2023 Studies in social security and health | 162

Tapio Räsänen

Empirical studies on family economics

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Empirical studies on family economics

Author

Tapio Räsänen, Master of Science (Statistics), Researcher
Kela Research, the Social Insurance Institution of Finland
firstname.lastname@kela.fi

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Abstract

Räsänen, T. **Empirical studies on family economics.** Helsinki: The Social Insurance Institution of Finland, Studies in social security and health 162, 2023. 208 pp. ISBN 978-952-284-163-6 (print), 978-952-284-164-3 (pdf).

This thesis studies how family policies affect families' childcare choices and how childbirth affects the gender wage gap. All four articles in this thesis use unit-level register data from Statistics Finland and the Social Insurance Institution of Finland. Econometric methods are applied to study the causal effects of family policies and childbirth on labor market outcomes. The first article studies the dynamic and heterogeneous effects of family policy on mothers' employment re-entry after childbirth. The methodology in this article combines a hazard model with time-varying covariates and regional variation in the level of the home care allowance. The results show that family policy affects families' choices both dynamically (the effect of higher allowances diminishes over time) and heterogeneously (the magnitude of the effect varies according to mothers' background characteristics). The second article studies how private early education and care subsidies affect families' choices when the option of high-quality subsidized universal public daycare is available. Regional variation in both private day care and home care allowances is used as an exogenous variation to identify causal effects. The results show that higher subsidies increase take-up but have no causal impact on home care or the employment rate of women with small children. Instead, private services crowd out public childcare. The third and fourth articles study child penalty – that is, how childbirth affects earnings. Third article shows that a longer-than-average childcare leave results in a greater child penalty. However, at the workplace level, a shorter-than-average childcare leave results in relatively small rewards. The fourth article uses a novel instrument (success of the first medically induced ovulation treatment) to identify the causal effects of fertility on labor earnings. The results highlight the mechanisms behind the wage gap caused by the birth of the first child. Women lose labor earnings by working shorter hours, less overtime, and fewer irregular hours when their children are small.

Keywords (YSO): family policy, labour market, employment, labour supply, mothers, child home care allowance, child care allowances, family leaves, home care, child care, day care, equality (values), earned income, wages, wage differentials, private day care allowance, private services, public services

Tiivistelmä

Räsänen, T. **Empiirisiä tutkimuksia perhetaloustieteestä.** Helsinki: Kela, Sosiaali- ja terveysturvan tutkimuksia 162, 2023. 208 s. ISBN 978-952-284-163-6 (nid.), ISBN 978-952-284-164-3 (pdf).

Tässä väitöskirjassa tutkitaan perhepolitiikan vaikutusta perheiden lastenhoitovalintoihin ja lapsen syntymän vaikutusta sukupuolten välisiin palkkaeroihin. Väitöskirjan artikkelit hyödyntävät Tilastokeskuksen ja Kelan yksilötason rekisteriaineistoja. Kausaalivaikutuksia työmarkkinatulemiin tutkitaan ekonometrisillä menetelmillä. Ensimmäinen artikkeli tutkii perhepolitiikan dynaamisia ja heterogeenisia vaikutuksia äitien työhönpaluuseen lapsen syntymän jälkeen. Artikkelissa käytetty menetelmä yhdistää hazardimallissa ajasta riippuvia muuttujia sekä kotihoidon tuen tason vaihtelua. Tulokset osoittavat perhepolitiikan vaikuttavan perheiden valintoihin sekä dynaamisesti (korkeamman kotihoidon tuen vaikutus pienenee lapsen iän myötä) että heterogeenisesti (vaikutuksen suuruus vaihtelee äitien taustaominaisuuksien mukaan). Toisessa artikkelissa tarkastellaan lasten yksityisen hoidon tuen vaikutusta perheiden valintoihin, kun saatavilla on myös julkinen varhaiskasvatus. Artikkelissa hyödynnetään yksityisen hoidon tuen alueellista vaihtelua kausaalivaikutusten tunnistamisessa. Yksityisen hoidon tuki lisää yksityisten varhaiskasvatuspalveluiden käyttöä, mutta tuella ei ole vaikutusta kotihoidon tuen käyttöön tai pienten lasten äitien työllisyyteen. Sen sijaan yksityiset palvelut syrjäyttävät julkisesti tuotettuja palveluja. Kolmas ja neljäs artikkeli käsittelevät sitä, kuinka lapsen syntymä vähentää äitien työtuloja (engl. *child penalty*). Kolmas artikkeli osoittaa, että keskimääräistä pidempi lastenhoitojakso pienentää äitien työtuloja. Työpaikkatasolla keskimääräistä lyhyempi hoitojakso johtaa kuitenkin suurempiin työtuloihin, mutta ero on suhteellisen pieni. Neljännessä artikkelissa käytetään uutta instrumenttimuuttujaa (ensimmäisen ovulaatiohoidon onnistuminen), jonka avulla tunnistetaan hedelmällisyyden kausaalivaikutus työtuloihin ja -tunteihin. Pienten lasten äidit menettävät työtuloja tehdessään lyhyempiä työpäiviä sekä vähemmän ylitöitä ja epäsäännöllisiä työtunteja.

Asiasanat (YSO): perhepolitiikka, työmarkkinat, työllisyys, työvoiman tarjonta, äidit, kotihoidon tuki, lastenhoidon tuet, perhevapaat, kotihoito, lastenhoito, päivähoito, tasa-arvo, ansiotulot, palkat, palkkaerot, yksityisen hoidon tuki, yksityiset palvelut, julkiset palvelut

Sammandrag

Räsänen, T. **Empiriska studier om familjeekonomi.** Helsingfors: FPA, Social trygghet och hälsa, undersökningar 162, 2023. 208 s. ISBN 978-952-284-163-6 (hft.), 978-952-284-164-3 (pdf).

Den här avhandlingen studerar hur familjepolitik påverkar familjers val av barnomsorg och hur barnafödande påverkar löneskillnader mellan könen. Alla fyra artiklar i avhandlingen använder enhetsbaserade registerdata från Statistikcentralen och Folkpensionsanstalten i Finland. Ekonometriska metoder tillämpas för att studera de kausala effekterna av familjepolitik och barnafödande på arbetsmarknadsutfall. Den första artikeln studerar de dynamiska och heterogena effekterna av familjepolitik på mödrars återinträde på arbetsmarknaden efter barnafödande. Metoden i den här artikeln kombinerar en hazardmodell med faktorer som varierar över tid och regional variation i nivån på hemvårdsstödet. Resultaten visa att familjepolitiken påverkar familjers val både dynamiskt (effekten av högre stöd minskar över tiden) och heterogent (effektens storlek varierar enligt mödrars bakgrundskarakteristika). Den andra artikeln studerar hur stöd för privat vård av barn och hemvårdsstöd påverkar familjers val när högkvalitativ subventionerad offentlig dagvård är tillgänglig. Regional variation i både privatvårdsstöd och hemvårdsstöd används som exogen variation för att identifiera kausala effekter. Resultaten visar att högre privatvårdsstöd ökar användningen av privata dagvårdstjänster men har ingen kausal effekt på hemvård eller på sysselsättningsgraden för kvinnor med små barn. Istället konkurrerar privata dagvårdstjänster ut offentlig vård. Den tredje och fjärde artikeln studerar hur barnafödande påverkar arbetsinkomster (eng. *child penalty*). Den tredje artikeln visar att längre vårdledigheter än genomsnittet har negativa konsekvenser för arbetsinkomster. På arbetsplatsnivå kan däremot en kortare vårdledighet än genomsnittet leda till lönepremier, om än relativt små. Den fjärde artikeln använder ett nytt instrument (framgång vid den första medicinskt stimulerad ägglossningen) för att identifiera de kausala effekterna av fertilitet på arbetsinkomster. Kvinnor förlorar arbetsinkomster genom att arbeta färre timmar, mindre övertid och mindre oregelbundna arbetstider när deras barn är små.

Nyckelord (ALLFO): familjepolitik, arbetsmarknaden, sysselsättning (tillstånd), arbetskraftsutbud, mödrar, hemvårdsstöd, barnavårdsstöd, familjeledigheter, hemvård, barnavård, dagvård, jämställdhet, förvärvsinkomster, löner, löneskillnader, privatvårdsstöd, privata tjänster, offentlig, service

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I was introduced to microsimulation and register data at Statistics Finland in 2014 and have been working on both subjects to this day. I would like to extend my best wishes to my clients and collaborators as well as present and former members of the Research and Microsimulation teams at Statistics Finland. I would especially like to thank Statistics Finland and Kela for providing research data and access to the Fiona remote access system. Thank you to my cell mates, Miska Simanainen, Ilpo Airio, Sampo Varjonen, Vappu Verronen, and colleagues at Kela. Many thanks to Aarni Soppi, Iiro Ahomäki, and Visa Pitkänen for their support with the studies.

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Jyväskylä 15.8.2023

Tapio Räsänen

Contents

List of original publications

This thesis is based on the following original publications:

I Österbacka, E., & Räsänen, T. (2022). Back to work or stay at home? Family policies and maternal employment in Finland. *Journal of Population Economics, 35*(3), 1071–1101. https://doi.org/10.1007/s00148-021-00843-4

II Räsänen, T., & Österbacka, E. (2023). Subsidizing private childcare in a universal regime. *Review of Economics of the Household*. https://doi.org/10.1007/s11150-023-09657-7

III Österbacka, E., & Räsänen, T. (2023). *Selection and signaling at the workplace level. The impact of childcare leave length on child penalty* [Manuscript submitted for publication].

IV Räsänen, T. (2023). *How does motherhood affect women's careers? Causal estimates using medically induced ovulation treatments*. [Manuscript submitted for publication].

The publications are referred to in the text by their Roman numerals and reprinted (print edition) by permission of the copyright holders.

List of figures

List of tables

1 Introduction

Family policies affect how families make decisions regarding paid employment, parental care, and the division of labor within the family. In the 2000s, the use of the term *family policy* became common in public policy or social policy. The term is multidisciplinary and used in research on economics, social policy, sociology, education, and demography as well as in policy making. According to the narrowest definition, family policies are public policies that explicitly affect families with children (Zimmerman, 1979). Policymakers introduce family policies to influence how families make decisions or, for example, to compensate families' childrearing costs. Using applied microeconometrics and economic theory, this thesis helps us understand the different, and sometimes unintended, consequences of family policies.

This thesis draws on two strands of economic literature in family and labor economics. The first strand is related to the classical problem of how families make decisions regarding paid employment and parental care. The first two essays contribute to the literature by offering causal evidence from quasi-experiments. The results are in line with the standard labor supply model, in which parents choose between subsidized childcare and employment or non-employment and home care.

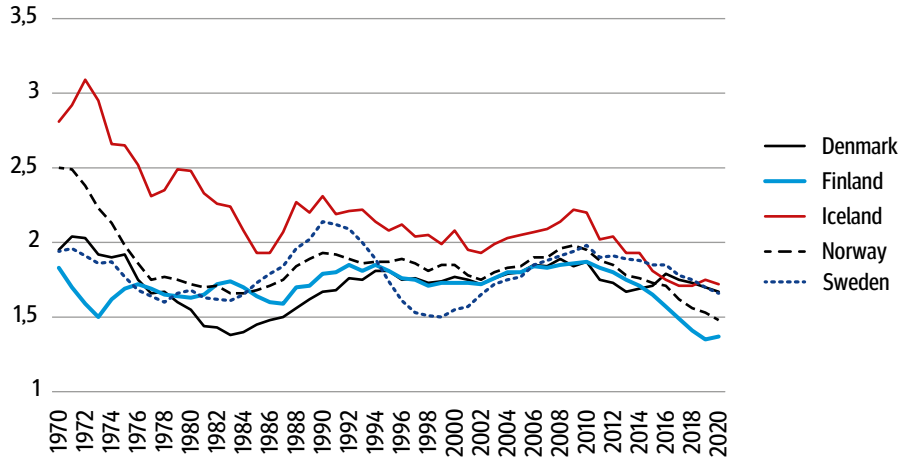
In the second strand, researchers employ econometrics to answer how childbirth affects earnings. The shadow price of fertility – in other words, the opportunity cost of childbirth and childrearing – is central when interpreting the consequences of childbirth on labor market outcomes. The last two essays contribute to the discussion on the consequences of childbirth on gender inequality in earnings.

Applying econometrics to address economic problems is central to my empirical thesis. Empirical studies offer causal evidence on how family policies affect families' decisions regarding paid employment and parental care. I also quantify the effects of childbirth on labor market outcomes and gender inequality in earnings. The main empirical application of my research for policymaking is to show how family policy, particularly childcare subsidies, affects the length of childcare leave and, in turn, gender inequality in earnings.

1.1 Background

In recent decades, OECD countries have introduced or improved several family policies, but the total fertility rate (the number of children per woman) has decreased to an all-time low in the 2020s. However, this historical decline in fertility rates began in Europe and the USA in the late 19th century and the early 20th century (Guinnane, 2011). Although the decline was interrupted by the post-war baby boom, also in Finland, after the boom, fertility rates have been declining in the Nordic countries (Figure 1, p. 12). Declining fertility rates, which are well below the fertility replacement rate, characterized the 2010s in all Nordic countries.

Figure 1. Fertility rates in Finland and other Nordic countries between 1970 and 2020.



Source: OECD (2022).

Economic theory offers two main rational choice explanations for fertility as demand for one's own children, both of which may also explain the fertility changes in the 20th century. First, according to the Easterlin hypothesis, fertility rates may be determined by the relative cohort size and income of young males (Easterlin, 1978; Macunovich, 1998). The literature contains some support, including micro and macro evidence, for the use of relative income variables to explain fertility rates (Macunovich, 1998). However, the second theory, known as the quality–quantity trade-off by Becker (1960) and Becker and Lewis (1973), has become the main theoretical framework in new family economics.

The opportunity cost of children is central in both rational choice explanations of fertility (Friedman et al., 1994). For example, the opportunity cost (or the shadow price) of fertility can be lost market income and consumption opportunities, but explanations with more components have been presented (see, e.g., Walker, 1995). When a child is born, family members are faced with lost leisure or paid labor and increased expenditure – for example, due to the need for larger housing and feeding or clothing children. Fertility not only increases expenditure on children but also results in foregone earnings and lost human capital (Walker, 1995). In addition, early or late childbearing may have an effect on life cycle earnings (Hotz et al., 2005). In summary, shadow prices can be used when comparing opportunity costs between the number of children (quantity), the investment in a single child (quality), leisure, and consumption opportunities.

According to the quality–quantity trade-off in relation to children by Becker and Lewis (1973), the costs of both the quality and quantity of children determine the demand for children. The cost of quantity includes fixed costs per child, such as new

clothing, food, and other essentials (Becker & Lewis, 1973). The quality of children is a difficult concept to explain, but it can be split into two parts. Quality includes both constant costs per child and expenditures that can be jointly consumed by many children, such as training at home and hand-me-down clothes (Becker, 1991).

The demand for children is constrained by the budget (full income), where the budget constraint is not linear (Becker, 1991). Maximizing utility from the quality–quantity demand function for children gives us the marginal costs (shadow costs) of increasing either quality or quantity. The marginal cost of an additional child is greater the higher the quality of the children. Similarly, the marginal cost of an increase in quality is higher when the number of children is greater (Becker & Lewis, 1973).

The shadow price of fertility can be used to calculate the cost of having children. As summarized earlier, the different costs of having children may include increased expenditure, foregone earnings, and lost human capital. Walker (1995) presented a neoclassical model to calculate the shadow price of fertility. In this model, the three components that are useful when analyzing available family policies are foregone earnings, direct costs, and foregone human capital. Parents take care of their children at home and provide parental care, which results in foregone earnings. Direct costs include increased expenditure on children, such as food and clothing. Lastly, the time spent outside of training or the labor market may decrease one's human capital, which is also included in the shadow price of fertility (Walker, 1995).

Higher income does not necessarily increase fertility. Instead, increased female wage income is associated with a smaller number of children; women with higher education and wages face higher opportunity costs of childrearing (Guinnane, 2011). The income elasticity of having children was negative in the 20th century: the higher one's income, the smaller one's number of children (Guinnane, 2011).

1.1.1 Gendered division of labor and child penalty

In the 2020s, women exhibit high education levels, with more women having higher education degrees than in the 1980s. Indeed, occupation- and education-related gender inequality in wages has decreased since the 1980s (Gallen et al., 2019; Kleven et al., 2019a). However, child-related gender inequality in wages has remained at the same level (Kleven et al., 2019a). Results based on event-study methodology from several countries show that childbirth produces a child penalty in wages and labor market participation (Kleven et al., 2019a, 2019b; Sieppi & Pehkonen, 2019).

Becker (1991) argued that the gendered division of labor is caused by very small, sometimes biological, differences within the household. For example, if women have a comparative advantage in household production, then they specialize in it. Similarly, men specialize in market production if they have a comparative advantage compared to household production. Central to this theory of the gendered division of

labor is that comparative advantages, even if they are small, multiply in the labor market. For instance, childbirth is followed by time outside the labor market, and childrearing may reduce the time allocated to market production. The time spent outside the labor market, even if short, multiplies in the labor market and results in wage differences between men and women.

Recent empirical evidence has found evidence both for and against notions of biological differences and comparative advantages. Andresen and Nix (2022) suggested that although biological differences may explain some of the child penalty, the majority of the penalty is due to preferences and gender norms. They found that women who give birth suffer an earnings penalty immediately after childbirth. Women's earnings penalty persists in heterosexual couples, while men appear to suffer no child penalties. By contrast, mothers who give birth in same-sex female couples catch up to their partners two years after childbirth. This is not explained by partner specialization and smaller investment in children: same-sex female couples catch up to heterosexual couples in five years in terms of household-level income.

Overall, results from both heterosexual and same-sex couples suggest that the gendered division of labor and specialization in either market or household production is less important in the 2020s than it was at the beginning of the 20th century. In fact, institutional changes, such as father's quotas and paternity leave, have incentivized fathers to take more parental leave and share tasks in home production (Farré & González, 2019; Tamm, 2019). Early education spending and in-work benefits reduce gender differences in labor market outcomes (Olivetti & Petrongolo, 2017). As preferences, gender norms, and institutions change slowly, understanding the current institutional context of family policies in Finland is important.

1.1.2 Family policies in Finland

In the 21st century, OECD countries have adopted family policies, and egalitarian views have become more common. Similar to the other Nordic countries, Finland is characterized by generous family policies and a dual-earner model instead of a male breadwinner model (Engster & Stensöta, 2011). In Finland, the female employment rate is high compared to central European countries but is lower than in the other Nordic countries (Nordic Statistics, 2022). However, full-time work is more common and part-time work is less common among women in Finland compared to the other Nordic countries (Nordic Statistics, 2022).

It is important to understand the institutional context, including the policies that affect families' decision-making. Although there are several ways of defining family

policy, a realist definition of family policy fits microeconomics reasoning.[1] A realist definition describes family policy as a rational policy model. In this model, actors such as families, family members, or government members are seen as rational decision makers who consider alternative outcomes and their consequences (Zimmerman, 1979).

Available childcare options constitute a significant part of the institutional context in Finland and other Nordic countries. Table 1 (p. 16) describes the family benefits and childcare options available to families with small children in 2010. When children are 9–10 months old, they are taken care of at home based on *parental leave allowance*. At the beginning of the 21st century, parents had a total of 43.8 weeks of parental leave allowances (17.5 weeks of *maternity leave allowance* and 26.3 weeks of *shared parental leave allowance*). In 2003, in addition to the three weeks of *paternity leave allowance*, fathers received a modest, conditional parental leave quota of two weeks (Haataja, 2016). Although *parental leave allowance* can be shared, only a small fraction of fathers use shared parental leave (Saarikallio-Torp & Miettinen, 2021).

The level of *parental leave allowances* depends on the employment and earned income of wage earners. The replacement rate of the allowance is 70% with a ceiling. Some collective bargaining agreements ensure that parents receive full wages during a part of the parental leave – for example, a couple of months for the mother and 2–3 weeks for the father. The majority of parents receive an *earnings-related parental leave allowance*. However, 27% of the mothers received the *minimum parental leave allowance* in 2000, and 14% of the mothers received the same allowance in 2010 (Kela, 2001, 2011).

All families residing in Finland have the right to universal, public, and subsidized early education for their children after parental leave. Alternatively, families are eligible for a *home care allowance* if the child does not attend public or private day care. Families can use the *home care allowance* until the youngest child turns three years old. The majority of families, mainly mothers, use at least a few months of the *home care allowance*.

1 Explicit family policy affects families directly, while implicit family policy includes all other public policies that affect families indirectly (Zimmerman, 1979). Zimmerman (1979) defined family policy as (1) social policy that explicitly affects families, (2) policies that have explicitly agreed-upon goals and affect families, and (3) everything that the government does for and offers to families.

Table 1. Available childcare options and statutory allowances by the age of the child in Finland between 2000 and 2009.

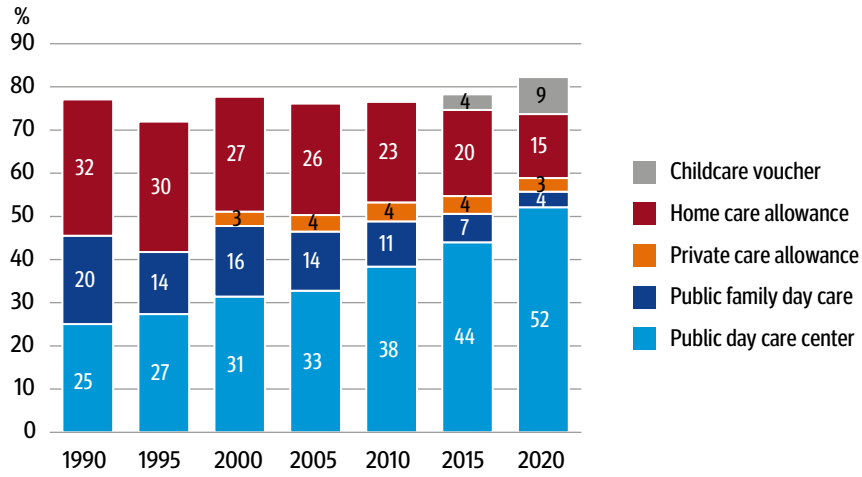
Age	Home care	Public care	Private care
0–9 months old	Parental leave allowance		
9 months to 3 years old	Home care allowance	Subsidized public care	Private day care allowance
3–5 years old	Home care allowance for siblings	Subsidized public care	Private day care allowance
6 years old		Subsidized public care Preschool	Private day care allowance

Families can choose from several options for early education after parental leave and/or home care allowance. In addition to public childcare, parents can use a *private care allowance* to purchase private early education. The public, private, and non-profit sectors offer center-based day care for children under the age of six. Similarly, family day care is offered by all three sectors, as well as by self-employed entrepreneurs. Family day care is usually provided in a home-like environment, such as the caregiver's home, with only a few children.

In recent years, there have been changes in the take-up of available options. Figure 2 (p. 17) shows the proportion of children aged 0–6 years in public childcare, private childcare, and home care between 1990 and 2020. The figure also reflects the four major institutional changes in early education. First, the *child home care allowance* was introduced in 1985 alongside universal public day care. The proportion of children aged 0–6 years in home care was highest during the 1990s, but this number has shrunk over the last 20 years. In addition, the use of the *home care allowance* for long periods has become more uncommon.

Second, public family day care was more common at the beginning of the 1990s than in the 2010s: 20% of children aged 0–6 years attended public family day care in 1990, but this proportion dropped to 11% in 2010 and to 3% in 2020. Third, in 1997, the *private care allowance* was introduced. Families could use the allowance to buy subsidized private center-based care or family day care or hire a childminder at home. Fourth, *childcare vouchers* became more common after a law change in 2009. After this change, municipalities could provide a flat-rate or means-tested *childcare voucher* for families that could be used to buy subsidized private early education services.

Figure 2. Proportion of children aged 0–6 years attending early education, receiving home care, or attending private childcare.[a]



[a] Source: Kela and the National Institute of Health and Welfare. Parental leave allowances and preschool have been excluded from the figure. Information on childcare vouchers is available from 2015.

Although no one monitors the quality of parental care, both public and private childcare have similar regulations regarding the quality of services and the required child-to-staff ratio. Municipalities approve new private providers and are required to offer public childcare to all eligible children. Both private and public providers are monitored, which should ensure that minimum quality requirements and the child-to-staff ratio are upheld in both private and public center-based care and family day care.

In summary, the state and municipalities subsidize the public day care, private childcare, and home care of all children in Finland. Services and direct subsidies, however, entail different costs for the municipalities that are required to offer early education for all children. Subsidizing home care and private childcare may reduce public expenditures compared to public childcare. At the same time, these subsidies may also have unintended consequences in terms of the female labor supply, gender inequality, and child outcomes.

1.1.3 Female labor supply and childcare

The Nordic countries are characterized by high public expenditure on childcare and the dual-earner model whereby both adult members of households with children work full time or part time. We can draw two main inferences from the last three sections on fertility, the gendered division of labor, and the institutional context: (1) higher female wages result in higher opportunity costs of fertility because women lose earnings while on childcare leave; and (2) at maximum, only one person divides their effort between both market and home production. Furthermore, men may have

a comparative advantage over women in market production; if women earn less than men, then women may focus more on home production (Becker, 1991).

The existing literature mainly focuses on the effects of childcare subsidies or prices on female employment and childcare attendance rates. However, the results on highly subsidized childcare regimes have been mixed. For instance, lowering formal childcare prices, increasing subsidies, or increasing access to formal childcare may not increase female labor market participation, at least in Nordic and European countries in which formal childcare is heavily subsidized (Lundin et al., 2008). Two reasons – heterogeneous effects and the reallocation of slots – explain these limited or null results. First, changes in prices or subsidies may cause the reallocation of caregivers and childcare slots as well as changes in provision type (Bassok et al., 2014; Brewer et al., 2016; de Muizon, 2020; Havnes & Mogstad, 2011; Schuss & Azaouagh, 2021; Viitanen, 2011). Second, heterogeneous effects may explain the small effects of childcare subsidies on female employment (de Muizon, 2020; Schuss & Azaouagh, 2021).

The standard labor supply model can be used to analyze how childcare subsidies affect dual-earner families. Families choose between parental care and subsidized public or private childcare. Childcare can be provided as parental care, when one parent stays at home to take care of the child, or as formal childcare outside the home.

A discrete choice model (Kornstad & Thoresen, 2007; Thoresen & Vattø, 2019; Berlinski et al., 2020) formalizes the choices between paid employment, formal childcare, and parental care. Parents, denoted by mother m and second parent or father f, choose jobs $\{k_m, k_f\}$ from a pool of available jobs S and childcare option r from a pool of available formal childcare options B. Both $\{k_m, k_f\}$ and r are finite, and options within B and S are mutually exclusive.

A single-parent or a dual-earner household with individual taxes maximizes utility in terms of time and budget constraints, restricting choices in the model. Let $U(C, h_m, h_f, k_m, k_f, r)$ be utility from consumption C, the utility of working in jobs $\{k_m, k_f\}$ for $\{h_m, h_f\}$ hours and choosing a childcare option r. Without specifying the functional form, a utility function with deterministic $v(\cdot)$ and stochastic part $\varepsilon(\cdot)$ expresses the preferences of the family as follows:

$$U(C, h_m, h_f, k_m, k_f, r) = v(C, h_m, h_f, k_f, k_m, r) + \varepsilon(C, h_m, h_f, k_f, k_m, r)$$

The stochastic error term $\varepsilon(C, h_m, h_f, k_f, k_m, r)$ includes unobservable factors, such as individual preferences for work, leisure, parental care, or the quality of formal childcare.

Parents receive net wages $\{h_m w_m, h_f w_f\}$ by working $\{h_m, h_f\}$ hours. Household disposable income and budget constraint is

$$C = h_m w_m + h_f w_f - h_d p_r + I$$

where either $h_f w_f = 0$ or $h_m w_m = 0$ in the case of a single-parent household. Term I includes all other, non-labor income. The demand for paid childcare is h_d hours, and p_r is the out-of-pocket cost of formal childcare option r (Berlinski et al., 2020).

In a joint labor supply model, both parents can provide parental care or work (Thoresen & Vattø, 2019). Following Berlinski et al. 2020, parents are subject to time constraints

$$h_f + t_f + l_f = 16$$

$$h_m + t_m + l_m = 16$$

where $\{h_i, t_i, l_i\}$ correspond to hours at work, parental care, and leisure.

In the Finnish institutional context, public day care and different forms of private day care are available, and public day care, private day care, and home care are all subsidized. With the subsidies, the different alternatives for formal childcare change to

$$p_r = p_{r,m} - p_{r,s}(h_m w_m, h_f w_f, I, X)$$

where $p_{r,m}$ is the unsubsidized market price of childcare option r and $p_{r,s}(h_m w_m, h_f w_f, I)$ is the subsidy for option r. Subsidies or reductions to childcare fees may depend on household characteristics X, such as the number of children or household income.

In summary, parents have several choices for providing care for their children in the simplified joint labor supply and childcare choice models. The Finnish institutional context emphasizes the following two choices:

(1) Parents can choose to provide care at home, but parental care and formal day care are mutually exclusive. The family receives a cash benefit (parental leave allowance or the home care allowance) if it chooses parental care, which will increase non-labor income I. However, one or both parents provide parental care at home, which reduces net income from work.

(2) Parents can choose a public or private childcare provider with market price $p_{r,m}$ where available options are subsidized. However, eligibility and available subsidies may vary depending on, for example, background characteristics or municipality of residence.

If either eligibility, available subsidies, or the amount of available subsidies varies, then both reduced-form and structural-form estimations are possible given appropriate data.

In this thesis, I estimate reduced-form results instead of providing structural-form evidence.[2] The joint labor supply and childcare choice model can be used to analyze how changes in childcare subsidies affect the choice between parental care and formal childcare. For instance, with all other prices constant, different levels of the *home care allowance* or the *private care allowance* affect the price of childcare. On the one hand, increasing the *home care allowance* increases the relative price of childcare (either public or private). On the other hand, increasing the *private care allowance* decreases the relative price of private childcare. I further discuss these two inferences in the first two articles.

1.2 Overview of the empirical articles

This thesis includes one published research article and three manuscripts. Table 2 (p. 21) summarizes the author contributions in all four articles that led to the publication or the finalized manuscript according to the Contributor Roles Taxonomy.[3] All research conducted as part of this thesis is part of family leave reforms and gender quality (LAPE II) research project at Kela, the Social Insurance Institution of Finland. Kela provided the resources for data collection, computing resources, and analysis tools. All members of LAPE II shared tasks regarding project administration, supervision, and funding acquisition. However, the largest contribution to these tasks came from Miia Saarikallio-Torp and Anneli Miettinen, who were responsible for project management, research activity planning, reporting, and leadership.

2 See Kornstad and Thoresen (2007) or Thoresen and Vattø (2019) for a context in which the home care allowance is available or Berlinski et al. (2020) for relevant structural-form estimations.

3 See description at https://www.elsevier.com/authors/policies-and-guidelines/credit-author-statement for a brief summary of Brand et al. (2015).

Table 2. Articles included in the thesis and author contributions leading to publication or manuscript.

Publication/Manuscript	Conceptualization	Methodology, formal analysis, data curation	Writing
1. Österbacka, E., & Räsänen, T. (2022). Back to work or stay at home? Family policies and maternal employment in Finland. Journal of Population Economics, 35(3), 1071–1101. https://doi.org/10.1007/s00148-021-00843-4	Shared responsibility for conceptualization and research questions	Räsänen was mainly responsible for methodology, formal analysis, and related tasks	Shared responsibility for original draft, reviewing, and editing
2. Räsänen, T. & Österbacka, E. (2023). Subsidizing private childcare in a universal regime. Review of Economics of the Household. https://doi.org/10.1007/s11150-023-09657-7	Shared responsibility for conceptualization and research questions	Räsänen was mainly responsible for methodology, formal analysis, and related tasks	Shared responsibility for original draft, reviewing, and editing
3. Österbacka, E., & Räsänen, T. (2023). Selection and signaling at the workplace level. The impact of childcare leave length on child penalty [Manuscript submitted for publication].	Shared responsibility for conceptualization and research questions	Räsänen was mainly responsible for methodology, formal analysis and related tasks	Shared responsibility for original draft, reviewing and editing
4. Räsänen, T. (2023). How does motherhood affect women's careers? Causal estimates using medically induced ovulation treatments. [Manuscript submitted for publication].	Solely responsible for conceptualization and research question	Solely responsible methodology, formal analysis, and related tasks	Solely responsible for original draft, reviewing, and editing

1.2.1 Institutional context of the empirical studies

Table 3 (p. 22) contains the shadow price of fertility, the three components presented by Walker (1995), and their counterparts in the Finnish institutional context. Finnish family policies cover foregone earnings and direct costs. For instance, maternity, paternity, and parental leave allowances replace lost income. Similarly, the child home care allowance replaces some of the lost income, but the flat rate is much lower than parental leave allowances. Higher allowances also increase the relative price of out-of-home care.

Table 3. Shadow price of fertility, examples Finnish family policies, and articles on each topic.[a]

Component	Example policy	Use	Article
Foregone earnings	Maternity, paternity, and parental leave allowances	Replaces lost income	1
Foregone earnings	Home care allowance	Replaces lost income, increases the price of public childcare	1, 2, 3
Foregone earnings	Flexible care allowance		4
Direct costs	Child benefit	Replaces direct costs	
Direct costs	Private care allowance	Reduces the price of private childcare	1, 2
Direct costs	Subsidized day care	Reduces the price of public childcare	1, 2
Human capital accumulation			3, 4

[a] See Walker (1995).

All four empirical articles cover a large number of Finnish family policies. Different components of Finnish family policies are analyzed ceteris paribus – that is, when all other things remain constant. Most emphasis is on the *home care allowance*, the *private care allowance*, and *subsidized public day care*. Section 1.2.2 presents the empirical methodology and data used to analyze these policies.

1.2.2 Overview of data and methods

All four essays use the FOLK modules from Statistics Finland and unit-level register data from Kela. The first data set, used in the first two essays, consists of a 60% random sample of all Finnish women who gave birth between 2001 and 2009 (Österbacka & Räsänen, 2022). The second data set, used in the third essay, consists of a 70% random sample of all Finnish women who gave birth between 1997 and 2017. Table 4 (p. 23) summarizes the data sources, methods, and exogenous variation sources. In addition to the data from Statistics Finland, the first three essays use information on childcare allowances from Kela. The fourth essay uses information from Kela's drug reimbursement register.

The labor market outcomes and the majority of basic demographic information in the four essays come from administrative registers and research data modules. The FOLK personal data modules from Statistics Finland include basic demographic, labor market, and earnings information on the full population of Finland from 1988 to 2017. The Structure of Earnings Statistics (SES) data from Statistics Finland includes job characteristics for all employees except those in firms with fewer than five employees. Lastly, information on exact birth dates is used in the fourth essay.[4]

4 The FOLK modules and SES data are described in the Taika research data catalogue (https://taika.stat.fi/en/).

Table 4. Data, samples, methods, and exogenous variations in the four articles.

Article	Data	Sample	Method	Exogenous variation
1	FLEED	Families 2000–2009	Hazard model	Home care allowance
2	FLEED	Families 2000–2009	OLS, FE	Private care allowance
3	FOLK, SES	Families 2000–2009	Event study, IV	Home care allowance
4	FOLK, SES	Women 2001–2009	IV	Fertility treatments

Notes: Acronyms under the Method heading refer to ordinary least squares (OLS), fixed effects (FE), and instrumental variables (IV) estimation. Acronyms under the Data heading refer to Finnish Longitudinal Employer-Employee Data (FLEED) and Structure of Earnings Statistics (SES) data. In addition, FOLK refers to FOLK research data modules.

Appropriate econometric methods are used in causal identification. Table 4 presents the data sources as well as the methods and sources of exogenous variation. The first three articles use exogenous variation in different childcare subsidies. All three articles use regional variation in top-offs to the *child home care allowance*. However, the second article uses similar regional top-offs to the *private care allowance*. The first two articles use difference-in-differences to identify the causal effect of childcare subsidies on labor market outcomes and childcare choices.

The third and fourth articles use instrument variables to identify the causal effect of childbirth and childcare leave on labor market outcomes. The third article follows Kleven et al. (2020b) to identify the causal effect of childbirth on labor earnings. Event-study methodology enhanced with an instrument variable is used to identify the effect of taking a longer-than-average childcare leave on labor market outcomes. The last article follows a recent study by Lundborg et al. (2017) that used in vitro fertilization treatments to identify the causal effect of childbirth on labor market outcomes.

1.2.3 Back to work or stay at home? Family policies and maternal employment in Finland

The first article studies the heterogeneous and dynamic effects of family policy on employment entry after childbirth. The policy instrument in this article is the home care allowance, a flat-rate cash benefit to support the home care of children. The main result shows that higher subsidies for the home care allowance affect the decisions that women and families make, both dynamically (the effect diminishes over time) and heterogeneously (the magnitude of the effect varies according to background characteristics). Women with steady labor market attachments return to work faster and are less affected by the increase in the home care allowance than women with weak labor market attachments. The main policy implication is that the heterogeneous effects of family policies should be considered when designing or redesigning policies.

The existing literature shows that higher home care subsidies reduce the employment rate of women with small children. Kosonen (2014) showed that higher levels of the home care allowance reduce the employment rate of women with children under three years of age. Furthermore, the home care allowance increases the relative price of public childcare while reducing the relative price of home care (Kornstad & Thoresen, 2007).

Not only subsidies but also the background characteristics of women and families with small children affect the length of childcare leave. Fitzenberger et al. (2013) and Kuhlenkasper and Kauermann (2010) identified the dynamic effects of background characteristics and replacement rates of family benefits on the duration of childcare leave. Burgess et al.'s (2008) results indicate that there should be bunching at time points when the replacement rate of family benefits is reduced. Overall, women's labor market attachments and other background characteristics affect their employment re-entry after childbirth. The first article contributes to the literature by combining both dynamic and heterogeneous effects.

This article uses administrative register data on employment, unemployment, and childcare duration. The study population consists of women who gave birth to their first or second child between 2000 and 2009.

Between 2000 and 2013, municipal supplements to the home care allowance created exogenous variation in relation to the flat-rate benefit for different families residing in different municipalities. We apply a hazard model to estimate the causal effect of subsidies on the employment hazard (the likelihood of transitioning from childcare leave to employment). In addition, by using time-varying covariates and allowing the coefficient value to change according to the age of the child, we estimate both time-varying and heterogeneous policy effects while controlling for background characteristics as well as year and municipal fixed effects.

The results show that labor market attachment before childbirth affects the length of childcare leave, but higher subsidies for home care also increase the average length of home care. Women who are attached to the labor market, either by permanent or temporary work contracts, return to employment faster and are less affected by increases in the home care allowance. Similarly, women with higher reservation wages or tertiary education return to employment faster and are less affected by the increases. However, women who are outside the labor force or unemployed return to work slower and are more affected by the increases in the home care allowance.

Lastly, the dynamic effects show that higher subsidies reduce the employment hazard the most when the first or second child is less than two years old. Regardless of mothers' labor market attachments, the effect of higher subsidies diminishes as the child

grows older. In addition, we find some evidence that staggered reductions in benefits result in higher employment hazard before and after the reduction.

1.2.4 Subsidizing private childcare in a universal regime

The second article studies how subsidies to private early education and care affect the childcare arrangements that families make when high-quality subsidized universal public childcare is available. The policy instrument in the second article is the private care allowance, a subsidy for private childcare that enables families to buy subsidized care at private childcare centers, use private family day care, or hire a private childminder. The main results show that subsidies to private childcare increase take-up but crowd out public municipal day care. The crowding out of municipal day care reduces public and total childcare expenditures. In addition, there is a socioeconomic gradient in the take-up of the home care allowance and the private care allowance.

This article is related to four strands of economic literature: (1) employment and demand, (2) no-use subsidies, (3) equity and segregation, and (4) the net costs of early education programs. The article contributes to the first two strands of the literature and offers policy recommendations and future research topics for the latter two.

First, how childcare subsidies and tax credits affect employment and demand for childcare are widely studied topics in North American and European contexts. The results are context specific, as some countries offer only public childcare, only private options, or subsidize both alternatives. For example, compared to already available public childcare, further subsidizing childcare does not necessarily increase tax revenues and women's employment rates (Eckhoff Andresen & Havnes, 2019; Glomm & Meier, 2020; Lundin et al., 2008).

Second, in the Finnish context, both private and public childcare options are subsidized, and the home care of small children is subsidized as well. No-use subsidies, such as the home care allowance in the Finnish context, have been studied using data from several Nordic countries. Overall, no-use subsidies reduce the labor force participation of mothers (Giuliani & Duvander, 2017; Hardoy & Schøne, 2010; Kosonen, 2014; Österbacka & Räsänen, 2022).

The last two topics, equity and net costs, constitute gaps in the economic literature on childcare subsidies. The net costs of the programs in OECD countries have been neglected in the literature, except in a few studies (see Berlinski et al., 2020; Eckhoff Andresen & Havnes, 2019). We propose that these two gaps in the literature should be addressed as soon as data on child outcomes and center-level information become available.

In this article, we employ difference-in-differences analysis using administrative register data on families in Finland from 2000 to 2009. In the 2000s, many municipalities

adopted or offered municipal supplements to private childcare; exogenous variation arose from regional subsidies to the private day care allowance. Difference-in-differences analysis identifies the causal effects of increased subsidies on take-up, employment, and crowding out from public day care.

The results show that higher supplements to private daycare increase take-up, but the increases have little-to-no effect on the employment rate of women. In addition, private childcare crowds out public childcare and reduces both total and public expenditure on childcare. Parents with high income and education are likelier to use private childcare, while families with low socioeconomic status use home care. However, the quality of services or caregivers cannot be evaluated using administrative register data, and the topic requires further research.

1.2.5 Childcare leave and child penalty: Selection or signaling at the workplace level?

The third article studies how the length of childcare leave affects the child penalty (the reduction in earnings after childbirth). Similar to the first article, the policy instrument in the third article is the home care allowance, which produces variation in the length of childcare leave among employed women in Finland. The results show that if women choose longer (shorter) childcare leave than their peers at the workplace level, then they suffer larger (smaller) child penalties in monthly earnings. However, the self-selection of longer or shorter childcare leave explains a portion of the penalty.

Studies that use an event-study approach are the most recent addition to the literature (Kleven et al., 2019a, 2019b; Sieppi & Pehkonen, 2019). Although research on the child penalty, particularly using the event-study methodology, is becoming more frequent, several gaps remain in the literature. The majority of studies focus on population-level averages rather than show the underlying mechanisms or report heterogeneity among women with children. This third article contributes to the literature by showing that women who stay at home for longer suffer larger child penalties. However, women who return to work faster suffer smaller penalties but do not gain large wage increases.

We apply event-study methodology and compare the earnings trajectories of employed women to those of men after first childbirth. Women and men who had their first child between 2002 and 2006 are followed for five years before and 10 years after childbirth.

This article makes two methodological contributions to the literature. First, we identify a novel use of administrative data by calculating the average workplace-level childcare leave for all industries and workplaces in the sample. We use employee-employer microdata to link mothers to their workplaces via pseudonymized identifiers and compare them to their peers at the workplace level. We calculate workplace

averages for all workplaces and compare mothers' individual leave lengths to workplace averages.

The first part of the article shows that choosing a longer (shorter) childcare leave compared to one's peers results in a larger (smaller) child penalty than average. However, similar to previous research, childcare leave is nonrandom. The length of a mother's childcare leave represents a joint-optimization problem at the family level as well as individual preferences between home care and employment re-entry. To remove self-selection, we use an instrumental variable methodology in which we interact the instrument with the length of childcare leave in the event-study model. We use a municipal supplement to the home care allowance as an instrument.

The second part of the article shows that part of the child penalty stemming from longer-than-average childcare leave can be attributed to the self-selection of longer childcare leave. We derive coefficients for groups of mothers, including compliers, always-takers, and never-takers, with different work-family preferences. The results show that part of the child penalty is caused by self-selection. Family-oriented mothers self-select longer childcare leave. Career-oriented mothers, by contrast, can signal their commitment to the workplace by returning to employment faster than the workplace average.

1.2.6 How does motherhood affect women's careers? Causal estimates using medically induced ovulation treatments

The fourth article uses medically induced ovulation treatments to identify the causal effect of fertility on labor earnings. The identification strategy relies on the assumption that the success of the first medically induced ovulation treatment is as good as random in relation to previous labor earnings. The results show that women not only lose years of employment due to childcare in the short run when the children are small, but they also lose labor earnings by working shorter hours, less overtime, and fewer irregular hours. On average, women lose two years of employment and €50,000–€100,000 in cumulative labor earnings in the first 10 years after childbirth.

Relatively few studies have established a credible causal connection between the mechanism behind the wage gap and giving birth to the first child. Several studies have established the connection between giving birth to the second or subsequent child and gender inequality measures in wages or hours worked. However, women who have children may have different preferences than childless women, which causes a selection problem. Many studies seek to overcome this selection problem by using instruments such as twin births, a mixed sibling sex-composition, or unplanned pregnancies (Angrist & Evans, 1998; Ashcraft et al., 2013; Bronars & Grogger, 1994; Jacobsen et al., 1999; Nuevo-Chiquero, 2014). The weakness of previous studies with twin births or a mixed sibling sex-composition is that they only include mothers with

children. Recent studies by Lundborg et al. (2017) and Markussen and Strøm (2020) include childless women and first childbirth.

I use the success of the first medically induced ovulation treatment as an instrumental variable. The identification strategy suggested by Lundborg et al. (2017) enables me to estimate the causal effect of childbirth. Fertility treatments generate exogenous variation for women without any previous children. This identification strategy has several strengths compared to previous studies. More studies estimate the effect of fertility at the intensive margin (the effect of adding one more child to the family) than at the extensive margin (giving birth to the first child).

The study population includes women (aged 24–40 years) who started their first fertility treatment between 2001 and 2010. The study uses unit-level data on all individuals in Finland, and the data set includes purchases of medical substances used in fertility treatments from 1999–2010 collected from the drug reimbursement register. Administrative unit-level data on purchases are linked to employee-employer data from Statistics Finland.

The results show that employment effects at the extensive and intensive margins explain a large portion of the wage gap between women with and without children. Furthermore, employed women with children work fewer hours and receive fewer wage supplements than do childless women. Immediately after childbirth and until the child enters primary school (i.e., 0–7 years after childbirth), reduced employment increases the earnings penalty. An increase in part-time work and fewer wage supplements from irregular and overtime work explain a portion of the earnings penalty among employed women. When the children are older (i.e., 9–15 years old), mothers work more and earn similar or higher wages than childless women and catch up to childless women in monthly earnings.

1.3 Summary

All four articles apply economic theory and econometric methods to analyze the economic consequences of childbirth, available childcare options, and childcare subsidies. Family policies clearly affect families' decisions. The empirical results have policy implications by enabling policymakers to make informed decisions.

Three of the articles present empirical results from two policy instruments in Finnish family policy – namely, the *home care allowance* and the *private care allowance*. The empirical results align with the standard labor supply model, with one additional policy-related result. Families make decisions between paid employment and parental care; the relative costs of home care, public childcare, and private childcare matter for these decisions.

The first two articles show that families with low socioeconomic status and mothers with low opportunity costs choose home care. Families with high socioeconomic status, by contrast, are likelier to use private childcare. Mothers with higher opportunity costs are likelier to re-enter the labor market faster after childbirth than mothers with lower opportunity costs. The results confirm the findings of previous studies while showing that family policy can increase the socioeconomic differences between families.

The last two articles reveal how childbirth affects gender equality. Reduced full-time employment and increased part-time work among employed women explain the majority of the earnings gap between women and men with children. The results of the third article show that a longer-than-average childcare leave may contribute to the wage gap between men and women even ten years after the first childbirth. However, the results also indicate that preferences and self-selection explain part of the earnings gap: family-oriented women experience larger penalties, while work-oriented mothers experience smaller penalties. In addition, the last article provides support for compensating wage differentials: mothers are willing to forego earnings either to avoid unfavorable job characteristics or to gain job amenities.

The results of the last article show that wage supplements from overtime work and irregular hours explain a portion of the gender wage gap between childless women and employed women with small children. Large and small differences in labor market decisions accumulate to a relatively large child penalty ten years after childbirth. However, there is no permanent decrease in wages because mothers catch up to childless women, regardless of lost work experience during childcare leave.

Lastly, gender inequality in earnings is present even in the egalitarian Nordic countries, but the results from all four articles show that the situation is not as grim as anecdotal evidence would suggest. The persistent notion of mothers who remain at home for long periods after the first childbirth is both inaccurate and outdated; mothers work between childbirths and return to the labor market relatively quickly after childbirth. In addition, Finnish policy changes in 2022, which increased fathers' parental leave quotas, support a more equal division of labor within families. However, it remains to be seen whether the recent changes cause fathers to participate more in childcare and housework.

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Even though fathers have participated in childcare more and more in the 2000s, mothers still use the majority of parental leaves in Finland. Non-employment during childcare leave explains a large portion of earnings differences between mothers and fathers after childbirth. In addition, available childcare subsidies steer families' childcare choices and may shorten or lengthen childcare leaves.

This study shows that childcare subsidies affect families' choices between home care and public or private early childhood education and care. Furthermore, the choices may affect the career development of mothers. Different mechanisms explain mothers' reduced earnings after childbirth, the so-called child penalty. First of all, non-employment during childcare leave explains the largest share. Additionally, childcare leaves that are longer than average result in larger child penalties. Secondly, employed women work fewer hours, more part-time, and less overtime when their children are small.

The Social Insurance Institution of Finland
Kela Research
Phone +358 20 634 11
julkaisut@kela.fi
www.tietotarjotin.fi/tutkimus

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