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on the labour supply
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Tuomas Kosonen

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Abstract

This paper studies the effect of child-care subsidies on maternal labour supply. In the Finnish child-care system, parents taking care of their children at home receive a relatively generous home-care allowance. I use variation arising from changes in the municipality-specific supplement to this allowance to identify the causal effect of subsidies on the labour force participation of parents. A municipal supplement creates plausibly exogenous variation in subsidies, since the opportunity to take them up depends on municipal-level rules, but not on changes in individual labour supply decisions. Moreover, a supplement policy affects labour supply in a transparent way since the amount of supplement one is eligible for does not depend on income. Robustness checks indicate that the results are not driven by policy endogeneity or residential sorting. I find a large negative effect on the labour force participation and income of mothers. 100 euros higher supplement per month reduces the maternal labour supply by 3 per cent. The estimated effect is larger for higher-educated than for medium-educated mothers.

Key words: Labour supply of parents, child care subsidies, participation tax rate

JEL classification numbers: H2, J13, J22

Tiivistelmä

Tämä artikkeli tutkii kuinka paljon vanhemmille annettu tuki vaikuttaa heidän työn tarjontapäätöksiinsä. Suomessa pienten lasten äidit ovat oikeutettuja saamaan kotihoidontukea, jos he hoitavat lastaan itse kotona. Kotihoidontuen kuntalisä tarjoaa vanhempien työn tarjontapäätöksistä riippumatonta vaihtelua tukien suuruuksissa. Kuntalisissä on paljon ajallista ja alueellista vaihtelua, mikä mahdollistaa luotettavan kausaalipäätelmän tekemisen tukien vaikutuksista työn tarjontapäätöksiin. Lisäksi kuntalisä ei useimmissa tapauksissa riipu vanhempien

tuloista. Kotihoidontuen havaitaan vaikuttavan suhteellisen paljon vanhempien työn tarjontaan. Jos kotihoidontukea korotetaan 100 eurolla kuukaudessa, pienentää se tulosten mukaan äitien työllisyyttä noin 3 prosentilla. Yllättäen enemmän koulutetut reagoivat herkemmin työn tarjonnan kannusteisiin kuin hieman vähemmän koulutetut äidit.

Asiasanat: Lasten hoidon tuki, vanhempien työn tarjonta, osallistumisvero

JEL-luokittelu: H2, J13, J22

1 Introduction

A key question faced by most industrialized countries concerns policy measures aimed at increasing labour supply. With ageing populations, a smaller workforce will have to provide for a larger retired share of the population. At the same time it has proved difficult to extend working lives through changes in retirement policies (Lindbeck and Persson (2003) and OECD (2009)). This has led to increased attention towards the study of labour supply decisions in different phases of working age. One important gap in working lives occurs when parents have children. Mothers in particular may not participate in the labour force for many years after they give birth.

This paper studies the impact of child-care subsidies on maternal labour supply. In the Finnish day-care system, a relatively generous home-care allowance is given to parents who stay at home to take care of their children. This subsidy clearly increases incentives to stay outside of the labour force for prolonged periods. Changes in a municipal supplement to this allowance provide exogenous variation in the labour supply incentives of parents. A parent is eligible for a supplement based on the municipality she lives in and the age of her youngest child. On the contrary, other characteristics of a parent do not affect the amount of supplement he or she is eligible for. Therefore the variation in supplements is exogenous to labour supply incentives of individuals.

A municipal supplement to the home-care allowance provides a good case of a regional experimental set-up. There are no other regionally varying policies that affect mothers of young children in Finland. Moreover, a municipality might offer a supplement simply because it is viewed that mothers should take care of their own children. In this case the decision to implement a supplement policy would not depend on the municipal employment situation. There is, however, a worry that a supplement policy could in some way depend on economic conditions of the municipality and therefore on the labour supply of parents. After presenting the estimation approach, I discuss institutional reasons and empirical evidence showing that policy endogeneity does not cause a threat to the identification strategy.

The main results show that increasing the supplement has significant negative labour supply and earned income effects. The estimated effect indicates that 3 per

cent fewer mothers participate to the labour force when a supplement is increased by 100 euros per month. Surprisingly, I find a larger effect for higher-educated than for lower-educated mothers. To put these reduced-form estimates into a policy context, I estimate participation elasticity using exogenous variation as an instrument. The results indicate a participation elasticity of 0.8 for all mothers. These findings survive a battery of sensitivity and robustness checks. I study the labour force participation of fathers as well, but do not find any effect on their labour supply.

In comparison with previous studies, a municipal supplement provides several attractive features for studying the labour supply effects of a policy. Having many treatment and control regions allows me to compare very similar people with each other. For example, Eissa and Liebman (1996) compared mothers and women without children and Blundell et al. (1998) compared women across education levels and cohorts, although it is reasonable to assume that these groups behave in different ways. In addition, municipalities have changed their supplement policies on several occasions. The multiple reforms introduced at different points in time help to distinguish the treatment effect from common macro shocks to treatment or control group. This would not be the case if the reforms were enacted simultaneously or if there was only one treated group (Schone (2004) and Baker et al. (2008)).

In the quasilinear-utility form consumption function set-up, that e.g Saez (2002) uses, the decision to participate depends on the relative difference in after-tax income when working and when not. There can be variation in both, income when working and when not. Most previous studies (e.g. Baker et al. (2008), Milligan and Stabile (2007) and Lundin et al. (2008)) utilize exogenous variation in the after-tax income when working. On the other hand, a municipal supplement affects the after-tax income when not working. This makes analysis more reliable because the variation in subsidies affects participation incentives of everyone instead of just those in a specific part of income distribution.

Using this feature, a municipal supplement allows me to estimate a participation elasticity. To estimate the participation elasticity, the income associated with the counterfactual participation status needs to be simulated for everybody in the sample. The municipal supplement is used as an instrument for the change in after-

tax income simulated for everybody. The amount of supplement one is eligible for does not depend on family income. Consequently, the municipal supplement is a good instrument for the income difference. The resulting IV estimate, the participation elasticity, can be used in tax simulations analysing the optimality of tax systems (Saez (2001), Saez (2002) and Immervoll et al. (2007)). The estimated participation elasticity of 0.8 is higher than that used in many simulations.

Because the supplement affects individuals in all parts of the income distribution equally when they do not work, it is possible to analyse how parents from different parts of income distribution react to changes in taxation. Although the counterfactual income is by definition missing, the education of everyone is known. Education is a good proxy for income. Thus the divided sample results by education are used to estimate the effect taxes have across income distribution. This is interesting since many earlier papers analysed policies where most of the variation in labour supply incentives affected the lower end of income distribution (e.g. Eissa and Liebman (1996) and Milligan and Stabile (2007)), with the exception of Eissa (1995). I find a u-shape in response profile by education. The result that high-educated mothers respond more to changes in taxation than medium-educated mothers is interesting. It also bears relevance to the optimal income tax simulations mentioned above. The participation elasticity profile across education levels is something that earlier literature has not been able to produce.

This study also adds to the literature estimating the labour supply effects of child-care policies. These policies range from lowered day-care prices (Lundin et al. (2008), Baker et al. (2008) and Lefebvre and Merrigan (2008)) to the employment responses of maternity leave (Baker et al. (2008b)) and other child-care services (Fitzpatrick (2010)) to child-care-related benefits (Milligan and Stabile (2007))¹. A typical finding is that policies have some effect, although not in all cases².

¹Milligan and Stabile (2007) studied the National Child Benefit reform in Canada. With province-level reforms, the variation that they observed does not arise from a single treated group, a problem in many of the articles cited above. Their results indicate an elasticity of 0.96 from having earnings as a major source of income, which is comparable to what I find.

²Lundin et al. (2008) do not find any employment effect from a Swedish reform that put a cap on child-care prices. Similarly, Havnes and Mogstad (2009) do not find that a Norwegian day-care reform had any effect on maternal labour supply. This is interesting, since the Swedish and Norwegian child-care institutions are similar to those in Finland, except that Finland has a significant home care-allowance system.

The rest of the paper proceeds as follows. In section 2, I present the source of the variation in child-care subsidies. I also provide a short description of the Finnish child-care system. The identification issues and the econometric specification are discussed in section 3. In section 4, there is a description of the data-set and the descriptive statistics. The estimation results and some robustness checks are given in section 5. A discussion of the economic interpretation of the results and an estimation of participation elasticity are presented in section 6. Section 7 discusses the economic policy implications of a supplement. The last section concludes the study. The appendices contain the tables and figures referred to in the text.

2 Forms of child care

Child care can be structured in many ways. To understand the particular features of the Finnish institutions, I first compare these to the arrangements in other countries. I then describe the Finnish day-care system in more detail and discuss how the institutions result in exogenous variation in the parents' incentives to supply labour.

How is Finland doing compared to other countries?

The Nordic countries provide extensive public day care, subsidized private day care and parental leave policies. Children are entitled to a place in a public day-care centre. The price for day care is heavily subsidized by the government. In Anglo-Saxon and central European countries day care relies more on private providers. The price a household ends up paying for day care can be much higher than in the Nordic countries. Parental leave policies are provided in the Nordic countries for parents whose youngest child is under one year old (with national variation). This is much more than in the other OECD countries in general. In Finland the home-care allowance continues for as long as two years after the end of maternity leave. The home-care allowance works in a similar way to parental leave: one has the right to return to one's previous work place after the leave and there is a subsidy from the government to the parent.

A key feature that countries try to influence through their child-care institutions is the employment rate of mothers. Figure A1 presents maternal employment rates by the age of the youngest child in selected countries in 2005. It is evident that the Nordic countries have higher employment rates than the OECD countries on average.

The first column in figure A1 shows the employment rate of mothers whose youngest child is under 3 years old. This column stands out for Finland even compared to the other Nordic countries. In contrast to Sweden and Denmark, Finland provides a home-care allowance for this group. I hypothesize that the Finnish home-care allowance system has an effect on the labour supply of parents. When mothers are no longer eligible for this allowance, their employment rate shoots back to the high level seen in the other columns in figure A1.

Finnish day care

The idea of the Finnish child-care system has been to provide financial assistance to parents regardless of the choice a parent makes. After maternity leave (when the newborn child is 10 months old), parents can choose essentially between three child-care alternatives, all of which are financially subsidized by the government: home care, public day care or private day care.

Public day care is the predominant choice in Finland for a typical family. Every child under the age of 7 (when they start primary school) is entitled to a public day-care place if they request it³. A child can be placed in public day care even if neither of the parents are in work. Day-care fees are regulated by the government - a typical family with two children in public day care paid 380 euros in day-care fees per month in 2005. Private day care is also subsidized⁴. Furthermore, municipalities are able to pay a municipal supplement on top of the private day-care allowance if they choose to. Majority of tax revenue is collected by central government and part of tax revenue is collected by municipalities directly. Central

³This is stated in legislation. Before 1995 the law stated that every child under the age of 4 is entitled to public day care.

⁴This system has been in place nationwide since 1997. Between 1995 and 1997 there was an experiment in 33 municipalities that provided a similar allowance. Viitanen (2007) describes this experiment in detail. She found a positive effect on the use of private day care, but little effect on labour force participation.

government then redistributes tax revenues to municipalities using government grants. Thus municipal budgets are partly determined by decisions of central government and the extent and quality of services that municipalities need to offer to citizens is controlled by national legislation.

This study focuses on the employment effect of the home-care allowance and a supplement to it. Thus, the question of interest is not whether a family chooses private or public day care. These two choices are similar in terms of the employment decision.

When a child under 3 years of age is cared for by a parent, he or she is entitled to the child home-care allowance (HCA). This national allowance can be paid until the youngest child not in public or private day care reaches the age of 3. The amount depends on the family's characteristics and is from 300 to 500 euros per month. The child home-care allowance may be paid to either parent, although it is predominantly the mother who takes up the allowance. If a parent receives the HCA, the same family can't receive other forms of child care support (public or private day care) for the same child. Thus this feature rules out the use of HCA for financing private day care⁵.

A municipal supplement to the HCA constitutes an interesting variation in this study. Some municipalities pay a supplement on top of the national HCA while other municipalities have no supplement policy. The municipal supplement has been part of the Finnish child-care system since the 1980's. The observation period reaches from 1995 to 2005. Over this period, there were around 450 municipalities in Finland. Five of them had adopted a supplement policy in 1995 and the figure had increased to 65 by 2005. Figure A2 shows how the municipal supplement has spread over time and figure A3 shows the population in 2005 on the map of Finland. Clearly the group offering a supplement contains bigger cities than the group that does not, but there are cities in the group that does not have the supplement policy.

A parent in work faces different fee and subsidy schemes than a parent not in work. A formula below describes the fees and subsidies when a parent is in work (I_{work}) and when not ($I_{Notwork}$):

⁵Which is supported by a different allowance, private-care allowance.

$$I_{work} = Earned(I) - DC(I) \quad (1)$$

$$I_{Notwork} = HCA(I) * 1(chage < 3) + S * 1(m = 1, chage < 3, other) \quad (2)$$

where *Earned* refers to earned income net of tax, *DC* to day care fees, *HCA* to home-care allowance, *S* to the supplement to it and *chage* to the age of the youngest child in household. The *I* in parentheses indicates that the fee or subsidy is a function of personal or family income. The eligibility for the supplement depends on municipal level rules, but not on income (in most cases).

Although there are strict national rules about how municipalities have to provide child care, municipalities may choose their supplement policies relatively freely. Thus there is a lot of variation in the details of how each municipality pays its supplement. Typically a municipal supplement is paid per child. It is possible to receive an extra supplement if the youngest child has older siblings. The mean monthly supplement level in the data is 200 euros and the mean sibling-extra supplement is 50 euros per family. With the exception of a few municipalities, the municipal supplement does not depend on family income. There is also a prior-work condition in some smaller municipalities, according to which to be entitled to the municipal supplement the parent must have worked prior to the parental leave.

Why do municipalities pay supplements to the home-care allowance? The literature does not say much about the reasons. Typically municipal councils use assessments made by municipal civil servants to indicate what would happen if a supplement is implemented in municipality. These assessments typically compare the costs arising from public day care with the costs of the HCA taking the potential supplement into account.

3 Identification and econometric strategy

To estimate the effect of a municipal supplement on maternal outcomes, I apply a differences-in-differences (DD) and a triple difference approach. In the DD strategy I compare outcomes for mothers living in different municipalities before and after there was a change in supplement policy. Mothers living in a municipality that did not change its supplement policy comprise the control group. A supplement policy is measured as the actual supplement a mother is eligible for based on her observable characteristics. Thus it is not a dummy variable as in the basic DD approach. The model is estimated for mothers with children in the home-care allowance eligible age, when the child is between 9 months and 3 years old. In the triple-difference estimation the third difference is whether or not the youngest child is under 3 years old. This distinction is meaningful, since the upper age limit for the youngest child to receive a supplement is 3 years old. I estimate the OLS equation:

$$Y_{iy m} = \alpha + \beta_1 P_{iy m} + \beta_2 X_{iy m} + \beta_3 Mun_m + \beta_4 Year_y + \varepsilon_{iy m} \quad (3)$$

The dependent variable is labour supply or earned income, Y . In the labour supply case it is a dummy variable with a value of 1 when a parent participates and zero otherwise and in the earned income case it is a continuous variable. The key explanatory variable is P (eligibility to municipal supplement). The model identifies β_1 , the effect of a subsidy $P_{iy m}$ on labour supply $Y_{iy m}$ in year y , municipality m and for individual i . In the case of labour supply, β_1 shows the change in probability of a parent supplying labour when P is increased by one unit. The other variables in equation (3) are the municipal (Mun_m) and year ($Year_y$) dummies and a control vector ($X_{iy m}$). When estimating the triple difference, the control vector includes the interaction terms of the dummies used in the DD approach. Any change in P is allocated to a simultaneous change in Y . The only reason for a change in Y should be that there is a change in P , conditional on the covariates. Since P varies in the municipality and year dimensions, the identification relies on municipal and year-level changes. That is why the controls include municipal-level variables such as average unemployment rate and share of children in day care relative to the number of children in a municipality. The control vector also includes

individual-level variables to take into account the individual-level variation. This should reduce variation in the error term.

Changes in a municipality’s supplement rules depend on the age of the youngest child. Simultaneously a mother’s decision to return to work is correlated with the age of the youngest child. Consequently, β_1 would be biased away from zero if this correlation were not taken into account. Municipal supplement rules regarding the youngest child’s age vary considerably. In some cases the upper age limit for eligibility is raised gradually from 1 year and 2 months to 2 years. Thus to be able to control for this variation in a flexible way, I needed to include dummies for the age of the youngest child. In the main estimates, a dummy for each 3 months of age of the youngest child controls for all the unwanted correlation between policy rules and child’s age. Other specifications for the length of the age interval in the dummy produce similar results as in the main estimates.

Identification issues

The DD approach identifies a causal effect of the municipal supplement on outcome Y provided that certain assumptions hold. I use the standard DD assumption that selection into treatment should be exogenous to outcome. In particular, the model identifies β_1 conditional on controls if the following condition holds:

$$E[Y_{iym}^0 | m, y, P_{iym}, X_{iym}] = E[Y_{iym}^0 | m, y, X_{iym}] = \delta_m + \lambda_y + \beta_1 X_{iym} \quad (4)$$

where I note the outcome of the control group by Y_{iym}^0 . The assumption that guarantees the identification here is that P_{iym} (eligibility to supplement) is exogenous to Y_{iym}^0 (labour supply). Also, the average employment time trends need to be parallel between the treatment and control groups. It seems reasonable that mothers within a municipality do not self select into treatment, since the municipal supplement is offered to everyone living in a municipality with children of the correct age. There would be a problem with identification if changes in a supplement would induce mothers to be more fertile. It seems unlikely that changes in fertility is a problem from the identification point of view, since a change in supplement potentially affects employment during current year. Potential increase

in fertility, in turn, would lead to increased number of 1 year old children two years from the change in supplement. Finally, the composition of the treatment and control groups needs to be similar; it would be problematic if parents move from one municipality to another based on changes in supplement policy. This is unlikely since there are fixed costs to moving outweighing potential gains from extra supplement, and furthermore spouses are tied to their current job. After the estimation results, I present some robustness checks as a defense against these potential problems.

"How Much Should We Trust Differences-in-Differences Estimates" is a question raised by Bertrand et al. (2004). Their simulations show that potential problems with inconsistent standard errors are less severe if there are many treated and control groups and the reforms are implemented at different points of time. One virtue of analysing the Finnish home-care allowance system is that there are over 400 municipalities, 65 of which had supplement policies in 2005. In addition, the reforms were implemented at different points of time.

Policy endogeneity

One potential problem here is policy endogeneity, as discussed by Card and Levine (2000) and Lalive and Zweimuller (2004). The main worry is that a shock to municipal economy leads to a change in supplement rules. For instance, if a municipality reacts to a recession by increasing the supplement, it might appear that the supplement has an effect on, say, employment, when in reality there is no causal effect. Fortunately for the identification, there are institutional reasons dampening this worry and empirical evidence against policy endogeneity hypothesis.

Municipal councils usually make the decision to implement a supplement based on assessment made by municipal civil servants. The assessment typically includes calculations about financial situation of the municipality, how many children would be affected by the new policy and how large the costs of the new policy are to the public day care in the municipality. After having the report, the municipal council deals with the proposal and if it is approved, the municipal government makes the final decision in their meeting. This whole process takes time and the civil servants influence the decision implying that quick changes based on sudden

shocks or political desires are not likely to cause sudden changes in supplement policies. The identification in this paper relies on the effects of sudden changes in municipal policy on changes in employment. Thus the slow decision process is a defense against policy endogeneity. An economic shock that affects employment in a municipality is unlikely to affect the supplement policy quickly. On the contrary, a change in municipal supplement is likely to affect the employment of the target group on the same period the reform happens. Political economy considerations are dampened by the influence of civil servants to the decision process. Changes that are not possible within a given budget period are less likely to be implemented than if the decisions were entirely on the hands of elected municipal councils.

As to why municipalities want to implement supplement policies, it seems the main reasons are attempting to reduce the number of children in public day care and having an image of child-friendly municipality. This reasoning still does not guarantee that the policy endogeneity regarding employment is not present. Therefore, as a further evidence against policy endogeneity hypothesis, I describe below how municipal level data behaves prior to implementing a supplement policy.

Figure A4 and table A1 presents coefficients from a fixed-effects regression on municipal-level data where indicator of implementation of supplement to home care allowance ($1(implem)$) explains number of dependent variables (Y_{tm}) in year t and municipality m . The regression model used is:

$$Y_{tm} = \alpha_m + \beta_{-2}1(implem_{t-2,m}) + \beta_{-1}1(implem_{t-1,m}) + \beta_01(implem_{t,m}) + \beta_11(implem_{t+1,m}) + \beta_21(implem_{t+2,m}) + X'_{tm}\zeta + \epsilon_{tm}$$

I have included leads and lags of the implementation indicator variable ($1(implem_{t-2,m}) - 1(implem_{t+2,m})$) and year fixed effects and in applicable cases number of children as covariates (X'_{tm}). Shocks to dependent variables prior to implementation of the supplement would be evidence of policy endogeneity. The identification strategy used in the micro-level analysis uses municipal-level fixed effects. Therefore level differences between municipalities do not endanger identification.

The first dependent variable in the table and the figure is the amount of resources in euros a municipality uses to the supplement. The idea of this variable is

to show that the supplement policy rules affect the dependent variable when they should. Figure A4 shows results of three other variables that are relevant from the policy endogeneity point of view: Number of babies (aged 0 or 1 years), net costs of municipality in all local government activities and the employment rate of women. The important fact to take away from the figure is that there is no significant variation in coefficients of leads and lags of the implementation variable. The stable coefficients indicate that a municipal supplement was not implemented in response to a sudden change in economic conditions described by these three outcomes.

Women are a relevant group as a potential future treatment group, therefore their employment rate describes important economic conditions for the analysis. Majority of women are not mothers of 1-2 years old children in any one point of time. Thus women are much larger group than mothers with small children.

Table A1 shows leads and lags from regressions with other dependent variables: in column (2) cost of child care to municipality in log euros, in column (3) the logarithm of number of children in private care, in column (4) the logarithm of number of children receiving the home care allowance, in column (5) employment rate and in column (6) the logarithm of migration to a municipality. The evidence against policy endogeneity in these results is that there does not seem to be significant variation in coefficients prior to implementation of the supplement. More rigorous robustness tests are performed with micro data after the main estimation results. The number of children receiving the home-care allowance is likely to be affected by implementation of the supplement to it, if the supplement policy is to have any take-up. Indeed there is slight increase in this variable one year after the municipality implements the supplement.

4 Data and descriptive statistics

The main data set in this study is individual-level micro data for the years 1994 to 2005. The data come from multiple sources. The base data, Income Distribution Statistics (IDS), come from Statistics Finland and are individual-level data, containing over 25,000 observations from about 10,000 households per year from a population of about 5 million Finns. The main estimation sample includes families

whose youngest child is between 9 months and 3 years old. Pooled for all years, there are about 6,000 households in this group and about 14,000 households that have children under the age of 6. The data contain a rich set of variables describing family characteristics, demographics, incomes and benefits derived from registers and surveys. The rest of the information is at the municipal level and has been linked to IDS data. It comes from a survey of municipalities conducted by the University of Turku, a survey of municipalities conducted by the author, from the Social Insurance Institution of Finland and from Statistics Finland. The data are a repeated cross section at the individual level, although there is a rotating panel system⁶. Aggregated to the municipal level, the data constitute a panel where each municipality can be followed over the years.

Table A2 shows descriptive statistics. It categorizes mothers according to the age of their youngest child. Mothers in the main estimation sample, shown in the first column, are on average 32 years old and have at least high school education almost 50 per cent of the time. The most typical families are those with one or two children, but there are also larger families in the data.

The main outcome variables are employment status and earned income of a parent that comes from tax registers measured as a sum for the whole calendar year. I construct the employment status using earned income of a parent and a threshold level derived from the earned income of everyone in the data. I define mothers as employed when their annual earned income is higher than half of the mean income for women in labour force in the data⁷. The choice of the threshold is somewhat arbitrary. However, it is important to note, that the results are not sensitive for the precise selection of employment threshold. This is discussed in more detail in robustness checks after the main estimation results. Putting the employment threshold to zero would not be a good measure of employment. In this case someone who works just one day in the very end of year would be categorized as employed although practically she has not worked in that year.

Figure A5 shows the actual earned income distribution in the main estima-

⁶In rotating panel each household is surveyed in two consecutive years and each year half of the sample consists of new households. Thus there are two consecutive observations for each individual.

⁷More specifically I have measured income from women who are between 20 and 59 years old and not being in sick leave, retired or other ways outside of the labour force.

tion sample divided into three education categories: low-⁸, medium-⁹ and high-education group¹⁰. It is evident that there are a lot of mothers not working during the whole calendar year in all groups. The threshold for participating varies by the education categories and by year. For low educated, the typical mean income calculated for women in the labour force is 15000€ per year, leading to employment threshold of 7500€ per year. For the high education category the typical mean income is 25000€ per year leading to employment threshold of less than 13000€ per year. According to Statistics Finland (2011) a woman in full-time employment earned in 2008 about 2500€ per month. This illustrates that someone earning around 10000€ per year could not have been in full time employment the whole year.

The explanatory variable in the main estimations is a supplement to the home-care allowance. The amount of supplement one is eligible for is imputed to everyone in the sample using observable characteristics (family size, age of children and municipality they live in) and based on the eligibility rules. These rules are described in section 2. The main variation in the rules is by the amount of supplement and age limit of the youngest child after which one is no longer eligible for it.

The home-care allowance, day-care fees and family income are implemented for everyone in the data according to policy rules using the estimated income associated with full-time working and family characteristics. In estimating participation elasticity, the net difference of these variables defines the change in after-tax incomes associated with entry. To make income uncorrelated with actual working status, it is imputed for those not being in work based on observable characteristics and the incomes of those who are in work. Two after-tax incomes are calculated for each family, one corresponds to the mother not being in work and the other to the mother being in work. If there are many children, the only scenario calculated is one where all the children are treated in a similar way.

Figure A6 shows the employment trend of mothers by the age of the youngest child. It is evident how the employment rate of mothers increases with the age of the youngest child. The figure also shows the share of those receiving a municipal

⁸where education qualification is primary education or the information is missing

⁹where education qualification is secondary education, or post-secondary but not tertiary

¹⁰where mothers have an educational qualification equivalent to bachelor or higher

supplement relative to all mothers in the sample by the age of the youngest child. It is noticeable how the two lines have opposite slopes. A variable for the age of the youngest child in the estimations captures the correlation of employment of mothers and the age of the youngest child.

Table A3 shows the mean values, standard deviations and the number of observations of supplement and employment rate. The table contains statistics of mothers whose youngest child is between 9 months and 3 years old for selected years. Table A3 is divided to two parts: the left panel contains everybody in the sample for the year in question, and the right panel contains only those who live in a municipality with a supplement policy in place in the year in question. The second variable from the left, the share receiving supplement, is the share of the whole sample that lives in a municipality that has the supplement policy. It is evident that this figure has increased over time. Over the same time period, the mean amount of supplement parents are eligible for has changed. The average monthly supplement is around 200 euros towards the end of the observation period. Mothers do not on average have a very high participation rate, and this is also reflected in their low gross incomes. From the right panel it is interesting to see that the employment rate and the mean earned income have fallen over time in the group eligible for supplement relative to the whole sample in the left panel.

5 Estimation results

Main results

Table B1 shows the main estimation results. The dependent variables are the mothers' labour supply dummy and earned income. The monetary variables (such as the municipal supplement and earned income) are in 100 euros per month. I perform all the estimations for fathers as well and find zero effect on their labour supply.

The results in table B1 are organized as follows: there are two panels, top and bottom, which are divided according to the dependent variable. The top panel presents the results for the employment dummy, which is coded as 1 if the earned income is more than half the average income of working-age women.

In the bottom panel the dependent variable is earned income. In column (i) there is a plain regression of municipal supplement on the dependent variable. Column (ii) adds to this individual-level covariates; dummies for the age of the youngest child for every three age-month intervals, and a number of other control variables. Column (iii) presents a difference-in-differences (DD) estimate, including year and municipal-level dummies and other municipal level control variables. By controlling for municipal-level differences, the point estimates become negative and statistically significant. Column (iv) presents the triple difference results. The third difference is between having the youngest child in the age group of 9 months to 2 years or of 3 to 5 years. The latter age group is never entitled to a supplement or the home-care allowance. An advantage of the triple-difference estimate is that it allows controlling for municipality-specific time trends.

The main result for the work-dummy indicates that increasing the municipal supplement by 100 euros per month causes 3% fewer mothers to participate. The main result for income indicates that increasing the municipal supplement by 100 euros per month decreases the annual income by 1100 euros¹¹. Since there is probably some variation in the way in which mothers respond to the municipal supplement, I interpret these results as the average treatment effect on the treated.

The participation response implied by the main result is surprisingly large compared to earlier literature. To put it into context of employment rates and incomes the participation elasticity is estimated in section 6 below. Potential reasons for this large participation response are that mothers value their time at home with small children more than other population groups and that a parent can return to a job she or he had prior to taking up the home care allowance. These explanations alter the psychological costs of taking up a job, but they do not affect the financial incentives. Therefore what is measured here is how much financial incentives affect participation decision.

Sensitivity and robustness checks

The result in column (iii) seems to be robust to a quite flexible set of control variables. As a sensitivity check I tried to include a linear time trend for every

¹¹The average net-of-tax income per month for a woman working full time is around 1500 € (own calculations).

municipality, use another definition for the work dummy¹² and exclude some individual municipalities or years. Tables C2 and C3 show some of the results. Since the point estimate does not change much when conditioned on municipal-level variables, the result does not seem to depend directly on the macroeconomic conditions of the municipality. The coefficient of the supplement is in general quite robust to controlling for many individual and municipal-level effects. However, one variable deserves special attention; age of the youngest child. Since this variable is closely correlated with the employment of mothers and the treatment is not constant within the age of the youngest child, it turns out to be important to include this covariate, as is done in all applicable estimates.

There are various threats to identifying true average treatment effect on the treated with the chosen strategy, as discussed in the identification section. I perform robustness checks in table B2 to check if there is a problem with identification. Column (i) introduces a pseudo-rule that makes mothers whose youngest child is between 3 to 5 years old eligible for the municipal supplement if they live in a supplement municipality. The estimates are otherwise similar to those in table B1, column (ii) for the work-dummy outcome. Families with older children appear natural candidates for performing a robustness check on, since their characteristics should otherwise be close to families that just have a little younger child. The zero result here indicates that a supplement policy does not have a delayed effect on mothers employment. This is in line with OECD (2007) statistics that indicate that the employment of mothers with children of this age is much higher than the employment of mothers with younger children.

Column (ii) of table B2 presents a robustness check for a different group: women who are going to have a child the following year. Here I utilize the rotating panel feature of the data. The model is estimated for families that will have a child aged 9 months or younger the following year, but do not currently have any children between 9 months and 3 years old. Thus, they are not yet entitled to municipal supplement, but live in municipalities that have the policy. This estimate should tell something about the potential anticipation effect. However,

¹²The other definition is the number of months worked as based on a survey question. The results for this are shown in table C1. There is a measurement error in this variable, thus I did not use it in the main estimates.

the coefficient of the supplement is zero. This indicates that there is no serious anticipation effect (although the sample size is only 541 in this estimate).

Column (iii) of table B2 checks if there is a higher probability of ending up in the estimation sample associated with changes in a supplement policy. The outcome is a dummy indicating whether or not a person is a child under three years old (who are usually those who are entitled to a supplement). This model is estimated for everyone in the data. The result shows that the supplement does not have any effect in terms of causing children to end up in the estimation sample. Thus families with small children do not seem to move to municipalities offering a supplement¹³. Moreover, mothers in supplement municipalities do not seem to be more fertile because of the supplement. Column (iv) presents a baseline estimation, but with the simplified rules needed for the implementation of a supplement used in other robustness checks. The coefficient of the municipal supplement is similar to main estimates, and the simplification of rules does not seem to affect the estimates.

Divided sample results

To check for possible variation by sub-groups, I divided the sample according to two dimensions: the mother's education and the number of children in a family. These characteristics are determined first and the participation decision is made later. Thus dividing the sample along these dimensions should not be correlated with treatment effects. The results are shown in table B3. The dependent variables are again the mothers' labour supply dummy in the top panel and earned income in the bottom panel. The supplement is measured in 100 euros per month.

The divided sample results by education suggest there is an u-shape in response profile: low-educated respond more than medium-educated and the high-educated respond the most. The same overall picture in both cases, although the earned income coefficient is not significant for low-educated group¹⁴. It is surprising that for the high education group the coefficient is larger than for the medium educa-

¹³Finnish municipalities are typically large in surface area. Thus, moving to another municipality usually means moving to a completely different city or town.

¹⁴For participation essentially the same set of results came out when the participation threshold was defined as 30 % of mean income of the education group.

tion group. This is surprising because education is usually highly correlated with incomes, which figure A5 confirms in the present case. The interpretation of the result is that mothers who have high income potential respond more to changes in taxation than mothers who have medium income potential.

There are possible explanations for this that are not directly related to income potential. Some of the mothers in medium income group could still be doing their studies in the university. Thus they would not respond by returning to a job in any case. This explanation is not likely to be the whole story, since the average age of a mother in the sample is 32 and a typical student is much younger. Moreover the typical education field in medium education group is practical education that is not directly applicable to university studies. Other explanation is that mothers in high education group have more secure job where they can return to. They then would feel secure to return to that job later and spend the two years at home with a child. The hypothesis goes on by stating that this would not be possible for women in medium education group with less secure and perhaps even temporary jobs. Again this seems unlikely to be the whole explanation, since for example medical nurses are in the middle education group and often have secure public sector jobs in Finland.

In the previous literature, there are very few attempts to estimate labour supply responses of higher income or education individuals. Eissa (1995) studied labour supply effects of The Tax Reform Act of 1986 in 99th income percentile married women. She found overall labour supply elasticity of 0.8. Eissa and Liebman (1996) found a larger estimate for their lower education group than for higher education group. The reform analysed by Eissa and Liebman was Earned Income Tax Credit (EITC) reform targeted to working poor. These type of reforms that depend on income tax schedule always affect specific part of the income distribution more than other parts. The municipal supplement analysed here is based on the municipality a mother lives in. Moreover it does not depend on income prior to having the child. Consequently, the amount one is eligible for does not depend on the education one has. The supplement thus provides a good way to analyse participation responses across education levels.

The result that mothers having higher income earning capability respond more than those having medium earning capability is surprising, since in the literature

the opposite is often assumed (Saez 2002 and Eissa et al. 2008). In the literature on optimal income taxes with an extensive margin of labour supply it is usually assumed that the poor have higher participation elasticity than the rich (see e.g. Saez 2002 and Immervoll et al. 2007). This assumption is usually made when simulating the welfare effects of a tax reform across income distribution. This is partly what I find, but as an addition there is the higher participation elasticity for higher educated mothers.

It is also interesting that the result is much stronger for families with 1 or 2 children (coefficient is more significantly different from zero) and the coefficient for larger families, although non-significant, is actually positive. The result for parents with three or more children should be interpreted with caution since there are not that many of them. Even so, this result is interesting because it implies that the participation elasticity profile is essentially non-linear in the number of children.

6 Participation elasticity

It is important to put the effect of a supplement on labour supply in a policy-relevant context. This can be done by using the participation elasticity. The idea is to put the participation effect into the context of prevailing employment rates and benefit and income levels. Furthermore, optimal income tax models that take the extensive margin into account, employ an inverse elasticity rule that uses the inverse of the participation elasticity (Saez 2002).

To estimate the participation elasticity, I need to calculate the net after-tax income associated with participation for everybody. For this, I need to know two income numbers for every mother. One measures after-tax income when not being in work (and taking care of the children) and the other measures after-tax income when being in work (and placing the children into public day care). The income measures used in the analysis corresponding to each choice are shown in equations (1) and (2). The net after-tax income is calculated by taking the difference of these two measures. I need to make assumptions to be able to calculate these measures, and one of them is that the two choices mentioned above are the only ones available to mothers in respect of taking care of their children.

Only one of the two incomes is always observed in any data. A typical solution to this is to simulate the two income measures for everybody based on pre-determined characteristics. I use incomes of those in work to predict incomes for every parent based on observable characteristics including age, education and gender.

The difference in these would itself suffer from an endogeneity problem. Therefore I use the municipal supplement as an instrument for the change in after-tax incomes associated with participation. The various robustness checks presented in the previous section contribute to validating the use of this instrument. To be a good instrument, the municipal supplement should affect exogenously the incentives to supply labour. On the other hand, it should directly affect the income one gets when the change in participation status is made. The coefficient are expected to have a positive sign because the subsidies enter the income equation with a negative sign.

The results are shown in table B4. The explanatory variable is a dummy for participation status as in the main estimates. Now the unit of measurement is 1 euro per year. The first stage, shown in the first line, is very strong. There is almost a one-to-one relationship between change in incomes and the amount of supplement one is eligible for. The second stage results from 2SLS suggest that the amount mothers gain when they participate leads to an increase in participation probability of .003 % for each additional euro per year.

The participation elasticity (η) implied by the coefficient in the table B4 can be calculated as

$$\eta = \frac{dparticipation}{dincome} * \frac{income}{participation} =$$

$$\beta * \frac{income}{participation} = 0.0000295 * ((9814)/(0.348)) = 0.83$$

where β refers to the coefficient of income in the second stage regression. The above elasticity is calculated on an annual basis. The 9814 euros, the *income*, is the average change in net income associated with labour market entry for a typical mother. The 0.348, the *participation*, is the average participation rate in

the population for which the estimation was made.

Table B5 shows the participation effect by education level. The result is significant for mothers with low or missing education and for mothers with a bachelor degree or higher. The participation elasticities implied by these estimates for low, medium and high education levels are $0.000038 * (7050/0.2) = 1.3$, $0.000017 * (8060/0.35) = 0.4$ and $0.000038 * (17470/0.44) = 1.5$, respectively. These participation elasticities confirm the u-shape profile of participation elasticities by education suggested by the reduced-form divided sample results. Higher educated respond to financial incentives more than medium educated even when accounting for their higher than average income.

The estimate is performed more structurally here than in other studies analysing child-care benefits and prices (Baker et al. (2008) and Milligan and Stabile (2007)). Here the change in net after-tax income associated with entry is taken explicitly into account. This is possible since supplements do not directly depend on income. To report some earlier estimates in the literature, Baker et al. (2008) estimated a participation elasticity of 0.236 resulting from decreasing child-care cost, and Milligan and Stabile (2007) reported an elasticity of 0.96 for having earnings as a major source of income utilising the Canadian benefit reform. Eissa and Liebman (1996) estimated a participation elasticity of 0.6 for single mothers.

7 Policy implications

This section presents crude calculations of the economic implications of supplement policies. Based on the estimates in this paper and aggregate municipal-level statistics, it is possible to look at how desirable a supplement policy is from the municipal point of view and the total economy point of view. To be able to fully assess the optimality of the policy, I would need an estimate of the welfare of individuals and the effects of the policy on other groups, most notably children.

I need to make certain assumptions to be able to calculate all the figures relevant for these estimates on the effectiveness of the policy analysed. I only present results for mothers. This is justified because I find that fathers do not often take up supplements and that the estimated labour supply effect for them is zero. I assume that the children are put in public day care in the cases where the mother

works, which is the prevalent choice in Finland. I need to calculate the effect on an average mother. To this end, based on my own calculations from the data, I assume that a mother has 1,4 children, has a spouse who is in work, earns 1600 euros per month before taxes when working full- or part-time and faces municipal and national income tax rates of 16 per cent and 25 per cent respectively.

I compare the situations where a mother is in work and where she is not in work from a public sector expenditure point of view. If a mother works, she pays on average 500 euros in taxes and 280 euros per 1.4 children in day care fees per month. But, the total cost per child in day care is 1300 euros per month¹⁵. If the mother does not work, she receives 300 euros in home-care allowance per month. Summing these rough estimates ($500+280-1300 = -522$ euros compared to -300 euros), it seems that without a municipal supplement it is less costly for the public sector if the mother does not work. This result is driven mainly by the high cost of public day care. Naturally, these calculations would look different if the longer-term effects were taken into account. Then lost pension savings and the effects of deteriorating working skills would be taken into account.

It might not be optimal for the municipality to provide a supplement. Even with a fairly large participation elasticity estimate, the costs of increasing a supplement with the current participation rates are larger than the gains, because the supplement is paid to every child in eligible group, not only for those switching their care status.

This can be seen from a simple example. Assume there are 1000 mothers in a municipality, of whom 355 work and the rest are taking care of their children. Increasing the home-care allowance by 100 euros per month via a supplement would induce 33 more mothers to stay at home. The amount of public funds saved from day-care costs is $33*(1300-280)=33,660$ euros. At the same time, the municipality would need to pay the supplement to every mother already staying at home and to those the new policy induced to stay there. The cost of the new policy is then $688*100=68,800$ euros. Thus this rough example shows quite clearly that municipalities lose out in reforms introducing a supplement to the home-care allowance, even if lost tax revenues are not accounted for.

¹⁵This figure came from own calculations from municipal-level database ALTIKA provided by Statistics Finland.

8 Conclusion

This paper presents evidence on the extent to which child-care benefits affect the maternal labour supply. An important component of this study is a particular feature of the Finnish child-care system: a municipal supplement to the child home-care allowance. This provides plausibly exogenous variation to the labour supply incentives of mothers.

To be entitled to a municipal supplement a parent needs to stay at home taking care of children, the children must be below a specified age limit and live in a municipality that has the policy in place. Because of regional policy reforms, the control group and the treatment group consist of very similar mothers. The municipalities changed their policies many times during the observation period.

I found that a municipal supplement to the home-care allowance has a negative effect on the labour supply decision of mothers. The main estimate indicated that increasing a municipal supplement by 100 euros per month causes 3 per cent fewer women to participate. I did not find any effect on the labour supply of fathers. The results also show that when the home-care allowance period ends, mothers return to employment. Thus the policy does not seem to have a delayed effect on employment.

To put the results into a policy context, I estimated the participation elasticity. In the estimation the effect of changes in incomes associated with entry was regressed on the probability of entering the labour force. The municipal supplement was used as an instrument of the changes in incomes. It is a good instrument, since it clearly affects the changes in incomes when entering the labour market. At the same time prior analysis has established that supplements are exogenous to labour supply incentives. The result implies a participation elasticity of around 0.8. This estimate is towards the high end of the elasticities found in other studies for the population as a whole. It thus supports the view that the participation response is larger for mothers than for the rest of the population (Blundell and MaCurdy 1999).

An attractive feature of the home care allowance analysed here is that it allows to estimate directly how much financial incentives affect labour participation, not only a feature that is correlated with financial incentives. Moreover the financial

incentives of every mother, regardless of their education, is altered in a similar way. It is therefore surprising to find a larger effect for those with higher education than for those with medium education. This result is something that earlier literature has not produced, perhaps due to lack of suitable variation in incentives for every education and income level.

When education is taken as a proxy for income, one would expect that those with higher earnings potential (high education) would be less responsive to the same monetary incentives than those with lower earnings potential (low education). In studies where the effects of a tax reform are simulated, it is assumed that a participation elasticity profile is declining in income (e.g. Saez 2002 and Immervoll et al. 2007). The result obtained in this study implies that the participation response may, at least in population of mothers, first decline in income, but then increase again towards the high end of the income distribution. Since for example the Earned Income Tax Credit (EITC) is targeted towards the working poor, this finding may have implications regarding the optimality of an EITC-type reform.

References

- [1] Baker, M., Gruber, J. and Milligan, K., 2008: Universal Child care, Maternal Labour Supply and Family Well-being. *Journal of Political Economy* 2008, Vol. 116, no. 4.
- [2] Baker, M. and Milligan, K., 2008b: How Does Job-Protected Maternity Leave Affect Mothers' Employment? *Journal of Labour Economics* 2008, Vol. 26, no. 4.
- [3] Bertrand, M., Duflo, E. and Mullainathan, S., 2004: How Much Should We Trust Differences-in-Differences Estimates? *Quarterly Journal of Economics* February 2004, Vol. 119, No. 1: 249–275.
- [4] Blau, D., 2003: Child care subsidy programs. Working Paper no. 7806, National Bureau of Economic Research, Cambridge, MA. Reprinted in Robert Moffitt, ed.: *Means-tested transfer programs in the United States*, Chicago: University of Chicago Press.
- [5] Blau, D. and Robins, P., 1988: Child-Care Costs and Family Labour Supply. *The Review of Economics and Statistics* 70: 374-381.
- [6] Blundell, R., Brewer, M. and Shephard, A., 2005: Evaluating the labour market impact of Working Families' Tax Credit using difference-in-differences. Institute for Fiscal Studies, Externally published reports, June 2005.
- [7] Blundell, R., Duncan, A. and Meghir, C., 1998: Estimating Labor Supply Responses Using Tax Reforms. *Econometrica*, Vol. 66, No. 4 (Jul., 1998), pp. 827-861.
- [8] Blundell, R. and Macurdy, T., 1999: Labor supply: A review of alternative approaches. *Handbook of Labor Economics*, in: O. Ashenfelter & D. Card (ed.), *Handbook of Labor Economics*, edition 1, volume 3, chapter 27, pages 1559-1695 Elsevier.

- [9] Card, D. and Levine, P., 2000: Extended benefits and the duration of UI spells: evidence from the New Jersey extended benefit program. *Journal of Public Economics* 78, pages 107-138.
- [10] European Commission, 2007: Ten years of the European Employment Strategy (EES). Directorate-General for Employment, Social Affairs and Equal Opportunities, Unit D.2.
- [11] Eissa, N. 1995. Taxation and Labor Supply of Married Women: The Tax Reform Act of 1986 As a Natural Experiment. NBER Working Paper 5023.
- [12] Eissa, N. and Hoynes, H., 2004: Taxes and the labor market participation of married couples: the earned income tax credit. *Journal of Public Economics*, 88, pp. 1931– 1958.
- [13] Eissa, N. and Liebman, J., 1996: Labor Supply Response to the Earned Income Tax Credit. *The Quarterly Journal of Economics*, Vol. 111, No. 2 (May, 1996), pp. 605-637.
- [14] Fitzpatrick, 2010. Preschoolers Enrolled and Mothers at Work? The Effects of Universal Prekindergarten. *Journal of Labor Economics*, Vol. 28, No. 1, The University of Chicago Press.
- [15] Havnes, T. and Mogstad, M., 2009: Money for Nothing? Universal Child Care and Maternal Employment. IZA DP No. 4504, Germany.
- [16] Immervoll, H., Kleven, H., Kreiner, C. and Saez, E., 2007: Welfare Reform in European Countries: A Microsimulation Analysis. *The Economic Journal*, 117 (January), 1–44.
- [17] Laine V. and Uusitalo, R., 2001: Kannustinloukku-uudistuksen vaikutukset työvoiman tarjontaan. VATT Research Reports 74, Helsinki.
- [18] Lalive, R. and Zweimuller, J., 2004: Benefit entitlement and unemployment duration. The role of policy endogeneity. *Journal of Public Economics* 88, pages 2587-2616.

- [19] Lefebvre, P. and Merrigan, P., 2008: Child-Care Policy and the Labour Supply of Mothers with Young Children: A Natural Experiment from Canada. *Journal of Labour Economics*, 2008, vol. 26, no.3, The University of Chicago.
- [20] Lindbeck, A. and Persson, M., 2003: The Gains from Pension Reform. *Journal of Economic Literature*, American Economic Association, vol. 41(1), pages 74-112, March.
- [21] Lundin, D., Mörk, E. and Öckert, B., 2008: How far can reduced childcare prices push female labour supply? *Labour Economics*, vol. 15(4), pages 647-659, August, Elsevier B.V.
- [22] Milligan, K. and Stabile, M., 2007: The integration of child tax credits and welfare: Evidence from the Canadian National Child Benefit program. *Journal of Public Economics*, Elsevier, vol. 91(1-2), pages 305-326, February.
- [23] OECD, 2005a: *Babies and Bosses - Reconciling Work and Family Life (Vol. 4): Canada, Finland, Sweden and the United Kingdom (2005)*.
- [24] OECD, 2005b: *Society at a Glance: OECD Social Indicators 2005 Edition*. OECD, Volume 2005, Number 2, March 2005.
- [25] OECD, 2007: *Babies and bosses: Reconciling work and family life*. OECD, 2007.
- [26] OECD, 2009: *Pensions at a Glance 2009: Retirement-Income Systems in OECD Countries*.
- [27] Saez, E., 2001: Using Elasticities to Derive Optimal Income Tax Rates. *The Review of Economic Studies*, Vol. 68, No. 1 (Jan., 2001), pp. 205-229.
- [28] Saez, E., 2002: Optimal Income Transfer Programs: Intensive versus Extensive Labor Supply Responses. *The Quarterly Journal of Economics*, Vol. 117, No. 3, (Aug., 2002), pp. 1039-1073, MIT Press.
- [29] Schone, P., 2004: Labour supply effects of a cash-for-care subsidy. *Journal of Population Economics*, 2004, vol. 17, Springer-Verlag.

- [30] Statistics Finland 2011. National Accounts, Total earnings by employer sector and gender, 2008. Read from http://www.stat.fi/tup/suoluk/suoluk_palkat_en.html in 24 February, 2011.
- [31] Viitanen, T., 2007: Childcare voucher and labour market behaviour: Experimental evidence from Finland. Sheffield Economic Research Paper Series, SERP Number: 2007011, United Kingdom.

A Appendix Tables and Figures

All the tables and figures are in this appendix.

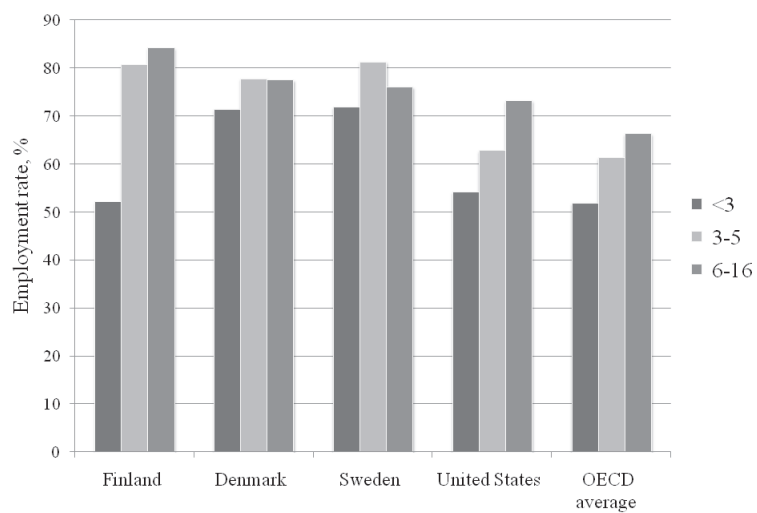


Figure A1: The employment rate of mothers by the age of the youngest child.
Source: OECD (2007).

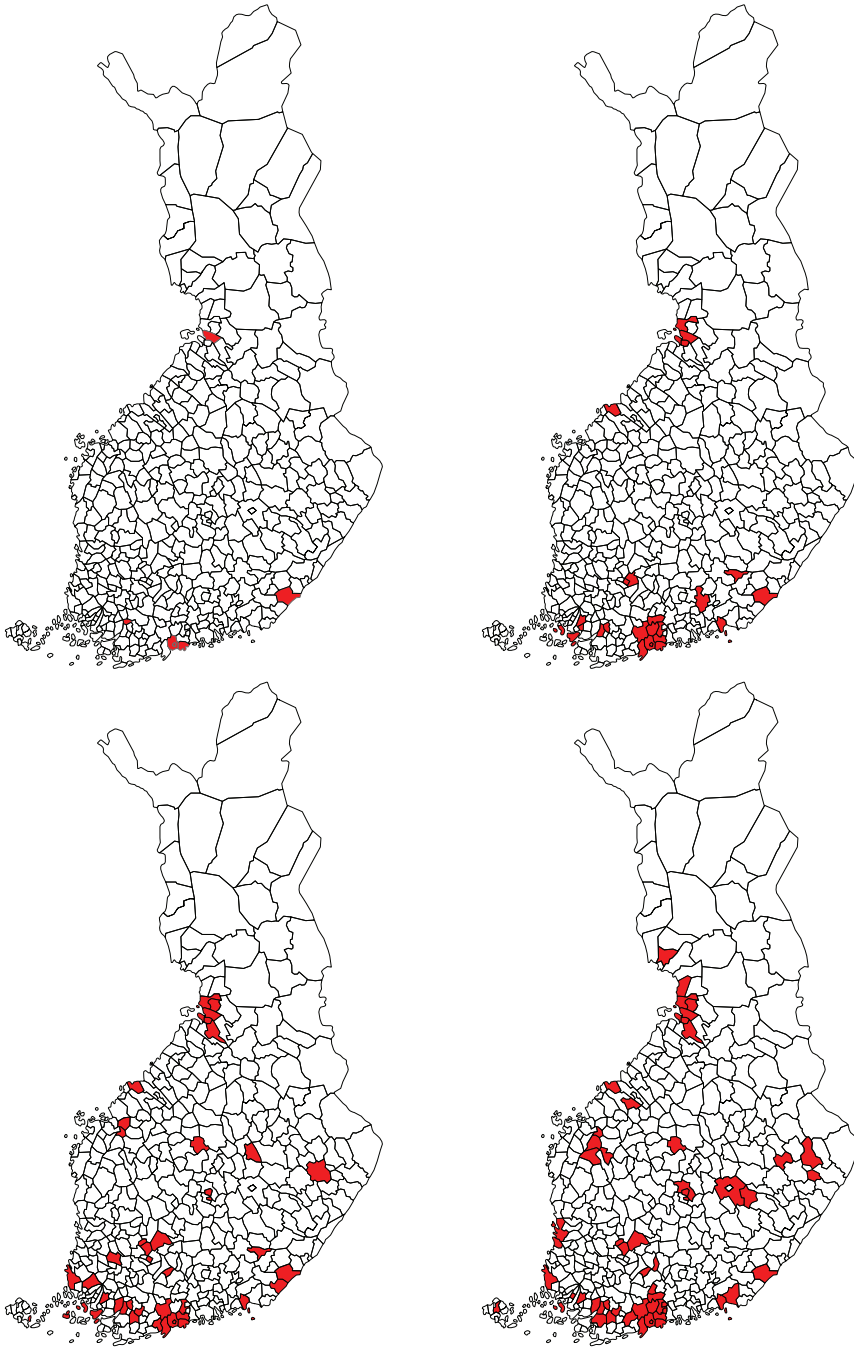


Figure A2: Maps of Finland showing municipalities having a supplement policy in selected years

Note: The above maps of Finland show municipalities with a supplement policy marked in black. The maps correspond to the situations in 1995, 1998, 2001 and 2005 respectively.

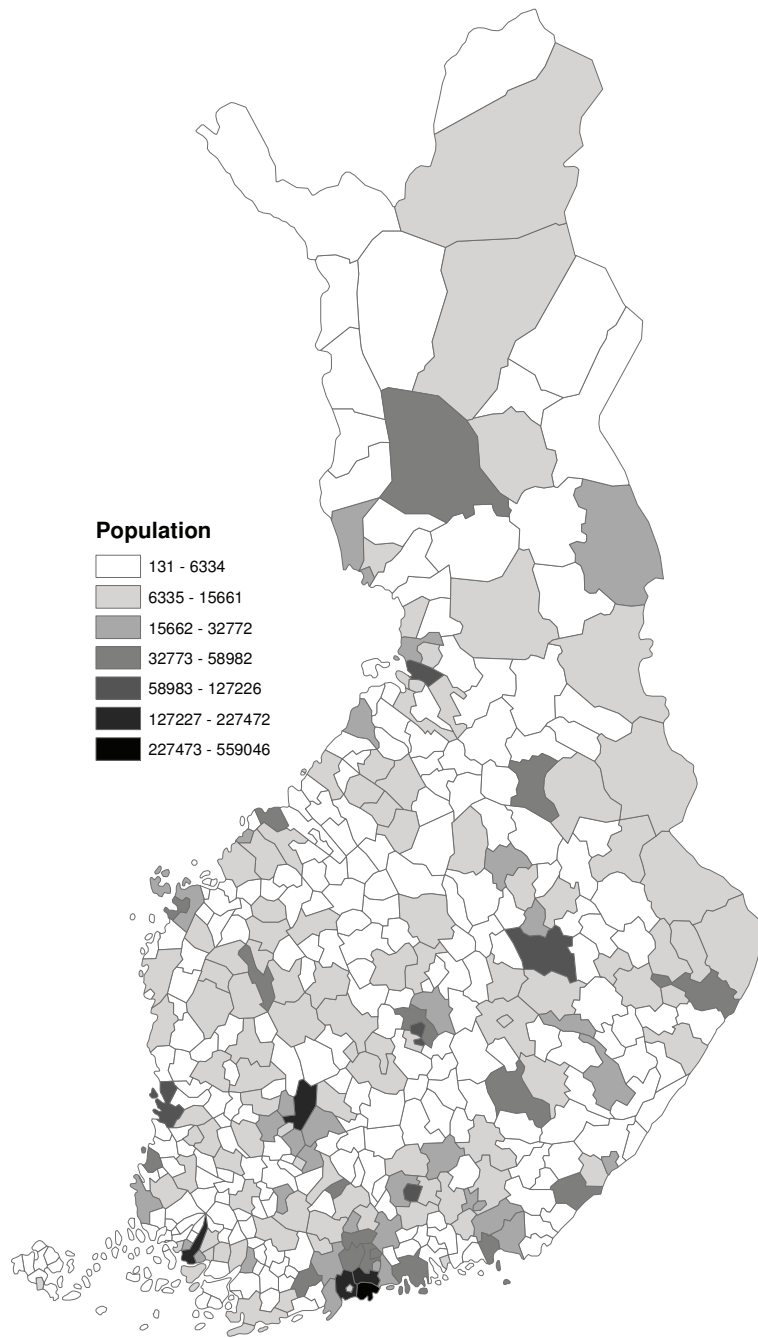


Figure A3: Map showing the population of each municipality in 2005

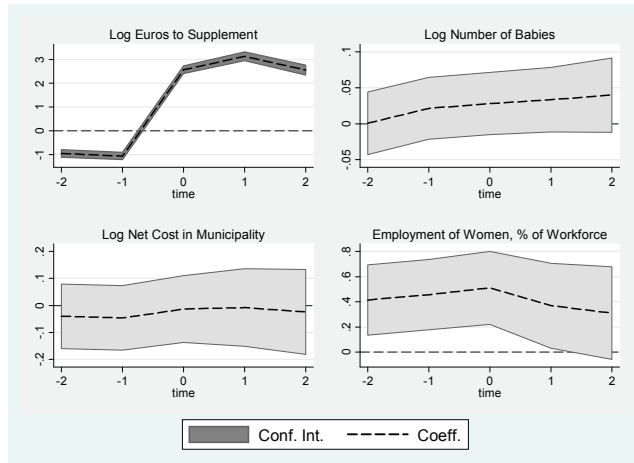


Figure A4: Leads and lags of regression coefficients when a supplement to home care allowance was implemented in a municipality. 4 different dependent variables.

	(1)	(2)	(3)	(4)	(5)	(6)
VARS	Supplem.	CareCost	Priv.care	Homecare	Empl	Migrate
implem.-2	-0.95*** (0.08)	0.017 (0.022)	-0.068 (0.069)	0.0033 (0.013)	0.0065** (0.0033)	-0.005 (0.028)
implem.-1	-1.06*** (0.08)	0.018 (0.022)	-0.103 (0.069)	-0.0084 (0.013)	0.0069** (0.0033)	-0.015 (0.031)
implem.	2.56*** (0.08)	0.005 (0.021)	-0.07 (0.07)	6.6e-05 (0.013)	0.0109*** (0.0034)	-0.023 (0.036)
implem.+1	3.14*** (0.1)	-0.004 (0.022)	-0.162** (0.079)	0.0244* (0.0145)	0.0076* (0.004)	-0.021 (0.036)
implem.+2	2.54*** (0.11)	0.014 (0.025)	-0.039 (0.086)	0.0182 (0.0157)	0.0066 (0.0044)	-0.042 (0.041)
Constant	-5.96*** (0.51)	5.22*** (0.13)	-3.86*** (0.55)	-1.17*** (0.1)	3.58*** (0.00)	3.34*** (0.187)
N	4057	4173	3406	3406	4494	3430
R^2	0.49	0.18	0.06	0.64	0.8	0.26
N of Mun	290	321	319	319	321	312

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A1: Leads and lags of municipality implementing the supplement

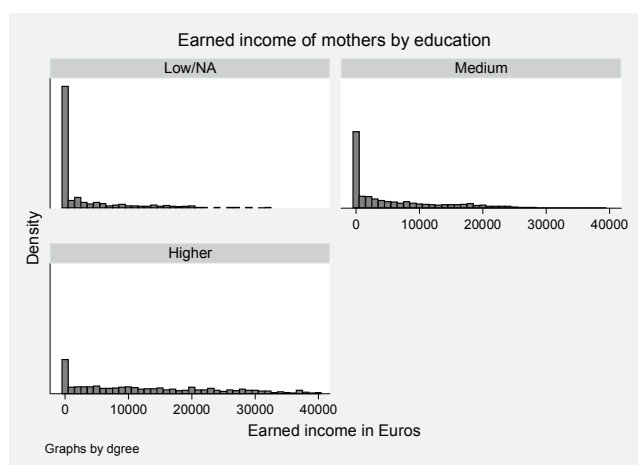


Figure A5: The distribution of earned incomes divided by education in a group of mothers whose youngest child is between 9 months and 3 years old

	Youngest child 9 mon. to 2 yo.		Youngest child 3 to 7 yo.	
	Mean	Sd	Mean	Sd
Number of obs.	5709		8411	
Age	32.09	(5.26)	36.24	(5.40)
Earned income	7726	(10510)	14983	(12979)
Employment rate	0.35	(0.48)	0.65	(0.48)
Education N/A	0.11		0.12	
Basic education	0.42		0.43	
Higher education	0.26		0.26	
Bachelor or higher	0.21		0.18	
N of children under 7	1.65	(0.70)	1.24	(0.45)

Table A2: Descriptive statistics

Note: Mean and standard deviations of the descriptive statistics. In the left panel the youngest child is between 10 months and 3 years of age and in the right panel the youngest child is between 3 and 7 years of age.



Figure A6: Employment rate of mothers by the age of youngest child and proportion receiving a supplement.

Year	All				Conditional on eligibility for supplement			
	Share receives supplement	Employment rate	Earned income	N	Supplement	Employment rate	Earned income	N
1995	0.06	0.36	6305	761	120	0.46	7881	46
	<i>0.24</i>	<i>0.48</i>	<i>8294</i>		<i>30</i>	<i>0.50</i>	<i>9754</i>	
1997	0.12	0.42	8244	761	185	0.40	7448	91
	<i>0.32</i>	<i>0.49</i>	<i>10016</i>		<i>71</i>	<i>0.49</i>	<i>8102</i>	
1999	0.17	0.37	7941	693	206	0.39	8491	116
	<i>0.37</i>	<i>0.48</i>	<i>10306</i>		<i>83</i>	<i>0.49</i>	<i>9997</i>	
2001	0.20	0.39	8932	713	212	0.35	7216	145
	<i>0.40</i>	<i>0.49</i>	<i>10554</i>		<i>76</i>	<i>0.48</i>	<i>8906</i>	
2003	0.20	0.37	9452	667	204	0.30	9029	132
	<i>0.40</i>	<i>0.48</i>	<i>12735</i>		<i>67</i>	<i>0.46</i>	<i>14672</i>	
2005	0.23	0.36	9466	638	190	0.32	7453	144
	<i>0.42</i>	<i>0.48</i>	<i>11989</i>		<i>75</i>	<i>0.47</i>	<i>9374</i>	

Table A3: Outcome and treatment variables

Note: The left panel contains all observations for the selected years and the right panel only those who are eligible for a supplement in that year. The standard deviations are given in italics below the mean values.

B Estimation Results

Outcome	Coefficient	(i) OLS	(ii) OLS	(iii) DD	(iv) DDD
Work	Supplement	-0.01 (0.011)	0.006 (0.007)	-0.033*** (0.010)	-0.036*** (0.013)
	Obs	5,709	5,709	5,709	11,205
	R-sq	0.000	0.117	0.205	0.432
Income	Supplement	275 (320)	269** (123)	-939*** (254)	-1,108*** (388.0)
	Obs	5,725	5,725	5,725	11,287
	R-sq	0.001	0.245	0.313	0.490
Indiv. controls		No	Yes	Yes	Yes
Years		No	No	Yes	Yes
Municipalities		No	No	Yes	Yes
2nd level interactions		No	No	No	Yes
Standard errors in parentheses (clustered on municipal level)					
*** p<0.01, ** p<0.05, * p<0.1					

Table B1: The main estimation results

Note: OLS estimates for a population of mothers. In the top panel, the dependent variable is the labour supply dummy of mothers. In the bottom panel, the dependent variable is earned income of mothers. The supplement is measured in 100 euros per month. Column (i) is a plain regression of the supplement on the dependent variables and column (ii) adds to this individual level covariates. Column (iii) shows the DD results and column (iv) presents the triple difference results. The third difference is between whether or not the youngest child is older than 3 years of age. Individual covariates used: age, education, spouse's income, number of children, the size of household and indicators for each 3 month intervals of children's age. Municipal-level covariates used: municipal income tax rate, municipal unemployment rate, average income in municipality, average number of places in public child day care relative to the number of children in municipality.

	(i)	(ii)	(iii)	(iv)
	3-5 yo. child	Next year child	Prob. in sample	Main estimate
Supplement	0.0129 (0.0136)	0.0149 (0.0509)	-2.83e-06 (1.41e-05)	-0.0316*** (0.0101)
Obs.	4722	541	217837	5877
R^2	0.219	0.548	0.057	0.259
Years	Yes	Yes	Yes	Yes
Municipalities	Yes	Yes	Yes	Yes

Standard errors in parentheses (clustered on municipal level)
*** p<0.01, ** p<0.05, * p<0.1

Table B2: Robustness checks

Note: The dependent variable in columns (i), (ii) and (iv) is the mother's labour supply dummy and in column (iii) it is an indicator with the value of 1 for children under the age of 3 as a dependent variable. The estimation sample in column (i) is mothers whose youngest child is between 3 and 5 years old and in column (ii) women who will have a child next year. Column (iii) is estimated for everyone in the data. Column (iv) shows the main result, but with simplified supplement rules.

Participation	
First stage	-1.037*** (0.0341)
F-value	925.44
Change in incomes	-2.95e-05*** (8.85e-06)
Obs.	5876
R^2	0.191
Elasticity	0.83

Standard errors in parentheses
(clustered on municipal level)
*** p<0.01, ** p<0.05, * p<0.1

Table B4: Change in mothers participation in response to change in incomes

Note: 2SLS results for the mothers' participation dummy. The first stage regresses municipal supplement on change in incomes associated with entry. The second stage explains the participation dummy with the first-stage predicted value.

	Low educ.	Medium educ.	High educ.	1 child	2 children	3 or more children
Work Supplement	-0.075** (0.034)	-0.019 (0.014)	-0.05** (0.023)	-0.05*** (0.014)	-0.046*** (0.014)	0.030 (0.048)
Obs.	647	3873	1189	2633	2535	541
R^2	0.462	0.226	0.380	0.265	0.269	0.444
Income Supplement	-773 (602)	-269 (234)	-2,288*** (610)	-1,511*** (298)	-957*** (318)	223 (966)
Obs.	647	3888	1190	2650	2535	540
R^2	0.498	0.241	0.392	0.345	0.379	0.495

Standard errors in parentheses (clustered on municipal level)
*** p<0.01, ** p<0.05, * p<0.1

Table B3: Divided sample results

Note: The dependent variable in the top panel is the mothers' labour supply dummy and in the bottom panel the mothers' earned income. The sample of mothers whose youngest child is between 10 months and 3 years is divided by family size and mother's education. All the estimates were controlled with the same control vector as for the main results.

	(i) Low educ.	(ii) Med. educ.	(iii) High educ.
First stage	-1.081*** (0.103)	-1.037*** (0.026)	-1.113*** (0.042)
F-value	110.8	1650	706.5
Change in incomes	-3.78e-05* (2.16e-05)	-1.72e-05 (1.12e-05)	-3.81e-05*** (1.48e-05)
Obs.	696	3977	1203
R^2	0.439	0.212	0.357
Elasticity	1.3	0.4	1.5

Standard errors in parentheses (clustered on municipal level)
*** p<0.01, ** p<0.05, * p<0.1

Table B5: Participation response by mothers education

Note: 2SLS results for the mothers' participation dummy divided by their education level. Column (i) shows results with basic education or whom education information was not available, in column (ii) the highest degree attained is high school or equivalent and in column (iii) bachelor level or higher. Change in incomes and other monetary values measured in euros per year.

C Robustness and sensitivity checks

Table C1 reports estimates based on an outcome variable where mothers have reported working 10 or more months in an interview. Column (iii) reports a DD estimate equivalent to the main estimates. Although the coefficient is smaller, it implies a similar participation elasticity, since the participation elasticity measured in this way is smaller than in normal estimates.

	(i)	(ii)	(iii)
Supplement	-0.0548*** (0.00616)	-0.0843*** (0.00958)	-0.0140* (0.00827)
Years	No	Yes	Yes
Municipalities	No	Yes	Yes
Child age		No	Yes
Obs.	6023	6023	6023
R^2	0.013	0.139	0.273

Standard errors in parentheses (clustered on municipal level)
 *** p<0.01, ** p<0.05, * p<0.1

Table C1: Estimations with work dummy based on survey question

Note: OLS estimates for the mothers' labour supply dummy with a value of 1 when reported working 10 or more months per year in a survey. Supplement measured in 100 euros per month.

Outcome	Coefficient	(i)	(ii)
Work	Supplement	0.0026 (0.0093)	0.0043 (0.0095)
	Obs.	5527	5527
	R^2	0.197	0.224
Income	Supplement	244 (279)	-91 (262)
	Obs.	5560	5560
	R^2	0.366	0.387

Standard errors in parentheses(clustered on municipal level)

*** p<0.01, ** p<0.05, * p<0.1

Table C3: Sensitivity check: results for fathers

Note: OLS estimates for fathers' labour supply dummy and earned income. Supplement measured in 100 euros per month. Column (i) is similar to the main DD estimates for mothers. Column (ii) adds linear municipality trends to this.

Outcome	Var	(i)	(ii)	(iii)	(iv)	(v)	(vi)
Participation	Supplement	-0.026* (0.013)	-0.042** (0.021)	-0.026* (0.013)	-0.030** (0.013)	-0.036*** (0.0094)	-0.027*** (0.010)
	Obs.	5,709	3,572	4,493	5,273	5,709	5,709
	R^2	0.225	0.245	0.223	0.206	0.206	0.203
Income	Supplement	-974*** (342)	-1,133*** (423)	-861** (361)	-693*** (233)		
	Obs.	5,725	3,581	4,506	5,289		
	R^2	0.325	0.350	0.321	0.313		

Standard errors in parentheses(clustered on municipal level)

*** p<0.01, ** p<0.05, * p<0.1

Table C2: Sensitivity checks

Note: OLS estimates for the mothers' labour supply dummy and earned income. Supplement measured in 100 euros per month. Column (i) includes linear municipal trends where some smaller municipalities were grouped together. Column (ii) includes only years from 1995 to 2001 and column (iii) only years from 1998 to 2005. Column (iv) leaves out the largest municipality in the sample. Column (v) sets the employment threshold to 70 per cent of the mean income and column (vi) sets the threshold to 30 per cent of the mean income.

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