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IS THERE A MOTHERHOOD WAGE PENALTY IN THE FINNISH PRIVATE SECTOR?

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ABSTRACT: Using data from the Finnish private sector, this paper shows that giving birth to a child has negative effects on the mother's wage. Analysis of the reasons for the wage penalty associated with motherhood suggests that the loss of human capital during the child-related career break is an important factor behind the motherhood wage penalty. The paper also finds some evidence that mothers' selection into different types of firms than childless women may contribute to the wage penalty. Instead differences in unobserved time-invariant individual characteristics between mothers and childless women seem to be unimportant in explaining the motherhood wage penalty. Finally, there seems to be variation in the child-penalty across worker and firm characteristics. For example, the penalties are lower in the female-dominated industries than in the male-dominated industries. There is also variation in the motherhood wage penalty across the conditional wage distribution. Most notably, the large average wage penalties for mothers who spend longer periods at home taking care of their children appear to be driven by heavy penalties at the upper tail of the conditional wage distribution.

Keywords: Wages, Mothers, Human Capital

JEL classification: J13, J24

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TIIVISTELMÄ: Tämä tutkimus käsittelee perhevapaiden vaikutusta äitien palkkakehitykseen Suomen yksityisellä sektorilla. Palkkavaikutusten suuruuden arvioimisen lisäksi tutkimuksessa tarkastellaan, miten ns. lapsisakon suuruus vaihtelee lapseen liittyvän urakatkon pituuden mukaan. Kolmantena teemana tutkimuksessa pohditaan lapsisakon pysyvyyttä. Onko lapsen saamisella pysyviä vaikutuksia äidin palkkauraan vai ovatko vaikutukset luonteeltaan lyhytkestoisia? Tutkimuksessa käsitellään myös yrityspiirteiden merkitystä lapsisakon määräytymisessä ja pyritään vastaamaan kysymykseen, valikoituvatko äidit mahdollisesti erityyppisiin yrityksiin kuin lapsettomat naiset ja mikä merkitys tällä on lapsisakon suuruuden kannalta? Viimeisenä aiheena tutkimuksessa perehdytään siihen, miten lapsisakon suuruus mahdollisesti vaihtelee työntekijän ja yrityksen piirteiden mukaan. Lisäksi tutkimuksessa tarkastellaan lapsisakon suuruutta ehdollisen palkkajakauman eri osissa. Kärsivätkö korkeatuloiset äidit mahdollisesti suuremman sakon kuin matalatuloiset äidit?

Tutkimuksessa käytetty aineisto koostuu Tilastokeskuksen ns. FLEED-aineistosta sekä Kelan rekisteriaineistosta. FLEED-aineiston tietoja on käytetty vuosilta 1993-2002, Kela-aineisto kattaa vuodet 1995-2002. FLEED-aineisto sisältää hyvin monipuolista tietoa monista palkan määräytymisen kannalta tärkeistä taustatekijöistä. Kelan rekistereistä on poimittu tieto henkilön vuodenaikaisista perhevapaapäivien lukumäärästä. Yhdistetty aineisto on edustuva yksityisen sektorin osalta.

Tutkimuksessa keskitytään äiteihin, jotka synnyttävät ensimmäisen lapsensa vuosina 1996–1997. Näitä naisia verrataan samanikäisiin lapsettomiin naisiin ennen ja jälkeen lapseen liittyvän urakatkon. Tällöin saadaan tietoa äitien suhteellisen palkka-aseman muutoksesta urakatkon aikana. Tutkimuksessa estimoidaan kaksi eri palkkamallia. Ensimmäisessä mallissa huomioidaan ainoastaan

henkilöominaisuuksia, kuten ikä ja koulutus. Tämän lisäksi malliin sisällytetään urakatkon pituutta kuvaavia muuttujia. Toisessa spesifikaatiossa malliin lisätään yrityksen taustaominaisuuksia, kuten yrityksen koko, ikä- ja koulutusrakenne ja kannattavuus. Vertailemalla näiden kahden mallin tuloksia saadaan tietoa yrityspiirteiden merkityksestä lapsisakon kannalta.

Tulokset osoittavat, että ennen lapseen liittyvää urakatkoa tulevien äitien palkka-asema ei merkittävästi eroa lapsettomien naisten palkka-asemasta. Sen sijaan urakatkon jälkeen tilanne on toinen. Kun huomioidaan ainoastaan henkilön taustaominaisuudet, välittömästi työmarkkinoille paluuta seuraavana vuotena kahden vuoden tai sitä lyhyemmän urakatkon kokeneet äidit ansaitsevat noin 10 prosenttia vähemmän kuin lapsettomat naiset. Tätä pidemmän urakatkon kokeneiden kohdalla vastaava lapsisakko on tuplasti suurempi, noin 20 prosenttia. Mutta vaikka lapsisakko heti työmarkkinoille paluun jälkeen onkin huomattava, se pienenee verrattain nopeasti ajan kuluessa. Kolme vuotta työmarkkinoille paluun jälkeen äidit, jotka viettivät kaksi vuotta tai lyhyemmän ajan kotona lapsen kanssa, eivät eroa lapsettomista naisista palkan suhteen. Sen sijaan kauemmin kotona olleet äidit ansaitsevat tulosten mukaan vielä kolme vuotta paluun jälkeenkin noin 10 prosenttia vähemmän kuin lapsettomat naiset.

Yrityspiirteiden sisällyttäminen malliin ei muuta edellä tehtyjä johtopäätöksiä. Jonkin verran lapsisakon suuruus kuitenkin pienenee yrityspiirteiden huomioon ottamisen johdosta. Karkeasti arvioiden pieneneminen on noin 8 prosenttia. Äitien valikoituminen erityyppisiin yrityksiin näyttää siis selittävän äitien lapsettomia naisia alhaisempaa palkkaa vaikkakin valikoitumisen merkitys on verrattain pieni.

Lapsisakon suuruudessa havaitaan jonkin verran vaihtelua työntekijän ja yrityksen piirteiden mukaan. Esimerkiksi iäkkäämmät äidit kärsivät pienemmän lapsisakon kun nuoret ensisynnyttäjät. Tulokset lapsisakon vaihtelusta yrityksen piirteiden mukaan osoittavat, että sakko on keskimäärin pienempi naisvaltaisilla toimialoilla verrattuna miesvaltaisiin toimialoihin. Tehtäessä johtopäätöksiä tuloksista koskien lapsisakon vaihtelua työntekijän ja yrityksen piirteiden mukaan on kuitenkin syytä pitää mielessä, että ne ovat verrattain epätarkkoja. Lisäksi käytettyyn lähestymistapaan liittyy todennäköisesti merkittäviä endogeenisyysongelmia. Tästä syystä niitä tuleekin tarkastella lähinnä suuntaa antavina.

Edellä esitellyt tulokset koskevat keskipalkkoja. Tutkimuksessa analysoitiin myös, miten lapsisakon suuruus vaihtelee äidin tulotason mukaan. Kärsivätkö korkeatuloiset äidit enemmän tai vähemmän suhteessa kuin matalatuloiset äidit? Tulokset palkkajakauman eri osissa tukevat aikaisemmin tehtyjä johtopäätöksiä. Lapsisakon suuruudessa havaittiin kuitenkin myös vaihtelua tulotason mukaan. Esimerkiksi pidemmän urakatkon kokeneiden äitien suuri lapsisakko johtuu ennen kaikkea suurista sakoista korkeatuloisten äitien keskuudessa. Sen sijaan kahden vuoden tai lyhyemmän lapsiin liittyvän urakatkon kokeneiden äitien osalta sakon suuruudessa ei juuri havaita vaihtelua tulotasosta riippuen.

Mahdollisimman luotettavien tutkimustulosten saamiseksi tutkimuksessa selvitettiin lapsen vaikutuksia äidin palkkaan usealla eri tavalla. Tulokset eivät riipu käytettävistä lähestymistavoista. Esimerkiksi palkkakasvumallien tulokset ovat yhdenmukaisia palkkatasomallin tulosten kanssa. Näin ollen äitien ja lapsettomien naisten mahdolliset erot esimerkiksi sellaisten havaitsemattomien tekijöiden suhteen, kuten motivaatio tai urasuuntautuneisuus, ei selitä lapsen ja äidin palkan negatiivista yhteyttä.

Asiasanat: Palkat, äitiys, inhimillinen pääoma

JEL-koodit: J13, J24

1. Introduction

The gender wage gap has narrowed in nearly all labour markets during recent decades as a result of women's increased investments in education, on-the-job training and other forms of human capital. However, at the same time the wage differentials between mothers and childless women, the so-called motherhood wage penalty, have remained constant or even increased in many countries (e.g. Waldfogel 1998; Joshi et al. 1999). As a result the importance of family status as a component of the gender wage gap has increased. Nevertheless, the motherhood wage penalty and the factors behind it have received much less attention in the literature than the gender wage gap in general.

This paper is about the motherhood wage penalty in the Finnish labour market. Using data from Statistics Finland covering the period 1993-2002 I explore several important questions about the effects of children on women's wages. First, how large is the motherhood wage penalty in the Finnish private sector? Second, how does the penalty vary with the length of the career break? Third, how permanent is the penalty? Fourth, do firm characteristics affect the size of the motherhood wage penalty after human capital-related and other individual background factors have been controlled for? Finally, how does the penalty vary with worker and firm characteristics and across the conditional wage distribution?

This paper makes several contributions to the existing literature of the motherhood wage penalty. First, the empirical strategy applied in the paper differs somewhat from that typically used in the motherhood wage penalty literature. Most of the existing studies have investigated the wage effects of children by simply including a child-dummy or a variable indicating the number of children in the pooled wage model (i.e. mothers and childless women pooled together). This approach has the obvious drawback that it does not provide any information, for example, on relative wage changes due to childbirth or how the motherhood wage penalty evolves with time. The empirical approach taken in this study sheds light on these aspects.

Secondly, due to the lack of appropriate data, most earlier studies on the motherhood wage penalty have focused on the role of worker characteristics in determining the size of the penalty while paying much less attention to firm and job characteristics. However, mothers may systematically search for firms or jobs that allow them to more easily combine work with family obligations and forsake wages for these features. If this is the case, then it is important to also take employer characteristics into account in the wage regressions. My data set contains a rich set of firm characteristics that the earlier literature (e.g. Brown and Medoff 1989; Winter-

Ebmer 1994; Winter-Ebmer and Zweimuller 1999) has found to be important determinant of wages (e.g. size, productivity, female share of the workforce etc.) allowing me to explore the question of the importance of employer characteristics in explaining the motherhood wage penalty.

This paper also explores how the motherhood wage penalty varies across worker and firm characteristics. The earlier research on this issue is very scarce. However, there are reasons to expect that the child-penalty might vary, for example, by the age of the mother at first birth. Also the female share of the employment in an industry might affect the size of the penalty. The variation of the motherhood wage penalty across these and some other background characteristics as well is investigated in the paper. And besides the effects of children on the average wages of women, I also explore how the penalties vary across the conditional wage distribution. This issue has also received little attention so far.

Finally, there is no earlier research on this topic from the Finnish labour market. Also the number of papers from the other Nordic countries is fairly small, while most of the studies on the motherhood wage penalty have focused on the US and the UK. Although the purpose of this paper is not to replicate earlier studies in a different institutional setting but to investigate the motherhood wage penalty using new data and new kind of approach, Finland is nevertheless an interesting country to study the wage effects of children as its institutional arrangements differ from those in place in the US and the UK (see e.g. Kangasniemi 2003).

Earlier studies have found a child-penalty of about 10 per cent even after several productivity-related characteristics have been controlled for (e.g. Waldfogel 1995, 1997, 1998; Budig and England 2001). My estimates of the size of the motherhood wage penalty correspond roughly with these studies. I find, however, that the penalty varies significantly with the time spent outside the labour market to take care of the child. Mothers who return to the labour market within two years after the birth of the first child suffer considerably smaller wage penalties than mothers who stay longer at home to take care of their children. Furthermore, the penalties seem to decrease fairly quickly with time. For example, mothers who experience a break no longer than two years do not differ from non-mothers in terms of wages after three years from the return to the labour market. These findings are in line with the human capital-based explanation for the motherhood wage penalty. I also find some evidence that mothers' selection into different types of firms than non-mothers may explain some of the observed wage penalty for children whereas differences in unobserved factors between mothers and childless women do not seem to be important in explaining the motherhood wage penalty. The child-penalty seems also to vary across worker and firm characteristics. For example, the penalties are lower in the female-

dominated industries than in the male-dominated industries. The motherhood wage penalty varies across the conditional wage distribution as well. Most notably, the large average penalties for mothers who spend longer periods at home seem to be driven by heavy penalties at the upper tail of the wage distribution.

The paper starts with a discussion about the theoretical background and the previous empirical studies on the motherhood wage penalty. Section 2 also includes a short description of the Finnish family leave system. Section 3 describes the data and presents the methodological approach used in the paper. Section 4 presents the results. Section 5 focuses on robustness tests. The last section draws the main conclusions.

2. Background

2.1 Theoretical Considerations

The most commonly applied theoretical framework in the literature estimating the wage effects of children on women's wages is based on the human capital theory developed by Becker (1964) and Mincer (1974). Factors that the human capital theory considers important in explaining the motherhood wage penalty can be illustrated with a simple graph shown in Figure 1. The solid line describes the wage-experience profile among women who have continuous working careers. The dashed line on the other hand illustrates wage development among women who experience a child-related career break. As can be seen from the figure, one reason for the existence of the motherhood wage penalty is differences in the accumulated work experience between mothers and non-mothers. As mothers spend time out of the labour market to rear children they tend to accumulate less work experience, and thus have lower wages, than childless women. It is also possible that the stock of human capital accumulated prior to the career break depreciates during the time out of the labour market. Furthermore, firm specific human capital is lost if mothers return to employment at a different employer.[1] Therefore, as is illustrated in Figure 1, it might be that immediately after the return to the labour market mothers do not earn the same wage level as before the career break but have to settle for a lower wage.

[1] It is not a priori clear whether a change of employer results in lower or higher wages. The loss of firm specific human capital affects wages negatively. However, through labour market search a worker might be able to find a job in which his/her productivity is higher than in the previous job leading to higher wages.

Figure 1: Illustration of the possible effects of a career break on wages

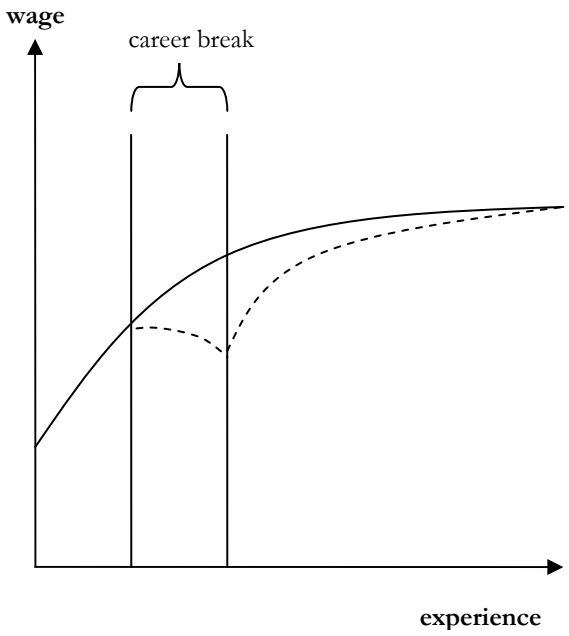

Figure 1 is of course a rough description of the possible effects of children on women's wage careers. There are several other human capital based explanations for mothers' low relative wages in addition to those mentioned above. First of all, it is plausible that anticipation of future career breaks affects pre-labour market human capital investments. Therefore, we might see other women invest more heavily in education than mothers-to-be. For the same reason, mothers-to-be may be less motivated to do wage-enhancing investments in job training. These differences in human capital investments may not only contribute to wage differentials before the child-related career break, but may also imply that mothers do not catch up to other women in wages even in the years following the break (in contrast to what is assumed in Figure 1).

Another explanation for mothers' lower relative wages can be derived from the theory of compensating wage differentials. According to this theory, in the competitive labour market all jobs are equally attractive to the worker in the equilibrium when both pecuniary and non-pecuniary aspects of jobs are taken into account. If mothers seek jobs that are easier to combine with family requirements and forsake wages for these features, then mothers will earn less than other women.

A less often offered explanation for the motherhood wage penalty is differences in labour market mobility between mothers and non-mothers. Models of job search (e.g. Jovanovic 1979; Burdett 1978) emphasize that there is heterogeneity in the quality of employee-employer matches. By searching for better matches workers can experience wage gains through job mobility. It is plausible that because of family requirements mothers are more restricted in their mobil-

ity behaviour than are childless women. Therefore, both the probability of job changes and the returns to mobility may be lower for mothers than for other women thus contributing to the motherhood wage penalty.

Theories of discrimination offer yet another explanation for the wage gap between mothers and other women. Economic theories of discrimination can be classified into two broad types of models. The first class of models, initiated by Becker (1971), formalizes discrimination simply as a "taste" or prejudice by one group against another. The second group of models of discrimination is statistical discrimination. Seminal papers in this area are Phelps (1972) and Arrow (1973). These models have their roots in imperfect information about the productivity or/and behaviour of a group of individuals. In a world of imperfect and asymmetric information employers have incentives to use easily observable characteristics in forming expectations on the productivity of workers and to discriminate among workers. For example, if mothers are *on average* less productive than other women (or other workers) then mothers who are motivated and highly productive may suffer from discrimination. This is because they belong to a group whose members are *on average* fairly loosely attached to the labour market and as a result less productive as well.

Finally, it might be the case that there is no causal relationship whatsoever between children and mothers' wages and that the correlation between wages and children is instead due to unobserved heterogeneity. Individual characteristics like ambition or commitment to the labour market may bias cross-sectional estimates of the motherhood wage penalty if women with less ambition to succeed in the labour market are more likely to have children. These unobserved factors may well explain at least some of the wage gap between mothers and other women.

The theoretical underpinnings of the paper focus on the human capital theory. Motivated by the human capital model, this paper investigates how the motherhood wage penalty varies with the length of the child-related career break. Also, if the depreciation of the stock of human capital during the career break is an important factor behind the wage penalty, then we might see mothers catch up with other women in wages after the return to the labour market as mothers update their knowledge and job-related skills. Therefore, I investigate how the child-penalty evolves with time after a mother returns to the labour market. Beyond the human capital theory, I explore the importance of firm characteristics in determining the size of the motherhood wage penalty. This is motivated by the theory of compensating wage differentials. And as discussed above, the motherhood wage penalty may reflect differences in unobserved characteristics between mothers and childless women. To investigate this possibility, I also estimate a wage growth model which should remove time-invariant individual heterogeneity.

2.2 Previous Empirical Research

It is a well-established empirical fact that women with children have lower wages than childless women. The size of the motherhood wage penalty varies somewhat between studies, but typically a gross estimate of the child penalty, i.e. without controlling for background characteristics of workers, lies somewhere between 10 to 20 per cent (see recent evidence by e.g. Budig and England 2001; Davies and Pierre 2005). This gap has also been fairly stable, or even widened, over the past few decades (see e.g. Waldfogel 1998; Joshi et al. 1999). At the same time the wage gap between men and women has narrowed. As a result the motherhood penalty has become an increasingly important component of the gender wage gap in general.

What explains the motherhood wage penalty? One of the most important factors contributing to the penalty is labour market experience. Some researchers have even found that after differences in work experience between mothers and non-mothers have been fully controlled for, the wage penalty practically disappears (e.g. Hill 1979). Nevertheless, a much more common finding is that a statistically (and economically) significant motherhood penalty remains also after differences in actual work experience have been accounted for (e.g. Neumark and Korenman 1994; Waldfogel 1995, 1997, 1998; Anderson et al. 2003). Therefore, the fact that mothers accumulate less work experience than childless women is not the whole story behind the motherhood wage penalty. The underlying mechanisms are much more complex and manifold.

Firm-specific human capital has received little attention in empirical research on the motherhood wage penalty. Perhaps one reason for this lack of interest is the fact that in many countries (e.g. in Finland) persons taking a family leave are protected against dismissal during the family leave. Therefore, researchers may have considered the potential loss of firm-specific human capital due to child-related career breaks to be of little importance in this context. Similarly the research examining possible depreciation of the human capital during the maternity leave is scarce. There is some evidence suggesting that skill depreciation may take place during the break, at least in the cases of prolonged employment breaks (e.g. Skyt Nielsen et al. 2004).

The theory of compensating wage differentials states that job characteristics and differences in that respect between mothers and other women may contribute to the motherhood wage penalty. The two most heavily studied job characteristics in this literature are part-time jobs and the sector of employment (public vs. private sector). Several studies find that controlling for part-time employment reduces the motherhood penalty, but that even after the part-time status has been accounted for a significant wage penalty remains (Waldfogel 1997; Joshi et al. 1999; Anderson et al. 2003; Davies and Pierre 2005). There is also evidence on the motherhood wage

penalty in both the public and the private sector. The penalty is typically somewhat larger, however, in the private sector (e.g. Skyt Nielsen et al. 2004). Felfe (2006) uses a data set from Germany which includes information on several pecuniary and non-pecuniary job features. She finds that some part of the motherhood wage penalty in Germany can be interpreted as a compensating wage differential. The contribution of job characteristics to the wage penalty is nevertheless rather small: the inclusion of the variables for job characteristics in the wage model diminishes the motherhood wage penalty by 10 per cent.

There exists a large body of empirical literature testing the effects of job mobility on wages based on the predictions of job search models (e.g. Bartel and Borjas 1981; Topel and Ward 1992). Mobility has proved to be an important way to move up in the wage distribution. Although it seems plausible that there are differences in the process of mobility between mothers and other women (primarily because mothers may be more constrained in their mobility due to family commitments), this topic has not yet received any attention in the literature on the motherhood wage penalty. There is some empirical evidence documenting that the wage gains from mobility are lower for women than for men. This difference in returns to mobility is partly explained by gender differences in reasons behind mobility: women are more likely to change jobs due to family or other non-market related reasons whereas men's mobility is typically motivated by money (e.g. Sicherman 1996; Keith and McWilliams 1997, 1999; Manning 2003). Given this evidence it might be a productive direction for future research to analyze differences in mobility behaviour between mothers and childless women as well.

Most papers about discrimination and its role in explaining labour market outcomes between different demographic groups are theoretical in nature. This is understandable because it is, at the very least, challenging to provide direct empirical evidence of discrimination. A common approach is to interpret the residual wage gap (i.e. the wage gap that remains after relevant productivity-related characteristics have been taken into account) as evidence of the labour market discrimination. The obvious problem with this approach is that we cannot ever be totally confident that all the relevant worker characteristics have been controlled for. It is also plausible that we include variables in the wage regressions that are themselves affected by discrimination. In the gender wage gap literature, there are some studies which have focused on examining the variation of the gender wage gap across the wage distribution (e.g. Albrecht et al. 2003). It has been argued that a priori there should be no reason for the gap to vary across the distribution, and that the finding of increasing gender wage gaps throughout the conditional wage distribution would be evidence of the so-called glass ceiling. Of course, this method is open to the same kind of criticism as the more conventional average-effect-focused regression methods.

Previous research of the motherhood wage penalty has shown somewhat conflicting results for the importance of unobserved individual heterogeneity. Korenman and Neumark (1992), using short first-difference models, found evidence of a bias due to unobserved heterogeneity, but in another study in which they used data on sisters, they concluded that the motherhood wage penalty does not reflect unobserved heterogeneity (Neumark and Korenman 1994). Also for example Waldfogel (1997) found that to the extent that unobserved heterogeneity can be accounted for by applying difference and fixed-effects models the negative effects of having children on women's wages are not due to unobserved heterogeneity.

2.3 Family Leave Legislation in Finland

Institutional arrangements, especially family leave legislation, affect mothers' labour market outcomes. Therefore, in analysing the motherhood wage penalty it is important to have basic knowledge of the national legislation governing the duration of the family leaves, the provision of day care etc. Next I briefly outline the general features of the family leave legislation in Finland. Since this paper investigates the effects of child-related career breaks on mothers' wages, the focus is mainly on women thus excluding, for example, the paternity leave and paternity allowance from the discussion.[2]

The underlying premise of the Finnish family leave system is, on the one hand, to support mothers' labour market participation, but on the other hand, to give mothers (and fathers) the opportunity to stay at home to take care of their children. Maternity leave is 105 weekdays in Finland. During that period mothers receive maternity allowance, which is based on earnings preceding the leave.[3]

After the maternity leave, mothers may take parental leave, to which fathers are entitled as well. The use of parental leave is flexible: parents can decide to split the parental leave as they wish and it is also possible for them to reduce their working hours while taking turns staying at home to take care of the child. The duration of the parental leave is 158 weekdays. Similar to the maternity allowance, also the parental leave allowance is earnings-tested.

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2 Fathers' use of the family leaves might potentially be of some importance with respect to mothers' labour market behaviour and therefore a discussion about fathers' rights to the family leaves would be in order. However, in Finland fathers use only a small fraction of the leaves they are entitled to implying that their use of the family leaves is unlikely to affect mothers' labour market outcomes in any significant way.

3 If labour income is € 25 000 or below (per year), the allowance is 70 percent of the income. If labour income is higher than € 25 000 then the allowance is 40 percent, and if income exceeds € 38 000 the allowance is 25 percent. There is also a minimum maternity allowance which was € 15.20 per day in 2006.

Parents are also entitled to care leave until the child is three years old. Care leave is unpaid, but it is possible to receive a child home care allowance for this period. Similar to the parental leave, the use of care leave is very flexible. Parents are entitled to an unpaid reduction in working hours or to partial care leave until the child finishes his/her second year at school. Eligibility for the partial care leave requires that a parent has been employed with the same employer for at least the past six months.

An important part of Finnish family policy is legislation on the care of small children which aims to promote mothers' participation in working life. After the parental leave, parents that do not choose to stay at home to look after a child using the care leave opportunity have two options for child care before the child starts school: municipal day-care or private day-care. Regardless of the parents' income level or employment status, every child under school age (typically seven) is entitled to municipal day-care after the parental leave. The fee for the day-care depends on the size and income of the family, but for example the lowest-income families are totally exempt from these fees. As an alternative to the municipal day-care, a municipality can pay a private child care allowance to provide day-care for a child.

It should be noticed that the Finnish family leave system is fairly generous compared to most other OECD countries. The duration of the maternity leave is rather long and the coverage of publicly provided child care is high in Finland. In fact, Finland and the other Nordic countries are typically considered as forerunners in promoting family-friendly policies. This statement also gets support from a study investigating family-friendly policies across OECD countries (OECD 2001). According to this study, the Nordic countries ranked highest on most of the family-friendly indices examined.

3. Data and Empirical Strategy

3.1 Data

The empirical analysis is based on a panel data set from Statistics Finland that links information on employees, establishments and firms. The data are a 1/3 random sample of individuals that were 16-69 years old in 1990. These individuals are followed to 2002 and each year every third of the 16 year-olds are added to the sample. The data set is constructed by linking data from various data sources: Business Register, Census of Manufacturing, Financial Statements Statistics, R&D survey, ICT survey, and Employment Statistics. The resulting data are called the Finnish Longi-

tudinal Employer-Employee Database (FLEED).[4] The detailed version of FLEED is maintained at Statistics Finland and because of confidentiality concerns outside researchers get a somewhat limited version of it. Therefore, in my sample the number of variables is somewhat smaller compared to the original FLEED. Also, variables for establishments and firms are modified meaning basically that information on employers is in the form of classified variables (e.g. size group) and growth rates (e.g. rate of employment change) etc.

Information on family leaves comes from the records of The Social Insurance Institution of Finland (KELA). KELA data can be linked to FLEED by using individual identification codes. The KELA data set covers the period 1995–2002, and it contains information on maternity and parental leaves, but not on care leave. This naturally causes problems when trying to identify those mothers who stay longer at home to take care of their children. However, I define the duration of the child-related career break in a way which should differentiate between mothers experiencing a relatively short employment break and mothers staying longer at home (see appendix and the discussion in Section 3.2 below).

In the analysis that follows I focus on individuals who can be linked to firm characteristics using a firm identifier. This practically restricts the sample to the private sector. I also exclude entrepreneurs because their labour market behaviour is probably different from that of paid employees. Furthermore, the earnings of self-employed individuals are difficult to measure properly. In line with most of the earlier studies on the wage effects of children, I restrict the analysis to women. I compare women giving birth to their first child between 1996 and 1997 to women who have no children at their first appearance in the data and who do not give birth during the observation period. The analysis focuses on potential mothers by restricting the sample to women who were 16-39 years old in 1996/1997.

The data used in the paper can be described as a particularly rich data set. It contains not only several human capital-related variables (e.g. the level and type of education, age, job tenure) but also information on many relevant firm characteristics (e.g. industry, firm size, productivity, female share, age structure, average education level, foreign ownership). As is pointed out by, for example, Felfe (2006), the importance of job and firm characteristics has not received much attention in the motherhood wage penalty literature, mainly due to a lack of appropriate data. Firm characteristics may play a role in explaining the penalty as there is some empirical evidence that mothers tend to seek different jobs and firms than women without children (see Section 2.2 above). The most disturbing shortcoming of my data is the lack of information on working hours and part-time status. Mothers tend to make up for shorter working hours and work on

[4] More about the data sources and the linking process can be read from Ilmakunnas et al. (2001) and Maliranta (2003).

a part-time basis (at least while their children are small) more often than women without children. Therefore, my inability to control for hours spent in work may lead to an overestimation of the motherhood wage penalty. In my case, however, the lack of information on hours and part-time status is probably not such a big problem because I use data from Finland. In Finland, most employed women work on a full-time basis and part-time work is generally rare, also among mothers (see e.g. the report by European Foundation for the Improvement of Living and Working Conditions 2007).[5]

3.2 Empirical Strategy

Figure 2 illustrates the empirical strategy used in the paper. As discussed above, I focus on women giving birth to their first child between 1996 and 1997 (mothers) and on women without children (non-mothers). To get information on the effects of a child-related career break on women's wages I compare the wage outcomes of mothers and non-mothers both before and after the career break.[6] I analyse wages not only one year before the birth (t-1) but also two and three years before the break (t-2, t-3). This is because the behaviour of mothers-to-be may be affected by the future career break. Kunze and Ejrnaes (2004), for example, found a wage dip for mothers-to-be before the child-related career break. This finding is analogous to the famous Ashenfelter's dip (following Ashenfelter 1978) familiar from the labour market evaluation literature. The employment break lasts from year t0 to year t+1. In year t0 the mother gives birth to her first child. Year t+1 is the first year after the child-birth when the mother has a valid wage observation (see appendix about the definition of the valid wage observation) and no family leave days during the year. Years t+2 and t+3 are the corresponding observation points for wage comparisons two and three years after the end of the employment break, respectively. By investigating wages at several points in time we get information on how the possible motherhood wage penalty evolves over time.

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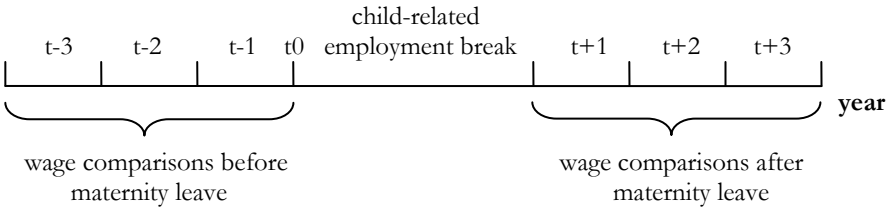
5 Kellokumpu (2007) also investigates the wage effects of children using data from the Finnish private sector. Unlike me, she has data on working hours. As expected, Kellokumpu finds that controlling for working hours decreases the motherhood wage penalty somewhat. However, the penalty remains statistically significant even when working hours have been taken into account. This supports my claim that the lack of information on working hours is probably not that disturbing in my case. My results should be interpreted as an upper bound for the wage penalty for the first child-birth.

6 Of course, non-mothers do not experience a child-related career break. They are women without children who must be found to be employed at least once both before and after 1997 to be included in the analysis. It is not, however, required that they must be employed in every year during the investigation period but other kind of career breaks not related to child-birth are allowed.

Figure 2: Time-frame of the empirical analysis



Of course, my measure of the length of the child-related career break defined as the difference between t+1 and t0 is a fairly rough measure of the actual duration of the career break. However, as my intention is not to try to estimate the effect of one family leave day on mothers' wages but rather to provide information on how the wage effects may differ between mothers who experience a relatively short career break (1-2 years) and mothers who stay considerably longer (three years or more) at home taking care of their children, my definition of the length of the break is well justified. Nevertheless, it is true that my conclusions may be affected by how the observation points for wage comparisons are defined. Therefore, in Section 5.2 I experiment with some alternative ways of defining the observation points and investigate how sensitive my results are in this respect.

It should be pointed out that some mothers experience more than one child-related career break during the investigation period. However, the focus of this study is on the effects on mothers' wages of the first observed child-related career break starting in year t0. Therefore for each mother I use at most one t+1, t+2 and t+3 wage observation. This simplifies the analysis somewhat. Nevertheless, future career breaks may well affect the wage penalties related to the first break. To control for this, the wage model includes a variable taking a value of one if a mother, who has returned to the labour market after the first child-related career break, appears on the maternity leave again later on during the observation period.

As a final note to the empirical strategy presented above it must be stressed that the mothers considered in this paper may be a somewhat select group. The empirical evidence shows that the labour market participation rate of mothers is typically lower than that of childless women (e.g. OECD 2002). I nevertheless focus on mothers who are observed in the private sector at least once during the three years preceding the birth of their first child and who return to the private sector after the child-related career break before the end of my observation period.[7] As a result, the mothers under consideration are fairly attached to the labour market and may not form a representative sample of all first-child mothers. Nevertheless, mothers' labour market participation is very

[7] Similar conditions apply to the comparison group as well, i.e. the comparison group consists of childless women who are employed in the private sector before and after year t0.

high in Finland implying that the potential bias resulting from ignoring mothers who do not return to the private sector during the observation period may not be so disturbing in my case. For example, a recent report by the European Foundation for the Improvement of Living and Working Conditions (2007) documents that the tendency among mothers to return to employment and maintain the same level of working hours as before the maternity leave is particularly evident in Finland (together with some other EU-countries). Mothers' high level of attachment to the labour market is evidenced in the case of my data by the fact that 87.8 per cent of mothers giving birth to their first child in 1996 and who were employed in the private sector at least one year during the period 1994-1995 are observed to be employed in the private sector also after the child-related break. The corresponding figure for mothers giving birth to their first child in 1997 is 83.4 %. Although the share of mothers returning to employment is high in my sample, excluding mothers staying longer out of the labour market may nevertheless give rise to a sample selection problem. The issue of the potential selection bias is addressed in Section 5.3.

To investigate the magnitude of the motherhood wage penalty in the Finnish private sector I estimate the following wage regression:

$$\ln W_{it} = \beta_0 + \beta_1 X_{it} + \beta_2 Z_{it} + \beta_3 Y_{it} + \varepsilon_{it} \qquad (1)$$

where i refers to individuals and t refers to year, lnW is the log of real monthly wages[8], X is a vector of worker characteristics, Z is a vector containing firm characteristics, Y is an array of year dummies, and ε is a disturbance term. As discussed above, the wage model is estimated for three years preceding year t0 and for three years following the return of the mother to the labour market after year t0. The vector of worker characteristics includes age, age squared, tenure, tenure squared, dummies for the level of education (4 categories), dummies for the field of education (3 categories), and a dummy indicating whether a woman is currently married. In addition, X includes career break variables. To allow the wage penalty effects to vary with the length of the child-related break, I include five indicators in the model: (i) no break, i.e. women without children (omitted group), (ii) one-year break (i.e. t+1 – t0 = 1), (iii) two-year break, (iv) three-year break, and (v) a break of more than three years.

It is plausible that mothers who differ with respect to the length of the child-related career break also differ in terms of some key background characteristics. For example, mothers who stay longer at home taking care of their children may be less career-oriented than mothers who experience a shorter career break. Therefore, we might see wages vary already before the break depending on the length of the future career break. To capture this potential heterogeneity in

8 Wages are converted into 2000 money using the Cost-of-Living index of Statistics Finland.

wages, I estimate the wage model for the period preceding the birth using the same set of career break variables as for the period following the return to the labour market. That is, I distinguish between future mothers who are going to experience a one-year break, a two-year break, etc.

Finally, as discussed above, mothers may experience several child-related career breaks during the investigation period. These additional career breaks may affect mothers' wage development following upon the first break. I control for this by including a variable in vector X which takes a value of one if a mother who has returned to the labour market from her first child-related career break appears on the maternity leave again later on during the investigation period.

Vector Z in equation (1) includes the following firm characteristics: size (4 categories), a dummy for foreign ownership, the personnel's average years of schooling and its square, the average age of the personnel and its square, average tenure and its square, the female share of the personnel, the log of a productivity measure, and industry dummies (24 categories).

To get some idea of the factors affecting the potential motherhood wage penalty in the Finnish private sector, I estimate two different versions of the wage model (1). First, I estimate a model which includes only the career break indicators, human capital-related variables (age, tenure and educational variables) and dummies for years and marriage. From this we see whether there is a motherhood wage penalty once the basic human capital variables have been accounted for. The second version adds firm characteristics to the wage regression. By comparing this model to the first specification we get information on the importance of the potential selection of mothers into different types of firms than non-mothers. All estimations include only workers employed in the private sector and boundaries for monthly wages are imposed to exclude potential outliers.[9] One might worry that these restrictions on wages affect my conclusions. The robustness of the results in this respect is discussed in Section 5.2.

The empirical strategy described above differs in at least two respects from those of earlier studies on the motherhood wage penalty. First of all, most of the previous papers have not controlled for firm characteristics because of a lack of data. Taking employer characteristics into account may, however, be of some importance. Mothers might substitute wages for certain firm characteristics which allow them to better combine family and working careers. Ignoring these employer characteristics leads to an overestimation of the motherhood wage penalty. Secondly, many of the existing studies have explored the effects of children on women's wages simply by including a child-dummy or a variable indicating the number of children in the pooled wage regression. Such an approach does not provide any information on, for example, how the motherhood wage penalty evolves over time or how the penalty varies with time spent outside

9 A lower bound of 600 euros and an upper bound of 20 000 euros for monthly wages are imposed.

the labour market. These aspects are very important when it comes to policy recommendations. For example, if it is found that the motherhood wage penalty is mostly due to long career breaks, then one policy option to improve mothers' labour market standing would be to increase subsidized day-care. This would help mothers to make a quicker return to the labour market after child-birth. The empirical strategy applied in this paper sheds light on these important issues.

3.3 Some Descriptive Results

Table 1A in the appendix presents summary statistics for periods t-1, t+1, t+2 and t+3. To keep the table manageable, periods t-3 and t-2 are not included. The results for the two excluded periods are, however, similar to those of period t-1. Also, I do not present statistics for all the variables used in the estimations, but only for those that I consider to be of most interest. Results for the excluded periods and variables are, of course, available from the author upon request.

As can be seen, before the childbirth, the average log real monthly wage of the mothers-to-be is somewhat higher than that of the non-mothers. After the career break, however, mothers lag behind non-mothers in wages. In period t+1, the wage gap between non-mothers and mothers is 13.8 log points. The gap exists also in periods t+2 and t+3, but the mothers seem to catch up to other women: three years after the break the wage gap between childless women and mothers is 5.1 log points.

Table 1A also documents that there are differences in the background characteristics between mothers and childless women. Mothers are, for example, slightly more educated than women without children. There are differences in the fields of education as well: in my sample, mothers choose more often than non-mothers social sciences and business or technology. The mothers are also slightly younger, have less job tenure, and are more likely to be married than women without children. There seem to be some differences in terms of firm characteristics as well. For example, compared to mothers, non-mothers work more often in firms with lower female shares of the personnel and in firms with more educated employees. These differences are statistically significant as well.

These summary statistics thus seem to imply that in line with the evidence from other countries, also in Finland there exists a motherhood wage penalty. However, as is evident from Table 1A, there are differences in the characteristics (besides family status) between mothers and childless women which may contribute to the wage penalty. Therefore, getting more credible evidence on the motherhood wage penalty in the Finnish private sector requires the use of a multivariable regression model. Results from this exercise are presented in the next section.

4. Results

4.1 Estimates of the Motherhood Wage Penalty

The estimates of the motherhood wage penalty are given in Tables 1 and 2. Table 1 shows the results for a model which includes only the human capital-related variables whereas Table 2 adds firm characteristics to the model. Estimations are run for four periods: t-1, t+1, t+2 and t+3. Because of the potential "Ashenfelter's dip effect", I estimated the models for periods t-2 and t-3 as well. The results for these years do not, however, differ much from those of period t-1 and therefore, I do not report them here. They are available from the author upon request.

The results in Tables 1 and 2 indicate that motherhood affects women's wages in the Finnish private sector. Starting with Table 1, the future mothers and other women do not differ that much in wages before the child-related career break after differences in human capital endowments have been controlled for. The future mothers' wages seem to be somewhat higher compared to childless women but the difference is statistically significance only in a case of a break of two years. However, after the child-related career break a considerable wage gap has emerged between childless women and mothers. Mothers who stay out of the labour market no longer than for two years lag behind non-mothers in wages 8-12 per cent in the year following the return to employment. Mothers spending longer periods at home suffer a wage penalty as high as 21.2 per cent in period t+1.

Even though the penalties immediately after the return to the labour market are fairly large, mothers seem to catch up to other women in wages during the first three years following the return. For example, mothers who experience a break no longer than two years do not differ from other women in terms of wages after three years from the return to the labour market. Also mothers who decide to stay longer at home taking care of their children appear to catch up with the wages of the childless women. However, the longer the child-related career break is, the longer it seems to take for a mother to catch up to the childless women in wages: mothers who experience a break of longer than two years suffer a wage penalty of 10.6-13.3 per cent still after three years from their return to the labour market. My results of the catching-up effect are very similar to those found by Datta Gupta and Smith (2002), who used data from the Danish labour market. Their results also suggest that children do have negative effects on mothers' wages, but that the effects are only temporary in nature.

Table 2 documents the results for the wage model containing both the human capital variables and firm characteristics. As can be seen, firm characteristics increase significantly the

model's ability to explain the observed variation in wages (R^2 increases by about ten percentage points). By comparing Tables 1 and 2 we notice that they have effects on the size of the motherhood wage penalty as well. For example among mothers who experience a one-year break, including firm characteristics in the model decreases the relative child-penalty[10] between periods t-1

Table 1: Wage regressions with controls for human capital

Dependent variable: log of real monthly wage				
Period	**t-1**	**t+1**	**t+2**	**t+3**
one-year break	0.023	-0.124	-0.044	-0.025
	(1.64)	(6.44)**	(1.93)	(0.97)
two-year break	0.040	-0.084	-0.053	-0.021
	(5.06)**	(6.17)**	(3.66)**	(1.30)
three-year break	0.008	-0.203	-0.112	-0.133
	(0.56)	(9.80)**	(5.01)**	(7.25)**
over three-year break	0.009	-0.212	-0.134	-0.106
	(0.70)	(11.93)**	(7.56)**	(4.74)**
(Omitted group: no child-related career break)				
age	0.097	0.076	0.071	0.060
	(15.87)**	(15.31)**	(12.35)**	(8.83)**
age^2/10	-0.013	-0.009	-0.009	-0.007
	(12.31)**	(12.51)**	(10.17)**	(7.25)**
tenure	0.031	0.014	0.013	0.011
	(20.39)**	(12.68)**	(10.76)**	(8.36)**
tenure^2/10	-0.014	-0.006	-0.005	-0.004
	(15.07)**	(9.54)**	(8.33)**	(6.66)**
lowest tertiary	0.139	0.157	0.161	0.167
	(18.30)**	(21.76)**	(21.41)**	(20.87)**
lower university (BA level)	0.231	0.284	0.297	0.298
	(18.96)**	(26.93)**	(27.02)**	(26.33)**
higher university (MA level or higher)	0.476	0.558	0.570	0.584
	(38.91)**	(51.41)**	(49.72)**	(47.71)**
(Omitted group: no higher than college)				
social	-0.041	-0.015	-0.011	-0.005
	(5.53)**	(2.13)*	(1.59)	(0.71)
technology	0.032	0.032	0.033	0.033
	(4.23)**	(4.26)**	(4.16)**	(4.02)**
(Omitted group: other field of study)				
married	-0.002	0.010	0.013	0.011
	(0.35)	(1.61)	(1.88)	(1.55)
constant	5.483	5.871	5.992	6.244
	(63.31)**	(74.04)**	(63.96)**	(55.01)**
observations	22 773	64 118	52 611	41 637
R-squared	0.30	0.23	0.21	0.19
Robust t statistics in parentheses				
* significant at 5%; ** significant at 1%				

Notes:

1. In addition to the variables presented above, the regressions also include year dummies and in the case of periods following the career break, a variable indicating whether a mother is observed to be on maternity leave later on during the investigation period.

10 By the relative penalty I refer to a change in the mother's wage position before and after the child birth. For example, if mothers who are going to experience a one-year career break earn 2 per cent more than childless women before the break and 10 per cent less than women without children immediately after the break, the relative penalty is 12 per cent.

and t+1 by 7.5 per cent. On the other hand, the average decrease in the relative child-penalty across the time periods (t-1 and t+1, t-1 and t+2, t-1 and t+3) is 6.8 per cent for this group of mothers. For mothers experiencing a two-year break, a three-year break or a break longer than three years the corresponding figure is 9.2, 8.8 and 7.2 per cent respectively. These figures correspond roughly with those found by Felfe (2006), who used data from Germany. She concluded that controlling for job characteristics diminishes the child penalty by about 10 per cent.

Table 2: Wage regressions with controls for both the human capital and firm characteristics

Dependent variable: log of real monthly wage				
Period	**t-1**	**t+1**	**t+2**	**t+3**
one-year break	0.023	-0.113	-0.041	-0.021
	(1.79)	(5.96)**	(1.87)	(0.86)
two-year break	0.038	-0.078	-0.049	-0.014
	(5.23)**	(5.99)**	(3.53)**	(0.93)
three-year break	0.014	-0.185	-0.094	-0.112
	(1.13)	(9.70)**	(4.48)**	(6.74)**
over three-year break	0.028	-0.189	-0.103	-0.074
	(2.33)*	(11.09)**	(6.34)**	(3.82)**
(Omitted group: no child-related career break)				
age	0.076	0.060	0.055	0.045
	(13.60)**	(13.36)**	(10.56)**	(7.24)**
age^2/10	-0.010	-0.007	-0.007	-0.005
	(10.35)**	(10.67)**	(8.48)**	(5.76)**
tenure	0.031	0.014	0.014	0.012
	(21.29)**	(13.99)**	(12.24)**	(9.92)**
tenure^2/10	-0.015	-0.006	-0.006	-0.005
	(17.03)**	(12.02)**	(10.74)**	(8.91)**
lowest tertiary	0.098	0.095	0.097	0.101
	(13.75)**	(14.61)**	(14.23)**	(13.86)**
lower university (BA level)	0.187	0.195	0.202	0.201
	(14.97)**	(19.54)**	(19.32)**	(18.44)**
higher university (MA level or higher)	0.380	0.417	0.423	0.435
	(30.37)**	(38.76)**	(37.24)**	(35.61)**
(Omitted group: no higher than college)				
social	-0.045	-0.030	-0.029	-0.026
	(6.55)**	(4.82)**	(4.35)**	(3.69)**
technology	0.010	0.005	0.005	0.004
	(1.40)	(0.69)	(0.67)	(0.50)
(Omitted group: other field of study)				
married	-0.004	0.008	0.009	0.008
	(0.60)	(1.33)	(1.55)	(1.19)
small firm	0.055	0.076	0.078	0.081
	(7.65)**	(11.44)**	(10.73)**	(10.14)**
middle size firm	0.052	0.072	0.071	0.074
	(6.59)**	(9.65)**	(8.75)**	(8.35)**
large firm	0.063	0.080	0.082	0.087
	(9.24)**	(12.03)**	(11.39)**	(11.18)**
(Omitted group: micro firm)				
foreign ownership (0/1)	0.063	0.051	0.051	0.052
	(7.32)**	(9.02)**	(8.32)**	(7.89)**
personnel's average years of schooling	0.145	0.177	0.167	0.185
	(4.58)**	(6.00)**	(5.21)**	(5.24)**
personnel's average years of schooling^2/10	-0.046	-0.051	-0.046	-0.054
	(3.57)**	(4.30)**	(3.59)**	(3.79)**
personnel's average age	0.020	0.000	-0.001	-0.002
	(3.37)**	(0.00)	(0.14)	(0.35)
personnel's average age^2/10	-0.002	-0.000	-0.000	0.000
	(2.85)**	(0.18)	(0.07)	(0.22)

(Table 2 continues)

personnel's average tenure	-0.010	-0.006	-0.006	-0.009
	(3.91)**	(2.76)**	(2.48)*	(3.06)**
personnel's average tenure^2/10	0.003	0.003	0.003	0.004
	(2.31)*	(2.54)*	(2.28)*	(2.62)**
female share of personnel	-0.107	-0.117	-0.118	-0.116
	(8.87)**	(10.63)**	(9.84)**	(8.68)**
ln(firm productivity)	0.070	0.056	0.058	0.068
	(14.21)**	(16.52)**	(15.10)**	(14.61)**
constant	3.669	4.230	4.395	4.463
	(16.33)**	(19.80)**	(18.87)**	(17.15)**
observations	22 773	64 118	52 611	41 637
R-squared	0.41	0.34	0.31	0.29
Robust t statistics in parentheses				
significant at 5%; ** significant at 1%				

Notes:

1. In addition to the variables presented above, the regressions also include year dummies, industry indicators (24 categories) and in the case of periods following the career break, a variable indicating whether a mother is observed to be on maternity leave later on during the investigation period.

It should be noticed that although my data contain a fairly rich set of firm characteristics, there are several important firm and job features for which I have no data. In particular, it is unfortunate that my data do not include any information on the degree of flexibility with respect to work-time scheduling or part-time work because these are the kinds of job characteristics that mothers may consider particularly advantageous in order to better combine family and career. Therefore, it is likely that I would find firm characteristics to be more important with respect to the motherhood wage penalty than what my results suggest if I were able to control for firm characteristics in a more detailed fashion.

To give a summary of the results documented in Tables 1 and 2, I find evidence of the motherhood wage penalty in the Finnish private sector. The penalty cannot be explained by differences in pre-market human capital investments between mothers and non-mothers as the penalty is observed even after the level and the field of education have been controlled for. I find some evidence that mothers may seek to work in different types of firms than non-mothers. Taking this into account in the wage regressions by including several firm characteristics in the wage model decreases the estimated size of the motherhood wage penalty by about 8 per cent leaving it, however, still statistically significant. Interestingly, the size of the penalty resulting from the first child-related career break varies strongly with the length of the break. Mothers who return to the labour market relatively quickly suffer a considerably smaller wage penalty than mothers who stay longer at home to take care of their children. This suggests that depreciation of the stock of human capital during the career break might contribute to the penalty as the depreciation is likely to be stronger among mothers who experience a longer break. Furthermore, the penalties seem

to decrease fairly quickly with time. For example, mothers who experience a break no longer than two years do not differ from non-mothers in terms of wages after three years from the return to the labour market. This finding not only supports the human capital based explanation for the motherhood wage penalty, but it also suggests that the long-term effects of children on mothers' wages are likely to be fairly small in the Finnish private sector.

4.2 Variation of the Motherhood Wage Penalty across Selected Background Characteristics

The estimates of the motherhood wage penalty presented above do not shed any light on how the penalty varies across mothers' background characteristics. Also previous research has paid little attention to this issue. There is some evidence that the penalty tends to differ, for example, by race (e.g. Waldfogel 1997), but the present knowledge about the variation of the wage effects of children among mothers is generally taken scarce. Yet, there are plenty of reasons to expect the motherhood wage penalty to vary by certain background characteristics, like education. For example, general and firm-specific experience is generally taken more valuable for high-skilled than for low-skilled employees. Therefore, low-skilled workers may be less vulnerable to wage losses due to depreciation of human capital during child-related career interruptions.[11] In the following, I extend my analysis by allowing the effects of children to vary by mothers' background characteristics.

I examine several potentially interesting background characteristics. First of all, I investigate how the wage penalty varies depending on whether or not the mother returns to the same employer preceding the career break. As discussed in Section 2.1, a priori it is not clear how a change of employer affects the motherhood wage penalty. Secondly, the motherhood wage penalty may vary depending on the age of the mother at first birth. Mothers who delay fertility and put effort into building a career before entering motherhood can be thought to suffer smaller wage penalties than mothers with early first births. This may follow from the fact that the early years in the labour market are of great importance for life-time wage growth (e.g. Murphy and Welch 1990). Therefore young mothers spending time at home to take care of their children during the stage of rapid wage growth may suffer particularly large penalties. In fact, there is plenty of empirical evidence supporting the view that postponing maternity decreases, or even eliminates, the motherhood wage penalty (e.g. Drolet 2002; Taniguchi 1999). I also investigate the

[11] Empirical evidence in this respect is highly contradictory. For example, Budig and England (2001) found that the motherhood wage penalty is not larger among highly educated mothers whereas Anderson et al. (2002) arrived at exactly the opposite conclusion.

variation of the motherhood wage penalty across education groups. The reasons for why this might be interesting were discussed above.

Apart from worker characteristics, I also examine how the motherhood wage penalty varies by employer characteristics. Some employer policies, like the provision of flexible work schedules, are clearly mother-friendly. There might be differences between firms in the provision of these family-friendly policies. For example, large firms might offer better opportunities for mothers to combine work and family than small firms. Therefore, I investigate whether the child-penalty varies with firm size. I also study the variation of the child-penalty by the share of female employment in the industry. To do this, I divide industries into three groups: male-dominated industries, female-dominated industries and balanced industries. An industry is classified as male-dominated if the male share of employment is at least 60 per cent. Correspondingly, an industry is female-dominated if at least 60 per cent of its employment consists of women. Otherwise, an industry is classified as balanced. Similar to firm size, some industries may be more mother-friendly than others. If female-dominated industries offer on average more family-friendly policies then we might expect the child-penalty to be smaller in these industries than in the male-dominated or in the balanced industries.

Table 2A in the appendix presents the estimates of the motherhood wage penalty separately for mothers who do not return to their former employer after the career break (movers) and for mothers who return to the same firm (stayers). In my sample, about 14 percent of the mothers giving birth to their first child during 1996-1997 change employer during their maternity leave. The results indicate that there is variation in the motherhood wage penalty depending on the mobility status. Mothers changing employer and staying at home no longer than for two years seem to manage the best: among them the coefficients for the break variable do not differ statistically from zero in any of the after the break periods. Stayers, in contrast, even if they returned to the labour market relatively quickly, lag behind childless women in wages due to the break. However, for mothers with a break over three years the mobility status does not make much difference: among them the child-penalty is large irrespective of the mobility status.

The figures in Table 3A give some support to the claim that postponing maternity decreases the wage penalty associated with motherhood. For example, if we compare mothers belonging to the age group 26 or below to mothers who are over 32 years old at first birth, we notice that the older mothers face smaller wage penalties than the younger mothers. However, the evidence on the profitability of postponing motherhood is not clear-cut. For these same age groups we observe that the advantage of the older mothers compared to the younger ones is most profound in the case of very short breaks (one year) or relatively long breaks (over three years) whereas for two-year breaks there is little difference in the relative penalties between the

two age groups. Hence, answering the question of whether or not fertility timing matters in terms of the wage effects of children in the Finnish labour market would require a more detailed analysis.

Table 4A investigates the variation of the motherhood wage penalty across education levels.[12] Similar to Budig and England (2001), I do not find that the motherhood wage penalty would increase with the educational level. On the contrary, higher educated mothers appear to experience smaller penalties than lower educated mothers: among mothers with no higher than a college level degree the penalties seem to be statistically significant also in the longer term (in periods t+2 and t+3) whereas for mothers with a university degree the penalties are typically significant only immediately after the return to the labour market.

The results presented in Table 5A show that the main conclusions made from Tables 1 and 2, namely that the motherhood wage penalty increases significantly with the length of the career break and that the penalty decreases fairly quickly after the return to the labour market, hold across firms of different sizes. Furthermore, Table 5A does not support the hypothesis that the child-penalty would be smaller in large firms. On the contrary, the penalties seem to be higher in them.

Table 6A shows the estimates of the motherhood wage penalty across industries with different female share of employment. Interestingly, penalties appear to be smaller in the female-dominated industries than in the male-dominated industries. Also in the industries classified as balanced the child-penalties seem to be lower than in the male-dominated industries. These findings are in line with the hypothesis that female-dominated industries offer more family-friendly policies and as a result the wage penalties due the child-birth are smaller in these industries.

The results discussed in this section suggest that the motherhood wage penalty varies somewhat across worker and firm characteristics. For example, the child-penalty seems to decrease with the age of the mother. Penalties appear also to be smaller in the female-dominated industries than in the industries with high male share of employment. However, it should be noticed that as I divide mothers into smaller sub-groups by background characteristics, the number of mothers in each group becomes fairly small. This leads to fairly imprecise estimates of the motherhood wage penalty. It is also likely that the analysis of the child-penalty across worker and firm characteristics suffers from serious endogeneity problems. Therefore, one should avoid making too far-reaching conclusions from Tables 2A-6A but rather take the documented estimates as suggestive.

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[12] Due to the lack of enough observations I combine lower and higher university levels to a single group.

4.3 Variation of the Motherhood Penalty across the Wage Distribution

The results in Tables 1 and 2 are estimates of the motherhood wage penalty at the mean of the observed distribution of wages. There might, however, be considerable variation in the wage penalty across the wage distribution. This could, for example, be due to discriminatory factors. If mothers face barriers to high-paying and demanding jobs, we may find larger motherhood wage penalties at the top of the wage distribution.[13] To get information on the effects of children at different points of the wage distribution, I utilize the quantile regression framework (see e.g. Koenker and Bassett 1978). The quantile regression technique is applied to the full wage model specification by use of the bootstrap option (to obtain robust standard errors). However, due to the large number of observations, estimation by bootstrapping becomes fairly burdensome and time-consuming. Therefore, I have drawn a 20 per cent random sample from the women without children. They were sampled from the 1996 cohort and then followed both before and after 1996.

There has recently been increasing interest in using the quantile regression techniques in the gender wage gap literature. Researchers have been occupied by the question of how gender affects both the location and the shape of the wage distribution. The quantile regression method provides tools to address this question. Several studies have documented that the gender wage gap typically varies across the wage distribution and therefore the mean gender wage gap might hide important information. For example, there is evidence from different countries that the gender wage gap increases throughout the conditional wage distribution with an acceleration in the upper tail of the wage distribution (e.g. Albrecht et al. 2003; Arulampalam et al. 2007). This has been interpreted as evidence of the existence of a glass ceiling preventing women from entering the most high-paying and demanding jobs. My paper makes an interesting contribution by applying the quantile regression technique in the analysis of the motherhood wage penalty. To the author's best knowledge, there are no earlier studies in this field of research that have utilized the quantile regression method.

Table 3 reports the estimated coefficients on the break variables together with t-values at different percentiles of the conditional wage distribution. The conclusion made earlier about the relatively low penalties for mothers who experience a short career break seems to hold throughout the conditional wage distribution. Nevertheless, there is also some interesting varia-

[13] Of course, any increase of the motherhood wage penalty throughout the wage distribution may be due to many factors, not only discrimination.

Table 3: The motherhood wage penalty along the conditional wage distribution

Dependent variable: log of real monthly wage				
Period	**t-1**	**t+1**	**t+2**	**t+3**
5th percentile				
one-year break	0.068	-0.292	-0.016	0.037
	(2.23)*	(5.00)**	(0.49)	(0.96)
two-year break	0.067	-0.055	-0.025	0.006
	(2.77)**	(1.84)	(0.67)	(0.18)
three-year break	0.027	-0.193	-0.089	-0.012
	(0.56)	(4.58)**	(2.17)*	(0.21)
over three-year break	0.050	-0.217	-0.035	0.036
	(1.61)	(4.89)**	(0.79)	(0.79)
25th percentile				
one-year break	0.022	-0.110	-0.022	-0.002
	(1.61)	(4.89)**	(1.05)	(0.10)
two-year break	0.049	-0.060	-0.020	-0.004
	(5.16)**	(5.04)**	(1.53)	(0.32)
three-year break	0.042	-0.196	-0.074	-0.069
	(2.56)**	(8.94)**	(3.69)**	(4.09)**
over three-year break	0.039	-0.146	-0.071	-0.062
	(2.28)*	(5.35)**	(4.97)**	(2.71)**
median				
one-year break	0.018	-0.087	-0.031	-0.019
	(1.17)	(5.34)**	(1.83)	(0.88)
two-year break	0.038	-0.061	-0.028	-0.013
	(4.85)**	(5.01)**	(2.49)*	(1.24)
three-year break	0.019	-0.159	-0.092	-0.088
	(1.66)	(8.80)**	(4.60)**	(5.29)**
over three-year break	0.026	-0.141	-0.099	-0.036
	(1.97)*	(9.47)**	(6.75)**	(1.10)
75th percentile				
one-year break	0.006	-0.092	-0.052	-0.011
	(0.29)	(4.90)**	(1.91)	(0.39)
two-year break	0.017	-0.070	-0.072	-0.033
	(1.56)	(4.72)**	(3.86)**	(1.81)
three-year break	-0.021	-0.171	-0.113	-0.124
	(1.27)	(7.41)**	(5.59)**	(5.31)**
over three-year break	0.017	-0.146	-0.108	-0.077
	(0.97)	(7.65)**	(5.95)**	(3.02)**
95th percentile				
one-year break	-0.065	-0.094	-0.120	-0.124
	(2.09)*	(1.76)	(1.67)	(1.30)
two-year break	0.014	-0.123	-0.139	-0.056
	(0.72)	(2.90)**	(2.75)**	(0.93)
three-year break	-0.010	-0.176	-0.184	-0.237
	(0.29)	(2.58)**	(2.02)*	(4.67)**
over three-year break	-0.001	-0.234	-0.157	-0.146
	(0.04)	(4.49)**	(2.45)*	(2.82)**

Notes:

1. The estimated model is the full model containing both the human capital variables and the firm characteristics. In all percentiles, the omitted group is women without children.
2. Robust t statistics are in parentheses.
3. * significant at 5 % level; ** significant at 1 % level.

tion in the penalties across the distribution. Most notably, the large average wage penalties for mothers who spend longer periods at home taking care of their children appear to be driven by

heavy penalties at the upper tail of the conditional wage distribution. Instead for mothers who experience a break of no longer than two years, the relative wage penalty for children is fairly constant across the wage distribution. Therefore, the glass ceiling type of explanation for the motherhood wage penalty does not receive clear-cut support in my data. However, it should be noticed that the standard errors for the estimated penalties are high. To get more reliable answers regarding how the motherhood wage penalty varies throughout the wage distribution would require a larger sample size.

5. Robustness Tests

5.1 Unobserved Heterogeneity

Thus far I have only taken observable characteristics into account in the analysis. It may well be that differences in some unobservable factors (e.g. in motivation) between mothers and childless women bias my estimates of the motherhood wage penalty. To give an example, if women with lower motivation to succeed in the labour market are more likely to have children, then this kind of unobserved heterogeneity may explain at least some of the negative correlation between children and mothers' wages. On the other hand, it is equally plausible that mothers who are observed in the labour market are those with high earnings potential. In this case, unobserved heterogeneity would lead to downward biased estimates of the child penalties.

To test the heterogeneity explanation for the motherhood wage penalty I apply a difference wage specification in which all variables are expressed as differences. Assuming that the unobserved factors do not vary over time, this method removes unobserved heterogeneity. I compare childless women to two groups of mothers: those who have experienced a two-year break and those who have spent four years at home taking care of a child. The estimated model is of the following form:

$$\ln \Delta W = \beta_0 + \beta_1 \Delta X + \beta_2 \Delta Z + \Delta\alpha + \Delta\mu \qquad (2)$$

where $\Delta \ln W = (\ln W_{it+j} - \ln W_{it-1})$ and $j = \{1, 2, 3\}$. ΔX and ΔZ on the other hand refer to changes in worker and firm characteristics respectively.[14] The error term consists of the individual fixed effect (α_i) and of the disturbance term (μ_{it}) which is assumed to be independently and identically distributed with zero mean and variance δ^2. Since the individual fixed effect is by assumption constant over time it drops out from the model.

[14] For mothers giving birth to their first child in 1996/1997 t-1 is 1995/1996, respectively. In the case of Table 4, t+1 refers to 1998/1999 whereas in Table 5, t+1 refers to 2000/2001.

The results for the difference model are shown in Tables 4 and 5. The same general conclusions that were drawn from Tables 1 and 2 can be made also now. First of all, mothers face a considerable wage penalty immediately after their return to the labour market, but they seem to catch up to childless women in wages. Secondly, mothers who spend a shorter period at home taking care of their children suffer much smaller wage losses compared to mothers who experience longer child-related career breaks. However, perhaps the most interesting observation from Tables 4 and 5 is that the results documented in these tables are remarkably similar to those presented in Table 2. This suggests that the previous conclusions about the existence and the size of the motherhood wage penalty in the Finnish private sector are not seriously biased by unobserved individual heterogeneity.

Table 4: Wage growth regressions: mothers vs. childless women, a two-year child-related break

Dependent variable: Δ log of real monthly wage			
Period	**t+1**	**t+2**	**t+3**
mother	-0.115	-0.072	-0.037
	(8.16)**	(4.28)**	(2.15)*
Δ tenure	0.023	0.024	0.024
	(15.18)**	(15.82)**	(17.20)**
Δ tenure²/10	-0.017	-0.016	-0.014
	(18.60)**	(20.23)**	(21.15)**
Δ married	0.009	0.003	0.009
	(0.94)	(0.34)	(0.97)
Δ in the level of education (0/1)	0.249	0.249	0.254
	(9.78)**	(10.25)**	(12.44)**
Δ in the field of education (0/1)	0.055	0.047	0.049
	(2.42)*	(2.25)*	(2.63)**
Δ in firm size: smaller	0.016	0.027	0.018
	(1.78)	(2.68)**	(1.81)
Δ in firm size: larger	0.038	0.057	0.062
	(5.66)**	(7.46)**	(7.84)**
(Omitted group: no change in firm size)			
Δ foreign ownership	0.017	0.024	0.023
	(2.20)*	(2.76)**	(2.78)**
Δ personnel's average age	0.022	0.025	0.028
	(2.68)**	(3.13)**	(3.79)**
Δ personnel's average age²/10	-0.003	-0.004	-0.004
	(2.51)*	(3.12)**	(3.66)**
Δ personnel's average years of schooling	0.104	0.036	-0.035
	(2.28)*	(0.78)	(0.75)
Δ personnel's average years of schooling²/10	-0.038	-0.007	0.020
	(2.10)*	(0.40)	(1.12)
Δ personnel's average tenure	-0.106	-0.112	-0.096
	(2.68)**	(2.78)**	(2.52)*
Δ personnel's average tenure²/10	0.006	0.006	0.004
	(3.49)**	(3.23)**	(2.44)*
Δ female share of personnel	-0.096	-0.104	-0.107
	(4.84)**	(5.03)**	(5.47)**
Δ ln(firm productivity)	0.024	0.022	0.033
	(4.94)**	(4.30)**	(6.11)**
Δ industry (0/1)	0.058	0.063	0.063
	(6.83)**	(6.88)**	(7.13)**

(Table 4 continues)

constant	0.121	0.180	0.195
	(26.10)**	(29.65)**	(30.00)**
observations	18 084	17 193	16 606
R-squared	0.09	0.08	0.11

Robust t statistics in parentheses
* significant at 5%; ** significant at 1%

Notes:

1. Δ refers to the difference between two time periods. For example, in the case of time period t+1, Δ tenure = tenure(t+1) – tenure(t-1),
Δtenure^2/10 = tenure(t+1)^2/10 – tenure(t-1)^2/10, and so on.
2. In addition to the variables presented above, the regressions also include year dummies and a variable indicating whether a mother is observed to be on maternity leave later on during the investigation period.

Table 5: Wage growth regressions: mothers vs. childless women, a four-year child-related break

Dependent variable: Δ log of real monthly wage			
Period	**t+1**	**t+2**	**t+3**
mother	-0.168	-0.100	-0.083
	(7.86)**	(4.78)**	(3.23)**
Δ tenure	0.024	0.022	0.021
	(17.07)**	(17.79)**	(14.50)**
Δ tenure^2/10	-0.015	-0.013	-0.011
	(21.16)**	(22.68)**	(19.27)**
Δ married	0.009	0.020	0.018
	(0.93)	(2.30)*	(1.84)
Δ in the level of education (0/1)	0.257	0.244	0.205
	(12.54)**	(15.09)**	(11.44)**
Δ in the field of education (0/1)	0.049	0.060	0.067
	(2.61)**	(3.79)**	(3.60)**
Δ in firm size: smaller	0.018	0.010	-0.003
	(1.79)	(1.05)	(0.30)
Δ in firm size: larger	0.062	0.058	0.051
	(7.79)**	(7.79)**	(5.56)**
(Omitted group: no change in firm size)			
Δ foreign ownership	0.023	0.026	0.048
	(2.79)**	(3.41)**	(5.10)**
Δ personnel's average age	0.024	0.025	0.035
	(3.20)**	(3.84)**	(4.01)**
Δ personnel's average age^2/10	-0.003	-0.003	-0.005
	(3.11)**	(3.85)**	(4.08)**
Δ personnel's average years of schooling	-0.039	-0.011	-0.136
	(0.85)	(0.23)	(2.32)*
Δ personnel's average years of schooling^2/10	0.022	0.014	0.066
	(1.22)	(0.74)	(2.80)**
Δ personnel's average tenure	-0.082	-0.092	-0.148
	(2.13)*	(2.61)**	(3.33)**
Δ personnel's average tenure^2/10	0.003	0.004	0.007
	(2.06)*	(2.61)**	(3.63)**
Δ female share of personnel	-0.111	-0.096	-0.126
	(5.60)**	(5.12)**	(5.69)**
Δ ln(firm productivity)	0.034	0.040	0.035
	(6.40)**	(7.90)**	(5.15)**

(Table 5 continues)

Δ industry (0/1)	0.060	0.068	0.075
	(6.73)**	(8.24)**	(7.36)**
constant	0.196	0.204	0.190
	(29.69)**	(30.45)**	(23.49)**
observations	16 252	15 914	7 635
R-squared	0.11	0.15	0.16

Robust t statistics in parentheses
* significant at 5%; ** significant at 1%

Notes:

1. Δ refers to difference between two time periods. See notes in table 4.
2. In addition to the variables presented above, the regressions also include year dummies and a variable indicating whether a mother is observed to be on maternity leave later on during the investigation period.

5.2 Sample Restrictions

Earlier in Sections 3.1 and 3.2 I discussed the restrictions applied to the data. One may be concerned that they might have affected my conclusions concerning the motherhood wage penalty. This section examines in a more detailed fashion the sensitivity of my results to the data restrictions made.

I start with the age restriction. I have focused on women who were 16-39 years old in 1996-1997. To gather confidence that my results are not driven by this restriction, I run the estimations also by using another sample of women consisting of potential mothers of age 20-35 in 1996-1997. The estimation results for this group are, however, very similar to those presented in Tables 1 and 2. The results using this different age restriction are not documented in the paper but they are available from the author upon request.

I also experimented with alternative ways of defining the after-the-break periods. As discussed above, year t+1 is the first year after the child-related career break when the mother has a valid wage observation and zero parental leave days. The length of the break is then based on the difference between year t+1 and the year the mother gives birth to her first child. This is of course quite a rough measure of the length of the break. There might, for example, be mothers who have been only one or a few days on parental leave in year x and at work for the rest of that year. In this situation it would then be more appropriate to define year x as her first year in employment after the break rather than year x+1 (as when using my preferred definition for year t+1). To ensure that my conclusions about the relationship between the size of the motherhood wage penalty and the length of the break are not seriously biased by the way the observation

points for wage comparisons are defined, I experimented with some alternative definitions. For example, instead of requiring zero parental leave days in year t+1, I allowed 63 parental leave days (about three work months) during that year. Table 7A in the appendix documents the results for this case. As can be seen, the estimates of the motherhood wage penalty in Table 7A correspond roughly to those presented in Table 2. Typically the estimated motherhood wage penalties in Table 7A are somewhat larger (about 1-4 percentage points) compared to those presented in Table 2, but the general conclusions that can be drawn from the two tables are nevertheless similar: the penalties decrease significantly with time and mothers who experience a relatively short break suffer smaller penalties than mothers spending more time at home. I also made estimations using a few other definitions of the after-the-break periods and they all produced results similar to those presented in Table 2.

Finally, I examined the sensitivity of my results to the restrictions imposed on the monthly wage. As mentioned in Section 3.2, in order to exclude outliers, I imposed a lower bound of 600 euros and an upper bound of 20 000 euros. To check that my conclusions are not driven by this restriction I estimated the full wage model without applying any restrictions on monthly wages. The results for the unrestricted model were very similar to those for the restricted model.

5.3 Other Robustness Tests

My estimations of the motherhood wage penalty imply that the penalty decreases fairly quickly with time spent in the labour market after the break. However, this conclusion is based on estimations where the underlying population is not exactly the same for all observation periods. Therefore, table 8A in the appendix shows the results for the full wage model in the case where I restrict myself to those individuals from whom I have wage observations for all the periods t-1, t+1, t+2 and t+3. As can be seen from the table, also for this sample I observe mothers catch up with other women in wages after their return to the labour market.

In Section 5.1 I discussed the problems arising from unobserved heterogeneity. There are, however, many other potential sources of bias. One is the potential sample selection bias resulting from the exclusion of women whose wages are not observed. To examine this, I compared the results of Heckman's selection model to the results of the OLS model. Estimations were run separately for the years 2000, 2001, and 2002. The dependent variable in the selection equation was a dummy indicating whether or not a woman is working in year t. Selection into employment was modelled using age, age squared, educational dummies, and dummies for mar-

riage and children as explanatory variables.[15] The results (not shown here) suggest that selection into employment is not likely to be a serious problem in my case. The coefficients for the break variables are typically similar in the Heckman selection model and the OLS model. Furthermore, the selection term differs significantly from zero only in some cases and when this happens, the inclusion of the selection term causes only small changes in the career break coefficients. Also several other studies using fairly new data have not found evidence of a significant selection bias (e.g. Waldfogel 1995; Joshi et al. 1999).

My results may also be biased because of endogeneity problems. Instead of children leading to lower wages, it is possible that low wages increase the probability to have children. If this is the case then ignoring the endogeneity of children and child-related career breaks would result in an overestimation of the motherhood wage penalty. The endogeneity of children could be tested by applying an instrumental variables method. Unfortunately, my data do not contain any variables which could be considered as valid instruments. However, several earlier studies have found that the exogeneity of children cannot typically be rejected (e.g. Korenman and Neumark 1994; Waldfogel 1995; Skyt Nielsen et al. 2004).[16]

6. Conclusions

This paper is about the motherhood wage penalty in the Finnish private sector. The motherhood wage effects are investigated by comparing the wages of women who give birth to their first child between 1996 and 1997 to the wages of childless women. Wage comparisons are made both before and after child-birth in order to obtain information on the changes in relative wage positions.

I find evidence on the existence of motherhood wage penalties in the Finnish labour market. The size of the average penalty roughly corresponds to that found in studies for other countries. The estimation results indicate that the motherhood wage penalty varies significantly with the length of the child-related career break. Mothers who experience a relatively short career break face considerably smaller wage penalties than mothers who spend longer periods at home taking care of their children. The penalties also seem to decrease fairly quickly with time

15 I also experimented with some other specifications without any changes in the conclusions.

16 Of course, the reliability of this conclusion depends in the end on the validity of the instruments used. Examples of variables used as an instrument for children are parents' education, the number of siblings and the partner's income. It is relatively easy to come up with reasons why these variables might be correlated not only with a child variable but also with the mother's wage. Therefore, the results concerning the exogeneity of children found in the literature can be called into question.

after the mother's return to the labour market. For example, mothers who experience a break no longer than two years do not differ from non-mothers in terms of wages after three years from the return to the labour market. These findings not only support the human capital-based explanation for the motherhood wage penalty, but they also suggest that the long-term effects of children on mothers' wages are likely to be fairly small in the Finnish private sector.

Beyond the human capital theory, I also investigated the importance of firm characteristics in explaining the motherhood wage penalty. I find some evidence that mothers may seek to work in different types of firms than non-mothers, and taking this into account in the wage regressions by including several firm characteristics in the wage model decreases the estimated size of the motherhood wage penalty by about 8 per cent leaving it, however, still statistically significant. Also the role of unobserved individual heterogeneity was investigated by estimating a wage growth model. The wage growth model produces similar results to those of the wage level model implying that the possible differences in unobserved factors between mothers and childless women are not the driving force behind the motherhood wage penalty in the Finnish private sector.

Also the variation of the motherhood wage penalty across worker and firm characteristics was examined. Some heterogeneity in the penalties was found in this respect. For example, older mothers seem to experience smaller penalties than younger mothers. Penalties were also larger in the male-dominated industries compared to the balanced or female-dominated industries. Furthermore, the results for the quantile regression model show some interesting variation in the motherhood wage penalty across the conditional wage distribution. Most notably, the large average penalties for mothers who experience a long career break appear to be driven by heavy penalties at the upper tail of the conditional wage distribution, that is, among higher-paid women. Instead for mothers who experience a break of no longer than two years, the relative wage penalty for children is fairly constant across the wage distribution. Therefore, the glass ceiling type of explanation for the motherhood wage penalty does not receive clear-cut support in my data.

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Appendix

Variable description

Log monthly real wage: Calculated by dividing yearly wages by work months. Wages are converted into 2000 money using the Cost-of-Living index of Statistics Finland. In the text the term *valid wage observation* is used. This refers to monthly real wage which is between 600 and 20 000 euros.

Career break variables: The length of the child-related career break is captured by five indicators: (i) no break, i.e. women without children (omitted group), (ii) one-year break (iii) two-year break, (iv) three-year break, and (v) a break more than three years. The length of the break is measured as t+1 – t0 where t+1 is the first year after the child-birth when the mother has a valid wage observation and no family leave days during the year whereas t0 refers to the year of child birth.

Tenure: The number of years spent working in the current company.

Non-permanent: A dummy which takes a value of one if a mother who has returned to employment after the child-related career break appears on the parental leave again during the investigation period and zero otherwise.

Firm size: Four categories: (i) micro = less than 20 workers, (ii) small = 20 – 99 workers, (iii) middle size firm = 100 – 299 workers, (iv) large = more than 299 workers.

Foreign ownership: A dummy variable which takes a value of one if foreign ownership of the firm is 20 percent or more and zero otherwise.

Productivity: Value added of the firm by worker.

Notes:

1. The above list does not contain all variables used in the analysis, but only those which require more detailed definition.

Table 1A: Summary statistics for selected sample of variables used in estimations

Women without children:

	t-1			t+1			t+2			t+3		
	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.
log montly real wage	20166	7.339	0.35	61555	7.553	0.40	50660	7.579	0.40	40236	7.602	0.41
Level of education:												
no higher than college	20166	0.589	0.49	61555	0.526	0.50	50660	0.521	0.50	40236	0.516	0.50
lowest tertiary	20166	0.323	0.47	61555	0.341	0.47	50660	0.340	0.47	40236	0.337	0.47
lower university	20166	0.034	0.18	61555	0.058	0.23	50660	0.061	0.24	40236	0.067	0.25
higher university	20166	0.054	0.23	61555	0.076	0.27	50660	0.078	0.27	40236	0.079	0.27
Field of education:												
other	20166	0.533	0.50	61555	0.490	0.50	50660	0.486	0.50	40236	0.485	0.50
social and business	20166	0.352	0.48	61555	0.385	0.49	50660	0.388	0.49	40236	0.388	0.49
technology	20166	0.115	0.32	61555	0.125	0.33	50660	0.126	0.33	40236	0.127	0.33
Other worker characteristics:												
age	20166	29.294	5.02	61555	33.116	5.29	50660	33.610	5.21	40236	34.094	5.15
age^2/10	20166	88.331	29.82	61555	112.462	35.52	50660	115.683	35.54	40236	118.900	35.64
tenure	20166	3.976	4.31	61555	5.673	5.36	50660	5.867	5.47	40236	6.061	5.58
tenure^2/10	20166	3.441	6.52	61555	6.095	10.08	50660	6.431	10.46	40236	6.783	10.85
married	20166	0.110	0.31	61555	0.159	0.37	50660	0.166	0.37	40236	0.174	0.38
Firm size:												
micro	20166	0.249	0.43	61555	0.213	0.41	50660	0.210	0.41	40236	0.213	0.41
small	20166	0.171	0.38	61555	0.180	0.38	50660	0.182	0.39	40236	0.183	0.39
middle	20166	0.133	0.34	61555	0.136	0.34	50660	0.135	0.34	40236	0.134	0.34
large	20166	0.448	0.50	61555	0.471	0.50	50660	0.473	0.50	40236	0.469	0.50
Other employer characteristics:												
foreign ownership	20166	0.077	0.27	61555	0.160	0.37	50660	0.170	0.38	40236	0.173	0.38
years of schooling	20166	11.633	1.19	61555	11.890	1.25	50660	11.913	1.26	40236	11.944	1.28
years of schooling^2/10	20166	13.675	2.94	61555	14.295	3.13	50660	14.350	3.15	40236	14.431	3.20
personnel's age	20166	36.546	4.73	61555	37.251	4.75	50660	37.307	4.77	40236	37.426	4.76
personnel's age^2/10	20166	135.799	33.05	61555	141.018	34.50	50660	141.457	34.77	40236	142.337	34.90
tenure	20166	7.360	4.32	61555	7.469	4.24	50660	7.430	4.21	40236	7.426	4.16
tenure^2/10	20166	7.287	7.38	61555	7.376	7.66	50660	7.289	7.59	40236	7.245	7.52
female share	20166	0.579	0.25	61555	0.561	0.25	50660	0.558	0.25	40236	0.559	0.25

(Table 1A continues)

Women giving birth to their first child in 1996/1997:

	t-1			t+1			t+2			t+3		
	Obs	**Mean**	**Std. Dev.**	**Obs**	**Mean**	**Std. Dev.**	**Obs**	**Mean**	**Std. Dev.**	**Obs**	**Mean**	**Std. Dev.**
log montly real wage	2607	7.360	0.33	2563	7.415	0.40	1951	7.500	0.40	1401	7.552	0.40
Level of education:												
no higher than college	2607	0.510	0.50	2563	0.481	0.50	1951	0.507	0.50	1401	0.507	0.50
lowest tertiary	2607	0.370	0.48	2563	0.379	0.49	1951	0.365	0.48	1401	0.377	0.48
lower university	2607	0.043	0.20	2563	0.046	0.21	1951	0.041	0.20	1401	0.042	0.20
higher university	2607	0.078	0.27	2563	0.094	0.29	1951	0.087	0.28	1401	0.074	0.26
Field of education:												
other	2607	0.470	0.50	2563	0.449	0.50	1951	0.458	0.50	1401	0.466	0.50
social and business	2607	0.390	0.49	2563	0.411	0.49	1951	0.401	0.49	1401	0.407	0.49
technology	2607	0.140	0.35	2563	0.140	0.35	1951	0.141	0.35	1401	0.128	0.33
Other worker characteristics:												
age	2607	27.829	4.20	2563	31.351	4.19	1951	32.490	4.34	1401	33.664	4.39
age^2/10	2607	79.209	23.96	2563	100.045	26.82	1951	107.441	28.73	1401	115.251	29.94
tenure	2607	3.494	3.25	2563	3.292	4.08	1951	3.781	4.18	1401	4.371	4.31
tenure^2/10	2607	2.278	3.93	2563	2.745	5.03	1951	3.180	5.83	1401	3.768	6.69
married	2607	0.458	0.50	2563	0.644	0.48	1951	0.605	0.49	1401	0.571	0.50
Firm size:												
micro	2607	0.254	0.44	2563	0.215	0.41	1951	0.211	0.41	1401	0.206	0.40
small	2607	0.169	0.37	2563	0.178	0.38	1951	0.188	0.39	1401	0.189	0.39
middle	2607	0.138	0.35	2563	0.143	0.35	1951	0.135	0.34	1401	0.129	0.34
large	2607	0.439	0.50	2563	0.465	0.50	1951	0.466	0.50	1401	0.476	0.50
Other employer characteristics:												
foreign ownership	2607	0.072	0.26	2563	0.164	0.37	1951	0.169	0.37	1401	0.173	0.38
years of schooling	2607	11.643	1.19	2563	11.810	1.21	1951	11.817	1.24	1401	11.859	1.25
years of schooling^2/10	2607	13.698	2.94	2563	14.095	3.03	1951	14.118	3.11	1401	14.220	3.16
personnel's age	2607	36.331	4.66	2563	37.185	4.59	1951	37.485	4.52	1401	37.713	4.44
personnel's age^2/10	2607	134.169	32.58	2563	140.375	33.10	1951	142.556	33.16	1401	144.197	32.91
tenure	2607	7.416	4.24	2563	7.629	4.33	1951	7.617	4.16	1401	7.674	4.09
tenure^2/10	2607	7.294	7.33	2563	7.693	7.93	1951	7.528	7.65	1401	7.561	7.54
female share	2607	0.587	0.26	2563	0.573	0.26	1951	0.564	0.26	1401	0.558	0.26

Table 2A: The motherhood wage penalty by mobility status

Dependent variable: log of real monthly wage Period	t-1	t+1	t+2	t+3
Movers:				
one-year break	0.054	-0.049	0.029	0.058
	(1.80)	(0.92)	(0.39)	(0.88)
two-year break	0.018	-0.034	0.012	0.003
	(1.04)	(1.16)	(0.30)	(0.11)
three-year break	0.033	-0.135	-0.057	-0.072
	(1.58)	(3.47)**	(1.73)	(2.26)*
over three-year break	0.030	-0.192	-0.091	-0.102
	(1.34)	(5.95)**	(3.17)**	(2.83)**
observations	20 727	62 055	51 052	40 501
R-squared	0.41	0.34	0.31	0.29
Stayers:				
one-year break	0.017	-0.124	-0.053	-0.040
	(1.16)	(6.19)**	(2.46)*	(1.59)
two-year break	0.042	-0.087	-0.060	-0.015
	(5.38)**	(6.13)**	(4.22)**	(0.88)
three-year break	0.006	-0.203	-0.105	-0.126
	(0.39)	(9.44)**	(4.13)**	(6.62)**
over three-year break	0.027	-0.188	-0.107	-0.066
	(1.93)	(9.60)**	(5.61)**	(2.96)**
observations	22 212	63 618	52 219	41 372
R-squared	0.41	0.34	0.32	0.29

Notes:

1. Movers refer to mothers who do not return to their former employer after the child-related career break. Respectively mothers who return to the same firm are denoted as stayers. In both cases, the comparison group is women without children.
2. The estimated model is the full model containing both the human capital variables and firm characteristics (as described in Section 3.2).
3. Robust t statistics are in parentheses.
4. * significant at 5 % level; ** significant at 1 % level.

Table 3A: The motherhood wage penalty across age groups

Dependent variable: log of real monthly wage Period	t-1	t+1	t+2	t+3
Age group: 26 or below				
one-year break	0.011	-0.212	-0.077	-0.047
	(0.55)	(5.81)**	(2.56)*	(1.06)
two-year break	0.053	-0.090	-0.043	0.000
	(4.03)**	(3.46)**	(2.08)*	(0.01)
three-year break	0.040	-0.184	-0.081	-0.117
	(1.98)*	(6.15)**	(2.10)*	(4.35)**
over three-year break	0.053	-0.187	-0.130	-0.112
	(2.88)**	(7.18)**	(5.56)**	(3.53)**
observations	20 953	62 310	51 253	40 622
R-squared	0.41	0.34	0.32	0.29
Age group: 27-32				
one-year break	0.022	-0.086	-0.058	-0.030
	(1.36)	(3.16)**	(1.97)*	(0.81)
two-year break	0.033	-0.069	-0.048	-0.003
	(3.39)**	(3.79)**	(2.39)*	(0.13)
three-year break	-0.005	-0.195	-0.114	-0.099
	(0.30)	(7.25)**	(4.16)**	(4.10)**
over three-year break	0.017	-0.202	-0.079	-0.039
	(1.05)	(8.29)**	(3.26)**	(1.50)
observations	21 494	62 866	51 610	40 925
R-squared	0.41	0.34	0.31	0.29
Age group: over 32				
one-year break	0.036	-0.066	0.024	0.015
	(0.96)	(1.76)	(0.42)	(0.35)
two-year break	0.028	-0.089	-0.063	-0.045
	(1.75)	(3.52)**	(2.08)*	(1.93)
three-year break	0.011	-0.172	-0.066	-0.135
	(0.34)	(3.37)**	(1.37)	(3.63)**
over three-year break	-0.005	-0.157	-0.112	-0.117
	(0.12)	(3.33)**	(2.55)*	(2.16)*
observations	20 658	62 052	51 068	40 562
R-squared	0.41	0.34	0.31	0.29

Notes:

1. The estimated model is the full model containing both the human capital variables and firm characteristics. In all age groups, the comparison group is women without children.
2. Robust t statistics are in parentheses.
3. * significant at 5 % level; ** significant at 1 % level.

Table 4A: The motherhood wage penalty across education groups

Dependent variable: log of real monthly wage Period	t-1	t+1	t+2	t+3
No higher than college:				
one-year break	0.011	-0.141	-0.009	-0.057
	(0.60)	(5.40)**	(0.28)	(1.72)
two-year break	0.062	-0.072	-0.052	-0.014
	(6.27)**	(4.50)**	(2.76)**	(0.76)
three-year break	0.013	-0.189	-0.120	-0.119
	(0.83)	(8.14)**	(4.73)**	(5.44)**
over three-year break	0.040	-0.169	-0.106	-0.065
	(2.51)*	(7.84)**	(4.42)**	(2.40)*
observations	21 495	62 789	51 649	40 947
R-squared	0.41	0.34	0.31	0.29
Lowest tertiary:				
one-year break	0.020	-0.096	-0.072	-0.021
	(0.98)	(3.01)**	(2.42)*	(0.66)
two-year break	0.022	-0.076	-0.050	-0.001
	(1.93)	(3.25)**	(2.25)*	(0.02)
three-year break	0.012	-0.175	-0.063	-0.098
	(0.58)	(5.15)**	(1.64)	(3.50)**
over three-year break	0.008	-0.214	-0.134	-0.106
	(0.40)	(6.90)**	(5.44)**	(3.57)**
observations	21 130	62 527	51 373	40 764
R-squared	0.41	0.34	0.31	0.29
University:				
one-year break	0.064	-0.063	-0.020	0.108
	(1.61)	(1.16)	(0.31)	(1.05)
two-year break	-0.011	-0.097	-0.027	-0.046
	(0.50)	(2.36)*	(0.59)	(1.07)
three-year break	0.023	-0.224	-0.062	-0.112
	(0.42)	(2.86)**	(0.79)	(2.27)*
over three-year break	0.029	-0.205	-0.025	0.011
	(0.65)	(4.58)**	(0.63)	(0.18)
observations	20 480	61 912	50 909	40 398
R-squared	0.42	0.34	0.32	0.29

Notes:

1. The estimated model is the full model containing both the human capital variables and firm characteristics. In all education groups, the comparison group is women without children.
2. Robust t statistics are in parentheses.
3. * significant at 5 % level; ** significant at 1 % level.

Table 5A: The motherhood wage penalty across firm size groups

Dependent variable: log of real monthly wage Period	t-1	t+1	t+2	t+3
Small firm:				
one-year break	0.061	-0.087	0.015	0.035
	(3.11)**	(2.57)*	(0.29)	(0.73)
two-year break	0.044	-0.070	-0.028	0.030
	(3.38)**	(3.14)**	(1.15)	(1.05)
three-year break	0.019	-0.205	-0.103	-0.087
	(0.89)	(6.19)**	(3.06)**	(2.73)**
over three-year break	0.034	-0.175	-0.116	-0.062
	(1.67)	(5.74)**	(4.28)**	(2.12)*
observations	21 069	62 376	51 287	40 685
R-squared	0.41	0.34	0.31	0.29
Medium size firm:				
one-year break	-0.001	-0.101	-0.088	-0.014
	(0.04)	(1.90)	(1.76)	(0.22)
two-year break	0.046	-0.050	-0.048	-0.012
	(3.10)**	(1.49)	(1.46)	(0.36)
three-year break	-0.000	-0.141	-0.096	-0.138
	(0.01)	(3.47)**	(2.21)*	(4.01)**
over three-year break	0.031	-0.183	-0.063	-0.084
	(1.14)	(4.98)**	(1.67)	(1.81)
observations	20 725	62 106	51 074	40 521
R-squared	0.41	0.34	0.31	0.29
Large firm:				
one-year break	0.002	-0.136	-0.056	-0.056
	(0.11)	(5.59)**	(2.33)*	(1.91)
two-year break	0.029	-0.095	-0.061	-0.043
	(2.87)**	(5.70)**	(3.33)**	(2.17)*
three-year break	0.018	-0.191	-0.086	-0.114
	(0.94)	(7.00)**	(2.70)**	(5.20)**
over three-year break	0.021	-0.204	-0.112	-0.081
	(1.22)	(8.66)**	(4.94)**	(2.74)**
observations	21 311	62 746	51 570	40 903
R-squared	0.41	0.34	0.31	0.29

Notes:

1. The estimated model is the full model containing both the human capital variables and firm characteristics. In all firm size groups, the comparison group is women without children.
2. In Table 5A, firm size groups are defined as follows: small firm: less than 50 workers, medium size firm: 50-299 workers and large firm: 300 or more workers.
3. Robust t statistics are in parentheses.
4. * significant at 5 % level; ** significant at 1 % level.

Table 6A: The motherhood wage penalty and the sex composition of the industry

Dependent variable: log of real monthly wage Period	t-1	t+1	t+2	t+3
Female-dominated industry:				
one-year break	0.029	-0.076	-0.014	-0.023
	(1.46)	(2.32)*	(0.36)	(0.50)
two-year break	0.055	-0.069	-0.004	0.025
	(4.54)**	(3.61)**	(0.17)	(0.82)
three-year break	0.016	-0.165	-0.071	-0.078
	(0.87)	(5.65)**	(1.98)*	(2.43)*
over three-year break	0.032	-0.155	-0.084	-0.069
	(1.74)	(5.25)**	(2.88)**	(2.59)**
observations	21 061	62 363	51 261	40 649
R-squared	0.41	0.34	0.32	0.29
Balanced industry:				
one-year break	0.041	-0.080	0.007	0.028
	(1.48)	(2.07)*	(0.14)	(0.56)
two-year break	0.024	-0.046	-0.061	-0.037
	(1.73)	(1.50)	(2.23)*	(1.36)
three-year break	-0.017	-0.193	-0.094	-0.108
	(0.65)	(4.99)**	(1.96)*	(3.39)**
over three-year break	0.024	-0.236	-0.133	-0.090
	(0.91)	(7.35)**	(4.34)**	(2.33)*
observations	20 891	62 273	51 187	40 621
R-squared	0.41	0.34	0.31	0.29
Male-dominated industry:				
one-year break	0.003	-0.160	-0.084	-0.049
	(0.17)	(5.76)**	(3.16)**	(1.48)
two-year break	0.032	-0.104	-0.071	-0.025
	(2.88)**	(5.61)**	(3.53)**	(1.21)
three-year break	0.037	-0.196	-0.107	-0.138
	(1.80)	(6.49)**	(3.96)**	(6.18)**
over three-year break	0.027	-0.191	-0.099	-0.066
	(1.35)	(7.39)**	(4.25)**	(1.94)
observations	21 153	62 592	51 483	40 839
R-squared	0.41	0.34	0.31	0.29

Notes:

1. The estimated model is the full model containing both the human capital variables and firm characteristics. In all industry groups, the comparison group is women without children.
2. In Table 6A, industry sex-labels are defined as follows: female dominated industry: female share of employment at least 60 percent, male-dominated industry: male share of employment at least 60 percent, and balanced industry: male share of employment between 40 and 60 percent.
3. Robust t statistics are in parentheses.
4. * significant at 5 % level; ** significant at 1 % level.

Table 7A: Robustness test: an alternative definition of the after-the-break period

Dependent variable: log of real monthly wage				
Period	**t-1**	**t+1**	**t+2**	**t+3**
one-year break	0.023	-0.154	-0.056	-0.041
	(2.52)*	(9.25)**	(3.37)**	(2.25)*
two-year break	0.041	-0.106	-0.085	-0.045
	(4.79)**	(7.08)**	(5.87)**	(2.98)**
three-year break	0.015	-0.225	-0.107	-0.123
	(1.10)	(11.50)**	(4.92)**	(6.78)**
over three-year break	0.001	-0.222	-0.114	-0.090
	(0.06)	(9.45)**	(4.41)**	(3.05)**
(Omitted group: no child-related career break)				
age	0.076	0.060	0.054	0.045
	(13.52)**	(13.41)**	(10.51)**	(7.27)**
age^2/10	-0.010	-0.007	-0.007	-0.005
	(10.30)**	(10.70)**	(8.43)**	(5.79)**
tenure	0.031	0.014	0.013	0.012
	(20.97)**	(13.43)**	(12.12)**	(9.83)**
tenure^2/10	-0.015	-0.006	-0.006	-0.005
	(16.80)**	(11.66)**	(10.67)**	(8.83)**
lowest tertiary	0.097	0.094	0.097	0.102
	(13.52)**	(14.40)**	(14.09)**	(13.88)**
lower university (BA level)	0.187	0.196	0.201	0.201
	(14.78)**	(19.48)**	(19.12)**	(18.46)**
higher university (MA level or higher)	0.379	0.416	0.422	0.435
	(29.77)**	(38.53)**	(37.05)**	(35.56)**
(Omitted group: no higher than college)				
social	-0.044	-0.030	-0.028	-0.027
	(6.32)**	(4.79)**	(4.24)**	(3.81)**
technology	0.011	0.006	0.004	0.004
	(1.52)	(0.88)	(0.64)	(0.59)
(Omitted group: other field of study)				
married	-0.005	0.006	0.008	0.007
	(0.72)	(1.11)	(1.32)	(1.04)
small firm	0.055	0.076	0.078	0.081
	(7.59)**	(11.30)**	(10.64)**	(10.14)**
middle size firm	0.053	0.071	0.070	0.075
	(6.59)**	(9.47)**	(8.61)**	(8.40)**
large firm	0.062	0.080	0.081	0.087
	(8.96)**	(11.94)**	(11.25)**	(11.23)**
(Omitted group: micro firm)				
foreign ownership (0/1)	0.063	0.051	0.050	0.051
	(7.29)**	(8.83)**	(8.19)**	(7.68)**
personnel's average years of schooling	0.145	0.173	0.165	0.179
	(4.55)**	(5.88)**	(5.15)**	(5.05)**
personnel's average years of schooling^2/10	-0.046	-0.050	-0.046	-0.051
	(3.55)**	(4.18)**	(3.55)**	(3.61)**
personnel's average age	0.020	0.001	-0.001	-0.002
	(3.31)**	(0.18)	(0.11)	(0.32)
personnel's average age^2/10	-0.002	-0.000	-0.000	0.000
	(2.80)**	(0.36)	(0.10)	(0.21)
personnel's average tenure	-0.010	-0.006	-0.006	-0.008
	(3.81)**	(2.70)**	(2.37)*	(2.92)**
personnel's average tenure^2/10	0.003	0.003	0.003	0.004
	(2.24)*	(2.60)**	(2.21)*	(2.50)*
female share of personnel	-0.107	-0.115	-0.119	-0.116
	(8.83)**	(10.46)**	(9.88)**	(8.67)**
ln(firm productivity)	0.069	0.056	0.058	0.068
	(14.05)**	(16.43)**	(14.96)**	(14.65)**
constant	3.674	4.231	4.407	4.492
	(16.22)**	(19.75)**	(18.87)**	(17.20)**

(Table 7A continues)

observations	22 461	63 846	52 412	41 542
R-squared	0.41	0.34	0.31	0.30
Robust t statistics in parentheses				
* significant at 5%; ** significant at 1%				

Notes:

1. In addition to the variables presented above, the regressions also include year dummies, industry indicators (24 categories) and in the case of periods following the career break, a variable indicating whether a mother is observed to be on maternity leave later on during the investigation period.
2. In table 7A, after-the-break periods are defined otherwise similar to that explained in Section 3.2, but here I allow 63 parental leave days during year t+1 instead of requiring zero leave days in that year.

Table 8A: Robustness test: following the same individuals through time

Dependent variable: log of real monthly wage				
Period	**t-1**	**t+1**	**t+2**	**t+3**
one-year break	-0.017	-0.120	-0.046	-0.013
	(0.76)	(4.31)**	(1.79)	(0.40)
two-year break	0.025	-0.074	-0.052	-0.014
	(2.24)*	(4.71)**	(3.41)**	(0.78)
three-year break	0.004	-0.183	-0.110	-0.117
	(0.19)	(6.57)**	(3.87)**	(5.30)**
over three year break	0.006	-0.179	-0.140	-0.097
	(0.25)	(5.43)**	(5.96)**	(3.85)**
(Omitted group: no child-related career break)				
age	0.074	0.054	0.046	0.040
	(11.33)**	(8.31)**	(6.79)**	(5.33)**
age^2/10	-0.010	-0.007	-0.006	-0.005
	(8.76)**	(6.71)**	(5.48)**	(4.30)**
tenure	0.027	0.010	0.004	0.001
	(16.62)**	(6.67)**	(3.02)**	(0.36)
tenure^2/10	-0.013	-0.004	-0.002	-0.001
	(13.68)**	(6.17)**	(3.29)**	(1.00)
lowest tertiary	0.096	0.102	0.105	0.106
	(11.74)**	(11.98)**	(12.25)**	(12.02)**
lower university (BA level)	0.187	0.217	0.222	0.230
	(12.50)**	(15.41)**	(16.00)**	(15.92)**
higher university (MA level or higher)	0.378	0.409	0.423	0.430
	(25.24)**	(27.04)**	(27.75)**	(27.21)**
(Omitted group: no higher than college)				
social	-0.057	-0.047	-0.046	-0.038
	(7.09)**	(5.67)**	(5.48)**	(4.48)**
technology	0.007	0.014	0.007	0.003
	(0.94)	(1.69)	(0.80)	(0.40)
(Omitted group: other field of study)				
married	-0.001	0.007	0.011	0.016
	(0.18)	(0.99)	(1.52)	(2.13)*
small firm	0.050	0.073	0.073	0.072
	(5.89)**	(7.93)**	(7.74)**	(7.37)**
middle size firm	0.050	0.069	0.071	0.072
	(5.38)**	(6.88)**	(6.90)**	(6.56)**
large firm	0.067	0.076	0.081	0.084
	(8.22)**	(8.64)**	(8.94)**	(8.86)**
(Omitted group: micro firm)				

(Table 8A continues)

foreign ownership (0/1)	0.064	0.056	0.055	0.056
	(6.38)**	(7.34)**	(7.11)**	(7.03)**
personnel's average years of schooling	0.195	0.197	0.207	0.216
	(4.96)**	(4.68)**	(4.72)**	(4.82)**
personnel's average years of schooling^2/10	-0.067	-0.064	-0.066	-0.069
	(4.23)**	(3.77)**	(3.74)**	(3.78)**
personnel's average age	0.015	0.003	0.009	-0.003
	(2.04)*	(0.31)	(1.05)	(0.36)
personnel's average age^2/10	-0.002	-0.000	-0.001	0.000
	(1.49)	(0.33)	(1.08)	(0.42)
personnel's average tenure	-0.013	-0.011	-0.015	-0.019
	(4.51)**	(3.57)**	(4.46)**	(5.42)**
personnel's average tenure^2/10	0.004	0.005	0.006	0.008
	(2.77)**	(3.10)**	(3.96)**	(4.45)**
female share of personnel	-0.098	-0.075	-0.087	-0.088
	(6.98)**	(5.30)**	(5.87)**	(5.52)**
ln(firm productivity)	0.075	0.084	0.085	0.082
	(12.92)**	(14.24)**	(13.56)**	(12.97)**
constant	3.455	3.979	3.987	4.340
	(12.43)**	(12.91)**	(12.52)**	(13.13)**
observations	16 512	26 308	26 308	26 308
R-squared	0.41	0.35	0.34	0.30

Robust t statistics in parentheses
* significant at 5%; ** significant at 1%

Notes:

1. In addition to the variables presented above, the regressions also include year dummies, industry indicators (24 categories) and in the case of periods following the career break, a variable indicating whether a mother is observed to be on maternity leave later on during the investigation period.

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