

The Family Gap in Pay

Evidence from Norway

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Preface:

I will start by thanking Professor Trond Petersen, my main advisor for the last 1.5 years. I thank him for his assistance on matters that are both methodological and substantial, as well as helping me through my writing process. Also his clarity and analytical skills have thought me much about studying sociology in general. I am very grateful to have had him as my main advisor. I will also thank him for giving me the opportunity to study at Berkeley, California for a year, which has been quite an experience.

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Even if this thesis could not been accomplished without the valuable assistance that I've been given, I take full responsibility for any errors written or printed in this study.

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Summary:

I will in this thesis examine the family gap in pay (i.e. differences in hourly pay between mothers and non-mothers) among Norwegian women.

While women in general make up a substantial part of the workforce today, a large literature shows that women with children have lower hourly earnings than women without children even with same type of education and experience. Evidence of a family gap in pay has been found for the United States, the United Kingdom, Germany and also for Norway.

Conventionally, five explanations have been given to explain the lower wages of mothers. (1) Mothers may earn less because they lose experience that are relevant for their work effort, (2) they may be less productive at work due to childrearing, (3) they may choose jobs more compatible with childrearing but at the expense of higher wages, (4) employers might discriminate against mothers, (5) or it could be that non-mothers differ from mothers in ways that are relevant for wages and careers. However, which of these explanations to put most emphasis on is still an unresolved matter in the literature of the family gap.

The available data was obtained from Statistics, Norway and the Confederation of Norwegian Enterprise (NHO). It covers the private business sector in Norway for the years 1980-1997. The data contains information about wages, establishments, occupation, age, education, family status, number of children (including when they were born) and more. The feature of the data (matched employer -employee data) allows me scrutinize the causes of the family gap in ways that have not been done before.

One important aspect concerns that of employer discrimination. With the available data I can see if mothers are being paid less than non-mothers once they perform the same work for the same employer. Another central aspect concerns the time-frame of the data. A presumption in the exciting literature of the family gap is that the lower wages for women with children can be explained by the lack of well-developed family policies in such countries. The data I have

available covers the years 1980-1997, a period with significant expansion in family policies in Norway. This allows me to see if the penalties to motherhood have changed over time, and to see if the family policies implemented in this years have had any of the intended effects.

I will use Ordinary Least Square Models (OLS) to examine the family gap in Norway with the natural log for wage as the dependent variable. In my analyses I will use different specifications of the OLS model, which will take into account the different levels of the data which arises with matched employer-employee data.

The main finding from my analysis is that it has occurred a great change in the situation for mothers in the private sector. The critical disparities in wages between mothers and non-mothers evident in the earliest years are severely reduced by the end of study. However, mothers still earn on average less than non-mothers, and these differences also increase with how many children you have. The main explanation for this is that mothers are sorted on different occupations and different establishments where lower wages prevail compared to non-mothers. Another important finding is when mothers and non-mothers actually work for the same employer and in same establishment, they receive same pay. As such within-job-wage discrimination is not what constitutes the family gap in pay in Norway.

Whether this differential sorting is due to some compensating differentials i.e. mothers seek this position because they are more easily combined with childrearing but at the expense of lower wages, or if it is a result of employer discrimination is difficult to determine. One could imagine that employers in the hiring situation channel mothers into lower paid occupations, or give mothers less promotions compared to non-mothers. But also mothers may choose to spend less time at work and /or give less effort at work when they have children. In order to settle such a discussion more research on how family life and work life intersect is needed.

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1 Introduction

How does motherhood affect employed women's wages?

Analyses about wage differences between men and women have been of interest to researchers for several decades. Traditionally, the lower wages of women or what has been known as the *gender wage gap* has to a great extent been explained by gender differences in the level of human capital (Becker 1962, 1985; Mincer and Polachek 1974) or by discrimination theories (Hersch 1991:746).

Many western countries implemented acts concerning equal pay and equal opportunity in the 1960s and the 1970s, which led to a decline in the gender wage gap (See Petersen 2002 for a thorough discussion). The decline was also prompted by a general rise in women's educational attainment and currently women's education level is close to that of men's. In addition, employment patterns among women have increasingly converged with those of men. Women no longer systematically leave the labor force permanently when they reach their childbearing years, and in many western countries the average age for women's first born have increased with several years (Rønsen 2004: 271; Taniguchi 1999). These effects combined have led to a rise in the human capital level of women. In many ways, these changes introduced women to a new opportunity structure, not available to earlier generations of mothers. In part this new structure implied that family responsibilities and wage labor was no longer incompatible. Despite these changes, evidence from several countries shows that the decline in the gender wage gap now has stagnated (see e.g. Blau and Kahn 2003).

This has led to a search for other explanations as to why the gender wage gap still exists. The role of family responsibilities and how this affects specially *women's wages* has now been greatly emphasized.

As early as 1989 did Arlie Hochschild describe in a qualitative study what she called the "stalled revolution". This concept referred to the fact that while most women have started to take on the traditionally male roles, they are still responsible for most of the home work such as childrearing and housework. As

such, the balancing act between paid work and family work is still a mothers struggle more than that of two parents (Hochschild 1989).

Several quantitative studies now show that mothers on average have lower hourly wages than women without children (Korenman and Neumark 1992; Waldfogel 1997; Budig and England 2001; Anderson, Krause and Binder 2002), and that the differences also increase with number of children. The differences in hourly wages between mothers and non-mothers are known as the family gap or what is also referred to as the motherhood penalty (Wadfogel 1998: 137)¹. The family gap constitutes the subject of my thesis.

Both in Great Britain and the United States the wage gap among women with children relative to men is approximately 30%, while among women without children the gap relative to men is about 10 % (Waldfogel 1997; Budig and England 2001). The differences between the wages for mothers and non-mothers seem to have escalated in some countries over the last decades, even while the gender wage gap has declined (Waldfogel 1998).

Thus many researchers emphasize this family gap in pay to be an important component in explaining the gender wage gap (e.g Nielsen, Simonsen and Verner 2004; Waldfogel 1997, 1998).

1.1 The family gap

Some clarifying remarks on what exact the family gap captures may be of interest. The family gap, or what some scholars refers to as the motherhood penalty, points to differences in hourly pay between mothers and non-mothers after controlling for variables that have severe effects on earnings such as education level and labor marked experience. Internationally, empirical research on this issue has expanded over the last ten years with emphasis on North

¹ Note that the family gap refers to the differential in hourly wages. If mothers have lower working hours this will not directly affect the gap. As Waldfogel points out, other family gaps could also exists, e.g. among those caring for parents or those who don't, but here it refers solely to the differences in hourly pay between mothers and non-mothers.

America and Great Britain (Waldfogel 1997; Joshi, Paci and Waldfogel 1999; Avellar and Smock 2003) as the leading countries, followed by some Scandinavian studies (Albrecht, Edin, Sundstrøm & Vroman 1999; Datta Gupta and Smith 2002; Hardøy & Schøne 2004) That a motherhood penalty exists is now well established, but the magnitude of it seems to differ across nations. Also, the effects seem to be somewhat sensitive to the methods applied (Datta Gupta and Smith 2002).

1.1.1 Direct effects and indirect effects

Several studies have measured the direct effect of having children on women's hourly wages. In quantitative analyses like this one, this is done by comparing hourly wages of mothers and non-mothers that are similar in ways which are relevant for wages and careers, and the only characteristic that separates them is whether they have children or not.

It is important to bear in mind that looking at differences in hourly wages for mothers and non-mothers, is likely to underestimate the long-term effects of children on women's wages. The appearance of children in women's lives has immediate effect on employment for mothers and can lead to sporadic participation in the labour market due to childrearing. This has been especially remarkable for women's labor market outcomes because, in relation to men, women disproportionately reduce their working hours and/or withdraw from the labor market. Reduced labor market experience, decreased on the job effort, extensive use of part time or job matches that require lower effort are, or can be viewed as consequences of motherhood or what some scholars term the indirect effects of motherhood (Avellar and Smock 2003; Anderson, Krause and Binder 2002, 2003). To gain a comprehensive understanding of women's or especially *mothers'* labor market outcomes and to assess the overall cost mothers experience of childrearing, it would be useful to examine both the indirect and direct effects. Due to both the limited time frame and available data, I will restrict my inquiry

to examining the pure or direct effect of motherhood on wages. Furthermore, these effects are more observable and available than the indirect effects and may therefore be more important for both women's employment and hiring decisions among firms (Anderson *et al* 2002).

1.2 Why should we be concerned about the family gap?

There are several reasons to why we should be concerned about a wage penalty for mothers. One reason is that of equity. In order to achieve equal opportunity and equal pay for women we need to find the reasons for the still growing gap between women with and without children (Waldfogel 1998).

Another reason is that the family gap affects other gender inequalities. Women may experience both a time cost and an opportunity cost as a by-product of motherhood. The time cost refers to the reduction in labor market activity. This reduces accumulation of capital and can lead to lower wages. The opportunity cost encompasses both the income foregone because of reduced working hours or withdrawal from the labor market. In the long run, such loss of income will have negative effects on the wage ratio and pension rights because it is based on previous earnings (Kravdal 1992).

Also the poverty rates between households will be affected by the motherhood penalty. The rates will diverge between households headed by single women and those headed by single men (Budig and England 2001). More generally one can argue that if countries are to utilize fully their labor forces, this should include women with children.

1.3 Goals of the thesis

In this paper I will examine the relationship between hourly wages and children. I will constrain my thesis to see how the motherhood penalty is in Norway among full time workers in private sector. The inquiry is further restricted to

women. Earlier research has shown that there is a penalty on wages for motherhood in Norway (Hardøy and Schøne 2003). My work will complement their study in two ways.

First, the data I have available covers a much longer time-period as I have annual information from the years 1980-1997. This time period covers an interesting chapter in Norwegian family policies. Norway's relevance in an international perspective lies much within that fact that during these years major extensions in the family policies have happened. If such policies have had any intended effects, namely to reduce some of the cost mothers pay in conjunction with childbirth, one should accordingly be able to trace such changes over time. Full employment for women and especially mothers came relatively early on in Scandinavia in general. In particular maternity leave and publicly funded day-care for children was presented as a means to maintain women in the workforce (Leira 2002: 11). Public childcare was also prompted as educationally advantageous for children. The degree and quality of family policies have however changed a lot under the period of study, from rather limited, at least in a Scandinavian perspective, to more generous and well-developed. I will point out the history of family policies more thoroughly in a later chapter.

Second, it is also important that the data used in this study allows for very precise comparisons of where in the market the family gap is most apparent (Petersen 2005). This calls for some thorough explanation. The data has a so-called matched employer-employee feature. This feature will allow me to scrutinize how children affect women's wages at different levels of the labor market. In my analyses, I will operate with four different levels: the population level, establishment level, the occupation level and occupation -establishment level. At the population level I will report on what is the average effect of children on hourly wages for working mothers when all women from the dataset are taken into account and compared, irrespective of the work they perform. However, I will account for differences in education level and experience and so

fort, to make sure that the only characteristic that separates them is whether they have children or not.

At the establishment level I will take into account the establishment, or what is also referred to as the firm-level, where the individuals are working. When I am referring to the occupation level, I will compare the effect of children among women that also work in similar occupation. Lastly, I can also compare the effects of children when the individuals are working in the same occupation and also for the same employer. This level will be referred to as the occupation-establishment level.

With these comparisons, I hope to see at which *level* the effects of children are most apparent, so it might be clearer where to navigate social policy and where it will have its greatest impact. This will be discussed further throughout the thesis.

Additionally, the data contains complete educational and marital histories. I can use this information to see if the penalties for having children vary between women with different education level and also if the penalties are different for e.g. divorced mothers than for married mothers.

1.4 Organization

The next chapter reviews relevant theories for explaining the gap between mothers and non-mothers earnings. In chapter 3 I will go through the exciting literature on the subject. In chapter 4 I will give an overview of what my thesis will complement the exciting literature on. Here I will also make an argument for the relevance of understanding the family gap in Norway. A brief explanation of the historical development of maternal leave schemes will be important here. In this chapter some specific and applicable research questions are also derived. In chapter 5 I will present the data available to me and give definitions of variables used in this thesis. Here I will also explain the methods which will be applied. Chapter 6 will describe the results from my regressions. This is followed up with

chapter 7 where I discuss the findings more thoroughly. In this chapter I will also look at some drawbacks in my analyses and give some suggestions for further research. The last chapter summarizes the main findings, and discuss the results and their relevance to the theories and previous research done on the family gap. A full literature review will be given in the Appendix.

2 Theoretical explanations for the family gap in pay

As a framework for my empirical analyses, I will in this chapter consider some theoretical explanations for the link between motherhood and lower wages. The study of women's wages relative to men's has a long tradition in sociology (Mincer and Polacheck 1974; O'Neill and Polacheck 1995). Traditionally, differences in pay between men and women have been explained by discrimination theories (see e.g. Hersch 1991) or with so called gender-specific factors, such as gender differences in qualifications (Blau and Kahn 2003). Among the latter, the human capital model has had the strongest influence here. Moreover, this theory has also become influential in the study of mothers' wages.

I will start this section with an introduction to human capital theories. Thereafter I will consider the theories of occupational segregation, and explain how this has relevance for understanding the family gap in pay. Under this section I will also mention the concept of compensating differences. These theories largely build on or influence by human capital theory as well. At last I will consider discrimination theories.

2.1 Human capital theory

A central aspect of human capital theory as developed by Becker (1962, 1985) and followed by Mincer and Polacheck (1974), is how it looks at individuals as resources with different values in a market. These resources can gain value through investment in education or job-experience which is likely to raise their productivity and wages. However, there are several causes for how motherhood can decrease the potential rewards from human capital.

2.1.1 Motherhood reduces employment experience

Mothers, and especially women with small children, have high rates of employment today in Western countries. Even so, an implication of motherhood

is that women with children often have more erratic job histories than non-mothers. Taking time out of the labor market to bear and raise children reduces accumulation of work experience. In turn, this will further affect the productivity levels of these women. This is because continuity interacts with the skill-level of workers and workers that stay more permanently in the workforce are therefore seen to be more productive (Polacheck 2004).

Additionally, the levels of human capital individuals already have attained are also subject to depreciation. Time away from the labor market, reduced working hours and so forth, can lead to lower wages mainly because of two reasons. First, individuals do not accumulate new human capital when they are absent from the labor market. Second, the human capital already accumulated in forms of education, skills or on-the job training may be subject to depletion when workers no longer practise or use their skills.

Mothers are more exposed to depreciation in human capital as a consequence of career interruptions due to motherhood. Since women without children are less bound by familial constraints and obligations they should according to this theory have steeper (positive) wage trajectories than mothers (Datta Gupta and Smith 2002)

Advocates of human capital theory have emphasized how different occupations also have different kinds of atrophy rate. The atrophy rate is the loss of earning potential that can be attributed to periods of work intermittence (Polacheck 1981:62). For example jobs with little specialized human capital, or little on-the job training are typically easier to re-enter after work interruptions. Instead this jobs require general human capital often acquired prior to job-attainment. One common way to examine this is to treat education level as essentially equivalent to skill-level. As such, this theory predicts lost experience to be more crucial for highly educated women compared to lower educated women, since they are likely to be in high skilled jobs as well. (Polacheck 2004). Since mothers take time away from work in conjunction with childbirth, one

could expect wage penalties for having children to be higher for women with high levels of education.

However, some researchers have emphasized a competing hypothesis (Anderson, Krause and Binder 2002). They argue that time and flexibility at work is crucial for working mothers (especially when they have young children). However, flexibility at work is generally a privilege that is more prevalent in jobs that requires high qualifications. If this argument carries some weight, one would expect high-skilled/high educated mothers to be less penalized than their low-skilled counterparts. Instead, higher penalties would be found among low-skilled workers, which are in less position to arrange the balancing act between work and childrearing.

2.1.2 Motherhood reduces work effort and job productivity

According to human capital theory mothers' lower wages can at large be explained by the lower levels of human capital they have attained relative to non-mothers because of lost experience. Nonetheless, this theory also depict that even among women with equal levels of human capital, women with children could still have lower wages due to differentials in productivity or on-the-job effort. Becker's (1985) theory of the "new home economies" argues that time spent on leisure activities is crucial for the effort or energy workers will have later at work. The rationale behind this is that mothers may be less productive at work than non-mothers because the latter can spend more of their non-employment time in leisure than in housework and childcare. As such, the human capital theory predicts that the time and effort women spend on paid work are affected by the family work or home duties they perform and this will subsequently influences their wages differently. As a result women without children have more energy for paid work, while women with children have less. Mothers may also "store" energy at work for anticipated work at home.

The relevance of this work effort model can be shown in both the academic and the popular press discussing the balancing act of working mothers with small children (Anderson, Krause and Binder 2002, see e.g. Elligsæther 2004).

The burden of caring responsibility for mothers could also have implications for *occupational differences* for women with children compared to women without children. Mothers may choose to be in less demanding jobs or less demanding occupations given the extra work they do at home. I will comment on this latter mechanism in the following section.

2.2 Theories of occupational segregation

Rarely emphasized in the literature of the family gap, is the concept of occupational segregation. In broad brush strokes, this concept refers to the vastly different male-female occupational distributions apparent in many western countries (see e.g. Anker 1998). What is of relevance here is that heavily female occupations are often less paid than heavily male occupations. As such a portion of the gender wage gap in pay can be explained by the differential sorting of men and women on different occupations. This theory I will argue, can however be relevant for our understanding of the family gap as well.

There are some debates about what causes these occupational differences and it could in fact have many potential sources. The role of educational segregation which also leads to occupational segregation and the role of gender specific socialization is examined thoroughly in England (2005).

The role family play for occupational segregation is less understood. However, there is one specific explanation that could be important for our understanding of the family gap in pay, and that is to which extent occupational segregation is induced by different family-friendly work conditions. Usually in the literature there is common to distinguish between supply and demand side mechanisms that generates occupational segregation. I will emphasise the topics from the literature that is relevant for explaining why differences between

mothers and non-mothers can come about, and pay less attention to theories that emphasize sex-differences.

Supply side

The supply side focus on the employers and what workers bring to the labor market of relevant human capital and also how individuals seek the best jobs after considering their own personal endowments (Anker 1998). For example will women with small children seek occupations where the combination of work and childrearing are less difficult and they may also prefer occupation with a work environment that are adjusted their needs as mothers. This could be more flexible hours to have time for childcare, it could also be that they choose occupations where it is less hard to take career breaks for a period of time in conjunction with childbirths.

Becker (1985) and later Polacheck (2004) have emphasized the supply side, that is employees them-self have different preferences which potentially also lead to different occupations. Becker argues that it is the division of labor within the family which fosters different work patterns and later creates segregation. As long as mothers tend to be the one responsible for housework and childrearing, Becker stress that women would rationally choose occupations which have high starting pay, but low returns to experience, and low penalties to career interruptions.

Demand side

The demand side, have the focus on employers. There are several ideas about why employers might discriminate in hiring or placement within job situations which leads to occupational segregation.

Employers might unconsciously or consciously have distinct preferences for whom will best do the work required in jobs or occupations. An example is that employers would prefer men in construction works or women in childcare.

This discrimination can happen in hiring processes, promotions or by channelling women and men in different kinds of jobs. However, one could also imagine that these preferences for who are best suited to do a job could make employers differentiate between mothers and non-mothers as well. If different occupations demand more unplanned overtime, they might prefer non-mothers over mothers, because the latter are considered more flexible in their work schedule.

Women are also considered to be higher cost workers, mostly due to characteristics mentioned above, employers might therefore trade off higher wages in jobs with primarily women. This is related to the concept of compensating differences.

2.2.1 Compensating differences

The theory of compensating differences predicts that characteristics within a job that is not very attractive for workers are compensated by higher wages. On the other hand, jobs that employees find attractive because of more flexible working time or even reduced working time, will give lower wages to compensate for expenses that employers experience by offering these advantages (Hardøy and Schøne 2004:15). Mothers may for example choose more “mother-friendly” jobs as a consequence of motherhood. These jobs are seen as more compatible with raising children, but at the expense of lower wages (Budig and England 2001). Qualitative studies have shown that the extra burden of domestic responsibility also called the “second shift” (Hochschild 1989) may channel mothers in to more “mother friendly jobs”.

However, this could also happen prior to having children. If women anticipate future work interruptions because they expect to have children they may choose to have jobs which seem more compatible with raising children. Hence, such expected work interruptions also influence one’s incentive for investment in jobs in terms of education level and fields of study (Polacheck

2004). Then again, it could also be that since women or especially mothers are considered high cost workers employees pay lower wages without offering any compensating advantages. Women are for example said to have higher turnover rates, due to childbirths and childrearing. High turnover rates nevertheless raises employers costs because they have to train new workers more frequently (Anker 1998).

Another demand side explanation focus on the role of statistical discrimination. I will comment on this in the next section.

2.3 Discrimination

2.3.1 Employer discrimination against mothers²

Another explanation for mothers' lower wages is employer discrimination. This explanation encompasses different ways employers might treat women with children differently from non-mothers, in terms of placing mothers in less rewarding jobs, promote them less, or pay them less within jobs (Budig and England 2001; Petersen 2005). In economic theory, it is common to differentiate between discrimination based on prejudice, or formalized as "taste" by Gary Becker and statistical discrimination (Altonji and Blank 1999). I will comment on the taste model first.

Here, employers make no assumptions about mothers' lower productivity, they simply discriminate mothers on the basis of their taste and preferences. It could be co-workers or customers who have this taste or employers themselves (Altonji and Blank 1999: 208). One premise for this form of discrimination is that employers know their employees family status, i.e. if the women have children or not.

² Nonetheless, it could be discrimination external to work organizations, which present formidable barriers to women, such as discrimination in the education system, stereotypes etc. Discrimination could also evolve in hiring processes or in prior employment relations. Subsequently this could affect the accumulation of experience attained. However, these forms of discrimination are outside this framework to try to distinguish. For a thorough explanation of discrimination theories, see e.g. Altonji and Blank 1999

Another form of discrimination that has been highlighted in the family gap literature is statistical discrimination. This concept has its foundation in economic theory and is closely related to costs of information. A premise for discrimination is that it is expensive to measure individuals' productivity capacities before hiring. Employers therefore use a proxy based on earlier experience or pre-assumptions/stereotypes to predict how individuals' will perform. Employers might assume women with children to be less productive at work, take more time off from work and so forth, given their status as "mothers". This can in turn lead them to assign women with children to different job, than non-mothers. There will then be a pay gap between mothers and non-mothers.

Nonetheless, this form of discrimination could also pertain to all women in general, irrespective of family status. The idea is once again, that it is costly for employers to measure individual productivity so employers use average data to predict how individuals will perform. Employers, according to this theory, expect all young women eventually to have children and to be absent from the labor market for a significant period of time. This may in turn show the way to statistical discrimination against all women. Employers can place women in different kinds of jobs, pay women less and so forth (Petersen 2005). This form of discrimination will however show up as sex-gap in pay, but not as a wage gap between mothers and non-mothers.

2.4 Selection effects

2.4.1 Unobserved heterogeneity

Most of these explanations see the impact of children on women's wages through some productivity related characteristics. For example how mothers in conjunction with childbirths lose experience which affect their productivity negatively. Or mothers are anticipated to take out more sick-leave days or reduce their working hours, and employers compensate for their lower work effort by paying lower wages. But contrary to other forms of explanations, where there is a

causal relation between effort and wages unobserved heterogeneity or what is also referred to as selection effect, looks at different characteristics within individuals, and on how these characteristics could affect wages.

Possible selection processes might be that women who have children may differ from those who do not in ways that are relevant for wages and careers. For example it might be that women with lower earning potential may have children at relatively higher rates (Budig and England 2001). Then the observed effects of children on earnings are not causal but rather exogenous. Even women with same qualifications could potentially have different wage profiles, if their ambition and motivation for work vary systematically with whether they have children or not. Without controls for such selection differences, the effects of children on women's wages could be overestimated.

The theoretical literature points to several explanations for why there is a correlation between motherhood and lower wages. In the next section I will look at some basic evidence for the family gap in pay from different countries.

3 Previous research and links to the theory

The theoretical explanations presented in chapter two pointed towards five different mechanisms for how motherhood has a negative impact on women's wages. (1) Mothers may earn less because they lose experience that are relevant for their work effort, (2) they may be less productive at work due to childrearing, (3) they may choose jobs more compatible with childrearing but at the expense of higher wages, (4) employers might discriminate against mothers, (5) or it could be that non-mothers differ from mothers in ways that are relevant for wages and careers.

In what follows, I will go through the basic evidence of a family gap in pay for several countries. I will also see how previous research links their findings to theoretical explanations.

3.1 The basic evidence

A large literature has addressed the impact of family status and children on wage outcomes. By controlling for human capital variables in a log wage equation, the effects of children on wages are singled out and the residual is interpreted as the motherhood penalty.

In several empirical analyses it has been found that children have a negative effect on women's wages. The negative impact also increases with how many children you have. These results hold for several countries among them the United States (Budig and England 2001; Waldfogel 1997), the United Kingdom and Germany (Harkness and Waldfogel 2003) and also for Norway (Hardøy and Schøne 2003). I will first go through some studies done within countries and also look into some studies using a more comparative design.

For the United States in general, a negative effect of children on mothers' wages is found. Nevertheless, the magnitude of the effects seems to be somewhat sensitive to the methods applied. Especially how the experience variable is

constructed seems to be crucial in some studies. Lundberg and Rose (2000) examine the correlation between wages and children among married mothers in the period 1980-1992. They report penalties of about 5% lower hourly wages for women's first birth, but they do not control for lost experience. Waldfogel (1997) using National Longitudinal Survey of Youth data, report a 6% penalty for one child with control for experience. This penalty declines to 4% when she controls for whether or not the woman mainly had part-time experience before giving birth. Budig and England (2001) use similar data as Waldfogel but includes an even more detailed measure of experience. They differentiate between both full-time and part-time experience and full-time and part-time seniority (the amount of time spent with the same employer). Also they include a measure of how many employment breaks the woman has taken, since continuity may influence wages. The idea behind this is that among mothers with equal years of experience, mothers who have more continuous experience may also have higher earnings. After controlling for this, a child penalty of 5% remains. They conclude that the remaining residual penalty to mothers is likely due to some combination of productivity differences and employer discrimination (Budig and England 2001:219). Similarly for all of these studies, is that controlling for selection does not have significant impact on explaining part of the motherhood penalty.

Only two studies from the United States have not found any negative effects of children on women's wages. One study done by Hill (1979) finds no penalties, but uses data much older than reported from the above studies. Also, she does not control for unobserved differences between mothers and non-mothers. Korenmark and Neumark (1992) studies the effect of children on women's wages for the years 1990-1992. They do not find any penalties, neither with nor without control for experience. But contrary to Hill they do perform analyses that control for unobserved differences. However, it could be that the two year interval Korenmark and Neumark performed the analyses for was too short to pick up any of the negative effects of children on women's wages.

For the United Kingdom the results are less conclusive. Joshi, Paci and Waldfogel (1999) examine the family gap among two British cohorts of women. In general they find that mothers earn less than childless women, and that this gap in pay is similar in both 1978 and 1991. Further they find that human capital differences could account for most of the gap in 1978, but this was no longer the case in 1991. The most prominent explanation for the wage differences between mothers and non-mothers for the latest cohort seems to be the propensity of British mothers to work in low paid part-time jobs. Once this is accounted for, they do not find any direct penalties for motherhood.

There is also a good deal of variation across countries in the effects of children on women's hourly wages. Some of whom can best be explained by cross-national comparisons.

Waldfogel and Harkness (2003) investigate the family gap in pay for seven industrialized countries (Australia, Canada, United Kingdom, the United States, Germany, Finland and Sweden). They find large differences across countries in the effects of children on women's hourly wages. The United Kingdom displays the largest penalties, as high as 24% lower wages for a woman with two children. The authors partially confirm Joshi, Paci and Waldfogels (1999) findings that some of these large differences can be explained by the propensity of mothers in the United Kingdom to work in low-paid part-time jobs. Nevertheless, even among full-time workers the largest penalties are found in the United Kingdom. Further, they find that the effect of children on women's pay to be smallest in the Nordic countries. The findings of Harkness and Waldfogel also points to a link between the family gap and the gender gap in pay. Based on computed female-male wage ratios they find that countries with higher gender gaps tend to have higher family gaps as well (Harkness and Waldfogel 2003). A drawback of their study is that they do not control for lost work experience. It is therefore hard to explain if the country-specific variations in the penalties are due to differences in how long mothers stay at home after having children or other more subtle

mechanisms. Given the large differences Harkness and Waldfogel find between countries, they emphasize that further studies should look at the possible effects family policies and maternity leave could have on the family gap within countries.

Waldfogel (1998) examine the relationship between lower wages for mothers and maternity leave. She compares women in two countries, United States and the United Kingdom. For the former country, a twelve week of unpaid maternity leave was passed under the Family and Medical Leave Act (FMLA) in 1993³. Waldfogel finds that among mothers who are provided a formal maternity leave there, is a positive effect of children on women's wages. She considers maternity leave to be one possible remedy for closing the family gap.

There are several reasons for why maternity leave can have a positive impact on mothers' wages. Leave schemas can induce women's connection with the labor market in general if they are based on previous earnings, as is the case in for example Norway. Moreover, it also gives women the right to go back to the same job after giving birth. This can protect women from losing job-tenure during their childbirth period (Waldfogel 1998). Similarly, Polacheck (2004) has argued that the negligible effects of children on women's wages found for Sweden and Finland are probably a consequence of the social policy inherent in these countries, promoting women's work. These policies are likely to raise women's level of work experience and job-tenure. Also, he argues that the universal access to maternity leave potentially could mitigate the severe penalties observed in other countries.

However the evidence of positive effects of maternity leave on mothers' wages pertains to the United States where maternity leave is a rare amenity. Such leave schemas could potentially be used by employers to attract the best workers, as long as this is a scarce amenity (Datta Gupta and Smith 2001)

³ The FMLA act only requires medium and large firms to provide the 12 weeks, not small firms.

Another concern is therefore how maternity leave affect mothers' earnings in countries with universal coverage. Some have argued that the positive effects discussed by Waldfogel, may be modified in countries with generous maternity leave (Datta Gupta and Smith 2002; Petersen 2005). The central argument is the following: when leave schemas cover the whole labor market, maternity leave will neither negatively nor positively affect wages relative to non-mothers. However, the universal character of the maternity leave will affect all women's wages relative to men (Datta Gupta and Smith 2002; Petersen 2005). Here the concept of statistical discrimination is of relevance. Since employers in countries with universal maternity leave eventually expect young female workers to use the maternity leave they might statistically discriminate against all women through lower wages or placement into different jobs.

Evidence of statistical discrimination is hard to point out. Such an explanation remains speculative as long as researchers do not have the necessary evidence. One study from Scandinavia addresses this concern indirectly. For Denmark, Datta Gupta and Smith (2002) do find penalties to motherhood, but the effects are miniscule. For one child, they find a 1% penalty, and for two children 2% penalty. However, when intra individual analyses are done (i.e. controls for unobserved heterogeneity), they find no effects of children on women's wages. They conclude that there is no indication that children have long-term effects of women's wages. In fact, it seems that within a woman's life, as transitions are made to having children, there are rather wage premiums for women with children compared to women without children. Yet their study also shows that the starting wages for women are considerably lower than those of men's, and that women's wages seem to continue to be lower than men's over the career (Gupta and Smith 2002:624). They conclude by asking rhetorically if it could be the case that the effects of children influences the wage level of all Danish women, instead of applying only to those who become mothers.

Of other Scandinavian studies I can mention Niensens', Simonsens' and Verners' (2004) also from Denmark. They use the same data as Datta Gupta and Smith, but give more emphasis to the different sectors wherein the penalties arise. To examine if the penalties to motherhood differ between the private and public sector they use a complex model to correct for the sample selection of women entering into the two different sectors. They demonstrate that in the "family friendly" public sector there is a clear positive effect of being a mother, but for the private sector the results are reversed, here they find a strong negative effect of children.

However, as Petersen points out, which of the two different conclusions reached by using the same data-set to put most emphasis on is not obvious. It depends on the researcher's level of confidence with results that are made with simple models or with complex models (Petersen 2005:7).

For Sweden, Albrecht, Edin, Sundström and Vroman (1999) examine the relation between different career interruptions and subsequent earnings. This study is somewhat different from other studies investigation the family gap, in which they also include men in their analyses. They find that different types of career interruptions have different effects on wages, and that these effects vary by gender. They find no penalties for children on wages among Swedish women who enter formal maternity leave schemas. Other forms of lost experience have a significant impact. The opposite scenario is true for men. Fathers who enter parental leave schemas suffer a significant wage loss, almost 10% per year (Albrecht *et al* :303).

The authors reason that these findings cast doubt on the human capital model. If the human capital level depreciates with time out of the labor market one would expect all kinds of career interruptions to have negative effects, and neither expect the effects to vary so strongly among men and women. Albrecht *et al* propose an alternative explanation that is based on signaling models. This theory is closely related to discrimination theories and is based on the premise of

cost of information. Since men rarely take out parental leave, the authors argue that employers take this as a signal of less career commitment from this men, and they respond by penalizing them(310). On the other hand, since traditionally all Swedish women take out parental leave when they have children, the mothers behavior cannot signal anything about their career commitment or productivity.

In Norway, Hardøy and Schøne (2004) do report penalties for children on women's wages ranging from 1, 5% for one child to 3, 5% for two children. They control for age, but not lost work experience. However, they do not perform intra-individual analyses as e.g. Datta Gupta and Smith (2002) They also find the penalties to be slightly higher for women in the private sector compared to women in the public sector.

3.2 Summary of the findings

As we can see from the literature numerous efforts have been made to explain the lower wages of mothers. Most of the studies of the family gap in pay are conducted within countries. Different samples and methodology have been used which affect the basic results as well as the institutional settings where the penalties arises. Even so, a somewhat clear pattern emerges from the literature. The "liberal welfare regimes" encompassing the United States and the United Kingdom (Esping-Anderson 1999) displays the largest penalties, while the "social democratic welfare regimes" display almost no penalties. Less is known for continental European countries.

Also the literature documents that maternity leave may have a positive impact on reducing the motherhood penalties in countries where such policies are scarce. Contradictory, in countries with universal access to maternity leave, this may have no effect at all, or negatively affect all women's wages (Datta Gupta and Smith 2002; Petersen 2005).

In the next chapter I will point to some issues not yet tackled by the existing literature and some research questions are then derived.

4. Empirical gaps in the literature and my contribution

The previous chapter looked at the basic evidence for the family gap. Despite the growing literature on this issue, and the excessive theoretical accounts for why there might be correlation between motherhood and lower wages, the causes of the family gap is not fully understood. For that reason, and in order to devise better strategies for how to close the family gap, more research on this subject is needed.

I will in this chapter address some topics yet to be analyzed in the literature of the family gap. As pointed out in the two previous chapters, a lot of theories explaining why women with children earn less than women without children exist. However, direct evidence for which of these theories are plausible is lacking.

On the background of previous research and theoretical considerations, I will first address where my contribution to the topic lies. Also, I will give some arguments to why Norway is an interesting case in the literature of the family gap. An introduction to family policies will be relevant here.

At the end of the chapter I will ask some specific research questions for later examination in my thesis.

4.1 The role of segregation

The first concern which has relevance for the family gap is based on previous findings from the data I have available.

The data I will use is where Petersen, Snartland, Becken and Olsen (1997) found the highest gender wage gap in Norway. Further research on the same data showed that sex-segregation at occupation level and establishment level partly explained these wage differences between men and women (Nielsen, Høgsnes and Petersen 2004). I will build on their study and examine to what extent segregation also can explain wage differences between mothers and non-

mothers. Occupational segregation was mentioned in the theoretical discussion as a possible component of the family gap, but to my knowledge there exists no study which has explored this issue further. However, segregation of mothers and non-mothers on different sectors in the labor market have been emphasized (Nilsen, Simonsen and Verner 2004).

Occupational sex-segregation is widespread in many western countries (for a comparative study see e.g. Anker 1998). A lot of this segregation can be explained by differences in educational attainment; where men and women choose different kinds of fields of study which also leads to different occupational choices. These educational preferences can have many sources, such as gender specific socialization in the families or education system. However, for the subject of this thesis I will be interested in the role family and children have for creating occupational segregation between mothers and non-mothers right.

There are some studies which point to segregation of mothers and non-mothers in to different sectors of the labor market. The explanation for such a pattern is that the labor market is divided in mainly two sectors; where one of the sectors are more family friendly than the other (see e.g. Nielsen, Simonsen and Verner 2003). Further it is found that women who intend to be, or are already mothers, deliberately seek to the sector which is most family friendly (Hansen 1995).

However, one could imagine that such family friendliness is not only limited to different sectors, but could potentially encompass different firms and occupations as well.

The features of the data, which will be explained thoroughly in the next chapter, also allows me to see if the penalties to motherhood are mainly due to different sorting of mothers and non-mothers on different establishments, occupations and occupation-establishments units. If the penalties for having children mainly flow through segregation, we will see a decline in the penalties

once controls for establishment, occupation and occupation-establishments are being made.

Given that I have large-scale data, which rarely holds information about characteristics of jobs (as to whether they provide childcare at work, involves a lot of unplanned overtime or so forth) the results from my analyses must be interpreted with caution. However, the results could be suggestive for further research and for further discussion about political implications of such findings.

A second topic I will explore further is the role of discrimination. As mentioned in the theoretical discussion, several theoretical accounts exist for why employers might discriminate against mothers. The common way to study discrimination is to control for human capital variables in a log wage equation, and the residual is usually interpreted as due to discrimination or productivity differences (see Budig and England 2001)

However, as Budig and England points out, one weakness in social science is that direct measures of either productivity or discrimination are hardly available (Budig and England 2001). Therefore, to empirically differentiate between these two processes is difficult. However, understanding which mechanism is most relevant here, will have implications for our understandings of the family gap, and subsequently for policy making around it (Petersen 2005). Matched employer-employee data can give new insights to this issue. Comparing mothers and non-mothers once they do same work for the same employer will at least tentatively give answers to if employers give differential treatment to mothers and non-mothers. Such a form of discrimination is called within-job wage discrimination (Petersen and Morgan and 1995). By taking into account the occupation-establishment mothers and non-mothers work in, I can examine if this is a prevalent form of discrimination in Norway, and so to say if this can explain some of the family gap in pay.

4.2 The role of different characteristics among women

Another concern that remains unsolved pertains to what extent the motherhood penalties are different among women with different characteristics. There are especially three characteristics that I will look further into.

4.2.1 Education level

In the theory chapter I mentioned how advocates of human capital theory developed two competing hypotheses of how penalties for having children might differ between women with different kinds of educational attainment. The first hypothesis was that penalties would be higher for women with high education levels. This was explained by the fact that the qualifications required in high skilled positions are also likely to be more vulnerable to atrophy. As such, mothers are more penalized in jobs where employers pay higher costs for their employees' career interruptions. The second hypothesis emphasized time as crucial for working mothers and assumed that more flexible working hours would also be more compatible with raising children. Contrary, they predicted mothers in low-skilled jobs to be more penalized for having children.

Little evidence of this is known in the family gap literature, and even less in the research pertaining to Scandinavian countries⁴. Most prior research on the family gap uses education mainly as a control variable and do not take into account that penalties could vary significantly between education groups. I will examine if the motherhood penalties vary between mothers with different kind of education level.

Another inquiry which came out of the theories of occupational segregation is to what extent wage penalties for having children will be different in jobs with mostly women, or in jobs with mostly men. The concept of compensating differences emphasized that mothers may trade off wages due to

⁴ Two studies from the United States have examined this issue, but the results are vague and ambiguous (see Anderson, Binder and Krause 2002, 2003). The results are also less relevant to other countries with different education systems.

some mother friendly characteristics of these jobs. Polacheck (2004) also argues that women, due to anticipated work interruptions in conjunction with childbirth choose occupations with low atrophy rates. These jobs are therefore considered more easily to re-enter after career breaks.

On the other hand it could also be that employers pay less in occupations primarily held by mothers, since mothers are considered high cost workers. All these mechanisms was more thoroughly discussed in chapter 2.

As such, I would expect sex-composition at job to have different impact on the motherhood penalties. I would expect for example lower wage- penalties for having children in occupations with more women, since this theory predicts that these occupations already pay less than occupations with more men. Contrary, I will expect the wage penalties for having children to be higher in heavily male dominated workplace, since career interruptions in conjunction with childbirth here will be more rare, and are therefore likely to be penalized more. Since originally the data set holds information about men as well, I have used this information to calculate female/male domination at the workplace.

4.2.2 Marital status

It could also be that the motherhood penalties vary for women with different marital status. There are some evidence that the motherhood penalties are especially crude for single mothers, and that these differences could be even larger than anticipated at least for the United States and the United Kingdom (Waldfogel 1998). For Scandinavian countries less is known of how marital status pertains to the family gap. In fact, most prior research on the family gap has included differential marital statuses additively (i.e. as a control variable) when trying to estimate the pure effect of children on women's wages. In addition to Waldfogel (1998), Budig and England (2001) have also explored this issue further. The results from these two studies are quite ambiguous. Budig and England find that married and divorced women have higher penalties than never

married women, contrary to Waldfogel's findings. Theoretically the causal arrow can point both ways. Budig and England (2001) argues that married mothers can choose to spend more time at home or choose mother friendly jobs at the expense of higher wages, given their spouses economic resources. This will in turn lead to higher penalties for married mothers consistent with the findings of Budig and England. Alternatively, the theory of marriageability (Waldfogel 1998a) states that married women are a select group, and that they typically have higher earnings than single women. This explanation is more consistent with Waldfogels findings. The effect marital status has on women's wages thus seems to be rather complex.

4.3 The role of family adaptations and family policies

Another question that I will examine is whether the penalties for children have changed over time. There are some reasons to expect that they have declined. First, as stated in the introduction, women no longer tend to leave the workforce permanently when they have children. This should narrow the human capital differences between mothers and non-mothers, and subsequently discrimination against mothers should also weaken. Changes and improvements in the private sphere could also facilitate the situation for mothers. Men have increased their time used on housework and children for the last decades leading towards a more dual breadwinner model (Leira 2002; Avellar and Smock 2003). Employers may respond to all these changes by not anticipating mothers to be less productive and give mothers the same opportunities as other workers.

Another reason to assume a decline in the family gap is the expansion of family policies in Norway during the last decades. In the previous chapter, we saw that some researchers are arguing that the family policies in Scandinavian countries might have a mitigating effect on the family gap in pay (Waldfogel 1998a; Polacheck 2004). The differences in benefits for families that exist among countries can partly be explained by the fact that in the Nordic countries

childcare and responsibility for generational reproduction is a public domain, whereas in the United States and the United Kingdom the provision of childcare is taken to the market (Leira 2002, Esping-Andersen 199?).

Norway is an especially interesting case in that matter. Its relevance lies much in the fact that is an “intermediate” case when it comes to family policies (Petersen 2005). As I will document further, Norway has more family policies than the United States and The United Kingdom, but less than Sweden and Denmark.

I will also emphasize the time-span the data covers. I have complete information from 1980 to 1997 for full-time workers from the private sector. This time-frame covers an interesting chapter in the development of family policies in Norway which has gone through some severe changes in the period of study. In this forthcoming section I will give a description of the historical change which has taken place concerning family policies in Norway.

4.3.1 Institutional setting

In Norway, the government has been an active agent in forming family policy that includes both men and women in the labor market. Norway therefore has a range of variation in childcare and public policies aimed at facilitating the combination of employment and family obligations. The dual breadwinner model has taken over from the traditional male breadwinner model. This has resulted in high female labor force participation and also high fertility rates compared to other western European countries (Kitterød 2003, chapter 3).

There are especially two interrelated amenities that are considered to have an impact on mothers’ wages, and can help mitigate the family gap: maternity leave and access to childcare services. But as we are about to see, there has been a considerable variation in the policies over the years of study. Along with a description of the public benefits for mothers’ (or parents) in Norway, I will make some comparisons to other countries where possible. This might be of

relevance for the comprehension of previous research and to better grasp the *implication* family policies have for the family gap in pay.

Parental leave

In Norway, paid leave schemas was established through the Social Insurance Act and dates back to 1956. Though both parents have been entitled to share the leave since 1977, the common practice is that women take time off from work (Kitterød and Kjelstad 2002).

To have a right to parental leave with job protection, women must have been in the same occupation at least six months before childbirth. This makes a strong incentive for Norwegian women to be employed full time even before giving birth or to delay having children until the wages are high enough (Rønsen and Sundstrøm 1998). Initially, mothers were entitled to 12 weeks of income compensation in conjunction with childbirths, but the compensation rate was pretty low. In 1978 the rate was raised to cover 100% of former income (Rønsen 2004: 278). Further extensions in the benefit period did not apply before 1987 when the leave was extended to twenty weeks.

The major extension happened in the 1990s. From 1993 the parental leave schemas have been available for 52 weeks with 80% pay or 42 weeks with 100% pay. 6 weeks are reserved for the mother, and four weeks are reserved exclusively for the father. Sweden has even longer paid maternity leave; 15 months with a 90% coverage of gross earnings (Albrecht *et al.* 1999: 299). In Denmark mothers have been eligible for 28 weeks of maternity leave at a 90% coverage rate in the private sector and with 100% coverage rate in the public sector. The period was further extended to 52 weeks in 1994 (Nielsen, Simonsen and Vroman 2003). The leave period in Norway has to be used in one go, or you would loose the benefit days. In comparison Swedish mothers can decide how to use their leave period in a more flexible way. They can use the leave full time or part time until the child is eight years old (Rønsen and Sundstrøm 1998).

Maternity leave is assumed to be important for mothers' wages in two important ways. First, it secures job-protection so that mothers don't have to apply for new jobs after childbirth. Usually, evidence points to that changing jobs after being away from the labor market in conjunction with childbirth reduces wages (Felmlee 1995).

Second, research have shown that the right to paid maternity leave with job-security speeds up the return to work for mothers in both Norway and Sweden (Rønsen and Sundstrøm 1998: 267). This should counterfact the depletion of human capital, since most mothers will return to the same job, within the time frame of the available leave schemas, and the schemas also protect against loss of seniority. However, the return to work is especially dependent on access to childcare services.

Childcare services

The access to childcare services has also changed a lot the last decades. This is an important component of the family policies, since access to such services will determine the return of mothers to work. Childcare is heavily subsidized in Norway. This is important because in other countries the choice of being home or returning to the workforce in conjunction with having children, is often based on the economic cost of childcare services. Childcare-services usually encompass kindergarten and day-care home in Norway. Private use of nanny's or au pairs is not really widespread (Rønsen and Sunstrøm 1998). As a consequence in order to go back to work after being on leave schemas, mothers rely heavily on vacancies in kindergartens for their children. There is usually an excessive demand for spaces in publicly funded kindergartens.

Even as late as 1987, only 5-8 % of children under three years old had access to publicly funded childcare in Norway (Leira 2002). This probably forced mothers to stay home longer than the parental leave schemas covered. However, during the beginning of the nineties expansions of publicly funded childcare

took place. In 1995 22% of children from 0-3 years old have access to publicly supported childcare. For the same year 61% of 3-6 years old also attended some form of public childcare (Leira 2002).

In addition, families with children under 18 years old are annually provided with a significant amount of financial support. Norway also has provisions in the tax system, giving tax relief to families with children. Single parents also pay lower fees in kindergartens. Both Sweden and Denmark have had much higher coverage rates for public kindergartens than Norway. This is probably also why Danish mothers make up a much bigger part of the workforce in Denmark than do Norwegian mothers in Norway (Ellingsæther 2004)

As mentioned earlier, the data available covers a time-span from 1980-1997. Hence, it covers a period with both limited and more generous leave schemas. The mothers included in this study have consequently faced very different parental leave schemas. Therefore, if the family policies have had any of the intended effects, this could enhance a reduction in penalties for mothers. To document such effects, and to determine the role of family policies for women's wages, are essential for our understanding of the family gap. In fact, Harkness and Waldfogel (2003) calls for more research on the impact of family policies on pay for mothers. They also call for more research on this issue especially for Scandinavian countries.

Considering the theoretical literature, previous research and the last considerations taken into account, I propose some research questions for further inquiry in this thesis. The first questions to be analyzed are:

1) What is the family gap in pay at the population level, the establishment level, the occupation level and the occupation-establishment level? Here it will be interesting to compare the coefficients as one goes from one level to another i.e. from the establishment level to the occupation level. It will also be of interest to see if there are any differences in hourly wages between mothers and non-mothers

once they work in the same occupation and in the same establishment. This will be an indicator of employers pay differential pay for equal work.

The second question to be analyzed are:

2) Which mothers bear the penalties?

Here I will mainly examine if there are any differences in penalties for having children among women with different education level. I will also look into if the penalties varies for mothers who work in heavily male dominated jobs compared to mothers who work in more sex-integrated or female dominated jobs.

I will also look into if the penalties for having children are different among women who have different marital status.

The third question to be analyzed are

3) What have happened to the family gap in pay over time?

Given the extension in family policies I will investigate the role family policies such as maternity leave and child care play in closing the gap between mothers and non-mothers.

I will now present the data I have available and explain the methods for my investigation.

5 Research design

In this section I will describe the data that are available to me and, and also explain my methods. Different from earlier studies of the family gap presented in the previous chapter, there are especially two advantages with the data I have available. As mentioned in the introduction, this is a longitudinal data set with a time-span over 18 year. If there are considerable changes over time that will affect the family gap, this will be captured by my analyses. Moreover, the matched employer-employee feature of the data allows me to see at which *level* in the labor market the differences in pay between mothers and non-mothers are most prominent.

I will first give a description of the data, and then give some definitions of variables. The last section of the chapter will explain the methods.

5.1 Data

The available data was obtained from Statistics Norway and the Confederation of Norwegian Enterprise (NHO). It covers white-collar workers in the private business sector in Norway. It is an important sector of Norwegian economy, in a way that it is central for wage setting for other sectors as well. Among the employees are white-collar workers in the manufacturing industries, oil and mining industries, building and construction work, transport and various other industries. Most of these other industries are small, compared to the manufacturing industries.

As an example I can mention that for 1992 we have complete data on 84% of the establishments and 94% of their white-collar employees. Thus the data are fairly complete.

It's also the industry for which Petersen *et al* (1997) found the highest gender wage gap for all different levels: the population, establishment, occupation and occupation-establishment level. This ensures enough variation in

the dependent variable, hourly wage, also at the occupation-establishment level, which I will describe later.

The data from the Confederation of Norwegian Enterprise is for white-collar employees and the information about both individuals and firms is available on an annual basis from 1980 to 1997. Originally, the data holds information for men as well, but for the purpose of this thesis, they are excluded. However, I have calculated the female proportion based on information about them as well for some later analyses. This will be explained under the relevant section when I describe the data.

The data contains information about wages, working hours, occupation, age, and more. The data have been matched to register data from Statistics Norway using the system of personal ID numbers in Norway. This gives us exact information about the employees. Of special interest for this thesis is that the register data offers information on number of children, the children's age, and marital status. We also have information about all the individuals' educational attainment. Included here, is information of not just the years attained, but also the fields of study. Overall this information gives us continuous educational, marital, and parental histories.

Table 5.1 give a description of the data, for which later analyses are done. Column 1-2 shows the number of women employed. For the year 1987 we only have information about individuals present in both 1988 and 1987, thus the number of observations for this year is lower than for the other years. In 1997 NHO changed the ways the data were compiled so the number of employees is lower for this year. Column 2 shows percent women in the data. Column 3 shows number of establishments. Column 4 shows the original number of occupations, while column 5 shows the aggregated grouping of the originally 210 occupations into 21 occupation groups. I will describe this in more I detail below. Column 6 shows the number of occupation-establishments, and finally column 7 shows the average wage for all women.

Table 5.1.

Number of observations included in the analysis by year. Share of women and women as percent. Also number of establishment, occupation, occupation groups and occupation- establishment for which the women work in. Last column shows the average of hourly wages for women.

| Years | Women | % | Establishment | Occupations | Occupation | Occupation | Women |
|-------|--------|-------|---------------|-------------|------------|---------------|--------|
| | | women | | | group | establishment | wage |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| 1980 | 13297 | 22.4 | 2888 | 201 | 21 | 31749 | 37.72 |
| 1981 | 13844 | 22.4 | 2914 | 201 | 21 | 32526 | 42.87 |
| 1982 | 15302 | 23.3 | 2869 | 204 | 21 | 32811 | 48.81 |
| 1983 | 15940 | 23.5 | 2862 | 205 | 21 | 33120 | 52.94 |
| 1984 | 16861 | 24.1 | 2762 | 203 | 21 | 32133 | 58.46 |
| 1985 | 17973 | 25.3 | 2727 | 205 | 21 | 32007 | 63.62 |
| 1986 | 19712 | 26.2 | 2743 | 203 | 21 | 32233 | 71.32 |
| 1987 | 15525 | 25.5 | 2361 | 207 | 21 | 26318 | 79.51 |
| 1988 | 20896 | 27.9 | 2812 | 211 | 21 | 32971 | 81.78 |
| 1989 | 21253 | 27.9 | 2797 | 210 | 21 | 32595 | 87.17 |
| 1990 | 21899 | 28.0 | 2674 | 210 | 21 | 31699 | 94.40 |
| 1991 | 28133 | 33.1 | 2741 | 211 | 21 | 34424 | 98.93 |
| 1992 | 28340 | 33.0 | 2844 | 210 | 21 | 34652 | 102.63 |
| 1993 | 28123 | 33.0 | 2795 | 209 | 21 | 33673 | 106.69 |
| 1994 | 28524 | 33.4 | 2903 | 209 | 21 | 34296 | 110.86 |
| 1995 | 28468 | 33.3 | 3022 | 209 | 21 | 34708 | 114.87 |
| 1996 | 28740 | 33.5 | 3121 | 208 | 21 | 35380 | 121.09 |
| 1997 | 25061 | 33.5 | 3140 | 208 | 21 | 32673 | 129.08 |
| Sum | 387872 | | 50972 | 3724 | 378 | 589960 | |

Note: Information about the individuals is collected on an annual basis, except for 1987. Here we only have information about individuals that was in the data in 1988 and 1987 so the numbers are lower for 1987. The procedures for collecting data were changed in 1996 so the number of observations is lower in 1997.

There are a few things worth mentioning from the table. First, the numbers of white-collar women has increased from 13 297 workers in 1980 to 25 061 in 1997. The computed percent female shows that this is largely a sector made up of men, as women make up roughly 20-30% of the workforce. However, the women's share has increased with roughly 10 % from 22.4 in 1980 to 33.5 in 1997. The largest increase happened from 1990-1991, and this reflects the fact that part-time workers were now included in the collecting process. I have nonetheless

excluded part-time workers from my analyses, so my findings will only pertain to full-time workers.

This means that I will ignore the potential effects part-time employment can have on the family gap in pay. This is cumbersome since part-time employment has shown to be an important component of the family gap in pay in other countries (see e.g. Joshi, Paci and Waldfogel 1999).

However, for Norway this may be different. There is a considerable market for part-time in Norway, and the last years the amount of women working part-time has also increased. However, of importance for this analysis is the fact that payment for part-time and full-time is not very different in Norway. In fact Norwegian working life legislations cannot discriminate between full-time and part-time work (Torp and Barth 2001). The one previous study of the family gap done in Norway, do not find substantial differences in the motherhood penalties for part-time workers compared to full-time workers (Hardøy and Schøne 2004). As such, I could not expect to find large differences in wages among full-time and part-time workers either. Nonetheless, it could of course be that part-time mothers are highly overrepresented in the lowest paid occupations and establishments in Norway.

The number of occupations varies from 210 in 1980 to 211 in 1987 and 208 in 1997. Each year there are 21 occupation groups. The table also show that there are several thousand establishments and also occupation-establishments, every year. This adds complexity to the analyses which I will describe in the section under methods, but it also allows for examining the family gap in new and different ways. The last column shows that the average wage has increased from 37.7 in 1980 to 129.1 in 1997.

5.2 Definitions of variables

As the aim of this thesis is how hourly wages relate to motherhood status, my variables are selected with the intention to clarify one aspects of how women's wages are affected by the presence of children. By systematically using control variables to make the individuals comparable, I hope to isolate the effect mainly children have on hourly earnings.

5.1.1 Dependent variable

Wage

My dependent variable is the logarithm of an individual's hourly wages. It is computed using information about contractual monthly pay and contractual hours worked per week. Overtime is not included in this and I will therefore not be mixing wages earned on a regular contractual basis with those of overtime. Overtime is usually paid at much higher rates than contractual work. If non-mothers work more overtime than mothers, but no distinction was made between the regular and overtime components, the average gap between mothers and non-mothers could be seriously overestimated (Nielsen *et al* 2004).

The contractual monthly pay is simply divided with the contractual hours worked per month. I then take the logarithm to arrive at the hourly wage. An advantage of the logarithmic specification is that it's simple to use as long as you only have positive values (Stolzenberg 1980: 465). Also the main reason for using the logarithm rather than the hourly wage itself is that coefficients can be interpreted as relative differences. Furthermore, all the articles surveyed in chapter 3 use the logarithm for hourly wage as the dependent variable. My findings are then easier to compare with previous research. I will give a brief illustration of how to interpret logarithms: with for example a coefficient for having 1 child showing -0.10 , this will be interpreted as the average hourly wage for mothers with 1 child is 10% lower compared to non-mothers. If the coefficient

is bigger than .15 / . 20 it must be exponentiated to show the relative difference. The formula to use is $(\exp(\text{coeff})-1)$.

5.1.2 Independent variables

Children

The principal independent variable is children under age 20, and by adding different control variables I can isolate the effect children have on women’s hourly wages. The structure of the panel data set up let me identify each person through identification numbers as I have described earlier. I therefore have exact information about each person’s children, how many they have and when they were born. My independent variable is constructed with four values. The reference category is ‘childless and the others have the values 1, 2 and 3 or more children under age 20. The reason for why I choose number of children under age 20 is because the effect of children on wages is considered to have a cumulative effect⁵.

Table 5.2 shows the number of women and percent women with no children, 1 child, 2 children and 3 or more children under age 20 for selected years.

Table 5.2: Distribution of women with no children, one child, two children and three or more children for selected years.

| Years | No children | | one child | | Two children | | Three or more | |
|-------|-------------|-------|-----------|-------|--------------|-------|---------------|------|
| | N | % | N | % | N | % | N | % |
| 1980 | 7134 | 58.95 | 2545 | 21.03 | 1793 | 14.82 | 629 | 5.20 |
| 1985 | 8923 | 56.34 | 3553 | 22.34 | 2722 | 17.19 | 640 | 4.04 |
| 1990 | 9124 | 49.92 | 4967 | 27.02 | 3575 | 19.56 | 611 | 3.34 |
| 1997 | 8180 | 36.86 | 5618 | 25.32 | 6638 | 29.91 | 1755 | 7.91 |

The table show that almost 60% of women do not have children in 1980, however the numbers decline steadily. Within 1990 there are about 50% of

⁵ I also tried the same variable using a dummy for children under age 7, but this does not change the results significantly.

women who don't have children. The largest decline is during the 1990. For the last years of observation, 1997, 36% do not have children. The severe decline in the 1990s is probably due to the inclusion of part-time workers in 1991. It seems reasonable that a lot of part-time workers have children. There is also a substantial increase in women with 2 children from 1990-1997, a rise with almost 10%. The share of women with 3 or more children is the smallest group, and pertains to only 5-3% of women during the 1980s. From 1990 to 1997 the share of women with 3 or more children have increased to almost 8%, also this raise is probably a reflection of the inclusion of part-time workers. In 1990 and 1997 women without children are still the largest group but women with two children make up a substantial share as well. The share of women with one child varies between 20-25%.

This table also shows that there is enough variation in this central independent variable to estimate the impact of number of children on women's wages.

Marital status

I also have *complete* (i.e. time- varying) information on the individual's marital status. In all my analyses I will use marital status as a control variable, when estimating the effects of children under age 20 on women's wages.

However, I will also estimate effects for having children for women separately by marital status. Then we can see if there are substantial differences in the child penalty between for example married mothers and divorced mothers.

I have access to a rather detailed set of marital status categories. They include single, married, divorced, separated and widowed. However, one problem with this variable is that at the time the data was compiled Statistics Norway could not differentiate between those singles and those co-habiting. I have therefore chosen to name the group single for never married. Also, I have recoded the three last groups to one. The dummies for marital status I operate with will

therefore be: Never married (the reference category), married, and the last category encompass divorced, separated and widowed. Table 5.3 shows the distribution of women on marital status for selected years.

Table 5.3: Distribution of women on differential marital status for selected years.

| Years | Never married | | Married | | Divorced* | |
|-------|---------------|--------|---------|-------|-----------|-------|
| | N | % | N | % | N | % |
| 1980 | 4696 | 38.81 | 5972 | 49.35 | 1524 | 22.84 |
| 1985 | 6335 | 40.02 | 7438 | 46.99 | 2056 | 12.99 |
| 1990 | 6630 | 36.332 | 9023 | 49.44 | 2599 | 14.24 |
| 1997 | 6555 | 29.64 | 12520 | 56.62 | 3041 | 13.74 |

*includes those separated, divorced and widowed

The percent never married is roughly about 40% in the 1980s but actually declines down to 30% at the end of the 1990s. Given that I lack information of cohabitation, I would have expected the proportion never married to have increased over the years as a result of the different domestic arrangement that has taken place during the time-period.

The percent married went down with 2% from 1980 to 1985, but has increased from about 50% in the 1990 to 56% in 1997. As was for the child variable shown in table 5.2, this is probably a reflection of the inclusion of part-time workers. This could indicate that being married and having two children is difficult in the private sector of the Norwegian economy.

The percent divorced/separated/widowed is stable around 12-23 % during the whole period.

5.1.3 Control variables

I use several variables as control variables, but I will never report estimates from the control variables in tables or in the text. I am solely concerned about the effect

children have on women's wages. A thorough discussion of them is at place anyway.

Education

The education variable is based on a detailed 6 digit code for education from the Norwegian standard for educational grouping, Statistics Norway (NUS 2000).

This information gives both length and type of the education. I have used both a broad and a finer differentiation of the education groups.

The broad classification differentiates between five large groupings based on both length and type of education: 1) Middle school 2) High school 3) College degree 4) Masters and higher and 5) Professional education. Middle school is the reference category.

Also I have used a second measure for education, which is a finer differentiation of the five groupings; middle school is set apart between middle school/junior high and high-school dropouts. High school, is set apart between those who finished high-school and those who completed high-school and also have some college. College degrees and masters' degrees from both technical colleges and university level is separated in humanities, social sciences, economics/administration, natural sciences or other subjects. Additionally; the professions are diverted into Civil Engineer, Civil Economist, Social Economist, Lawyers, Accountant and Engineer.

This distribution was generated to show important educational distinctions among white-collar workers. For example using a measure which only takes years of education into account, one would not necessarily see the distinction between those with masters and higher and professional education. While these categorization of education group is not most common to use, Petersen *et al* have confirmed in earlier analyses that the payoff to education varies substantially on which field the degree is obtained in (Petersen 2005).

On the other hand, there have been some strict qualifications to not just education level, but education type for some of the highest occupations among white-collar workers. Especially there has been a demand for civil engineers (Olsen 2004).

However, as with the experience variable, which measure I use, leave the results largely unaffected, and I end up by using the 5 groupings for all the analyses. The distribution of employees on the 21 different education levels is given in table 5.4, while numbers in bold displays the 5 groupings.

Table 5.4: Distribution on 20 education type and 5 educational group(bold type) for selected years in numbers and percent. Women only.

| | 1980 | | 1985 | | 1990 | | 1997 | |
|---------------------------------|-------|-------------|--------|--------------|--------|-------------|--------|--------------|
| | N | % | N | % | N | % | N | % |
| Middle school | | 71.6 | | 56.5 | | 47.1 | | 37.83 |
| 1 middle-school/junior high | 1820 | 14,3 | 1895 | 10,96 | 1748 | 8,73 | 1504 | 6,16 |
| 2 high-school drop out | 7276 | 57,28 | 7733 | 45,58 | 7671 | 38,33 | 7732 | 31,67 |
| High school | | 23.0 | | 31.14 | | 34.2 | | 31.9 |
| 3 finished high-school | 1946 | 15,32 | 3894 | 22,95 | 5134 | 26,65 | 6109 | 25,02 |
| 4 high-school plus some college | 988 | 7,78 | 1390 | 8,19 | 1516 | 7,57 | 1692 | 6,93 |
| College degree | | 3.2 | | 7.4 | | 10.5 | | 15.2 |
| 5 Humanities/human sciences | 181 | 1,42 | 486 | 2,86 | 572 | 2,86 | 874 | 3,58 |
| 6 Social sciences | 11 | 0,09 | 89 | 0,52 | 143 | 0,71 | 225 | 0,92 |
| 7 Economics/ Administration | 86 | 0,68 | 305 | 1,80 | 801 | 4,00 | 1810 | 7,41 |
| 8 Natural sciences | 25 | 0,20 | 85 | 0,50 | 182 | 0,91 | 265 | 1,09 |
| 9 other subjects | 104 | 0,82 | 285 | 1,68 | 409 | 2,04 | 568 | 2,33 |
| Masters and higher | | 0.4 | | 1.00 | | 2.4 | | 4.1 |
| 10 Humanities/Human sciences | 6 | 0,05 | 11 | 0,06 | 24 | 0,12 | 36 | 0,15 |
| 11 Social sciences | 1 | 0,01 | 3 | 0,02 | 45 | 0,22 | 92 | 0,38 |
| 12 Economics, Administration | 1 | 0,01 | 5 | 0,03 | 14 | 0,07 | 56 | 0,23 |
| 13 Natural sciences | 15 | 0,12 | 89 | 0,52 | 274 | 1,37 | 627 | 2,57 |
| 14 Other subjects | 23 | 0,18 | 63 | 0,37 | 121 | 0,60 | 173 | 0,71 |
| Professional education | | 1.7 | | 4.2 | | 6.7 | | 10.8 |
| 15 Civil engineer | 46 | 0,36 | 164 | 2,45 | 473 | 2,36 | 1120 | 4,59 |
| 16 Civil economist | 27 | 0,21 | 103 | 0,97 | 165 | 0,82 | 337 | 1,38 |
| 17 Social economist | 1 | 0,01 | 3 | 0,01 | 4 | 0,02 | 14 | 0,06 |
| 18 Lawyer | 1 | 0,01 | 10 | 0,02 | 19 | 0,09 | 33 | 0,14 |
| 19 Accountant | 6 | 0,05 | 15 | 0,06 | 27 | 0,13 | 78 | 0,32 |
| 20 Engineer | 139 | 1,09 | 375 | 0,09 | 672 | 3,36 | 1072 | 4,39 |
| sum | 12703 | 100,00 | 16,976 | 100,00 | 20,014 | 100,00 | 24,417 | 100,00 |

The table shows that the majority of women have middle school and high school education for all the years 1980,1985,1990 and 1997. While the share of women with completed middle school have declined from 71.5% in 1980 to 37.8% in 1997, there has been an increase of women with completed high school from 23% in 1980 to almost 32% in 1997.

Women with college degree has risen with roughly 12% during the period of study from 3% to 15%.

Only 1,7% women had completed some form of professional education in 1980 and the numbers have risen to 10,8% in 1997. The more detailed differentiation of

education groups also shows that the increase mainly have happened among civil engineer and engineers.

Potential Work Experience

I will use a constructed variable for labor force experience as a control variable. Since we have information about the individual's age and complete educational histories I can construct a variable that will indicate years of work experience. Several measures for this were experimented with. One was simply to use age. The other one was to impute "potential experience". This was done by taking the respondents age, subtract 16, and then subtract years of education beyond that obtained by age 16. However, none of this took into account the career brake in conjunction with the mother's childbirth. To account for this, the imputed "potential experience" variable was used, but in addition I subtracted one year per childbirth a woman have had. This is the measure that will be used in the subsequent analyses. However, it is not completely precise since the length of the maternity leave has changed a lot over the period and was much shorter the first years of study. Even so, childcare services in Norway did not exactly match the increase of women with small children in the labour force for a long time. This probably forced mothers to stay home to take care of their children even if they were not financially compensated by the state. As late as 1987 only 5-8% of children under three years old had access to publicly funded childcare (Leira 2002). For the 1990s the maternity leave coverage has been nearly a year and public childcare have better coverage rates. As such, the measure I use approximates the influence children have on mother's labor force experience. Also, potential experience is used in several articles surveyed in chapter 3. My results are then easier to compare with previous findings, than if I simply have used age.

Nonetheless, as was for the education variable, using either of the various specifications of experience leave the results largely unaffected.

Experience squared

It is likely to assume that the payoff of work experience will reach a maximum at a certain level. I include an experience-squared term to see if the relation between experience and hourly wages is linear. A significant square term would indicate that the relationship is curvilinear.

Both education and experience are associated with large wage gains, and will be included as control variables in almost all my analyses.

In addition, I will use the education variable to investigate possible discrepancies in penalties among the different education groups. Then the analyses will be conducted separately for each education group.

In table 5.5. I present some selected average values for the experience variable, education variable (in years) and average wages by number of children for the years 1980 and 1997.

Table 5.5: Average values for selected variables by number of children, 1980 and 1997

| | | No children | One child | Two children | Three or more children |
|------|---------------------|----------------|--------------|-----------------|---------------------------|
| 1980 | Average wage | 36,9 | 38,4 | 38,5 | 37,5 |
| | Average experience | 13,3 | 15,1 | 18,7 | 20,8 |
| | Length of education | 3,4 | 3,3 | 3,3 | 3,1 |
| 1997 | Average wage | 130,6 | 131,2 | 137,5 | 143,5 |
| | Average experience | 16,9 | 17,9 | 17,0 | 16,8 |
| | Length of education | 4,4 | 4,28 | 4,4 | 4,7 |

Note: only for individuals between 20-50 years old

If one look at the experience variables, the table show that it is probably on average a younger group of women that are apparent in 1997 than in 1980, since the average experience actually have declined, at least for women with 2 and 3 or more children, over the years.

The table also show that the average education level has risen for both women with and without children.

Accounting for different levels

Also to fully maximize the characteristic of the data set available to me, I will look at the effects of children on hourly wages at different *levels*. This is an important quality with the data. Not do I only single out the effects of marital statuses and children at the population or the market level, but I can also control for establishment, occupation and occupation- establishment unit (Petersen 2005) By comparing the estimates I can see how the effects of children on (log) hourly wages transform at different levels.

The population level

At the population level I control for marital status, education, potential experience and its quadratic term, to see the effect of children on hourly wages. Here, I report what on average is the effect of children, all else equal. By “all else equal” I refer to a concept in statistical analyses, in which one try to isolate an effect of independent variable on a dependent variable, after controlling for other variables that usually are prior to the effects of the independent variable (England 2005).

However, at this level all individuals are taken into account, irrespective of what kind of work the do, or what kind of occupation they work in. The estimates from this analysis will resemblance the estimates of the family gap from the articles reviewed in chapter 3.

The establishment level

I then control for the establishment level, estimating the effect of children on wages controlling for the establishment in which the employee works. I use

dummy variables for each establishment in the data. There are several thousands establishments in the data (see table 5.1 column 3).

We can then see if the effect of children also plays a role at the establishment level, when mothers and non-mothers work in the same establishments.

I also control for marital status, education, and potential experience and its quadratic term in this analysis. This needs some further explanation.

Occupational segregation have been emphasized in earlier studies as an important component of explaining the gender wage gap in pay. That is, women are sorted on occupations where lower wages prevails than men and thus this can explain the wage differences between men and women (see e.g. England 1982). Implicit in this analyses is that employers discriminate women to occupations that are lower paid. However, e.g. Polacheck (2004) have argued that some of these studies do the mistake and overestimate the importance of occupational segregation *per se* for explaining the gender wage gap. The criticism is that they do not include control variable for e.g. age and education. As such they do not account for “how much human capital one might have acquired” (Polacheck 2004: 20). Polacheck argues that it is the accumulation of human capital between men and women which leads to segregation, and not for example employer discrimination (Polacheck 2004). To meet such a claim I have included the control variable in these analyses as well.

The occupation group level

The occupation-group level variable needs some thorough addressing, as this variable is important for several of my analyses. First, I will use it to control for the occupation-group the employee works in, but second this variable are also important for answering the question if sex composition at the workplace can explain some of the motherhood penalties.

First I will explain how this variable was constructed. In the forthcoming analyses when I refer to the occupation-group level , I control for 21 occupation –

groups the employees works in. This is an aggregation of the 210 occupations which I presented in table 5.1.

However, in order to assemble the 210 occupations into 21 groups in a meaningful manner, some of the 210 occupations was excluded. The 21 occupational groups are therefore made up of about 155 occupations instead of 210. The reasons for this was that the 155 occupations are by the employing firms organized into a hierarchy, while the 55 occupations excluded did not fit into such a hierarchy.

The 21 occupation groups are further organized into five career ladders with workers in technical, supervisory, office, retail and warehouse position. Each of these ladders include from about 2 to 9 occupations. The different ranks within each career ladders are hierarchical so that each occupation group have more autonomy and higher salary. For example the office position ladder consist of 5 ranks of occupational groups where assistant director (13) is the highest level in this ladder, and routine work (17) is the lowest level. However I can not compare occupations across ladders. For example the highest positions one can occupy among the white-collar workers are company directors (1) and chief engineers (2), but also assistant director (13) and sub director (14).

The distribution of women on different occupations and career ladders are shown in table 5.6 for selected years. However, in addition to use occupation-group level as a control variable I will also use information based on the career ladders to examine if sex composition at the workplace can explain some of the motherhood penalties. To examine this I needed to calculate the share of female based on all workers in the data, including men. These numbers are showed in parenthesis within each career ladder. I will explain how to do this more thoroughly in the methods chapter, but basically this analyses will we based on the different career ladders.

Summing up, table 5.1 shows an aggregation of 155 occupations into 21 occupation-groups. These occupation –groups are further aggregated into five

career ladders each ladder consist of 2-9 occupations. Each career ladder displays percent women of all women and also percent women of total number (both men and women) in each ladder in parenthesis.

Table 5.6: Distribution of women and percent women of total women in each career ladders (bold type) and next in each occupation group, percent female of total (men and women) in parenthesis for selected years.

| | | 1980 | | 1985 | | 1990 | | 1997 | |
|------------------------------|-----------------------------------|----------------|--------|----------------|--------|----------------|--------|----------------|--|
| Occupation level | N | % | N | % | N | % | N | % | |
| Technical positions | | 7.1 | | 11.0 | | 14.9 | | 20.7 | |
| | | (5.96) | | (9.33) | | (13.92) | | (16.28) | |
| 1 | Company director | | 1 | 0.01 | 3 | 0.02 | 15 | 0.07 | |
| 2 | Chief engineers | 2 | 0.02 | 13 | 0.08 | 51 | 0.28 | 184 | |
| 3 | Managing positions | 16 | 0.13 | 87 | 0.55 | 217 | 1.19 | 494 | |
| 4 | Responsibility with leadership | 21 | 0.17 | 79 | 0.50 | 206 | 1.13 | 377 | |
| 5 | Responsibility without leadership | 26 | 0.21 | 170 | 1.07 | 430 | 2.35 | 876 | |
| 6 | Autonomous with leadership | 18 | 0.15 | 83 | 0.52 | 126 | 0.69 | 221 | |
| 7 | Autonomous without leadership | 104 | 0.86 | 351 | 2.22 | 584 | 3.20 | 1137 | |
| 8 | Qualified routine/work | 215 | 1.78 | 479 | 3.02 | 556 | 3.04 | 821 | |
| 9 | Routine work | 457 | 3.78 | 486 | 3.07 | 551 | 3.01 | 478 | |
| Supervisory positions | | 1.7 | | 1.2 | | 1.7 | | 1.5 | |
| | | (2.23) | | (3.69) | | (5.69) | | (5.73) | |
| 10 | Positions of leadership | 2 | 0.02 | 6 | 0.04 | 13 | 0.07 | 27 | |
| 11 | Workshop/managers | 15 | 0.12 | 30 | 0.19 | 75 | 0.41 | 59 | |
| 12 | Supervisor with direct control | 96 | 0.79 | 168 | 1.06 | 235 | 1.29 | 237 | |
| Office positions | | 87.5 | | 84.4 | | 80.7 | | 73.3 | |
| | | (45.89) | | (50.05) | | (54.73) | | (55.56) | |
| 13 | Assistant director | | 6 | 0.04 | 26 | 0.14 | 51 | 0.23 | |
| 14 | Subdirector | 83 | 0.69 | 168 | 1.06 | 428 | 2.34 | 692 | |
| 15 | Autonomous work | 692 | 5.72 | 1252 | 7.91 | 1953 | 10.69 | 2598 | |
| 16 | Qualified routine/work | 3934 | 32.51 | 5830 | 36.81 | 7482 | 40.94 | 7661 | |
| 17 | Routine work | 5885 | 48.63 | 6124 | 38.67 | 4877 | 26.68 | 5275 | |
| Retail positions | | 3.3 | | 2.1 | | 1.4 | | 3.6 | |
| | | (28.36) | | (25.9) | | (46.46) | | (55.54) | |
| 18 | Shop manager/executive | 26 | 0.21 | 30 | 0.19 | 37 | 0.20 | 32 | |
| 19 | Salesclerk/shop assistant | 376 | 3.11 | 302 | 1.91 | 231 | 1.26 | 769 | |
| Warehouse positions | | 1.1 | | 1.1 | | 1.4 | | 0.8 | |
| | | (5.4) | | (7.3) | | (9.57) | | (9.60) | |
| 20 | Manager/executive | 4 | 0.03 | 15 | 0.09 | 30 | 1.26 | 25 | |
| 21 | Clerk | 129 | 1.07 | 158 | 1.00 | 166 | 0.16 | 162 | |
| Total | | 12101 | 100.00 | 15838 | 100.00 | 18277 | 100.00 | 22191 | |

The distribution of women shows that most women work in office positions as the table display almost 87% in 1980 and 73% in 1990. Women are also mostly distributed at the three lowest ranks within the office position ladder.

The distribution of women in technical positions have increased from 7 % in 1980 to almost 21 % in 1997. For supervisory, retail and warehouse positions the distribution of women do not display any significant changes for the selected years.

The share of women, or the female/male ratio display that office positions and retail positions are the most sex-integrated career ladders, were women actually make up over 50% of all workers for 1990 and 1997 . The share of women is miniscule in supervisory positions and also warehouse positions where they make up only 1.5% and 1% respectively for 1997.

Earlier research done on the same data set available have shown that using the finer differentiation of 210 groups does not show very different results than if we use the aggregated one (Petersen *et al* 1997). As for establishment, I include controls for education, potential work experience and marital status. I use dummy variables for each occupation group. At this level, I can see if the effect of children also plays a role when mothers and non-mothers work in the same occupation- groups.

Occupation-establishment unit

Finally, we can control for the occupation-establishment unit that individuals work in. I can precisely estimate the effect of children on hourly wages, once employers' work in the same occupation for the same employer. I here use dummy variables for each occupation-establishment. As with the other levels I here include control variables. I can then see if the effect of children also plays a role at the occupation-establishment level, when mothers and non-mothers work in the same occupation-establishments.

This level also needs some further addressing. Some researchers have argued that controlling for occupation-establishment gives no meaning because the occupation-establishment per definition does not allow for any variation in pay. They argue that occupation-establishment is synonymous with wage level, and so the analysis makes no sense because per definition it cannot be any wage differences at such a level (see e.g. Barth 2003). This issue has mainly been emphasized in Scandinavian countries due to the form of wage setting which exists in this country. I cannot go into details about this in my thesis, but mentioned that Nielsen *et al* (2004) addressed this concern in a former analysis. By comparing wages in the same occupation-establishment they found that even within occupation-establishments there is a large degree of variation in pay. In fact, they found that within occupation-establishment the highest paid person could earn on average 22-34% more than the lowest paid person. As such occupational titles in the same establishments are not synonymous with wage levels, and there is enough variation in pay to estimate wage differences at this level as well.

For all four different levels, the analyses' will be obtained for each year. However, for the sake of clarity, I have computed the average impact of the coefficients for four different sub-groups. I will now present the methods that I will use for my analyses.

5.2 Methods

5.2.1 Analyzing panel data

The data I will use is a panel data set, also referred to as cross-sectional time series data. Their central feature is that one records at regular intervals the status each individual in the panel occupies, and the individuals are observed at least two points or more in time (Petersen 2004: 331). In contrast, cross sectional data only offers one observation pr. individual.

The multiple observations give the data a grouped or a multilevel structure. The numerous observations at each point in time of the individual are the lower level, and the group is the individual, the higher level (Petersen 2004: 332). The more time points the individual are recorded, the more information is provided. If each individual are observed each possible time points the data set are called balanced. My data are unbalanced, thus individuals are not necessarily recorded for all years.

In addition to the multiple observations of persons over time, the data also has another level, which arises from the occupation level and the establishment level. Also these levels are observed several points in time, as much as each year from 1980-1997. This means that we have a matching of the individuals and the establishments and occupations these individuals work in for multiple years. This gives a unique complexity to the data. We can for example compare mothers and non-mothers wages working in the same occupations and same establishments at a given time point. But also since the data spans over 18 years we can follow the trajectories of mothers and non-mothers wages and see how they change over time.

Another central feature is the within-individual information which arises with panel data. I can for example estimate wage changes as women moves from having no children to having 1, 2 and 3 or more children. Then we will see the within-individual differences.

5.2.2 Statistical models

Ordinary Least Square regression

Ordinary Least Squares (OLS) regression models are used to analyze differences in wages between individuals. In all the articles reviewed in Chapter 3, the estimates for the family gap are obtained with OLS. The results reported here would thus be more comparable when I use OLS than they would be with a different methodology.

In my analyses I will use different specifications of the model, which will take into account the different levels of the data (Petersen 2005).

I will start with a cross sectional analysis for each year between mothers and non-mothers with the natural log for wage as a dependent variable. Independent variables will be a dummy for marital status, education, experience and its quadratic term, and dummy variables for number of children under 20 years of age. I regress the logarithm of wages $\ln W_{oit}$ where $i=(1\dots,N)$ denotes individuals and $t=(1980-1997)$ denotes time on explanatory variables x_{ioet} where ϵ_{ioet} denotes the error term. However, I will use four different specifications of this equation:

$$\ln W_{oit} = \alpha_{P,t} x_{ioet} + \epsilon_{ioet} \quad (1)$$

$$\ln W_{oit} = \alpha_{E,t} x_{ioet} + \eta_e + \epsilon_{ioet} \quad (2)$$

$$\ln W_{oit} = \alpha_{O,t} x_{ioet} + \eta_o + \epsilon_{ioet} \quad (3)$$

$$\ln W_{oit} = \alpha_{OE,t} x_{ioet} + \eta_{oe} + \epsilon_{ioet} \quad (4)$$

η_e, η_o and η_{oe} are vectors of parameters capturing fixed effects of establishment, occupation and occupation-establishment unit and ϵ_{ioet} is the error terms.

Important here is that for each constant term there is also a different subscript. This is reflecting that we have different coefficients for each level. P is for the population level, E is the establishment level, O is for occupation level and OE is for occupation-establishment level.

Equation (1) does not take into account where the individuals work or what kind of occupation they are in. I will refer to this as the population level. The results from this analysis can be seen as a match up to the motherhood penalty reported from the articles surveyed in chapter 3, but with some minor adjustments: All of the estimates will be obtained separate for each of the eighteen years, but in the result section I will report the average of the yearly

coefficients for each sub-periods (1980-1984, 1985-1989, 1990-1994, 1995-1997). By comparing results from one sub-period to another I can see if the penalty has changed over time. I will only present the coefficients for 1, 2 and 3 or more children under 20 years of age, net of all other covariates. I will not show coefficients for the control variables since I am exclusively concerned about the effect having children on hourly wages. Also, for the rest of the analyses, this will be the common practice. Thence, what I mainly will report is the average impact of children under age 20 have on women's wages, net of all other covariates. The estimates from equation (2) take into account the workplace of the employees, the establishment level. Models from the third equation (3) controls for the occupation- group level and thus compare individuals in the same type of occupation groups. The fourth equation (4) also controls for the occupation-establishment unit an individual works in. We can therefore very accurately see if the motherhood penalty is present when mothers and non-mothers work in the same occupation for the same employer.

With my final analyses we can compare the coefficients at the different levels and see how they are changing once I control for establishment, occupation- group level and occupation-establishment unit. Each estimate describes one important aspect of the data, and will answer different questions.

Up to this point I have described methods for looking at the family gap both over time and at different levels in the market. But also of importance is to see if there are any intra-individual changes in the penalties for women with children. My second research question asked which mothers bear the penalties. I can decompose the data into different educational groups and also see how the child penalties interact with marital statuses, and also see if sex-composition at job have an effect on the motherhood penalties.

Which mothers bear the child penalties?

As mentioned earlier, it could be that the penalties for having children on wages vary according to different skill-level i.e. here measured as education level.

To see if the effect of children varies between different education-groups, I will use a model that resembles equation (1) but here I will estimate the effects separately for each educational group. I will use the broad classification of education. We can then see the effect of 1,2 and 3 or more children under 20 years old for those who have completed middle school, high school, college degree, masters and higher and professional education respectively. In this analysis I will report numbers for each year.

Sex-composition a job

Similarly, I want to examine if sex-composition at job can explain some of the motherhood penalties. In table 5.5 I showed the female/male ratios in parentheses for five different career ladders. I will estimate the effects of having children on mothers wages separately for five different career ladders. There are thus five career ladders the analyses will be done for: women in technical positions, supervisory positions, office positions, retail positions and last warehouse positions. I will do the analyses for each year here as well.

Marital status

As discussed in chapter 4, one might hypothesize that marital statuses in interaction with children will have different impact on women's wages, though the direction of this is hard to predict.

I will estimate the effects of children on women's wages separately by marital status. However, this will be done in two steps. First I will use the OLS model to estimate differences between women with 0,1,2 and 3 or more children separately for never married, married and divorced women (the last category includes separated and widowed as well). Then I will estimate within-individual

differences of having 0,1,2 and 3 or more children. I will explain how to do the intra-individual analyses below.

5.2.3 Fixed effects at the intra level

In addition to variations of the total estimator and fixed effects (i.e. dummy variables) to take into account the different levels, I will also use the fixed effect estimator to make use of the intra-individual information in the data in answering some of my research questions. I will now have fixed effects for persons. However, I will only perform intra individual analyses at the population level. I define a dummy variable $D_i = 1$ for individual i and 0 otherwise. This dummy are thus fixed across years for this individual. For this analyses the following specification will be used

$$\ln w_{oeit} = \alpha_{IP} x_{ioet} + \delta_i D_i + \epsilon_{ioet}$$

Where δ_i are fixed effects and now the subscript IP to the α coefficient denote that this is a fixed effect at the intra-population level.

Since the panel data contains repeated observations of each individual it is possible to control for unobserved explanatory variables, also referred to as unobserved heterogeneity. For example if women with (more) children are less career oriented than women without children we can use a so called fixed-effects for persons which allows us to take into account such unobserved characteristics.

Here I will look what happen to the respondents wages as they move from having 0 to having 1,2 and 3 or more children under age 20. When considering the child wage penalty, many scholars have argued the importance of controlling for unobserved heterogeneity (see e.g. Data Gupta and Smith 2002). The argument here is that the negative effect of children on women's wages reflects some unobserved characteristic that correlates with lower earning potential.

Mothers and non-mothers could vary systematically when it comes to for example motivation for work, career ambition and so on and then the observed negative effect of children are a reflection of such individual characteristics rather than that of children.

To control for such unobserved effects one can compare women with themselves and see if mothers also have lower earning potential prior to having children. Crucial for such analyses will be to compare estimates from both fixed effects and OLS to see if the coefficient have changed from one estimator to another.

However, this estimator need some further addressing. For the independent variables, we have two kinds of information, those who vary over time, such as wages or marital status, and those who are constant such as socio-economic background or sex. This distinction between time-variant and time-invariant variables is important for what can actually be estimated (Petersen 2004). One drawback with the fixed effect estimator is that one can only estimate effects of variables that change over time. To estimate coefficients for each year as done in the earlier analyses, will not work properly here because the variation between each year are too small to be considered time variant and therefore to be caught up by the estimator. Hence it will be necessary to divide the years into two groupings. I will therefore operate with two sub periods here: 1980-1989 and 1990-1997. Also I need to drop the education variable since it is not changing a lot over time.

The person- specific fixed effects will be obtained at the population level and I can compare the OLS and the fixed effects estimates. The fixed effects will account for the omitted variables in the OLS and it can help us see if the number of children under age 20 is biased by unobserved heterogeneity and also show the direction of this bias (Waldfogel 1997; Taniguchi 1999: 1014).

If mothers systematically have lower earning potentials than women without children, the fixed effect estimate of the child variable should be smaller than its counterpart in the OLS (Tanaguchi 1999: 1014).

5.2.3 Summary

To sum up, by estimating the effect of children for each year, we can follow the trajectories of the motherhood penalties, and see if they have declined over time. Also by comparing the changes in the coefficients as one move from the population level to establishment level to the occupation-group level and so forth, one can see where the wage penalties for having children arises. This will, at least tentatively, give some implication for where policy will have the greatest impact for reducing the family gap in pay.

And additionally, to see if the estimate varies systematically between women who are different with respect to their education, with respect to sex-composition at job, and with respect to different marital status', can be suggestive for where to target policies. This topic will be discussed further in the thesis.

6 Results

In this section I will present the results from my analyses. The main goal is to see how children under the age 20 affect women's wages. As indicated previously, it is important to reveal the mechanisms behind possible wage discrepancies between mothers and non-mothers. Any insight we gain on this topic is vital in illuminating other forms of gender inequality and inequity, especially the gender wage gap in pay.

Before I present the results from my analyses some thoughts around what the coefficients represent can be of interest.

In statistical models, one usually wants to include several control variables. This is to be sure that one has isolated a causal effect i.e. the effects children have on mother's wages, instead of being a spurious correlation. It is thus tempting to think that more detailed models, or models that include and account for several variables, also are more informative, and give more proof to the fact that an actual causal effect exists.

Petersen (2004) however argues that instead of looking at one estimator as better than another, one should rather think of the estimators as describing different aspects of the data, and they can be used in complementary ways to address different questions.

Consider the forthcoming analyses. I start by analyzing the wages of women with and without children with control for education and experience. I then extend the analyses to take into account the establishment these women work in. Further I account for the occupation and occupation-establishments. It is thus tempting to say that the penalties I find at the occupation-establishment levels are "superior" to the penalties I find at the population level, because here I have taken more information into account.

However, a more fruitful way to think of it could be that for example the estimates from the establishment level reports what's on average the difference between mothers and non-mothers wages once mothers and non-mothers work

in the same establishments. The estimates from the population level show on average the difference in wage between mothers and non-mothers with the same education level, and the same level of potential experience. Both estimators describe the data correctly.

Therefore, I will use each type of estimator in order to capture the specific dimensions of the data to which they are suited. The different estimators will play a role in answering the research questions posed in chapter 4.

In the first set of analyses I will see how the family gap in hourly wages is at four different levels, the population, establishment, occupation-group level and the occupation-establishment level. In these analyses it will be important to compare the changes in coefficients as one goes from one level to another. Here I will also address the concern of unobserved heterogeneity. I will therefore estimate effects of children on women's wages at the intra-individual level.

In the second set of analyses I will see how the family gap in pay is for women with different education levels. Here I will only take into account individual level characteristics such as experience and also control for marital status. We can then see if the motherhood penalty varies for mothers with higher or lower levels of education. Here I will do the analyses for each year for five different education groups.

I will also estimate the effects of children under age 20 on women's wages separately for five different career ladders. This is done in order to see if the penalties to motherhood varies with the sex-composition at the workplace.

Last, I make use of the within-individual information in the data set but now separately by marital status. Now I will make comparisons and examine the average impact children have on wages, as women moves from having 0 to 1 to 2 to 3 or more children for never married, married and divorced.

For this analysis the estimates will be obtained for 2 sub-set of years, 1980-1989 and for 1990-1997.

6.1 The family gap at different levels

The population level

The analyses are first done at the population level. In this analysis only individual level characteristics such as education and experience are taken into account. This analysis closely mirror the ones used in most of the articles surveyed in chapter 3 where only individual level characteristics are taken into account (e.g. Waldfogel 1997, 1998). To make use of the matched employer-employee feature of the data, the analyses are further done at the establishment level with fixed effect for establishment, followed up for the occupation level with fixed effect for occupations, and lastly, at the occupation-establishment level with fixed effect for occupation-establishment.

Through this analysis we can see if the effects we find at the population level are also observable at the other levels of analysis. Are the observed differences mostly due to individual-level differences in education and experience or are they a result of different sorting on establishments, occupations or occupation-establishments units? We will also learn how the family gap has developed in Norway over time and we will be in a position to answer the initial research questions posed in chapter 4.

The results in table 6.1 show the effect of number of children under age 20 at the population level, i.e. with only control for education, experience and experience squared. The reference category is a single woman, with completed middle school, 20 years old and with no children. This is the reference category used for all the subsequent analyses. The coefficients show the average across years for four sub-periods. All coefficients are statistically significant at 5% level or higher. The dummy variables for children are for having 1 child under age 20, 2 children under age 20 and 3 or more children under age 20.

The estimates are obtained for each year, but for the sake of clarity I present the average of the estimates for four sub-periods.

Table 6.1: The effect of children on (log) hourly earnings at the population level for four sub-periods, controlling for education, experience and experience squared

| | 1980-1984 | 1985-1989 | 1990-1994 | 1995-1997 |
|--------------------|-----------|-----------|-----------|-----------|
| 1 child | -.035 | -.027 | -.025 | -.022 |
| 2 children | -.078 | -.066 | -.037 | -.030 |
| 3 or more children | -.111 | -.105 | -.053 | -.036 |

Note: All coefficients are significant at a 5% level or (usually) 0,1% level. The analyses is restricted to individuals from 20-50 years old, full-time workers

The initial observation is that there is a negative effect of having children on (log) hourly wages and that the size of this effect depends on the number of children you have. This holds for all the four sub-periods. Over time, the negative effect of children on (log) hourly wages has steadily declined during the period under study.

Between 1980-1989 the wage penalties suffered as a result of having 1, 2 or 3 or more children below age 20 ranged from 3, 7 to 11%. During the following period, from 1990-1997, the same coefficients shrank to about 2, 4 and 6% respectively. Thus a woman with 2 children in 1997 earned an average wage, which was 4% lower than a childless woman with identical education and work experience.

The establishment level

The next step is to see the impact of children on wages measured at the establishment level. Are the wage penalties for children any different when we control for the establishment in which the women work? I now include fixed effects i.e. dummy variable for establishments. I also control for education level marital status and potential experience. Table 6.2 shows the results for this analysis.

Table 6.2: The effect of children on (log) hourly earnings at the establishment level for four sub-periods, controlling for education, experience and experience squared

| | 1980-1984 | 1985-1989 | 1990-1994 | 1995-1997 |
|--------------------|------------------|------------------|------------------|------------------|
| 1 child | -0.027 | -0.019 | -0.018 | -0.016 |
| 2 children | -0.061 | -0.051 | -0.031 | -0.022 |
| 3 or more children | -0.093 | -0.090 | -0.047 | -0.032 |

Note: All coefficients are significant at a 5% level or (usually) 0,1% level
 The analyses is restricted to individuals from 20-50 years old, full-time workers

Initially, one should note the similarity between the pattern observed at the establishment level and the general pattern we discerned at the population level. There is a negative effect of having children on (log) hourly earnings for all the four sub-periods studied, and the negative effect increases with how many children below the age of 20 you have. Also, the wage penalties measured at this level have been declining over time.

During the period 1980-1989 there is clear negative effects of having children. 1 child below the age of 20 reduces the wage with about 2-3%, 2 children reduces the wage additionally with 5-6% and for 3 or more children the hourly wages drops with about 9%.

In 1990-1997, these penalties are diminished. During this period, a woman with 1 child earns on average 1, 5% less than a woman without children, all else equal. For 2 children the wage penalty is about 2-3% and for 3 or more children the penalty ranges from 3-5%.

The penalties are for all sub-periods a bit smaller at the establishment level than at the population level. This could indicate that there are larger variations in wages between establishments than within establishments and that women with children tend to work in lower paying establishments than do women without children.

The occupation group level

Next, I look at the family gap at the occupation level controlling for 21 occupation groups. How the occupation group was assembled from the more detailed 210 occupations was explained in the previous chapter. I now use fixed effect for 21 occupation- groups. As for the occupation group level, I have included control for education and potential experience.

Table 6.3: The effect of children on (log) hourly earnings at the occupation-group level for four sub-periods, controlling for education, potential experience and experience squared

| | 1980-1984 | 1985-1989 | 1990-1994 | 1995-1997 |
|--------------------|-----------|-----------|-----------|-----------|
| 1 child | -0.023 | -0.016 | -0.010 | -0.004 |
| 2 children | -0.050 | -0.036 | -0.014 | -0.005 |
| 3 or more children | -0.063 | -0.054 | -0.016 | -0.005 |

Note: All coefficients are significant at a 5% level or (usually) 0.1% level
The analyses is restricted to individuals from 20-50 years old, full-time workers

The results from table 6.3 shows that women with 1, 2 or 3 or more children below age 20 earn 1-2, 3-5 and 5-6% less than women without children during the time period 1980-1989. These effects are smaller than we saw at the establishment level. Nevertheless, for women with more than 1 child, the penalties are still substantial.

For the next sub period 1990-1994, a significant change has occurred. Here all the coefficients have dropped down to around 1%. For the last sub-period 1995-1997, the penalties are less than 1%. This shows that for all practical purposes, women with children whom work in similar occupations are not penalized for having children.

The occupation-establishment level

We then control for occupation-establishment unit. This is accomplished by using fixed effect for the occupation-establishment women works in. We here

compare women who work in the same occupation and also for the same employer.

Table 6.4: The effect of children on (log) hourly earnings at the occupation-establishment level for four sub-periods, controlling for education, experience and experience squared

| | 1980-1984 | 1985-1989 | 1990-1994 | 1995-1997 |
|--------------------|-----------|-----------|-----------|-----------|
| 1 child | -.020 | -.019 | -.005 | -.003 |
| 2 children | -.041 | -.026 | -.008 | -.001 |
| 3 or more children | -.051 | -.045 | -.016 | -.005 |

Note: All coefficients are significant at a 5% level or (usually) 0,1% level
The analyses is restricted to individuals from 20-50 years old, full-time workers

Also here, the coefficients are much smaller compared to the population and establishment level, and even less than at the occupation level. During the 1980s we still find substantial penalties ranging from 2, 4 to 5% for 1, 2 and 3 or more children below age 20. But once again, the effects have almost vanished in the 1990s.

We can summarize the findings of these regressions as follows: when we measure the effect of children below age 20 on women’s hourly wages at the population level, we find substantial differences between mothers and non-mothers during the period under study. The penalties gradually incline with number of children. But also, the panel data shows that the penalties have declined substantially over time.

However, the wage differences also seem to vary substantially, depending on the level at which they are measured. It is at the population level that the wage penalty is strongest. Once we control for establishment, 21 occupation groups or occupation-establishment, the effects gets smaller and ultimately vanishes.

6.1.1 Selection effects

As I indicated in the theoretical discussion, it could be the case that women with children differ from women without children in unobservable ways that

influence their earning capacity. To control for such selection effects, we need to compare women with themselves both before and after having children. This can be accomplished with a fixed effect estimator. The fixed effect estimator controls for time-constant unobservable variables. Running a model with fixed effects, let us take into account any unobserved variables affecting earning capacity that are correlated with the number of children. The OLS model will not really capture this. Results from the fixed effect model are showed in table 6.5

Table 6.5: alternative estimators of (log) hourly wages, 1980-1989 and 1990-1997

| | 1980-1989 | 1990-1997 |
|--------------------|-----------|-----------|
| 1 child | -.019 | -.014 |
| 2 children | -.039 | -.030 |
| 3 or more children | -.059 | -.046 |

Note: All coefficients are significant at a 5% level or higher. The analyses is restricted to individuals from 20-50 years old, full-time workers

Controlling for unobserved heterogeneity

What we are looking for here is *if* and *how* the coefficients for children have changed, compared to the estimates obtained for the population level. To recapitulate: at the population level for the sub period 1985-1989, the negative impact of children on hourly wages was 3, 7 and 10%. Looking at the alternative estimator, controlling for fixed effects, we see that the coefficients have almost shrunk by 50 percent (and even more if I compare with the numbers from 1980-1984). These results lend some support to the supposition of selection effects. It seems that it is the mothers with lower earning capacity who are more likely to have (more) children than mothers with higher earning capacity.

But when we look at the coefficients for 1990-1997, which shows a penalty at 1, 3 and 4%, the coefficients are almost identical with the penalties estimated with the OLS model and the selection effects observed for the earlier period have now vanished.

6.2 Who are the mothers who are disadvantaged?

In this section I will consider if the child penalties interacts with some characteristics of women such as education level or marital status. Here I will pay attention to the second research question raised in chapter 4: which mothers bear the penalties? I will first look at educational differences.

Earlier research has generated 2 competing hypotheses explaining the link between women's wages and children. According to the "work-effort" hypothesis, which treats skill level as essentially equivalent to education level, highly educated women pay a smaller penalty for having children than women with less education because they can secure a more flexible work-schedule, which is more easily combined with childrearing. Advocates for the human capital theory, on the other hand, argue that it is the more highly skilled women who are penalized through lower pay. Highly skilled women should lose more of their human capital when they interrupt their career to have children and should therefore end up paying a greater wage penalty for motherhood than their less-skilled counterparts. Their person-specific human capital "depreciates" more rapidly when compared with the more fungible human capital of women with easily acquired skills. On this theory, we would expect the wage penalties to be higher for mothers with high levels of education (education is once again used as a proxy for skills).

6.2.1 Five different education groups

My analysis follows the conventions of earlier research in using education level as a proxy for skill-level. I ran the analysis separately for different education groups. The results are shown in table 6.6.

Table 6.6: the effect of 1,2, and 3 or more children on (log) hourly wages for five different education groups for the years 1980-1997. Restricted to individuals 20-50 years old. With control for experience and experience square. Row (1)middle school, row (2) high school, row (3) college degree, row (4) masters and higher and row (5) professional education

| | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 |
|----------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| 1 | | | | | | | | | | | | | | | | | | |
| 1 | -.032 (.005) | -.030 (.004) | -.036 (.004) | -.029 (.004) | -.030 (.004) | -.037 (.004) | -.026 (.004) | -.021 (.004) | -.020 (.003) | -.017 (.003) | -.023 (.003) | -.021 (.003) | -.019 (.003) | -.018 (.003) | -.013 (.004) | -.011 (.004) | -.021 (.004) | -.026 (.004) |
| 2 | -.089 (.005) | -.080 (.005) | -.081 (.004) | -.074 (.004) | -.076 (.005) | -.073 (.005) | -.067 (.005) | -.063 (.005) | -.061 (.004) | -.046 (.004) | -.041 (.004) | -.045 (.004) | -.035 (.004) | -.032 (.004) | -.030 (.004) | -.027 (.005) | -.030 (.005) | -.031 (.005) |
| 3 | -.119 (.007) | -.107 (.007) | -.108 (.007) | -.101 (.007) | -.091 (.007) | -.117 (.008) | -.108 (.008) | -.100 (.008) | -.101 (.007) | -.079 (.007) | -.077 (.008) | -.067 (.008) | -.062 (.008) | -.042 (.008) | -.039 (.008) | -.039 (.008) | -.048 (.008) | -.046 (.009) |
| 2 | | | | | | | | | | | | | | | | | | |
| 1 | -.064 (.008) | -.036 (.008) | -.036 (.008) | -.037 (.007) | -.035 (.007) | -.030 (.007) | -.039 (.006) | -.021 (.007) | -.026 (.005) | -.025 (.005) | -.029 (.005) | -.036 (.005) | -.031 (.005) | -.025 (.005) | -.022 (.005) | -.021 (.005) | -.028 (.005) | -.023 (.006) |
| 2 | -.097 (.011) | -.092 (.010) | -.088 (.010) | -.094 (.009) | -.083 (.009) | -.080 (.008) | -.092 (.008) | -.079 (.008) | -.079 (.007) | -.071 (.006) | -.055 (.006) | -.054 (.006) | -.046 (.006) | -.039 (.006) | -.041 (.006) | -.037 (.006) | -.043 (.006) | -.037 (.006) |
| 3 | -.163 (.018) | -.163 (.017) | -.140 (.016) | -.155 (.016) | -.111 (.016) | -.126 (.016) | -.130 (.014) | -.114 (.015) | -.124 (.013) | -.097 (.013) | -.089 (.013) | -.082 (.012) | -.084 (.011) | -.062 (.012) | -.049 (.011) | -.058 (.010) | -.041 (.010) | -.042 (.010) |
| 3 | | | | | | | | | | | | | | | | | | |
| 1 | <u>-.050</u> (.030) | <u>-.043</u> (.026) | <u>-.040</u> (.024) | <u>-.040</u> (.021) | <u>-.025</u> (.019) | <u>.003</u> (.017) | <u>.008</u> (.015) | <u>.035</u> (.068) | <u>-.013</u> (.013) | <u>-.021</u> (.012) | -.024 (.011) | -.039 (.011) | -.025 (.010) | -.024 (.009) | -.022 (.009) | <u>-.016</u> (.009) | -.025 (.009) | -.024 (.010) |
| 2 | <u>-.042</u> (.036) | <u>-.047</u> (.032) | <u>-.054</u> (.028) | -.074 (.026) | -.070 (.023) | -.063 (.019) | -.072 (.018) | -.059 (.019) | -.055 (.015) | -.049 (.014) | -.040 (.014) | -.035 (.013) | -.035 (.012) | -.051 (.011) | -.042 (.011) | -.036 (.011) | -.045 (.010) | -.028 (.011) |
| 3 | -.136 (.055) | -.173 (.053) | -.097 (.043) | -.092 (.042) | -.082 (.037) | -.138 (.033) | -.127 (.031) | -.073 (.031) | -.074 (.027) | -.103 (.025) | -.095 (.025) | -.075 (.023) | -.056 (.023) | <u>-.041</u> (.021) | -.044 (.020) | <u>-.035</u> (.019) | -.047 (.019) | -.043 (.019) |
| 4 | | | | | | | | | | | | | | | | | | |
| 1 | <u>.176</u> (.105) | <u>.080</u> (.082) | <u>.029</u> (.073) | <u>.033</u> (.058) | <u>.042</u> (.051) | <u>-.013</u> (.038) | <u>-.050</u> (.032) | -.063 (.026) | <u>-.040</u> (.022) | <u>-.033</u> (.020) | -.062 (.022) | -.047 (.021) | -.047 (.021) | <u>-.017</u> (.018) | -.072 (.021) | <u>-.022</u> (.019) | -.032 (.016) | <u>-.021</u> (.020) |
| 2 | <u>.300</u> (.164) | <u>.199</u> (.107) | <u>.129</u> (.087) | <u>.129</u> (.068) | .138 (.056) | .089 (.043) | <u>.021</u> (.035) | <u>-.030</u> (.029) | <u>-.003</u> (.025) | <u>-.012</u> (.024) | <u>-.038</u> (.025) | <u>.014</u> (.022) | <u>-.009</u> (.022) | <u>-.003</u> (.019) | <u>.001</u> (.022) | <u>.023</u> (.020) | <u>.006</u> (.018) | <u>.009</u> (.022) |
| 3 | <u>.310</u> (.171) | .427 (.132) | <u>-.032</u> (.014) | <u>.112</u> (.118) | <u>.101</u> (.093) | <u>.039</u> (.070) | <u>.037</u> (.057) | <u>-.045</u> (.046) | <u>-.031</u> (.040) | <u>-.028</u> (.036) | <u>-.015</u> (.040) | <u>-.009</u> (.037) | <u>-.015</u> (.032) | <u>.017</u> (.029) | <u>-.007</u> (.032) | <u>-.000</u> (.030) | <u>-.028</u> (.024) | <u>-.010</u> (.028) |
| 5 | | | | | | | | | | | | | | | | | | |
| 1 | <u>-.021</u> (.040) | <u>.001</u> (.034) | <u>.008</u> (.033) | <u>-.027</u> (.029) | <u>-.005</u> (.026) | <u>-.018</u> (.022) | <u>.004</u> (.020) | <u>.004</u> (.021) | <u>-.010</u> (.017) | <u>-.007</u> (.015) | <u>.008</u> (.014) | <u>-.005</u> (.013) | <u>-.009</u> (.013) | <u>-.020</u> (.012) | <u>-.013</u> (.012) | -.026 (.011) | -.023 (.011) | <u>-.015</u> (.012) |
| 2 | <u>.050</u> (.055) | <u>.071</u> (.047) | .089 (.039) | .165 (.038) | .082 (.034) | <u>.043</u> (.030) | <u>.045</u> (.027) | <u>-.012</u> (.026) | <u>.017</u> (.021) | <u>.002</u> (.018) | <u>.019</u> (.017) | <u>.014</u> (.015) | <u>-.008</u> (.014) | <u>-.001</u> (.014) | <u>-.005</u> (.013) | <u>-.020</u> (.013) | <u>-.023</u> (.012) | <u>-.022</u> (.012) |
| 3 | <u>.066</u> (.126) | <u>-.031</u> (.084) | <u>-.015</u> (.085) | <u>.094</u> (.068) | <u>.013</u> (.050) | <u>-.034</u> (.049) | <u>-.013</u> (.043) | <u>-.059</u> (.046) | <u>-.087</u> (.036) | <u>-.023</u> (.034) | <u>.036</u> (.030) | <u>.027</u> (.025) | <u>.021</u> (.024) | <u>.033</u> (.023) | <u>.017</u> (.020) | <u>.007</u> (.019) | <u>-.001</u> (.018) | <u>.011</u> (.018) |

Note: All coefficients are significant at a 5% level or higher, except coefficients with underscore, not significant. Numbers in parentheses are standard errors.

It's easy to get confused by all the different numbers here, but after a second look a clear pattern emerges from the analysis.

To start off: row 1 and 2 show the results for women who have completed middle school and high school. Here the pattern is unambiguous; having children brings down wages for both groups during the period surveyed. These negative correlations increase with the number of children under 20 years old. Although the penalties are gradually declining over time, the magnitudes of the coefficients remain substantial throughout the eighties and beginning of the nineties.

A similar pattern is observed with respect to those women who have completed college (row 3), but especially for the earliest years, some of the coefficients are not significant. Even so, for the most part they show a negative effect of children on women's wages. There are some coefficients that are positive for the years 1985, 1986 and 1987, but these are small in magnitude and they are not significant.

Contradictory, the results for the 2 remaining groups, those with a master's degree or a professional degree, are harder to interpret. The correlations between (log) hourly wages and children are for the most small and positive for these 2 groupings. There does not seem to be an increasing relationship between the number of children and wage reductions. Also, almost none of the coefficients are significant.

In brief, these analyses show that education level does have an impact on the penalties, and more schooling reduces the effects substantially. Eventually, one should note that the moderating effect of education does not seem to pay off until the woman has reached the masters or professional level.

6.2.2 Sex-composition at the workplace

Further I wanted to investigate if sex-composition at the workplace could explain some of the penalties. The background for these analysis was to see if the penalties varies for women in more heavily populated male jobs, compared to jobs with more women.

Some researchers have argued that it is reason to suspect the penalties for having children to be lower in female dominated positions and higher in male

dominated positions. The argument for was described thoroughly in the theoretical chapter, but mention it briefly again. The theories predict that penalties for having children would be larger in heavily male dominated jobs, because career interruptions in conjunction with childbirth will here be rare, and therefore penalized more. Contrary, the theory predicts the penalties to be lower in more female dominated workplaces because either these jobs are more easily to re-enter after career interruptions, or these jobs are already lower paid to “compensate” for the expenses employers have with workers that take more career breaks.

So how does this theory pertains to the data I have available?

The computed female/male proportion from table 5.5 showed that office positions and retail positions were the occupations with highest share of women, displaying 55% and 56% respectively for the last years of observation. I should mention before I show the results from this analyses that the private sector is mostly a sector where men work so to see if the penalties are lower in *heavily* female occupation-groups is not possible. In fact the highest percent female domination I find for one of the career ladders shows 55,5% of women, thus it seems more sex-integrated than female dominated.

Still, I considered it useful to see if working in environments with different sex-composition could explain some of the penalties for having children. For what it's worth, the career ladders did display some significant variation in level of sex-integration and also sex-segregation.

To examine this, I did the analyses for five different career ladders. I also did the analyses for each year to see if there was any changes over time. The results are showed in table 6.7.

Table 6.7: the effect of children on (log) hourly wages for five career ladders for the years 1980-1997. Restricted to individuals 20-50 years old. With control for education, experience and experience square. Row (1) technical positions, row (2) supervisory positions, row (3) office positions, row (4) retail positions, row (5) warehouse positions

| | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 |
|------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| 1 | | | | | | | | | | | | | | | | | | |
| 1 child | -.044 (.016) | -.043 (.015) | -.029 (.014) | -.036 (.013) | <u>-.020</u> (.013) | -.026 (.012) | -.028 (.011) | -.026 (.011) | -.019 (.009) | -.021 (.009) | -.031 (.009) | -.029 (.008) | -.026 (.008) | -.018 (.007) | -.022 (.008) | -.024 (.008) | -.021 (.008) | -.022 (.009) |
| 2 children | -.081 (.022) | -.056 (.019) | <u>-.034</u> (.018) | <u>-.009</u> (.017) | <u>-.032</u> (.017) | -.039 (.016) | -.039 (.014) | -.040 (.014) | <u>-.008</u> (.011) | <u>-.014</u> (.011) | <u>-.012</u> (.012) | <u>-.015</u> (.010) | <u>-.012</u> (.009) | <u>-.008</u> (.009) | <u>-.005</u> (.009) | <u>-.012</u> (.009) | <u>-.009</u> (.008) | <u>-.009</u> (.009) |
| 3 or more | -.085 (.033) | -.074 (.027) | <u>-.043</u> (.027) | <u>-.042</u> (.025) | <u>-.021</u> (.027) | <u>-.033</u> (.025) | <u>-.009</u> (.023) | <u>-.037</u> (.023) | -.042 (.019) | -.041 (.019) | -.019 (.018) | -.002 (.017) | -.025 (.015) | -.006 (.015) | -.000 (.015) | -.008 (.013) | -.009 (.012) | -.011 (.013) |
| 2 | | | | | | | | | | | | | | | | | | |
| 1 child | <u>-.050</u> (.046) | <u>-.057</u> (.035) | <u>-.051</u> (.035) | <u>-.010</u> (.032) | <u>-.036</u> (.034) | -.078 (.031) | <u>-.005</u> (.027) | <u>-.046</u> (.027) | -.052 (.024) | -.073 (.023) | <u>-.037</u> (.020) | -.055 (.023) | <u>.003</u> (.021) | <u>-.007</u> (.021) | <u>-.032</u> (.021) | <u>-.021</u> (.021) | <u>-.011</u> (.021) | <u>-.007</u> (.024) |
| 2 children | -.075 (.044) | -.117 (.035) | -.111 (.036) | -.080 (.032) | <u>-.057</u> (.034) | -.088 (.035) | <u>-.029</u> (.028) | <u>-.048</u> (.029) | -.074 (.028) | -.085 (.027) | -.064 (.026) | -.088 (.025) | -.031 (.029) | -.026 (.028) | -.077 (.028) | -.034 (.027) | -.020 (.026) | -.015 (.030) |
| 3 or more | <u>-.095</u> (.050) | -.101 (.041) | -.102 (.042) | -.093 (.047) | <u>-.057</u> (.051) | <u>-.054</u> (.051) | <u>-.060</u> (.045) | -.098 (.048) | -.105 (.048) | -.094 (.047) | -.096 (.043) | <u>-.046</u> (.060) | <u>-.063</u> (.062) | -.100 (.048) | -.075 (.038) | -.077 (.035) | <u>-.034</u> (.033) | <u>-.027</u> (.039) |
| 3 | | | | | | | | | | | | | | | | | | |
| 1 child | -.041 (.004) | -.035 (.004) | -.036 (.004) | -.033 (.004) | -.036 (.004) | -.036 (.004) | -.028 (.004) | -.017 (.004) | -.023 (.003) | -.022 (.003) | -.026 (.004) | -.030 (.003) | -.026 (.003) | -.026 (.003) | -.022 (.003) | -.016 (.003) | -.028 (.003) | -.025 (.004) |
| 2 children | -.087 (.005) | -.079 (.005) | -.080 (.004) | -.077 (.004) | -.074 (.004) | -.073 (.005) | -.078 (.004) | -.068 (.005) | -.069 (.004) | -.057 (.004) | -.047 (.004) | -.043 (.004) | -.039 (.004) | -.037 (.004) | -.037 (.004) | -.034 (.004) | -.042 (.004) | -.033 (.005) |
| 3 or more | -.129 (.008) | -.117 (.007) | -.108 (.007) | -.106 (.008) | -.100 (.008) | -.124 (.008) | -.128 (.008) | -.112 (.008) | -.114 (.007) | -.096 (.007) | -.084 (.008) | -.069 (.008) | -.064 (.008) | -.046 (.008) | -.042 (.007) | -.045 (.007) | -.047 (.007) | -.037 (.007) |
| 4 | | | | | | | | | | | | | | | | | | |
| 1 child | <u>-.008</u> (.020) | <u>-.029</u> (.020) | <u>-.030</u> (.018) | <u>-.029</u> (.020) | <u>-.017</u> (.025) | <u>-.043</u> (.026) | <u>-.032</u> (.031) | <u>-.009</u> (.031) | <u>-.008</u> (.026) | <u>-.006</u> (.159) | <u>-.012</u> (.027) | <u>-.019</u> (.023) | <u>.010</u> (.022) | <u>.021</u> (.024) | <u>.014</u> (.022) | <u>.005</u> (.019) | <u>-.035</u> (.019) | -.066 (.021) |
| 2 children | -.049 (.023) | -.049 (.022) | <u>-.035</u> (.020) | <u>-.044</u> (.025) | <u>-.016</u> (.030) | <u>-.022</u> (.032) | <u>-.061</u> (.035) | -.100 (.035) | <u>-.037</u> (.030) | <u>-.059</u> (.030) | <u>-.028</u> (.036) | <u>-.024</u> (.028) | <u>-.021</u> (.028) | <u>-.018</u> (.031) | <u>-.019</u> (.030) | <u>-.055</u> (.028) | <u>-.022</u> (.025) | <u>-.024</u> (.026) |
| 3 or more | -.076 (.026) | -.100 (.028) | -.097 (.026) | -.099 (.030) | <u>-.030</u> (.038) | -.108 (.039) | <u>-.003</u> (.049) | <u>-.045</u> (.058) | <u>-.081</u> (.050) | <u>-.008</u> (.053) | <u>-.019</u> (.052) | <u>.025</u> (.054) | <u>.018</u> (.049) | <u>.004</u> (.046) | <u>.054</u> (.047) | <u>-.044</u> (.040) | <u>.001</u> (.062) | <u>-.036</u> (.044) |
| 5 | | | | | | | | | | | | | | | | | | |
| 1 child | <u>.001</u> (.038) | .080 (.034) | <u>-.004</u> (.034) | <u>-.002</u> (.032) | <u>-.008</u> (.031) | <u>-.033</u> (.035) | <u>-.044</u> (.027) | <u>-.033</u> (.029) | <u>-.035</u> (.020) | <u>-.020</u> (.020) | <u>.000</u> (.020) | <u>-.038</u> (.019) | <u>.002</u> (.023) | <u>-.008</u> (.021) | <u>.002</u> (.024) | <u>-.015</u> (.024) | <u>.002</u> (.028) | <u>.005</u> (.029) |
| 2 children | <u>-.033</u> (.039) | <u>.059</u> (.040) | <u>-.007</u> (.039) | <u>-.040</u> (.040) | <u>-.068</u> (.038) | <u>-.057</u> (.042) | -.080 (.036) | -.082 (.035) | -.065 (.025) | <u>-.009</u> (.027) | <u>-.044</u> (.025) | -.076 (.026) | <u>-.044</u> (.024) | <u>-.033</u> (.025) | <u>-.037</u> (.028) | <u>-.031</u> (.028) | <u>-.052</u> (.035) | <u>-.005</u> (.037) |
| 3 or more | <u>.143</u> (.074) | <u>.038</u> (.058) | -.106 (.049) | <u>-.091</u> (.056) | <u>-.051</u> (.061) | <u>-.102</u> (.064) | -.159 (.056) | <u>-.102</u> (.054) | -.087 (.034) | <u>-.021</u> (.041) | <u>-.064</u> (.042) | <u>-.061</u> (.045) | -.131 (.058) | <u>-.067</u> (.049) | <u>.001</u> (.051) | <u>.011</u> (.052) | -.148 (.062) | <u>-.057</u> (.058) |

Note: All coefficients are significant at 5% level or higher, except coefficients with underscores; not significant. Numbers in parentheses are standard errors.

As with the education analyses, the table seems a bit overwhelming. But one finding that has been consistent in all the former analyses is apparent here as well. The wage penalties for having children does for the most part increase with how many children you have, and they also decline over time. However, the penalties does not seem to vary systematically with the sex-composition at work. The most heavily female- dominated career ladders are office positions and retail positions. I find no support for the suggestion that the magnitude of the penalty varies systematically with the degree of female- domination in the workplace. In fact the penalties are rather different for the two career ladders, showing clear negative effects for women in office positions(row 3) and small, and for the most part insignificant effects for women in retail position.

For the most male dominated career ladders, supervisory positions (row 2) and warehouse positions (row 5) the effects are ambiguous, displaying both negative and positive coefficients.

There are very few observations in some of the career ladders, and so I tried to combine observations for groupings of years, to see if a more clear pattern then would emerge (results not shown). However, I still did not find any support for the suggestion that the motherhood penalties vary systematically with male/female domination at the workplace.

6.2.3 Intra-individual changes

I will also investigate the penalties to motherhood among women with different marital status. I will do this in two separate analyses.

First I will use an Ordinary Least Square model. The estimates from this model will display the differences between women with 0,1,2 and 3 or more children separately by marital status.

Next I will use a fixed effect estimator. The estimates from this model will display the within-individual differences as a women goes from having 0 to having 1, 2 and 3 or more children under age 20. By comparing estimates from

OLS and fixed effect estimator I can examine if the differences for having children on wages are larger between women than within an individual's life. Since the fixed-effect can only estimate variables that change over time, I cannot run the analyses for each year. I also have to exclude the education variable, since it is not changing much over time. This was also explained thoroughly in the methods chapter. I will build on a study of Budig and England (2001) and use both OLS models and fixed effects model with fixed effects at the intra-individual level. Instead of pooling the data across years as they did, however, I run the analyses for 2 different sub-periods, 1980-1989 and 1990-1997. This allows me to see if the effects have changed over time. Table 6.7 shows results from the 2 models.

Table 6.8: Effect of children on women's hourly wages from Ordinary Least Square and fixed effects models, by marital status.

| 1980-1989 | | | | | | |
|--------------------|-----------------------|-----------------------|-----------------|-----------------|-----------------|------------------------|
| | OLS | | | Fixed effects | | |
| | Never married | Married | Divorced | Never married | Married | Divorced* |
| 1 child | -.009 (.004) | <u>.003</u> (.003) | -.030 (.005) | -.030 (.002) | -.013 (.001) | <u>.0003</u> (.003) |
| 2 children | <u>.009</u> (.013) | -.042 (.003) | -.073 (.006) | -.063 (.007) | -.028 (.002) | <u>.002</u> (.003) |
| 3 or more children | .121 (.053) | -.133 (.005) | -.179 (.000) | -.118 (.027) | -.039 (.003) | -.012 (.005) |

| 1990-1997 | | | | | | |
|--------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| | OLS | | | Fixed effects | | |
| | Never married | Married | Divorced | Never married | Married | Divorced* |
| 1 child | -.029 (.002) | -.016 (.002) | -.024 (.002) | -.022 (.001) | -.007 (.011) | -.008 (.003) |
| 2 children | -.019 (.003) | -.021 (.001) | -.039 (.003) | -.042 (.002) | -.021 (.001) | -.016 (.003) |
| 3 or more children | -.029 (.008) | -.025 (.002) | -.044 (.005) | -.059 (.005) | -.035 (.002) | -.023 (.004) |

Note: all coefficients are significant at 5% level or higher, except coefficients with underscore; not significant. Numbers in parentheses are standard errors. Restricted to individuals 20-50 years old, full-time workers
 *divorced includes here those who are separated, divorced and widowed

Ordinary least square

The OLS model shows that for the first time-period surveyed, 1980-1989, divorced women experience the highest penalties for having 1, 2 and 3 or more children compared to never married and married women. The penalties range from 3, 7 to 17% respectively. Married women also pay large wage penalties of children, but these effects are largely limited to second and higher order births, which displays penalties of about 4 and 13%. Within the next time period, 1990-1997, the penalties have declined severely for both married and divorced women. However, the largest change in the coefficients is for never married women. During the years 1980-1989, never married seemed to mostly have a premium for

children, though this was limited to women with 3 or more children. Within the next time period, these effects give way to negative effects.

Fixed effects

In the fixed effect model I will now investigate the average impact on wage as a woman goes from having 0 children to having 1, 2 and 3 or more children. I will conduct this separately by marital status. To state the relevance of estimating two models one can ask: do women also prior to having children earn less when compared to women without children?

To control for such selection effects, we need to compare women with themselves both before and after having children. To explain the effects of the fixed effect analysis I will make comparisons between the OLS and the fixed effect model. So what does this tell us?

Never married women

I will first comment on the results which pertains to never married.

In the OLS model when I compare never married women with 1, 2 and 3 or more children, we actually don't see any differences in wages except for women with 3 or more children which shows a 12 % raise in hourly wages. However, turning to the fixed effect estimator, the effect children have on wages as a woman goes from having 0 to having 1, 2 and 3 or more are now pretty severe. This means that between never married women with and without children, children do not play a significant role for lowering wages, but the fixed effects shows that never married women are penalized relatively to themselves, in that way that they would have done even better without children. Hence, the women who have gotten children appear to be somewhat different from those who did not, and appears to have higher earning potential than those who did not get children (given the small and positive coefficient in the OLS model), and as a result the

difference between those who get children and those who do not are smaller than the within-individual differences in wages from 1,2, and 3 or more children. For the next time period the small and positive coefficients from the OLS model have given way to negative effects. In the OLS model, when I compare never married women with 0,1,2 and 3 or more children, there is now a relatively small negative difference in wages between those with 0, 1, 2 and 3 or more children of about 2-3 %. However, when I do intra-individual comparisons, there is larger negative impact on the individuals wage as women make transitions from having 0 to having 1, 2 and 3 or more children. The penalties are now of 2.2, 4.2 and 5.9%.

Again this means the following: women, who get children, do get penalized in wages for having children, that is relatively to themselves, in that they individually would have done better had they not had the children. But, the women who have gotten children appear to be somewhat different from those who did not, and appears to have higher earning power than those who did not (given the small coefficients in the OLS), and hence the difference between those who get children and those who do not are smaller than the within-individual differences in wages from 1,2, and 3 or more children.

Married and divorced women

For married women a different pattern emerges. Lets start with the years 1980-1989. In the OLS model, when I compare married women with 0,1,2, and 3 or more children there are relatively large differences in wages between those who are not mothers and those with second or higher order births. A women with 2 children earn on average 4 % less compared to non-mothers and a woman with 3 or more children earn on average about 13% lower hourly wages.

However , when I do intra-individual comparisons, there is smaller negative effects on the married women's wages, that is relatively to themselves, as women make transitions from having 0 to having 1,2, and 3 or more children, namely of

1.3, 2.8 and 3.9%. So this reflect that among married women, those who have gotten children also earned lower wages prior to having children. As such the coefficients in the OLS model are bigger than it's counterpart in the fixed effect estimator. The same pattern also hold for divorced women.

When we turn to the next time-period, there are no substantial differences in the coefficient estimated from the OLS model compared with estimates from the fixed effect model for married women. For divorced women, the coefficients estimated with fixed effects show slightly smaller effects than compared to the OLS model. This can indicated that the selection effects still holds for divorced women, i.e. that divorced women also prior to having children had lower earning power than women who do not have children.

6.3 Summary of results

I can summarize the results from the different analyses' as follows:

With control for education and experience, mothers earn less than non-mothers for the whole time-period of study. These larger penalties in the earliest years are possible due to some selection affects, indicated by the results we saw from the alternative estimator. However, for the 1990s there are no longer any indications for such selection effects. The penalties have gradually declined over the years, and by the time period 1994-1997 the penalties for having children have been cut in half. At the occupation level and occupation-establishment level, the penalties were strong during the 1980s but have vanished in the 1990s. This findings indicate that the motherhood penalties observed are due to differential sorting of mothers and non-mothers on different occupation and occupation-establishments that pay less, rather than due to employers paying mothers less than non-mothers.

Further, the results showed that higher education level do correlate with lower motherhood penalties. However, the causal effect of education level for the motherhood penalties is not obvious and do need some further discussion.

Among women with different marital status, the results are complex. I will try to summarize them as follows. For never married women there seem to be a selection effect for the whole time-period surveyed, though it is declining over time, in that never married women with children, on average have somewhat higher earning potential compared to never married women without children. For married and divorced women the direction seems to be opposite. At least for the years 1980-1989 married and divorced mothers have lower earning potential compared married and divorced non-mothers. However, these selection effects seems to have vanished out for married mothers in the next time-period. For divorced women, the selection effects still holds. The results will need some further discussion.

7. Discussion

The previous analyses showed the impact of children under the age of 20 on women's wages. I examined how the wage gaps induced by children between mothers and non-mothers varied significantly with what kind of occupations and establishments they worked in. I also examined the role that education level, sex-composition at job and marital status had for the motherhood penalties. The results also displayed that the relationships between motherhood and wages have changed over time.

In this following section, I will discuss the findings more thoroughly and give some thoughts to how such wage differences between mothers and non-mothers can come about. I will organize the discussion after the research questions posed in chapter 4. I will also discuss some methodological drawbacks in these analyses.

7.1 Wage levels

I will first discuss the results from the analyses pertaining to research question one. What is the family gap at the population level, the establishment level, the occupation-group level and the occupation-establishment level? Most important here is not to look at the coefficient at each level per se, but more how they change as one move from one level to another. The results was shown in chapter 6 (table 6.1-6.4).

In the earliest part of the period 1980-1989, there was clearly a penalty on wages for women with children under 20 years of age at all the four different levels. At the population level i.e. with control for only education and experience, mothers earn on average about 3,7 and 11% lower hourly wages with 1, 2 and 3 or more children respectively than non-mothers, all else equal. At the establishment level we found smaller effects displaying 1.5% lower wages for

having 1 child, 2-3% lower wages for having 2 children and 5-6% for having 3 or more children.

Especially penalties at the occupation-establishment level are worth mentioning. The results displayed that mothers on average earn between 2, 4, and 5% lower wages for having 1, 2 and 3 or more children than non-mothers. At this level I compare mothers and non-mothers in the same occupations working in the same firm, and I am therefore examining if employers pay mothers and non-mothers the same wages, once they perform same job for the same employer. The sizable penalties at the occupation-establishment level do indicate that differential treatment of mothers and non-mothers took place during the 1980s.

However, over time, these effects have declined. For the latest period 1990-1997, there are still penalties at the population level and establishment level but these are pretty low, at least for having 1 or 2 children. However, once control for occupation-group is made, women with and without children earn about the same wages. There are thus two processes going on here simultaneously which affect the family gap in pay, something that the multilevel structure of the data illustrates. One is how the penalties for having children decline as one account for the different levels, another is the across-time dimension, showing how the penalties decline over time. Therefore, the best explanation for the observed pattern is that mothers tend to work in occupations and establishments where lower wages prevails. However, when mothers and non-mothers work in the same occupations and occupations-establishments, they receive the same pay. The reduction in the penalties for having children under 20 years of age are simply due to different sorting of mothers compared to non-mothers on different establishments and occupations. Given the decline in the penalties at the population level over time, this also indicates that the wage differences between occupations and establishments in 1997 are not nearly as severe as was for the beginning of the 1980s.

One should also note that it is not the occupation-establishment level that reduces the coefficients the most, but the occupation-group level. This result is striking given that I only control for 21 occupation group which is an aggregation of 155 occupations.

What remains to be explained however, is why women with children are sorted on such occupation and establishments that pay less? Why do mothers jobs pay less? I consider some possible explanations.

7.1.1 Discrimination

One plausible explanation for the observed penalties could be employer discrimination against mothers. Employers may take career interruptions as a signal of less career commitment or consider women with (more) children less work-oriented compared to non-mothers. This can subsequently lead employers to give mothers less access to promotions within firms. Employers might also assign mothers to less rewarding jobs or jobs with less advancement systems metaphorically referred to as the “sticky floor”⁶. This concept was meant to describe the vast occupational segregation of women in low paid jobs (Behreide 1992). These jobs typically offer less advancement opportunities than do higher positions or even no access to promotions within firms. Within the time-frame of this thesis, I have not been able to look at career advancement and promotions in these occupations mostly held by women with children. Further research should look at characteristics of these jobs and address if these are primarily dead-end jobs. However, the decline in the penalties once control for occupation or occupation-establishments are being made does indicate that jobs that primarily mothers hold are on average lower paid compared to jobs non-mothers hold.

⁶ The concept of the sticky floor was initially offered to complement the more familiar notion of the “glass ceiling hypothesis”. The latter was a statement that as women moves upwards on the work organizational ladder they meet sever obstacles and barriers, which eventually exclude women from top-position. For a thorough examination of the glass ceiling hypothesis e.g. Baxter and Wright 2000.

Placing workers in less rewarding jobs, or dead-end jobs also lies within the “opportunity structure” for employers to discriminate (Petersen and Saporta 2004).

Petersen and Saporta argue that in order to find out more about discrimination, we need to look at the possibilities for *where* employers can discriminate. For example, one could imagine that it is easier for employers to discriminate in hiring situations than in wage setting. Hiring situations are based more on subjective decisions from employers compared to wage setting within occupations. Especially the scale of pay in Norway is traditionally very fixed compared to other countries. Thus the hiring situation could provide better opportunities for employers to give differential treatment. Promotions and placements within firms are also based on subjective decisions, and so here lies an *opportunity* for employers to give differential treatment between mothers and non-mothers. It could for example be that mothers are systematically allocated to jobs with few advancement opportunities in point of hiring. As Petersen and Saporta explains it: “even with fair wage setting and promotion policies within firms, there will be differential outcomes if women are not hired into the firms and occupations with good wages and promotion opportunities” (Petersen and Saporta 2004: 896). The vast segregation of mothers in lower paid jobs could indicate exactly this, that mothers are not hired to the establishments and occupations with good wages, but channeled into low-paid ones.

Further, this theory could also be appropriate for explaining why the penalties have declined at the occupation-establishment level. The negligible penalties once control for occupation and occupation-establishment are made does provide evidence that no within job-wage discrimination exists for the last years of study. This level captures the occupation level within the firm, so basically it will show if mothers are being paid less than non-mothers, once mothers and non-mothers work in the same occupation for the same employer. Such differential treatment is forbidden by law under the acts of equal pay for

same jobs. While these acts were implemented in the late 1970s one could expect to find a time lag in enforcement of these laws, and so the opportunity to discriminate mothers whom hold the same jobs as non-mothers was more feasible during the 1980s.

7.1.2. The concept of choice

A pay gap between mothers and non-mothers can come about without any employer discrimination against mothers (Petersen 2005). The larger gaps between mothers and non-mothers could be a reflection of differential employment choices from mothers adapting to a family situation. Mothers might choose to put fewer hours into work, or be promoted less than non-mothers because they want to spend more time with their children or have more energy for housework. Mothers may seek positions with lower wages or less career advancement simply because these jobs are more compatible with raising children. As such, the “sticky floors” discussed in the previous section, could be the bridging workplace for mothers who are juggling both jobs and childrearing at the same time. However, if mothers are assigned to do most the unpaid work at home and they have less effort or energy to give at work, the concept of “choice” is ambiguous. As Avellar and Smock puts it: “ Choices are firmly entrenched in the context of viability; if a woman cannot get ahead in a job, or share the child care equally with a partner, her choices are limited” (Avellar and Smock 2003:605). As to whether mothers are in lower paid occupation because of employer discrimination or by adaptive preferences caused by the division of labor within the family, remains an unresolved question.

7.2 Characteristics among women

When it comes to the results pertaining to answer the second research question, who are the mothers who are disadvantaged, the explanations are even less conclusive. I will comment on the results from the education analyses first.

7.2.1 Education level

The results was shown in chapter 6 (table 6.6). For the three lowest levels, the results are straight forward. Mothers with middle school, high school and college degree bear the highest penalties. These results contradict the hypothesis instigated by advocates of human capital explanations. To recapitulate, advocates of human capital theory expected the penalties to be high for highly educated groups, because interruptions due to childrearing are more critical for high skilled persons. The idea behind such an explanation is that the atrophy rate i.e. the loss of earning potential that can be attributed to periods of work intermittence, is higher in positions which requires high education. When women have a career interruption in conjunction with childbearing one should then expect them to be more penalized than their lower educated counterparts. So what explains the rather different pattern observed here?

One explanation is that the motherhood penalty could also vary by *level* of education in different ways than simply replicate skill-level. Tanaguchi (1999) argues that education provides opportunities for career building that are crucial for women's wage attainment. By studying a young cohort he finds that early child bearers have the highest motherhood penalties because 'their career interruptions occur during a central period of career building. It could be that mothers with lower levels of education had children at a "critical stage" of their career building.

Another explanation relevant for the family gap is the phenomenon of homogeneity among married spouses. Kitterød (2003) found for Norwegian data that couple with higher education levels had more positive attitudes towards equally sharing of chores and childrearing compared to couples with lower education level. If this also holds for my data, the more equally division of labor in such homes could probably mitigate the penalties to motherhood for higher educated groups.

However, if higher educated women are married to men with equally or higher education than themselves, it is also possible that husbands, or spouses in such families provide more money in the family. Such economic resources could allow families to pay for more private services for housework, childcare and so forth. This could enhance the opportunities for careers for those women.

Rønsen and Lappegård (2005) have pointed out that the link between education and motherhood are multifaceted. It could be as Tanaguchi (1999) argues, that education in itself helps suppress the motherhood wage penalty. But a different explanation could be that women with higher level of education are positioning some unobserved characteristics (e.g. career motivation, ambitions) that also affect their wages. It is not easy to determine which way the causal arrow is aimed, and to establish this, one needs to use different statistical models than used in this thesis (e.g. history event analysis). The results from analyses done for different education levels should therefore be interpreted with caution.

7.2.2 Sex-composition at job

I also considered if the sex-composition at the workplace could explain some of the penalties. The result was shown in chapter 6 (table 6.7). I found no support for that theory. This needs some further addressing.

I expected the wage penalties for having children to be smaller in more female dominated workplace's than in more male dominated. This expectation had mainly two reasons. First, the theory of compensating differences emphasize that some jobs can be paid less if the employers offer some nonpecuniary amenities that workers will trade off for wages. If this theory carries some weight the penalties to motherhood should also be lower in such occupations because the wages have already been traded off. In the same vain, one would also expect the motherhood penalties to be higher in occupations with mostly male workers, since men are less likely to have career breaks in conjunction with childbirths. Accordingly, one would expect interruptions to be penalized more in heavily

male jobs. My findings shows that the penalties seems to go systematically neither up or down with female/ male domination at the workplace.

First, the largest effects of having children are displayed among women in office positions. Women are also the majority of workers in these positions. This contradict the theory of compensating differences. However the female/ male ratio reveals that the most heavily female dominated only reach up to about 50%. It could be that the grouping of occupations is probably too sex-integrated, contrary to sex-segregated, but not female dominated so the mothers do get penalized in these occupations.

However, results from career ladders mostly occupied by men does not show any higher penalties than was for the more sex-integrated ones. The vague and ambiguous results from this analysis are hard to say something accurate about, an so I leave it to further research to look more thorough into this questions.

7.2.3 Marital status

Next I considered the penalties for having children among women with different marital status. When it comes to the results from this section the analysis' did show some variation among women with different marital status.

First I would like to mention that since I lack information of people that co-habitates, I will not give much interpretation to the never married group. During the 1990s the patterns for marriage changed dramatically, and cohabitation has now become a more common type of domestic arrangement. In fact statistics show that in the 1990s the parents of about half of all children born in Norway were unmarried (Leira 2002: 69). But in the data available, I cannot distinguish between those co-habiting from those being single. This certainly makes it difficult to give much substantial emphasis on my findings.

However, for divorced and married women the result can be stated as follows. The OLS model showed that divorced and married mothers experienced

the highest penalties for having children under 20 years of age in the time period 1980-1989. Especially did the estimates show high penalties for second and higher order births. However the estimates from the fixed effects model revealed that the large penalties could be attributed to selection effects. Basically this means that married and divorced mothers had lower earning capacity than married and divorced women without children also prior to when they had children and so the effects one see from having 1,2 and 3 or more children on mothers wages are rather spurious than causal.

However the strong selection effects that was prominent in the 1980s is almost vanished for married mothers and are significantly reduced for divorced women over time. So the historical changes that has taken place over time is once again crucial for our understanding. As was discussed earlier, it also seem plausible that such selection effects should fade out as more and more women and mothers in general become part of the workforce.

After controlling for selection effects, married mothers have higher penalties compared to divorced women. So how can this be explained?

The first scenario could indicate that being married and having children are especially difficult in this sector. Such an interpretation is also consistent with the increase of married women and women with two children I showed in table 5.2 and 5.3 when part-time workers were included in a systematic manner in the data. However, given the similarity between the penalties for divorced mothers and married mothers this could also indicate that married mothers have another source of financial support, and so they have more time to allocate on their children without worrying to much about losing wages.

Divorced mothers are also harder to say something about, given that the penalties for having children can be attributed to selection effects. It is also peculiar that the penalties for divorced mothers are not higher than for married mothers. After all, a divorce can be costly for both parents involved, and even with child support and shared custody, the balancing act between family and

work must be harder to juggle alone, than shared as is the case for married mothers. But this also shows that in terms of economic depletion, a divorce need not be so crucial for women today, at least in terms of wage reduction due to motherhood.

7.2.4 Major changes over time

What has happened over time to the motherhood penalty? Has the extension in family policies had any of the intended effects, namely to make the family-work conflict more tenable?

The most straightforward finding from this study is the remarkable change in the penalties over time. For the 1980s, children decrease women's hourly wages significantly. This holds for both the OLS model and the alternative estimator, controlling for selection effects. The penalties diminished somewhat when I controlled for selection effects at least for the first period. It could be, as stated earlier that women with lower earning capacity also have (more) children, but the opposite direction could also be true, that mothers have lower earning capacity because of more children. Nonetheless, such effects are not apparent during the 1990s.

From the 1990s the disparities in wages observed between mothers and non-mothers during the earliest years have now changed dramatically, the penalties are cut in half for having 1, 2 or 3 or more children. What brought about such a change?

One possible explanation could be the increase of women with (small) children into the workplace. In Norway, this trend started in the 1970s and accelerated in the 1980. As such, the work behaviors of mothers and non-mothers converge more, and women with children stayed more continually in the labor force. Earlier, women with children left the workforce when they had children, now they remain employed. The maternity leave schemas available also made a strong incentive for women to be employed even before they have children. A

stronger connection to the labor market also raises the likelihood for women to return to the labor market after giving birth as well (see e.g. Rønsen and Sunstrøm 1998). It also seems plausible that the selection effects observed for the earliest years should diminish, as it becomes more and more institutionalized to combine family and careers.

However, women's employment and childcare services are closely interdependent. The increase of women with children in the workplace relies heavily on access to childcare services for children. Access to for example kindergartens allows women to maintain in the workforce over childbirth. The subsidized rates for kindergartens services in Norway should also enable women with children to choose such childcare services instead of being home. Over time the coverage rate of children on kindergartens have increased substantially. At the end of the period under study, 1997, almost 40% of children aged 1-2 years old had access to kindergartens, and the corresponding numbers for children aged 3-5 years old were 70% (Statistics Norway).

The considerable decline in the penalties over time carries weight to the explanation that the family policies have had some of its intended effects namely to make the balancing act more tenable.

7.2.5 Drawbacks and limitations

There are a few limitations to my research. The first analyses showed that occupational segregation had a significant impact in explaining the motherhood penalties. However, whether mothers seek these occupations by choice or whether employers channel mothers in to such jobs, cannot be explained by the current investigation. In fact to settle such a discussion is difficult as long as we don't have the necessary tools for examining discrimination. However, a more indirect approach could be taken. It could be interesting to examine what kind of occupations women work in before and after having children. Do they shift occupation? This will give increased information as to whether mothers are in

these occupations before having children, or if the job- placement happens primarily after having children.

Hansen (1995) has showed in an earlier study of the private sector that women tend to seek to the more family-friendly public sector upon motherhood. Such “family-friendliness” could also exist within establishments or within firms in the private sector. One could also look at promotion rates for mothers versus non-mothers. Are the occupations most mothers work in connected to any job-ladder within the firm, and do they offer the same advancement opportunities that jobs with mostly non-mothers and maybe men hold?

Another drawback concerns the education analyses. In these analyses I have not controlled for unobserved heterogeneity, so to answer why the penalties are smaller for higher educated groups of women with children is difficult. Nevertheless, the analyses are suggestive. Further research should look more thoroughly into this subject. Is it something about the jobs these women hold that makes it easier to combine family and career? Or are there some unobserved characteristics among women with higher education level that can explain lower penalties? Or is it more difficult for employers to discriminate women with children in positions that require high education? The questions are many, and so are the possible answers.

A third concern is the fact that I cannot separate between single mothers and cohabiting mothers in the dataset. This certainly modifies the explanatory power of this analysis. Since the poverty rates generally are higher for single mothers, more knowledge about the family gap for these mothers is especially urgent. Further research with access to more detailed marital status information than used in this thesis should address the consequences motherhood has for single mothers more thoroughly.

In the next chapter I will sum up the major findings from this study and discuss the findings in relation to the relevant theory and earlier findings. I will also discuss what political consequences my findings might have.

8 Conclusion and Policy Implications

The previous analyses have addressed the wage gap in pay between mothers and non-mothers in Norway. One of the goals for this thesis was to isolate the major determinants for this gap.

The first analyses focused on where in the market the penalties arise. I examined if the penalties mainly is due to differential treatment from employers or if they are due to differential sorting on occupations and establishments.

The second analyses tried to address if the penalties vary with some characteristics among women. I examined whether different educational attainment or different marital status played a role in creating penalties. I also examined if sex-composition at the workplace could explain some of the penalty.

All of these analyses also addressed the impact of children on women's wages over time and examined if the relationship has changed.

The reason for these analyses was the growing international literature that has addressed the impact children have on women's wages. Most studies show a negative effect. Out of this literature grew a specific interest in the potential role family policy can have in mitigating such effects (see e.g. Harkness and Waldfogel 2003). The longitudinal data set that I had available covers a period in Norway where several policies were implemented concerning the balancing act of family and careers for families. I have focused entirely on women's outcomes in this thesis.

This chapter summarizes the findings and discusses the results in relevance to theory and earlier research. I will also say something about policy implications for my findings.

8.1 Discussion

After controlling only for human capital variables, there is a penalty for having children on mothers' wages. The penalties also increase with number of children.

The penalties I find at the population level i.e. with only control for human capital variables resemble the penalties found in earlier studies, both in the United Kingdom and in the United States (e.g. Joshi, Paci and Waldfogel 1999; Budig and England 2001). However, the wage penalties I find are generally lower compared to findings from the United Kingdom and the United States. For example Budig and England (2001) report 7 % penalties for each additional child from the United States, while the penalties I find is about 2-4% for two or more children for the last period of study. What is also an interesting finding is whether using age or constructing more accurate measure of “potential experience” does little to account for the gap in pay between mothers and non-mother (results not shown). To focus solely on lost experience for explaining the family gap does not seem to be very fruitful for our understanding of the family gap⁷. This is also true for findings from the United Kingdom and the United States.

The penalties I find when only controlling for human capital variables, are higher than those found from other Scandinavian countries using similar methods. Results from Denmark showed no penalties (Datta Gupta and Smith 2002), and this was also true for Sweden (Albrecht, Sundström, Edin and Vroman 1999). As for the latter, Sweden has even more extensive family policies than Norway, which can affect the results.

In Denmark selection effects accounted for much of the wage gap between mothers and non-mothers. Once this was controlled for, they find no motherhood penalties. I have used similar methods as Datta Gupta and Smith (2002). I did find a tendency to selection effects in the earliest part of the time-period (see table 6.5), but these effects are no longer apparent in the latest years of study.

⁷ Here I mean as a direct cause. Of course lost experience could lead to lower advancement opportunities, or lower job-placement

8.1.1 Accounting for establishment, occupation-group and occupation-establishments

Contrary to previous research I was also able to depict where in the market the penalties arise. The matched employer-employee data available shows that the penalties to motherhood in Norway are mostly due to different sorting of mothers and non-mothers on occupations and establishments. This sorting seems to be the main determinant for which penalties arises. Whether such sorting of mothers and non-mothers arises from employer discrimination, educational segregation or adaptations to family situations is harder to say something about.

However, once mothers and non-mothers work in the same occupation or same occupation-establishment unit the penalties are vanished. As such, there is no evidence of differential treatment from employers for the last years of observation when mothers and non-mothers work in same occupation within the same firm.

Yet, there must be something about these jobs held by mothers that also can explain their lower wages. My findings indicate that the motherhood penalties largely flow through occupational segregation. This was discussed under the section occupational segregation in chapter 2. Whether such segregation happens due to some supply side mechanisms or demand side mechanisms is hard to say something accurate about. The supply side focused on what the employees, or in this case, women prefer. One obvious explanation would be to think that the jobs mothers hold have some mother-friendly amenities which makes it easier for mothers to combine work and family.

On the demand side, I also presented several ideas as to why employers might discriminate against mothers. Employers might channel mothers into different kinds of jobs than non-mothers because mothers are expected to take more sick leaves in conjunction with childrearing, or employers anticipate mothers to be less productive at work, and they respond to this by giving mothers less promotions or paying mothers less. In fact there are evidence of

employers discrimination for the earliest years of the study, when I examined the family gap in pay at the occupation-establishment level. However, these differential treatment effects vanished over time.

On the other hand, one can argue that the supply and demand side mechanisms are also heavily intertwined. The factors influencing mothers preferences for some type of jobs may also influence employers preference for workers.

Previous research has mainly looked at differences in penalties between public and private sector, and not on occupational segregation *per se* to investigate the family gap. This research has however pertained mostly to Scandinavian countries since within these countries there is a difference in family friendliness between the two sectors.

Nielsen, Simonsen and Verner (2004), do find from Denmark that the motherhood penalties are much smaller for public sector than the private sector. However, these result does not show up before after they have used a complex model controlling for selection effects to the sectors. It would be interesting to do something similar for Norway.

However, their result give some support to the theory of compensating differences, as they find no penalties for mothers working in the public sector, but large negative effects for mothers working in the private sector. What is important is that public sector pay less than the private sector.

While my findings only pertains to the private sector, the results shows that the establishments and occupations mothers work in, pay less than establishments women without children work at. While this is strong indication that the occupations also are more easily combined with motherhood, I will be careful in saying something ascertain about this. More evidence and proof of such “mother friendliness” is needed.

England have argued that at least for the United States, what generates occupational segregation is not necessarily mother friendliness in these

occupations, since the occupations heavily occupied by mothers rarely offers the amenities such mother friendliness would indicate (England 2005:281). However, this might be different for the Scandinavian welfare regimes, where for the most part the state have been active employer of women with children and also in the forefront when it comes to family policies at the workplace. The private sector is also enforced to follow such a practice.

8.1.2 Educational attainment

I also examined if the penalties varies for mothers with different educational attainment. Human capital theory depicts that higher educated women should experience the highest penalties because the human capital level in high skilled positions are more vulnerable to “depreciates”. I found no support for this hypothesis, in fact my results shows that the opposite is the case as the penalties are lower for higher educated women. This suggests that we need to consider other explanations.

Previous research of the family gap has not addressed this issue to a large extent. One exception is from The United States (see Anderson, Krause and Binder 2002, 2003), but the findings from these studies are ambiguous. The division of different education levels will also largely vary between countries, something that makes comparisons difficult. Budig and England (2001) also investigate if the motherhood penalty was dissimilar for different education groups, but did not find any significant variation, nor did they report the results from this analysis.

8.1.3 Sex-composition at job

I did not find any support for the supposition that sex-composition at the workplace should diminish or increase the motherhood penalties. As discussed previously, this could reflect the fact that this is largely a sector made up of men, and female are not overrepresented or dominating in any kinds of occupations

groups. But how does my findings correspond with previous research? Budig and England (2001) find that penalties are slightly lower for women in heavily male dominated jobs. Interestingly they also found that high-level male jobs penalized women less for having children. This findings are at stake with the compensating differential theory, and also human capital theory which emphasize that male jobs, and especially high level male jobs have high atrophy rates.

8.1.4 Marital status

The result from the analyses which examined the role marital status play for the motherhood penalties suffered some drawbacks in that I could not investigate the role for single mothers.

However, after controlling for selection effects I find that married mothers are most penalized compared to divorced mothers. Budig and England (2001) report similar results pertaining to the United States, however the magnitude of the penalties they find are more severe.

The differences in the penalties among mothers with different marital status indicates that the motherhood penalty is not exclusively a consequence of employer discrimination, unless one believes that employers discriminate more against married mothers than divorced mothers.(Budig and England 2001: 218) As such, it is probably a combination of lower effort from mothers at a given point in time, and also employer discrimination. The motifs and ways employers can discriminate was discussed in the previous chapter.

8.1.5 Family policies, a remedy for the family gap?

The role that children have played for women's wage outcomes has changed a lot during the period of study. In the earlier part of the period, the motherhood penalty was quite severe at the population level, the establishment level, the

occupation level and the occupation-establishment level. But over time, these effects decline, especially at the occupation and occupation-establishment level. This is an important finding and contradicts most research done on this before. Joshi, Paci and Waldfogel (1999) find for the United Kingdom that the gap between mothers and non-mothers has even widened over the years. Avellar and Smock (2003) do not find a reduction in the motherhood penalties over time for the United States. Evidence of a decrease in the motherhood penalty does (to my knowledge) not exist in Scandinavia prior to this study for the family gap literature.

The result from this investigation points to the notion of Norway as an intermediate case, as discussed in chapter 4. While Norway has more family policies than the United States and the United Kingdom, it has less than Denmark and Sweden. The results from my analyses' also mirrors this. For example are the penalties for having children on mothers wages that I find, much smaller than the penalties found in the United States, but larger than found in other Scandinavian countries.

8.2 Policy Implications

What are the implications of my findings?

If we look to research from Sweden, they found no gap in pay between mothers and non-mothers, and so it would be tempting to suggest even more generous maternity leaves. However, in terms of narrowing the gap between mothers and non-mothers I think there is little gain in further extensions. Women still lose income upon giving birth, and also valuable human capital that can help increase their wages. In such a perspective policies should encourage women to shorter career interruptions to help decrease the overall cost of children for mothers. However, this is probably in conflict with another concern of family policy, which is to protect children's interests. So one can ask what changes are needed to equalize the difference between mothers and non-mothers which is not conflicting the interest of children? It is beyond the scope of this thesis to reflect on different remedies vigorously, but I will mention some of them.

The crucial mechanism amplifying the family gap seems to be the amount of sorting on occupations. One remedy could be to lessen the amount of such sorting (Petersen 2005: 211). Whether the sorting happens in the hiring situation, or is a result of educational choices or adaptations to family will clearly require different resolutions. The targets for such resolutions will also vary. In hiring situations, increased vigilance or regulation of employers' actions could be beneficial (Petersen 2005: 211). Employers would here be the targets. When it comes to educational segregation, mostly the school systems and their recruitment systems would have to change. Typically young women will be the targets of such a change. Whether the sorting is mostly due to adaptations to family situation, the targets are not so self-evident. As discussed earlier, these adaptations among mothers could be a result of the unequal division of labor in the households, or it could reflect mothers' own preferences. If it's mostly due to the first mechanism, then fathers should be the main target. More pressure on equal sharing of childrearing or equal share of the parental leave could be

possible remedies. In fact we see the contours of such policy right now, with increased focus on the “daddy quota” (i.e. four weeks of the parental leave which is specifically designated for the father). But of course, to equalize the domestic arrangement between mothers and fathers, more transforming changes than the rather symbolic gesture four weeks represent is needed (Leira 2002). However, there will be upper bounds for how policy making can interfere with families’ lives. At last the practice of everyday life has to be determined by families themselves.

Another remedy could be to change the way internal labor markets are structured, especially within those lower paid jobs mostly mothers work in. This can occur through changing the promotion systems, providing more career opportunities in lower paid jobs, giving ways to different and less rigid forms of advancement and so forth. Raising the wages in these occupations is another suggestion.

The responsibility for such changes would not just be that of employers, but also for policy makers as they should try to induce such changes. But why would employers and policy makers be interested in such transforming changes? From an equity perspective it is unfair that mothers should have to pay the cost of motherhood in forms of lower wages. As argued by Budig and England (2001), we all benefit from mothers childrearing of the future generation. Childrearing will help children to become well-behaved, stable and productive adults which of both employers and society profits. The children growing up are also the future employees and tax-payers (Avellar and Smock 2003). It is also implemented in the government’s policy to keep up the high rate of fertility that we now have (to secure population replacement). And so the government should be an active agent in facilitating a combination of motherhood and being part of the workforce. While the family policies in Norway have had many goals, one of motifs for women’s employment have been pronatalist motifs (see e.g. Rønsen 2004). The higher fertility rates in Norway,

also indicates that these politics has been efficient. However, this motifs may have overlooked the fact that most of the cost of children affect women's pay.

For employers one can argue that mothers are an important part of their workforce and make important contributions to the paid economy. Employers should recognize their workers potential by giving mothers the same opportunities as other workers.

8.3 Concluding Remarks

I have in this thesis investigated how motherhood affect employed women's hourly earnings. There are two key findings in my thesis.

The first finding is that there is a difference in wages between women with and without children. The explanations for this is mainly due to differential sorting of mothers and non-mothers on different occupations and different establishments. Whether such sorting is mostly due to employer discrimination or employee adaptations is difficult to determine. More evidence of how families and mothers structure the balancing act between work and home is needed to answer such a question. However, once mothers and non-mothers work in the same occupations and within the same establishments, there is no evidence of differential treatment from employers.

The other key finding is that the combination of children and labor work for mothers in the private sector of the economy has become easier over the 18 year of study, as the gap in pay between mothers and non-mothers steadily has declined over the years. This change is probably a result of the extension in family policies implemented under the years of study, which was aimed at mitigating the work-family conflict for women.

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