect assuming that it reduces the depreciation of human capital or moderates the slowdown of its accumulation that occurs as a result of a mother's employment adjustment: weakened matching of the mother's skills with the job because of the move to a "mother-friendly" job or the reduction of working hours. Finding a significant subsidy effect in the long term would mean that the subsidy reduces the negative impact of maternal employment adjustment, and does, indeed, affect the human capital accumulation of working mothers in the early years of motherhood, which in turn increases future maternal earnings as well as current earnings.

The difference-in-differences estimation confirms that subsidizing child care for women with children up to 3 years old has a positive effect on maternal earnings during the years of subsidy receipt. During the three years of treatment (the years in which the child is in a subsidized child care facility), the earnings of actual subsidy recipients were 5.9 percent higher (standard error 0.017) in the first treatment year, 8 percent higher (standard error 0.028) in the second year, and 3.6 percent higher (standard error 0.018) in the third year. These results show that the child care subsidy decreased the negative effect of child care cost in the first years of child raising. The results of the estimation prove the validity of the control groups: The treatment and control groups have the same pre-treatment trend, and they are similar after controlling for observables. Additional robustness checks confirm these findings.

However, there is no significant evidence for the subsidy's effect after the treatment period. The earnings of mothers after the treatment period are similar for the treatment and control groups. The results suggest that the child care subsidy does not affect human capital accumulation to an extent that affects later earnings, and for working mothers, child care subsidies in the first three years after giving birth have only a temporary effect. The results differ from the findings in research on the long-term effect of public child care reforms in Canada and Spain, which estimate a persistent positive effect on maternal earnings and working hours (Lefebvre at el., 2009; Nollenberger and Rodriguez-Planas, 2011). These studies evaluate the total effect of public reforms that include several additional measures such as an increase of coverage of subsidized child care facilities, an increase of operating hours at the care centers, and a dramatic price cut (up to free use of care), while the current study evaluates the effect of the subsidies in Israel, which are significantly lower.

Analyzing the final effect of the subsidy may prove difficult because the sample in the study includes only working mothers, and not mothers who drop out of the labor market after giving birth because they don't receive a slot in the subsidized system. Taking into account the change in composition when weaker persons drop out of the control group but remain in the treatment group would increase the estimated results.

The rest of this paper is organized as follows. Section 2 summarizes the empirical literature on subsidized child care and its effect on maternal employment; Section 3 provides an overview of the child care policy in Israel; Section 4 presents the methodology; Section 5 describes the dataset in detail; Section 6 presents and discusses the empirical results; specification checks are presented in Section 7; and Section 8 concludes.

2. LITERATURE REVIEW: THE EFFECT OF CHILD CARE SUBSIDIES ON THE EMPLOYMENT OF MOTHERS WITH YOUNG CHILDREN

In recent decades, a variety of child care programs have been implemented in many countries in order to support working families and increase female employment. The monetary cost of these programs became a significant part of the government budget, and in order to evaluate

the effectiveness of the programs, extensive research has been developed. These programs provide an opportunity to explore the variation in child care cost based on exogenous factors by using experimental and quasi-experimental approaches. The existing studies primarily apply two methods: the instrumental variable method based on exogenous aspects such as date-of-birth cut-off rules that define eligibility for public child care (Bauernschuster and Schlotter, 2015; Gelbach, 2002); and the difference-in-differences method based on regional differences in the expansion of the reforms (Lefebvre and Merrigan, 2008; Schlosser, 2007; Landin et al., 2008).

Policy on subsidized child care may be categorized into two main types: universal and targeted. The first is common in continental and Nordic European countries where it is implemented primarily through broad public reforms that include an increase in child care subsidy (for example in Norway), and an increase in the capacity of high-standard public child care centers (for example, in Spain and Germany). Most of the research findings in these countries show that the subsidies have a positive effect on maternal employment. Evaluating the introduction of universal public child care for children from age 3 in Germany in 1996, Bauernschuster and Schlotter (2013) find evidence of a large positive effect on labor force participation of mothers. Using two identification strategies—difference-in-differences and instrumental variable—they show that a 10 percentage point increase in public child care provision increases employment of mothers whose youngest child is 3–4 years old by around 3.5 percentage points. Similarly, in Spain, the introduction of free public care for children from age 3 in 1991 had a significant and positive effect (Nollenberger and Rodriguez-Planas, 2011). The authors exploit geographic and time variation in public child care using difference-in-differences and triple-differences models, and find that the policy increased the employment of mothers with 3-year-old children by 8 percent and hours worked by 9 percent. The size and persistence of the effect is stronger for high school educated mothers in comparison to less educated mothers. In Quebec, Canada in 1997, implementation of a new policy for children aged 4 (transformation of the care from part-time to full-time, increase of slots, and a highly subsidized price) increased the participation rate of mothers with preschool-aged children by 8.1 percent and increased yearly earnings by $3,000-$5,000 (Levebvre and Merrigan, 2008).[5] Schlosser (2007) investigates the effect of providing universal public child care for children aged 3–4 years in Israel using the gradual introduction of free education across the country. She focuses on the employment of Arab mothers and finds that the policy had a substantial positive effect for educated mothers (12+ years of education).

However, studies in some other countries with high female employment rates found little or no evidence that universal child care had an effect on maternal employment (for example, Norway and Sweden), or found an effect only for a specific group such as single mothers (for

[5] In Canada, as in the US, subsidized child care is very small. As an exception, in 1997 Quebec province initiated a new child care policy. Under this policy, all eligible children received a slot in highly subsidized child care centers.

example, in Netherlands and France). Havnes and Mogstad (2011) study the effect of the expansion of subsidized child care in Norway from 1976. Exploiting the temporal and spatial variation in child care coverage, they find that substantial expansion of subsidized care has little effect on the employment of married mothers—0.06 percentage point increase in maternal employment for every percentage point increase in the child care coverage rate—and the costly reform primarily crowded out informal care arrangements. In Sweden, a child care price reform in 2002 introduced a cap on child care prices and lowered the average cost of care from 10 percent per family to 4 percent, but had no significant effect on the labor supply of married mothers (Lundin et al., 2008). In the Netherlands, an increase in child care subsidies decreased the parents' monthly fees by 50 percent, but had relatively little effect on maternal employment with substantial budgetary costs (Bettendorf et al., 2015). Goux and Maurin (2010) found that subsidized care had no significant effect on the employment of married mothers in France. They use a regression discontinuity design to evaluate the effect of the introduction of universal pre–elementary school for 3-year-olds in the mid-1990s. For married mothers with children aged 2 and 3, they do not find evidence of discontinuities in the relationship between the mothers' labor market participation and their children's ages. The significant positive effect of the reform is found only for single mothers. Another study on child care reform in France in 2004 finds that a reduction of around 50 percent of a family's expenditure on child care results in an increase of just 1.5 percent in women's labor force participation, encouraging the "crowding out" of informal care (Givord and Marbot, 2015).

The second type of subsidized child care policy is more common in Anglo-Saxon countries, where child care support for young children up to 5 years old is provided by social programs targeting specific population groups, mainly low-income working families, single mothers, or welfare recipients. Eligibility for the subsidy is means-tested based on specific individual characteristics, and this makes it more difficult to find exogenous variation in the cost of child care. In contrast, however, the social programs, targeted at the group of interest with regard to employment outcomes, provide unique data about individuals who actually receive the subsidies and whose employment behavior would be affected by it. Literature on the child care subsidy's effect on maternal employment of actual recipients is limited. This is probably due to a lack of appropriate data. Berger and Black (1992) use data from two Kentucky social programs that provide child care subsidies for low-income families. The programs provide subsidized slots in licensed daycare conditional on a mother working at least 20 hours per week. The authors compare the labor supply of single mothers who received child care subsidies with those on the subsidy waiting list before and after entering the waiting list. Berger and Black find that single mothers who received subsidized care are more likely to be employed, but the subsidies have little effect on hours worked. The results show that the average weekly subsidy of $46 induced an increase of 8–25 percentage points in maternal employment. Blau and Tekin (2007) investigate the effect of the PRWORA program[6] in 1996 that substantially increases funding for child care subsidies, and gives states

[6] Personal Responsibility and Work Opportunity Reconciliation Act (PRWORA).

flexibility in setting subsidy program rules. The authors use the subsidy rationing policies of different counties as identifying instruments under the assumption that employment status does not depend on how the subsidies are rationed. Using a 2SLS model, Blau and Tekin find that the program increased the employment of single mothers by 4.6 percentage points.[7]

While previous literature focuses primarily on the effect of subsidized child care on female participation, this study focuses only on working mothers and analyzes how child care cost affects mothers' earnings. After childbirth, a working mother is confronted with potentially high child care costs, and adjusts her employment by reducing working hours or moving to "mother-friendly" work, which could mean flexible hours, on-site care, or close proximity to child care (Felfe, 2012). According to the compensating wage differential theory, choosing "mother-friendly" work would decrease maternal earnings. This theory assumes that utility from employment includes pecuniary and non–pecuniary benefits, and a worker will trade off desirable non–pecuniary job amenities with wage. Therefore, a mother can substitute a job's convenience for child care with wage (Felfe, 2006). Child care subsidies reduce child care costs and the extent of the maternal employment adjustment after childbirth, resulting in a decrease of the negative effect of the cost of child care on maternal earnings.

According to extensive empirical research on the motherhood wage gap, work interruptions and a decrease in working hours can cause depreciation in human capital, and may affect the long-term earnings of mothers (Mincer and Polacheck, 1974; Becker, 1985; Polachek, 1995; Budig and England, 2001). In addition, giving priority to "mother-friendly" conditions rather than to professional considerations may harm the professional work experience of a mother and may affect her future earnings as well.[8] Implementation of family supportive policies may narrow the motherhood gap in the long term. For example, maternity leave coverage raises women's work retention over the course of the childbearing years, and thus works to raise women's wages by increasing work experience and job tenure and by allowing them to maintain good job matches (Waldfogel, 1998B).

A few studies analyze the persistence of the effect of universal child care reform on maternal employment. Nollenberger and Rodriguez-Planas (2011) find that the employment effect persists strongly among mothers with a high school education, and there is no long-term effect for less-educated mothers (high-school dropouts) and mothers with a college degree. The estimation shows that the reform led to relative increases of 8.3 percent and 7.1 percent in the employment of mothers with a high school degree in the first and second years after the reform's implementation. The increase in hours worked is stronger—10.4 percent and 11.2 percent for the same period of time. Lefebvre et al. (2009) investigate the long-term

[7] For a detailed overview of the studies on actual subsidy recipients see Blau (2003), and Blau and Currie (2004).

[8] Other sources of the "motherhood gap" that are listed in this literature are differences in productivity, whether real or perceived (statistical discrimination by employers), and selection (women with children may differ from childless women in ways that are correlated with earnings) (Waldfogel 1998A).

effect of the introduction of universal child care for 4-year-old children in Quebec, Canada. The authors find that the reform had a substantial dynamic labor supply effect on mothers who have a high probability of using subsidized care. The significant effect is estimated for participation, annual weeks worked, annual hours worked, and earnings. The effect is driven by an increase in labor supply of less educated mothers, and is found only in the triple-differences estimation. Haeck et al. (2015) evaluate the impact of a Canadian reform over more than 10 years after its implementation. They find that the policy had a persistent positive effect on labor force participation of mothers, mainly highly educated ones.

Recent empirical literature primarily analyzes the participation effect of subsidized child care, but understanding whether the subsidy affects maternal earnings is no less important, especially for policy design targeted at working mothers to decrease the motherhood wage penalty. Exploiting unique, rich panel data on actual recipients with young children, the current study presents results that could complete the gap of information on the child care subsidy's effect on maternal earnings in the short and long terms.

3. AN OVERVIEW OF THE ISRAELI SUBSIDIZED CHILD CARE SYSTEM FOR CHILDREN UP TO AGE 3

In Israel, child care for children from the ages of 4 months to 3 years is provided through a subsidized public child care system that includes child care centers and pre-nurseries. Until 2016, this system was regulated by the Ministry of Economy.[9] The Ministry regulates the authorization, operation and supervision of these facilities and sets prices. The child care institutions are usually open during a full working day—approximately 10 hours. Acceptance into the regulated system is based on uniform criteria set by the Ministry. Because the subsidized system targets mainly working families, the primary acceptance criterion is the parents' employment status and the number of the maternal working hours. Only mothers who work approximately a half-time job or more are eligible for a slot in the subsidized child care system.[10] Another requirement for eligibility is the father's employment or studies.

The fees in these centers are high—approximately 25–30 percent of female mean earnings in Israel, but low-income working families are eligible for a subsidy. The average subsidy is about 44 percent of the full monthly fees. The sum of the subsidy depends on family income, and is calculated according to the per capita labor income of the nuclear family. The highest subsidy goes to families with a very low income, whose per capita income is only 15–18 percent of the mean per capita labor income of a family in Israel. Such a family receives a subsidy equal to 72 percent of the monthly child care fees (Table 1).

[9] In 2016, the financing and management of subsidized child care centers was transferred from the Ministry of Economy to the Ministry of Labor, Social Affairs, and Social Services.

[10] There are several additional eligibility statuses, such as unemployment benefits receivers, full–time students, and new immigrants.

The subsidy decreases as a family's per capita income increases, so families whose per capita income is higher than 72 percent of the mean per capita labor income of an Israeli family, pay full fees.

Table 1
Subsidy as a percentage of child care fees according to family income, 2016

Family income level	Subsidy Percentage
(Family per capita labor income as a percentage of mean family per capita labor income in Israel)	(Subsidy as a percentage of monthly fees in the child care center)
15 – 18	72
19 – 28	68
29 – 36	60
37 – 40	52
41 – 44	43
45 – 48	35
49 – 52	25
53 – 56	17
57 – 60	10
61 – 72	5
73 – and higher	0

Source: The Ministry of Labor, Social Affairs and Social Services and author's calculations.

However, only a few eligible working families manage to get a slot in the supervised system because these slots are severely rationed—approximately one-quarter of eligible mothers in Israel receive a slot for their children. Because of the severe shortage of slots in subsidized care, the Ministry of Economy appoints special committees to decide who will be accepted into the supervised child care centers. The committees' decisions are based on uniform rules, and the main priority criterion during the researched period was the number of children in a family. Families with a larger number of children were given priority while all other characteristics of the eligible mothers were similar.

The study exploits the severe shortage of slots in subsidized care, assuming that families who are eligible for the subsidy (on average 44 percent of the monthly fees) do not use subsidized care because of the lack of slots. We need to deal with the main concern of the estimation, which is the possible correlation of maternal earnings with the geographical spread of child care centers. Historically, the vast majority of subsidized child care centers were built independent of the employment situation in the municipalities, and based primarily on the number of housing units in the neighborhood. Subsidized child care centers in Israel are usually established when new neighborhoods are built. According to the pre–2004 standards policy, for every 1,000 new housing units, one center with three care rooms was

built. In 2004, this was changed to 1,650 housing units (Spector, 2010). Building a subsidized center in an existing neighborhood is an extremely complex bureaucratic process with financing and land allocation problems. To receive financing from the government for a new subsidized center in an existing neighborhood, the local authority has to find appropriate land in the area, arrange a permit from the Israel Land Authority and be able to finance part of the project. This process often takes many years. For example, in January 2012, in order to deal with the severe shortage of slots, the government approved construction of 500 subsidized child care centers during the next 5 years and allocated the necessary funds. In the first three years, only 5 percent of the planned centers were built due to the cumbersome bureaucratic process. As a result, at the end of 2014, the formal procedure for establishing new subsidized centers was simplified.[11] Due to this bureaucratic complexity, the geographic distribution of the existing centers primarily reflects historical urban development, which is unrelated to the current labor market situation, or adapts to it with a large delay, if at all. However, to ensure that the estimation is not biased by endogeneity (availability of subsidized child care by municipalities), the regression includes a municipality fixed effect.

4. METHODOLOGY

The effect of subsidized care on earnings is evaluated by the difference-in-differences approach, which estimates the child care subsidy's effect on maternal earnings by comparing changes in the earnings of the treatment group with a valid control group over the short and long term. The treatment group includes eligible mothers with a child up to one year old in the first treatment year (2006), who received subsidized care. The treatment period covers the years when a child is in subsidized care, up to 3 years old. The control group includes mothers with a child up to age one in 2006, who were eligible for the subsidy but did not receive it. Eligibility for subsidized care is based on the eligibility criteria set by the Ministry of Economy. These criteria are uniform countrywide.

The key identification assumptions of this difference-in-differences estimation strategy are: 1) that the treatment and control groups have the same trend in pre–treatment earnings development of mothers and, 2) that there are no unobserved variables that change differently over time and affect the earnings of these groups differently. Regarding the latter, during the research period, in the end of 2008, the EITC (Earned Income Tax Credit) was paid for the first time in Israel. The credit is aimed at working families with children and the amount depends on the parent's earnings. However, during the first years of the EITC implementation in Israel the credit was paid to a limited number of workers and those in pilot areas only (less than one percent of all workers), so it is reasonable to assume that the credit had no significant

[11] In mid–2016, the government decided to transfer the financing and management of subsidized child care centers from the Ministry of Economy to the Ministry of Labor, Social Affairs, and Social Services, and to simplify the construction process.

effect on the studied population. Regarding the common trend assumption, it may be tested in the pre-treatment years using the panel data. In Section 6, a placebo treatment effect is estimated by including controls for each pre-treatment year in order to determine whether the treatment and control groups have the same trend in earnings.

Another requirement for unbiased estimation is no change in the composition of the treatment and control groups during the research period. In order to test whether the estimation results are influenced by a change in the composition of the groups, an additional estimation is provided in Section 7 that includes only persons appearing in the panel during the entire period of the study in 2003–11 (a balanced panel).

The estimation tests whether child care cost can negatively affect mothers' earnings in the short and long terms. The long-term effect may be explained by the fact that the subsidy decreases the negative impact of child care cost on employment, and thus affects human capital accumulation and earnings. The time period covered by the data allows for testing the theory over the short and long terms as well, by controlling for treatment effect in each year of the treatment period (2006–2008, short term effect) and after the treatment period (2009–2013, long term effect).

To overcome the main concern of the estimation that maternal earnings may be correlated with the geographical spread of child care centers, the estimation includes a municipality fixed effect.

The estimation of the treatment effect on earnings is expressed in the following equation:

$$Y_{it} = \beta_1 + \beta_2 T_{it} + \beta_3 D_{it} + \beta_4 Z_{it} + \beta_{5j} \sum_{j=2003}^{2013} (T_{ij} x D_{ij}) + \beta_6 S_s + \varepsilon_{ist}$$

where Y is the outcome variable (ln of mean monthly earnings in a year), i indexes individuals and t indexes time; T is a year fixed effect that captures the time effect common to the treatment and control groups; D is a group fixed effect that captures constant differences in earnings between the two groups; Z is a vector of socioeconomic characteristics of the individuals (such as family status, place of residence, number of persons in a family and spouse's earnings); and S is a vector of municipality dummies. The coefficient β_5 on the interaction term between year and treatment variables ($T_{uj} x D_{ij}$) captures the effect of the intervention—the impact of receiving the child care subsidy on earnings—between the two groups during the years, and ε is the error term.

5. DATA

The dataset used in this study is a unique panel of administrative earning records for 2003–13 from the Israel Tax Authority. It includes a representative 10 percent sample of the employed women in Israel. The sample is based on ID number. Only mothers with a specific

digit in a specific place in the ID number are sampled. The dataset contains annual employment data such as earnings, months worked, deductions, sector of employment, and spouse's earnings. The dataset contains a unique individual identifier that allows it to merge with two other administrative registers: Ministry of Interior data that include demographic information (age, year of immigration, number and age of children, family status, locality of residence) and Ministry of Economy data that include individual information on all children in subsidized care in 2006/2007, including the size of the subsidy, care provider, location of the center, and child's characteristics. The latter database is based on care providers' reports that contain detailed information on each child. The Ministry of Economy, which finances the subsidized care, decides who will receive the subsidy, and the amount, based on these reports.

The sample includes working mothers with children up to one year old in the first treatment year (2006) who are eligible for the child care subsidy. The main challenge of the data is an absence of educational information. Although the maternal wage before the intervention may control for the level of education, most of the mothers with children up to 3-years old are young workers at the beginning of their professional careers. Therefore, to overcome a lack of information on the mother's education, the sample was restricted to women who were at least 23 years old at the beginning of the panel—the usual age for women to complete a Bachelor's degree in Israel. At the beginning of the panel, the group fixed effect captures the differences in education level between treatment and control groups.[12] Educational changes during the panel period are controlled through the Israel Tax Authority information on tax benefits for completed post-secondary education, which are granted for one year after completion. Despite the low rate of utilization of tax credit points among mothers with children, mothers who have completed a Master's degree are likely to be earning a salary that allows them to utilize the credit points.

The final data limit the sample to working women who had a child up to one year old at the beginning of the treatment (2006), and who were eligible for the subsidized rate in the subsidized child care centers. The eligibility for the subsidy was calculated according to the Ministry of Economy's uniform criteria, which include parents' employment status and a means test (per capita labor income of the nuclear family).[13] The calculation is based on the parents' earnings in the year prior to the treatment (2005).

The study covers a long period of time—11 years—in which some mothers dropped out of the labor market. Table 2 shows that there were some differences in the employment rate of the two groups before the intervention in 2006. In 2003, the share of working mothers was higher in the treatment group, but the gap narrowed in the following years and closed in 2006. After the intervention in 2006, as expected, the share of mothers leaving the labor force was significantly higher in the control group than in the treatment group.

[12] Due to the mandatory two years of military service for women, the age of completing post-secondary education is higher in Israel than in other countries.

[13] See Fichtelberg-Barmatz (2008) and Fichtelberg-Barmatz et al. (2010) for more details.

Table 2
Changes in the employment rate in the treatment and control group during 2003–2013, 2006=100%

	Group		p_value
	Treatment	Control	
2003	90	86	0.000
2004	90	87	0.001
2005	93	91	0.021
2006	**100**	**100**	**.**
2007	97	93	0.000
2008	93	89	0.000
2009	90	85	0.000
2010	91	86	0.000
2011	90	86	0.000
2012	90	86	0.000
2013	90	86	0.000

In order to keep the composition of the treatment and control groups constant, the study focuses on women who were employed for most of the period, at least 2/3 of the studied period (mothers who worked 8 years or more between 2003 and 2013). Tightening this restriction does not change the results. The final database contains 30,960 observations for the years 2003–2013. In the first treatment year, there are 424 eligible mothers who benefited from the subsidized care and 2,255 eligible mothers who did not. Table 3 presents baseline summary statistics for the treatment and control groups. Mothers in the treated and control groups are of the same age. The work characteristics of the two groups are relatively similar—there are no significant differences in the months worked and the earnings of mothers and spouses in the groups. As a result, family income is similar in the two groups, but child care subsidy recipients are much more likely to have a lower per capita family income because in the treatment group the number of young children and children in general is larger. This is consistent with prioritizing subsidized care to families with more children when all other eligibility criteria are similar. Although the earning characteristics of mothers in the treatment and control groups are quite similar, it is still possible that they differ in the number of hours worked. One of the acceptance criteria for subsidized child care is the number of maternal hours worked (a mother has to work at least 22–24 hours a week), but this information is not available in our data, and we evaluate whether a mother works a minimal number of hours based on the legal minimum hourly wage.

Table 3
Descriptive statistics*

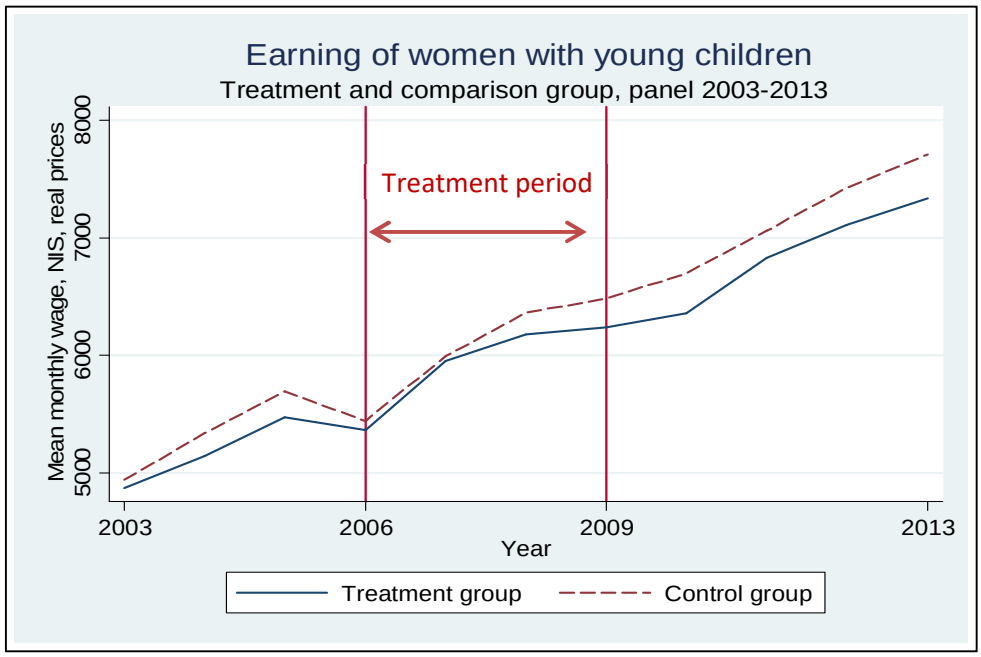
Variables	Group		p–value of difference
	Treatment	Control	
Age	31.9	31.8	0.682
Months worked	9.4	8.9	0.680
Immigrants	0.11	0.18	0.001
Single mothers	0.08	0.12	0.013
Arabs	0.06	0.08	0.095
Ultra-Orthodox	0.12	0.06	0.000
Working in the public sector	0.50	0.37	0.000
Spouse's monthly earnings in 2005	4,229	4,487	0.290
Children up to 3 years old	1.83	1.40	0.000
Children up to 18 years old	3.31	2.48	0.000
Spouse is employed in 2005	0.67	0.64	0.188
Family income in 2005	9,057	8,727	0.234
Persons in a family in 2006	5.23	4.35	0.000
Family's per capita labor income, 2005	2554	3321	0.000
Monthly subsidy eligibility, NIS	747	736	0.585
Mother's monthly earnings in 2003	4,524	4,472	0.756
Mother's monthly earnings in 2004	4,772	4,903	0.485
Mother's monthly earnings in 2005	5,158	5,413	0.086
Mother's monthly earnings in 2006	5,138	5,280	0.392
Mother's monthly earnings in 2007	5,655	5,505	0.442
Mother's monthly earnings in 2008	5,712	5,813	0.613
Mother's monthly earnings in 2009	5,591	5,750	0.488
Mother's monthly earnings in 2010	5,895	6,184	0.170
Mother's monthly earnings in 2011	6,285	6,491	0.344
Mother's monthly earnings in 2012	6,574	6,718	0.535
Mother's monthly earnings in 2013	6,848	6,911	0.806
Number of observations in 2006	424	2,555	
Number of observations in the panel	4,406	26,554	

* The treatment group includes mothers with a child up to one-year old who were eligible for subsidized child care and received it in 2006. The control group includes mothers with a child up to one-year old who were eligible for subsidized child care in 2006 but did not receive it.

The share of immigrants is lower in the treatment group. This is probably because immigrants are less informed about subsidies and eligibility criteria. Single mothers use less subsidized care as well, and around 30 percent of the single mothers in the sample are immigrants. In order to control for the differences between the control and treatment groups the estimated regression includes controls for being an immigrant, being a single mother, and other demographic characteristics.

Figure 1 shows the average monthly earnings by year from 2003 to 2013 for mothers who received subsidized care (treatment group) and those eligible who did not (control group).

Figure 1



The graph shows that while earnings of women in the control group before the intervention were a little higher than those of women in the treatment group, the earnings of both groups evolved with a very similar trend over time. As expected, maternal earnings declined in both groups during the year of childbirth. However, mothers in the treatment group started to receive subsidized care, and seem to have experienced less of a wage decrease. As a result, the initial gap in earnings of the two groups narrowed and eventually almost closed. After two years of subsidized care, the effect of the subsidy seems to be weaker. The gap reappears, and remains until the end of the researched period. The results of the regression estimations point to the significance of changes in the gap during the period of subsidized care.

6. RESULTS

Table 4 presents the main results of the estimation. The baseline regression (Model 1) includes only the dummy variables for time and treatment and their interactions (Table 4, Model 1). The next two models control for the mothers' individual (Model 2) and local (Model 3) characteristics. In addition, the last specification (Model 4) includes a fixed effect of place of residence in order to control for the variation in the availability of subsidized child care centers between municipalities. Interaction terms between year and treatment variables express the effect of the subsidies in each specific year. In the years before the treatment, the coefficients of the interactions are insignificant. During the years of receipt of subsidized care (coefficients of the interactions Treatment*2006, Treatment*2007, Treatment*2008 in Model 1) the baseline estimation provides significant positive results. The main results remain positive and significant after controlling for additional covariates in Models 2, 3 and 4. The estimated effect of the individual characteristics is consistent with standard findings in the analysis of earnings growth: the mothers' age is positively correlated with their earnings, while with each additional year earnings increase less; the presence of additional young children reduces maternal earnings growth; working in the public sector has a positive effect on maternal earnings; and weaker social groups such as single mothers, immigrants, ultra-Orthodox Jews, and Arabs are less likely to increase their earnings in the years of the panel.

The regression results indicate that there are no significant differences between the treatment and control groups because the treatment variable is insignificant. The regression results confirm the key identifying assumption of a common pre-treatment trend in the earnings of mothers who benefit from the child care subsidy, and those eligible mothers who do not receive the subsidy, since the interaction of the treatment term and pre-treatment years (Treatment*2003, Treatment*2004) are insignificant.

The interpretation of the main results is that subsidized care increases maternal earnings only while the subsidy is received (during the treatment period). In the first treatment year, mothers in the treatment group earned 5.9 percent (standard error 0.017) more than mothers in the control group, in the second year the gap widened to 8 percent (standard error 0.028), and in the third year, it narrowed to 3.6 percent (standard error 0.018). The results show that subsidies reduce the negative effect of child care costs on maternal employment, and that the earnings of the subsidy recipients grow more quickly.

Table 4
Effect of subsidized care on maternal earnings

Variables	Model 1	Model 2	Model 3	Model 4
Treatment	– 0.0282	-0.0292	-0.0020	0.0192
	-0.0241	(0.0235)	(0.0228)	(0.0235)
Treatment*2003	0.0277	0.0238	0.0245	0.0276
	-0.0262	(0.0262)	(0.0264)	(0.0266)
Treatment*2004	0.0096	0.0077	0.0090	0.0115
	-0.0244	(0.0243)	(0.0243)	(0.0244)
Treatment*2006	**0.0626*** **	**0.0573*** **	**0.0607*** **	**0.0593*** **
	-0.0174	**(0.0166)**	**(0.0166)**	**(0.0169)**
Treatment*2007	**0.0754*** **	**0.0797*** **	**0.0817*** **	**0.0810*** **
	-0.0285	**(0.0282)**	**(0.0284)**	**(0.0284)**
Treatment*2008	**0.0323* **	**0.0411** **	**0.0377** **	**0.0365* **
	-0.0182	**(0.0182)**	**(0.0187)**	**(0.0186)**
Treatment*2009	0.0181	0.0216	0.0199	0.0176
	-0.0276	(0.0292)	(0.0292)	(0.0290)
Treatment*2010	0.0057	0.0102	0.0119	0.0067
	-0.0282	(0.0289)	(0.0294)	(0.0290)
Treatment*2011	– 0.0051	-0.0078	-0.0078	-0.0125
	-0.034	(0.0362)	(0.0364)	(0.0368)
Treatment*2012	0.0314	0.0335	0.0261	0.0222
	-0.0356	(0.0362)	(0.0359)	(0.0360)
Treatment*2013	0.0131	0.0266	0.0074	0.0063
	-0.0281	(0.0295)	(0.0299)	(0.0304)
Age		0.0785***	0.0681***	0.0675***
		(0.0053)	(0.0047)	(0.0044)
Age^2		-0.0007***	-0.0006***	-0.0006***
		(0.0001)	(0.0001)	(0.0000)
Single mother		-0.0515*	-0.0559**	-0.0489*
		(0.0302)	(0.0269)	(0.0270)
Ultra-Orthodox		-0.0678**	-0.0797***	-0.1071***
		(0.0291)	(0.0228)	(0.0181)
Arab		-0.1519***	-0.1173***	-0.1109***
		(0.0236)	(0.0223)	(0.0227)
Immigrant		-0.1660***	-0.0235	-0.0841***
		(0.0340)	(0.0394)	(0.0261)
Works in Public Sector		0.1207***	0.1233***	0.1129***
		(0.0229)	(0.0217)	(0.0226)
Children aged 0– 5		-0.0279***	-0.0182*	-0.0167*
		(0.0091)	(0.0100)	(0.0099)
Children aged 6– 9		-0.0128	-0.0216**	-0.0191**
		(0.0081)	(0.0088)	(0.0084)
Newborn in family after 2006		-0.0359***	-0.0396***	-0.0388***
		(0.0123)	(0.0123)	(0.0122)
Individual characteristics		+	+	+
Municipalities characteristics			+	+
Municipalities FE				+
N	30988	30961	30920	30920
R^2	0.0353	0.1033	0.1239	0.1616

Standard errors in parentheses. *** p<0.01 ** p<0.05 * p<0.10

A comparison of the coefficients of all four models in Table 4 shows that adding controls results in only a small change in the magnitude of the estimated effect of the subsidies. The estimated effect in the short term is consistent with findings in the existing literature, which show that child care subsidies increase maternal earnings and hours worked (for example, Nollenberger and Rodriguez-Planas, 2011; Levebvre and Merrigan, 2008).

However, there is no significant evidence of a subsidy effect after the treatment period.[14] The post-treatment earnings growth of mothers is similar for the treated and control groups. The results suggest that the subsidies do not have a significant impact on human capital accumulation of working mothers, and thus do not affect later earnings. This result is different from the findings in previous studies, such as Nollenberger and Rodriguez-Planas (2011) and Lefebvre et al. (2009). These studies analyze the employment effect of broad public child care reforms in Spain and Canada, which include an extremely high subsidized share of the care price (75–100 percent) in comparison with the average 44 percent in Israel. Furthermore, the reforms comprised additional measures such as an increase in the slots in the subsidized care and an extension of the hours of care. The possible explanation for the differences in the results is that the findings in Spain and Canada reflect the cumulative effect of all benefits included in the public reforms, while this study only evaluates the effect of the subsidy, which is significantly lower than in both Spain and Canada.

7. ROBUSTNESS TESTS

a. Restriction of time period

The study examines the subsidy effect on working mothers only, over a long period of time—11 years. In order to keep the composition of the studied population constant, it is important to focus on mothers who are significantly involved in the labor market during the research period. This is to ensure that the significant positive results do not reflect the impact of new workers who join the labor market after the treatment period, or those who leave their jobs during the years of the panel. Therefore, the main estimation includes mothers who worked at least 2/3 of this period—that is, at least 8 years during 2003–2013. To be stricter with the sample definition and to eliminate the effect of composition change, an additional estimation is performed using a smaller sample that includes only mothers who worked during the entire period. The number of observations is reduced almost by a third, but the main findings remain the same (Table 5).

[14] In Israel, children aged 3–4 are treated in pre-compulsory kindergartens that are operated by the local authorities. The kindergartens are supervised by the Ministry of Education with pretty high participation rates of relevant-aged children.

Table 5
Specification checks:
Alternative definition of the sample: only mothers who worked the entire period of the panel 2003–2013

Variables	Model 1	Model 2	Model 3	Model 4
Treatment	– 0.0307	– 0.0179	0.0021	0.0302
	(0.0260)	(0.0240)	(0.0233)	(0.0241)
Treatment*2003	0.0413	0.0362	0.0363	0.0389
	(0.0276)	(0.0285)	(0.0285)	(0.0286)
Treatment*2004	0.0159	0.0172	0.0175	0.0185
	(0.0188)	(0.0190)	(0.0189)	(0.0191)
Treatment*2006	0.0542***	0.0524***	0.0537***	0.0530***
	(0.0138)	(0.0139)	(0.0139)	(0.0140)
Treatment*2007	0.0769***	0.0811***	0.0812***	0.0798***
	(0.0183)	(0.0179)	(0.0181)	(0.0180)
Treatment*2008	0.0320*	0.0381**	0.0357**	0.0342**
	(0.0163)	(0.0158)	(0.0158)	(0.0158)
Treatment*2009	0.0234	0.0270	0.0253	0.0223
	(0.0228)	(0.0230)	(0.0234)	(0.0233)
Treatment*2010	– 0.0177	– 0.0164	– 0.0142	– 0.0194
	(0.0294)	(0.0297)	(0.0300)	(0.0297)
Treatment*2011	0.0046	0.0035	0.0043	– 0.0011
	(0.0283)	(0.0296)	(0.0298)	(0.0299)
Treatment*2012	– 0.0140	– 0.0111	– 0.0166	– 0.0219
	(0.0377)	(0.0387)	(0.0387)	(0.0389)
Treatment*2013	– 0.0069	0.0020	– 0.0117	– 0.0112
	(0.0277)	(0.0284)	(0.0286)	(0.0288)
Individual characteristics		+	+	+
Municipalities characteristics			+	+
Municipalities FE				+
N	22012	21996	21976	21976
R^2	0.0587	0.1195	0.1414	0.1937
rmse	0.5290	0.5120	0.5058	0.4923

Standard errors in parentheses. *** p<0.01 ** p<0.05 * p<0.10

b. Alternative eligibility definition

Eligibility for subsidized child care is calculated based on Ministry of Economy criteria—the family's per capita labor income. To avoid behavioral effects, the study uses the pre-treatment income (2005) to evaluate subsidy eligibility for each mother in the sample. We conduct an additional robustness test by defining the sample based on earnings data two years

before the intervention—2004. Since childbirth may be a planned event, it is possible that maternal earnings in 2005 were affected by an expected birth. Therefore, we define a new sample of mothers eligible for child care subsidy based on their earnings in 2004. Table 6 presents results of the estimation where the eligibility identification is based on family income two years before the treatment (2004).

Table 6
Specification checks:
Alternative eligibility definition: based on 2004 income

Variables	Model 1	Model 2	Model 3	Model 4
Treatment	-0.0726**	-0.0556*	-0.0249	-0.0097
	(0.0294)	(0.0286)	(0.0267)	(0.0285)
Treatment*2003	0.0485	0.0381	0.0376	0.0377
	(0.0259)	(0.0262)	(0.0259)	(0.0261)
Treatment*2004	0.0145	0.0090	0.0103	0.0111
	(0.0167)	(0.0175)	(0.0171)	(0.0174)
Treatment*2006	**0.0660*** **	**0.0664*** **	**0.0686*** **	**0.0678*** **
	(0.0179)	**(0.0179)**	**(0.0177)**	**(0.0179)**
Treatment*2007	**0.0775*** **	**0.0869*** **	**0.0871*** **	**0.0869*** **
	(0.0271)	**(0.0272)**	**(0.0270)**	**(0.0271)**
Treatment*2008	**0.0298***	**0.0396** **	**0.0363** **	**0.0356** **
	(0.0169)	**(0.0169)**	**(0.0167)**	**(0.0167)**
Treatment*2009	0.0328	0.0359	0.0350	0.0333
	(0.0223)	(0.0240)	(0.0238)	(0.0237)
Treatment*2010	-0.0034	-0.0010	0.0006	-0.0019
	(0.0287)	(0.0287)	(0.0290)	(0.0288)
Treatment*2011	0.0077	0.0058	0.0039	0.0002
	(0.0336)	(0.0344)	(0.0343)	(0.0348)
Treatment*2012	0.0400	0.0422	0.0320	0.0299
	(0.0358)	(0.0362)	(0.0358)	(0.0359)
Treatment*2013	0.0202	0.0284	0.0077	0.0047
	(0.0271)	(0.0273)	(0.0273)	(0.0277)
Individual characteristics		+	+	+
Municipalities characteristics			+	+
Municipalities FE				+
N	31836	31809	31768	31768
R^2	0.0362	0.0907	0.1163	0.1506
rmse	0.5910	0.5742	0.5661	0.5567

Standard errors in parentheses. *** p<0.01 ** p<0.05 * p<0.10

The results are very similar to our previous findings: The subsidized care increased maternal earnings during the three years of the subsidy. In the years after that, there are no significant differences in the earnings of mothers in the treatment and control groups. However, estimation of the baseline regression (Model 1) shows significant differences between the groups, which disappear after adding controls for mothers' individual and local characteristics in Model 3, and a fixed effect of place of residence in Model 4.

8. CONCLUSION

Mothers with young children earn less than other women earn. This gap, often referred to in the literature as the "motherhood gap", is a result of factors such as a work interruption, a decrease in working hours, and a shift to "mother-friendly" work that is more convenient for child-raising but pays less. In order to mitigate the negative effect of child care on maternal earnings, a variety of family-supporting policies were implemented. This study examines the effect of child care subsidies on the employment of mothers with children up to 3 years old, using unique longitudinal administrative data from Israel covering 11 years. While most of the rich empirical literature primarily focuses on the participation effect of subsidized child care, this study analyzes the subsidy's effect on working mothers only, evaluating the effect on maternal earnings. After giving birth, in response to the potential high child care cost, maternal earnings are affected by an adjustment of maternal employment. Mothers reduce working hours and/or move to "mother-friendly" work giving priority to flexible workplace options that allow for a balancing of work and child care commitments. Family-supporting policies like child care subsidies mitigate the employment adjustment effect on maternal earnings.

Using the difference-in-differences approach, we find that child care subsidies reduce the negative effect of child care costs on maternal employment. A comparison of earnings of eligible mothers who actually received subsidized care (treated group) and eligible mothers who did not benefit from the subsidy (control group) shows that mothers who received the subsidy earned more in all three years of receiving the subsidy. The highest cumulative effect of the subsidy is in the second treatment year, while the most effective yearly effect is in the first treatment year when a mother deals with the highest child care cost.

However, there is no significant evidence of a post-treatment subsidy effect. The earnings growth of mothers after the treatment period is similar in both the treatment and control groups. Similarly, Brender and Strawczynski (2015) show that wages of mothers in Israel return to their pre-birth trend 2–3 years after birth. The results are different from previous findings in long-term research, such as Lefebvre et al. (2009) and Nollenberger and Rodriguez-Planas (2011), who find that subsidized childcare has a long-term effect. These studies analyze the effect of broad public reforms and reflect the cumulative effect of all benefits included in the reforms, while the current study focuses solely on the effect of child care subsidy. This study provides an opportunity to understand that, in addition to the fact

that subsidies are much higher in the public reforms, there are additional factors that play a significant part in the strong impact of the public reforms such as an increase of coverage of subsidized child care facilities and an increase of operating hours at the care centers. All these factors together are very important in the long term.

The main results indicate that subsidizing of child care for children up to 3 years old indeed decreases the negative effect of child care on maternal employment. The size of the effect on maternal earnings is relatively moderate in the short-term and insignificant in the long-term.

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