INVESTIGATING THE MOTHERHOOD PENALTY IN A POST-COMMUNIST ECONOMY: EVIDENCE FROM POLAND

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Submitted to

Central European University

Department of Economics

In partial fulfillment of the requirements

for the degree of Master of Arts in Economics

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Budapest, Hungary

2011

Abstract

The study provides evidence on the existence of the motherhood penalty in 2003-2009 time period in Poland. Several estimation methods are used to account for women's selection into motherhood. In particular, the effect of children on women's wages is obtained from the OLS estimation, fixed effects model and matching approach. The OLS estimation provides the estimate of 4% lower wages of women who have at least one child. The fixed effects model, which corrects for time-invariant unmeasured differences between mothers and non-mothers results in 13% lower wages of mothers. The average treatment effect based on the propensity score matching performed on the observed characteristics of mothers and non-mothers is consistent with the OLS estimation. Similarly, the effect found by the fixed effects estimation applied to the matched sample, which is obtained from the matching performed on pre-motherhood characteristics, is close to the initial fixed effects finding. Additionally, estimation of non-linear effects of children is provided. The findings suggest that there is little difference between the negative effect of one and two children; the difference occurs in case of three children and more. Moreover, the estimation of the bounds of the effect, that takes into account mother's selection into employment, is adapted. The bounding estimation suggests that there is high selection into working: women who earn low wages are more likely to drop out of the labor market once they become mothers. Consequently, if the employment selection could be accounted for, the effects would be even more negative.

Acknowledgements

I would like to express my gratitude to my supervisor, Professor Álmos Telegdy, for his excellent guidance, valuable comments and suggestions, and time devoted to my work. I am also very grateful to Professor Janusz Czapiński from Warsaw University for his help regarding the dataset. Finally, I would like to thank my dear Marcin for his encouragement and permanent support.

TABLE OF CONTENTS

LIST OF TABLES

Introduction

The study provides evidence on the existence of the motherhood penalty, which is the negative effect of children on women's wages, in the post-communist times in Poland. In particular, the cost of motherhood is investigated for the chosen years of 2003-2009.

The hypothesis, which states that indeed lower wages occur, meaning that children have negative impact on women's career, is already supported by the existing literature. Several theories have evolved to explain why women who have children may earn lower wages. In general, the motherhood penalty has been explained by: 1) human capital theory; 2) compensating wage differentials theory and choosing mother-friendly jobs, which in general pay lower wages; 3) Becker's work effort theory: productivity approach; 4) discrimination-based theories; 5) spurious correlation hypothesis (Budig and England, 2001).

However, most of the studies on this issue done so far, concentrate on well-developed Western economies, e.g. the US (Waldfogel, 1997; Budig and England, 2001; Korenman and Neumark, 1992; Anderson et al., 2003), Great Britain (Waldfogel, 1995; Joshi et al., 1999), Finland (Napari, 2010), Denmark (Simonsen and Skipper, 2006) as well as a set of Western countries (Davies and Pierre, 2005; Harkness and Waldfogel, 1999). The striking lack of quantitative analysis on the motherhood penalty for Central European countries may be associated with the low quality and limited access in those countries to the datasets which would allow for such research.[1] Therefore, the analysis presented in this study adds to the existing literature on the motherhood penalty in terms of its regional placement.[2]

[1] The estimation of the motherhood penalty suffers from the bias stemming from the selection into motherhood. The selection that is based on unobserved characteristics (e.g. career orientation) may be overcome with the use of fixed effects model performed on the panel data. Given the transition of those countries to the market economy and associated with it lack of the data from the times before the transition, the panel data could be collected only from the middle 90, which until now constituted a relatively short time period.

[2] Albeit there exist studies on that issue for Russia, e.g. Nivorozhkina et al. (2007), Zharikova (2006).

In addition, the existing literature on gender inequality in Central and Eastern European countries concentrates mainly on the gender wage gap and the changes in it before and after the transition (e.g. Russia (Ogloblin, 1999), Bulgaria (Jollife, 2002), Romania (Paternotros, 1999), Hungary (Jollife and Campos, 2005), as well as the whole region of Central and Eastern Europe (Pailhe, 2000; Brainerd, 2000)). The issue of discrimination arising as an unexplained component of the gender wage gap and the labor force participation were thus the main interests among the researchers. Although occupational segregation that is one of the sources of the gender wage gap has been investigated explicitly (e.g. Jurajda, 2003), little is known on its other source: women's responsibility of giving birth to a child and child rearing (England, 2005). Hence, my analysis also adds to the existing literature on gender inequality in post-communist times in Central and Eastern European countries.

Consequently, the country of my research, Poland, makes the present study distinct from the bulk of previous research concentrating on the existence of the motherhood penalty. In addition, the investigation of the cost of motherhood in Poland complements existing literature on gender inequality in post-communist economies.

Moreover, the fact that Poland is a post-communist economy has important implications for the existence of the motherhood penalty. This is mainly due to negative changes in family oriented policies that took place after the fall of communism. Most importantly means-tested eligibility criteria of family benefits were introduced and many child-care establishments were closed. In addition, the emergence of so-called "*private maternalism"* (Fodor and Glass, 2007) suggests that today's Polish mothers may face high obstacles in their professional development. On the other hand, the decrease in women's employment rate in post-communist times, may cause mother's selection into working, so that the cost of being a mother would eventually be not that high. Moreover, the high value of motherhood and family that exists in Polish society (Pascall and Kwak, 2005) may additionally decrease the

negative effect of children, since working mothers may be treated differently from their childless colleagues (i.e. employers may demand less from them offering at the same time equal wages). In consequence, the investigation of the motherhood penalty in post-transition times in Poland is important and interesting issue, since little can be inferred based on the presumptions.

Despite the fact that the study differs both in terms of geographical placement as well as the time period considered, its results might be well compared with the findings of Western economies. This is because the analyses that investigate the motherhood penalty in Western economies are mostly based on long panel datasets, which are observed mainly in the 1960s-1980s time period. The fact that during that time gender equality and family-oriented policies in Western economies were not given as much attention as nowadays, provides an excellent benchmark for the comparison with the present situation of Polish women.

The actual estimation of the motherhood penalty applied in this study is based on several econometrics methods. The empirical analysis is conducted with the use of the dataset on Polish households and individuals called: *Social Diagnosis 2000-2009 – Objective and Subjective Quality of Life in Poland.* Due to the lack of information on wages in 2000, four years of data collection are considered: 2003, 2005, 2007, 2009. The estimation strategy is primarily motivated by the selection problems that arise in the wage equations: selection into the motherhood and selection into working. Consequently, I firstly use two standard methods in the motherhood penalty research: the OLS and fixed effects estimations. I start with the OLS model knowing that it suffers from potential endogeneity bias. Then I correct for unobserved time invariant differences between mothers and non-mothers with the use of fixed effects estimation. Secondly, I implement a novel approach of dealing with the motherhood selection bias. In particular, I estimate the average treatment effect on the treated using a matched sample of treated (mothers) and controls (non-mothers). I first apply a cross-

sectional matching procedure in the time of the treatment and compare the wage level of mothers (in each year) with that of their matched childless analogues. Then, I take advantage of my dataset in which the individuals are observed in the successive years. As a result, I perform matching on pre-motherhood characteristics, i.e. in the time when motherhood in not yet a certain event. Moreover, I deal with the selection that takes place on unobservable characteristics and estimate the fixed effects model on a matched sample. I provide the estimates from matching based on pre-motherhood characteristics both for the effect of having at least one child and the effect of the first child. In addition I try to answer the question of what kinds of women, i.e. with how many children and of what age, carry the highest cost of motherhood. I thus estimate the OLS and fixed effects models with the detailed vector of the number of the children (one child, two children, three children and more) as well as by the age groups of children. Finally, I try to assess whether mother's selection into working has implications on the estimated effects. In order to do that, I apply the bounding estimation of Lee (2009) and provide the bounds of the estimated effects. The advantage of this method is that it does not require any exclusion restriction, which is needed for most commonly used Heckman sample selection correction (Heckman, 1979).

The findings in general suggest that the motherhood penalty that occurs in the form of lower wages of mothers does exist in Poland. The OLS estimation provides a small negative effect of having at least one child of around 4%. The finding is additionally confirmed by the average treatment effect from the cross sectional matching, which suggests that the method does not account for the bias present in OLS estimators. The fixed effects model, which eliminates the time invariant unmeasured heterogeneity of mothers and non-mothers, results in a much more negative effect of 13%. The fact that the estimate from the fixed effects model is higher indicates a positive selection on unobservables: those women who have larger potential to earn higher wages are more likely to be mothers. The average treatment effects

from the matching performed on pre-motherhood characteristics yield similar results to the fixed effects model. The OLS regression on matched sample provides a high negative effect of 22%, but it is eventually driven down to 13% by the elimination of unobserved time-invariant components. I thus conclude that both the matching in the time of the treatment and OLS, similarly to matching on pre-motherhood characteristics and fixed effects, provide consistent results.

A closer look into which mothers bear the highest cost of motherhood reveals that there is little difference in the effect between the number of children. The estimations that provide the effect of having an additional child yield 2% and 9% for OLS and fixed effects, respectively. The models that account for the exact number of children suggest that the main difference in the effect occurs when a woman has three children or more. The effects of having one and two children tend to converge (6% for OLS 16-20% for FE). Not surprisingly, the findings also indicate that women of pre-school aged children bear the highest cost of the motherhood.

The estimation of the bounds that considers the differences in the employment rates of mothers and non-mothers suggests that the estimated effect that accounts for motherhood selection based on both observables and unobservables (-13%) meets the upper bound. Therefore, I conclude that the estimated effects rather represent the best scenario. If the mothers' selection could be accounted for, we would expect to find even more negative effects. The fact that the effects are likely to be placed close to the upper bound indicates positive selection into working: women who earn higher wages are more likely to remain in the labor market once they become mothers.

The study is structured as follows. The next two chapters provide theoretical relevance for the motherhood penalty estimation. In particular, in chapter one existing theories on the motherhood penalty are presented together with the empirical findings that support them.

Chapter two discusses the evolution of family benefits in Poland from the communist until recent times. Moreover, an analysis of the implications of post-communist changes in the functioning of the economy for the motherhood penalty existence is provided. Chapter three presents the data used in the empirical analysis together with a detailed description of the transformations performed in order to obtain the relevant explanatory variables. Next, the detailed estimation strategy is described. Finally, chapter six reports the main findings and their interpretations and chapter seven concludes.

1. Theories on the motherhood penalty

The increasing female labor participation rate in the US, which has gradually evolved since the 1950s, has made many researchers interested in investigating women's position in the labor market. Consequently, the hypothesis that women, who were originally taking care of children and the household, due to their family responsibilities may earn lower wages, started being investigated both in sociological and economics research. In general, past literature suggests that there exist at least five possible explanations for the negative relation between motherhood and wages. The motherhood penalty has been thus explained by: 1) human capital theory, 2) compensating differential theory, 3) work-effort theory, 4) discrimination-based theories, 5) spurious correlation hypothesis. In the following subsections I will discuss each of theory in turn and analyze the evidence for its relevance found in the previous research.

1.1. Human Capital Theory

Human capital theory (Becker, 1964) as an explanation of the motherhood penalty is perhaps most widely used in empirical studies on that issue. According to the human capital model, the difference in the wages between mothers and non-mothers occurs due to the lost experience and career interruptions resulting from the child's presence. A woman who gives birth to a child usually stays at home to take care of the newly born child and thus breaks her career, which leads to lower experience accumulation and consequently to lower wages.[3]

Lost human capital indeed has been found to be an important factor of the motherhood penalty. However, various studies show a different size of the effect of the lost experience on

[3] The maternity leave after giving birth to a child differs among the countries. Albeit, recently the EU agreed to establish a minimal maternity leave of 20 weeks in the EU countries. The minimal career break to which European women are formally entitled is thus app. 5 months, which is a considerable time period. It is also worth noting that the parental leave for men is optional and lasts for at most two weeks (European Parliament Press Service, October 20th, 2010; available at: http://www.europarl.europa.eu/en/pressroom/content/20101020IPR88388/html/Extending-maternity-leave-to-20-weeks-with-full-pay).

the women's earnings. Budig and England (2001), using fixed effects estimation, show that after controlling for actual experience, the wage gap between mothers and non-mothers narrows by approximately one third. Similarly, Gangl and Zielfe (2009) find a motherhood penalty resulting from the lost human capital to account for one quarter of the total effect and Simonsen and Skipper (2006) for approximately three-quarters. On the other hand, Hill (1979) reports that after controlling for experience the gap completely disappears. In contrast, Korenman and Neumark (1992) find no significant difference between motherhood penalties if the experience controls are added.[4] The different results occurring in various studies follow presumably from the data inconsistencies and dissimilarities of the analyzed economies and time periods. Still, besides the extreme findings of Hill and Korenman and Neumark, most of the studies agree that the lost experience may account for a sizeable part of the motherhood penalty. However, as Baum (2003) shows, the negative effect of work interruption is temporary and is entirely eliminated after the second year of returning to work. In addition, Baum as well as Gangl and Ziefle (2009) also shows that remaining or returning to the same employer after the maternity leave results in a smaller penalty in wages.

Human capital theory, however, is not only associated with the lost experience. The motherhood penalty in the framework of human capital theory may be also considered in terms of human capital depreciation during the career breaks which relate to the child rearing. As suggested by Polachek (1981), women optimize their lifetime earnings and tend to choose jobs which, during the time out of the labor market are depreciating their human capital at a low rate. However, the effect of human capital depreciation on the wages of women who have children is rarely considered in the empirical studies. Albeit, there exist some evidence that a

[4] The result may be driven by the short time period analyzed, since authors use fixed effects estimation over two years 1980-1982. The period may be thus too short to capture the effect of motherhood on wages (Budig and England, 2001).

depreciation of the skills may indeed occur during the career breaks, (e.g. Nielsen et al., 2004).

1.2. Work effort theory – productivity approach

The work effort theory partially overlaps with the human capital theory. This approach concentrates on the productivity of the workers, so it might be linked to human capital theory, since less experienced workers are also considered to be less productive. However, the productivity approach based on Becker (1985) states that even when workers have equal human capital, there might exist a productivity differential between mothers and non-mothers. According to Becker, mothers may be less productive at work than non-mothers because they need to spend their energy and time on child-related activities and home production. The theory assumes that non-mothers spend more time out of paid work on leisure, which takes less energy than the child care and housework done by mothers. In addition, mothers may also "store" their energy, because they are experiencing a second shift in the form of family responsibilities and home production.

The productivity approach, due to its difficulties in measurement, is rarely considered in empirical studies. Yet some attempts have taken place: for example, Anderson et al. (2003) try to assess the productivity channel in the motherhood penalty by indirect analysis. They associate jobs requiring higher effort with the higher education needed to perform them. Therefore, they state that the motherhood penalty should be greater for higher educated women. The evidence found, stating that the highest motherhood penalty occurs among high school graduates, suggests that childcare does not influence the work effort of the mothers. However, they also report that younger children impose a higher effect on the wage penalty than older ones, which in turn is consistent with the productivity hypothesis. Nevertheless,

there is no formal direct proof that mothers exert less effort than non mothers in their workplace.

1.3. Discrimination theories

The difficulties with productivity measurement are also closely connected to discrimination theories. According to standard economics theory, discrimination occurs if workers with equal productivity are not paid equal wages for the same work. Therefore, in order to test whether employers tend to discriminate against mothers, one should control for productivity when estimating wage equations. Likewise, the discrimination of women having children may occur not only in the form of lower wages, but also in the form of the different treatment of mothers and non-mothers (e.g. promotion, placing mothers in less demanding jobs).

Economists tend to distinguish two types of discrimination: statistical and taste-based discrimination. Statistical discrimination involves productivity measurement. Since the cost to acquire information on potential employees is high (e.g. probation period and training program), employers tend to assess potential employees based on the average productivity they assume the workers have. If employers know that women who have children have on average lower productivity (but do not know the true productivity), they will offer them lower wages. Moreover, employers may also perceive young women as potential mothers and assume that their overall productivity is lower. Such discrimination is defined as sex discrimination (Budig and England, 2001) and is based on the assumptions of the expectation that most women will eventually become mothers. Moreover, sex discrimination tends to blur the difference between mothers and non-mothers, so that the gap between them diminishes. Eventually sex discrimination would be thus reflected in the gender wage gap. In contrast, the taste-based discrimination model assumes that employers have “taste” to discriminate a

particular group of potential employees. They do not make any assumptions about one's productivity, but simply dislike particular groups of workers.

In addition to economics, sociologists link discrimination against mothers with status characteristics theory. This theory states that the status characteristic is determined by the general beliefs which associate one status with greater worthiness and competence than another (Berger et al., 1977). In the framework of this theory motherhood is considered as a devaluated status. Consequently, mothers are given fewer opportunities in career development and are considered to lack the demanded competence.

The lack of appropriate productivity measures has forced many researches to leave it out of the analysis, admitting that discrimination may be reflected as an unmeasured residual effect. Until recently, the size of discrimination effect was thus unrevealed. The findings of Corell et al. (2007), however, indicate that mothers are systematically penalized in various dimensions of the hiring process, including their competence and the recommended starting salary. In addition, the authors find that male parents are not penalized, but rather in some aspects even benefit from their status. The study tests the status-based discrimination theory using an experimental setting based on the creation of pairs of application packages that differ only in the information revealing parenthood status. By the artificial creation of the applicants, they thus control for productivity. Moreover, the audit methodology is used to eliminate potential biases from the experiment (stemming from the fact that undergraduate students serve as the potential employers in the experimental setting). In general, their results suggest strong evidence for status-based discrimination and the presence of the motherhood penalty.

1.4. Compensating wage differentials

The fourth explanation of the motherhood penalty focuses on the compensating wage differential theory, which states that workers' compensation includes both pecuniary and non-pecuniary job aspects. The theory, when applied to motherhood, assumes that mothers are more willing to give up the pecuniary components of the compensation in return for a more family friendly work environment (non-pecuniary components). Family-friendly job characteristics include flexible working hours, part-time schedule, on-site daycare, telecommuting and limited travelling opportunities (Budig and Hodges, 2010).

The formal tests of this theory are based on the inclusion of job characteristics into the wage regression. The job characteristics considered are usually the sector of work (public, private), working hours, unionization, gender (occupational) segregation and irregular shifts. The most important factor of the family-friendly job characteristics is presumably part-time working schedule. Several studies have found that after controlling for a part-time job, the motherhood penalty is reduced (e.g. Anderson et. al, 2003; Woldfogel, 1997). There is also some evidence that the sector choice matters: private sector employment results in higher costs of being a mother (Nielsen et al., 2004). Still, the evidence is not clear, since the different estimation strategies show different results.[5]

In general however, the studies which include the wide range of job characteristics mentioned above find essentially no difference in the family gap size (e.g. Budig and England, 2001; Gangl and Ziefle, 2009). Consequently, the evidence found for this theory is rather weak and does not support its arguments.

[5] The same estimates provided by Simonsen and Skipper (2006) who use matching estimation however suggest, that the size of the motherhood penalty in public and private sectors is comparable and only slightly smaller for private sector employees.

1.5. Spurious correlation

The theories presented above discuss the presence of the motherhood penalty in terms of economic and social explanations. The following explanation in turn, concentrates on the estimation strategy and its implications. It says that it is possible that there is no casual relation between mothers' wages and children. The observed correlation might instead be due to the unobserved heterogeneity between mothers and non-mothers. The spurious effect may occur when unobserved characteristics like commitment to work, ambition and cognitive skills negatively affect wages and also raise fertility (or opposite). For example, women with less career ambition would exert less commitment to work, and thus their wage would be lower. At the same time such women may be more likely to have children, since they may see a child as a factor of their life satisfaction and personal success.

The individual unobserved characteristics that affect both wages and fertility decision would in general lead to biased cross-section estimates. The literature is thus extensively using either fixed-effects or first-difference panel data models, which allow for the elimination of time invariant unobserved heterogeneity, which have additive effects both on wages and motherhood. In addition, such methods also allow for the correction of the bias resulting from the selection to motherhood.

In general, previous research has shown a substantial reduction in the motherhood penalty when the fixed-effects model is used instead of the OLS estimation. Korenman and Neumark (1992) show that first-difference estimates do not support the results obtained from OLS estimation, and conclude that when accounting for unmeasured heterogeneity no effect of motherhood on wages is found. However, as already mentioned before, the time period considered by the authors may be too short to capture the negative effect on wages. In contrast, Waldfogel (1998) finds that first-difference and fixed-effects show no evidence of

significant heterogeneity bias in the estimation of the child's effect on women's wages. Similarly, Korenman and Neumark (1994) investigate siblings data and conclude that the motherhood penalty is not due to unobserved differences: they still find a motherhood penalty of 4 to 7 percent (depending on the independent variables included in the estimated equations).[6] Also other studies (e.g. Budig and England, 2001; Anderson et al., 2003) support the initial findings that controlling for unobserved heterogeneity indeed reduces the bias, but it does not explain the motherhood penalty existence completely.

In contrast, for some countries, e.g. Spain, Portugal, Ireland (Davies and Pierre, 2005) higher motherhood penalty is found when fixed effects estimation is used. These findings suggest a rather unexpected difference in the unobserved characteristics, that women with wage-enhancing characteristics are more likely to have children.

In general, the existing theories on why women who have children may earn lower wages do not fully explain the existing phenomena. Still, the studies that analyze the problem of the motherhood penalty show a substantial negative effect of children on women's wages, ranging from small penalties in Scandinavian countries, Belgium and France (0% and 1.5%; Datta Gupta and Smith, 2002; Davies and Pierre, 2005), moderate negative effects in Denmark, Spain and Portugal (3% to 6.5%; Simonsen and Skipper, 2006; Nielsen et al., 2004; Davies and Pierre, 2005) as well as US (Walfogel, 1998) to high negative effects of children on women's wages found in UK and Germany (12 to 30% ; Davies and Pierre, 2005; Gangl and Ziefle, 2009).[7] In most of the studies, human capital theory is applied as a basic approach. Similarly, the fixed effect estimation, which corrects the estimates for the spurious

[6] However, the results should be considered with caution, since the approach assumes that female siblings are endowed with the same unmeasured characteristics, which is highly questionable.
[7] The results differ in the definition of the motherhood penalty, e.g. the effect of at least one child (motherhood in general), one child, two or three or more children.

correlation hypothesis, is also considered to be a standard estimation strategy in motherhood research. Moreover, the inclusion of a wide range of job characteristics, especially part-time working schedule, is also regarded to be important in the estimation strategy. Not surprisingly, little attention is paid to discrimination and work-effort theories due to the lack of proper productivity measurement. Nevertheless, the existing theories on the motherhood penalty provide background for the model specification; in particular, they justify the inclusion of specific explanatory variables in the wage equations.

2. Family benefits in Poland – their historical and cultural evolution and implications on the motherhood penalty

The country of my research, Poland, makes the study distinct from previous research, which were mainly done for Western economies. The uniqueness of the analysis is related both to Poland itself and to the fact that it is one of the post-communist countries that underwent the transition to the market economy only about 20 years ago.

Poland's transition to the market economy brought many changes, which were highly visible not only regarding the changing functioning of the economy and politics of the country, but also the living standards and growing inequality in the society. The rapid rise in women's unemployment, hyperinflation and still low wages put many women in miserable living conditions and poverty (Pascall and Kwak, 2005). In addition, negative changes in the form and availability of family policies and child care establishments took place. The recent history of Poland is thus of particular matter for the analysis of the effect of children on women's wages.

In this chapter I will analyze both the communist and present family policies and the implications of the post-transition changes regarding women's position in the labor market. In addition, I will demonstrate that not only recent history of the country, but also exceptionality of highly religious Polish society, that pays special attention to the role of the family and motherhood, have important implications on the cost of motherhood in Poland.

2.1. Family benefits in Poland under communism

In communist economies female employment rates were very high, since the system assumed to activate the whole national labor force. Therefore, unemployment was officially not

existing (Cerami, 2006).[8] In addition to the communist ideology of full employment, the low wages created a need for a second salary in the household, which essentially meant that women were forced to work (Zimmermman, 2010). Yet, the communist policy of full employment and low wages coexisted with the traditional model of the family. The communist attempts to incorporate women into the active labor force went thus hand in hand with social benefits which were aimed to ease women's double responsibilities. As Tarasiewicz (1991) writes: "Low wages became a kind of substitute for social welfare" and Pascall and Kwak: "an expanded system of social services (…) compensated for the low wage level". The extensive system of social benefits provided by the state did not however release women from the burden of paid work and households activities. As Cerami (2006) states, it rather resulted in additional responsibilities of women and the introduction of the three-fold status of citizens-workers-mothers. Therefore, women in the communist countries were facing a double burden or a second shift, since they were both workers, mothers and home makers (Pascall and Kwak, 2005, pp.17-18).

Moreover, the double burden of women in their responsibilities might have been even more severe as regards Polish women. Family and motherhood have always been highly valued by the Polish society and has a special attention in Polish culture. It is to some extent due to the highly religious society and the doctrine of the Roman Catholic Church. Importantly, the role of the family and its traditional division of work and relationships were not undermined during the communist times, but even strengthened. The special attention paid to the role of the family is reflected in the Polish Constitution of 1952 (Article 79) as well as in the new Constitution of 1997 (Article 18 and 71), (Pascall and Kwak, 2005).[9]

[8] Pascall and Kwak (2005) report the women's employment rate at the time of the transition to market economy in Poland to be around 70%.
[9] For the exact statements of the Articles see Pascall and Kwak (2005), pp. 70.

Under the communism, family and social benefits constituted thus an inseparable part of the state functioning. As noted by Fodor and Glass (2007), family policies were a central part of the social engineering project, and in many aspects they were universal for all communist countries (e.g. pro-natalist goals). Still, the main aim of the family policies was, to enable women to meet their responsibilities of both paid and unpaid work.

The modest literature on family benefits available in Poland under the communism does not explicitly say what kind of benefits (the length of maternity leave, etc.) the families/women were entitled to. The general discussion of the policies (e.g. Fodor et al. (2002), Fodor and Glass (2007), Carami (2006)) provides information on family benefits under communism as: "extensive system of family benefits", "generous maternity leave", "state subsidies for child rearing", "subsidized childcare". The most accurate description of the evolution of family policies from 1970's is provided by Pascall and Kwak (2005) based on Balcerzak-Paradowska (1995). The available benefits have been divided by the authors into three groups: 1) benefits for parents (mainly mothers, only in 1984 was paternity leave introduced), 2) services for children, 3) help for families. A detailed description of those benefits is presented in Table 1.[10] It is also worth noting that during communism women could claim benefits on the basis of their employment.[11]

On the other hand, not only the family benefits and allowances are important for women who are expecting to have a child. At the other end, there is availability of the abortion. Under communism the abortion legislation law that was introduced in 1956 was considered as liberal, since it included the possibility of abortion when the living conditions of a woman are miserable (Nowicka, 2001). This liberal law was, however, changed after the collapse of

[10] Table 1 as well as all successive tables referred to in the main text are presented in section Tables (pp. 57).
[11] Similarly to Romania, but contrary to Hungary, where the basis for entitlement was universal. The distinct basis for the entitlement however did not make much difference due to the communist's full employment policy (Fodor et al., 2002).

communism, and since 1997 legal abortion is available only under special circumstances.[12] It is therefore worth noting that whereas during communism women had a right to terminate the pregnancy, nowadays this opportunity is much more restricted.

2.2. Family benefits in Poland after 1989

With the transition to the market economy women's employment rate started to fall across all post-communist countries. With the beginning of the collapse of communism (1988) the employment rate of Polish women was still relatively high at 64.1% (employment rate of women aged 15-64). But by 2001 this decreased to 48.4%, by 2006 even to 40.4% and in 2009 to 43.3% (Labor Force Survey, 2001, 2003, 2006).[13] At the same time female employment rate in European Union (EU15) amounted to 63.4% in 2000 and 65% in 2009 (EU25), (Labor Force Survey; Eurostat).

Moreover, together with the economic and political shifts, changes in the provision of social and family benefits took place. Fodor and Glass (2007) state that the emerging policy regime in Poland after the transition might be referred to as *"private maternalism"*, which is characterized by the reduction of public support and increasing privatization of care work in the family. This means that the changes in the family benefits provision has forced many women either to drop out of the labor market and depend on their husband or to rely on the paid care work or on family members, e.g. grandmothers.

The most important changes the transition brought as regards the family benefits is perhaps the means-tested eligibility criteria. The decreasing level of the entitled to receive family

[12] Abortion is available on a legal basis under three circumstances: 1) when it is dangerous for the life of the woman; 2) when it is dangerous for the embryo; 3) when the pregnancy is a result of crime (rape). In general, abortion in Poland is considered to be a very controversial issue, both by the society and the political parties (Nowicka, 2001).

[13] Not in all of the Central European countries female employment rate was that low. Although, female employment rate in Hungary was similarly low to Poland (e.g. in 2000 49.7%), in the Czech Republic it was much higher - 60.7% (employment rate of women aged 15-59; Fultz et al., 2003).

benefits was mainly caused by the fiscal pressures to cut governmental expenditure.[14] In addition, the declining level of fertility rates caused a shift of social benefits towards larger families in order to encourage their formulation. Moreover, the decentralization of child-care establishments was introduced, which essentially meant that the functioning and financing of such establishments as crèches and kindergartens were transferred from state to local authorities. As a consequence, many of those establishments, in particular crèches and kindergartens were closed, since the local authorities' capacity could not afford to support them. Moreover, the crèches and kindergartens which used to be maintained by the workplaces were also closed (Pascall and Kwak, 2005). The emerging private sector partially has taken over the former state role of family services establishments (*private maternalism*), but still the state is the main provider of family benefits in post-communist time in Poland. Hence, the fall of communism has introduced mainly unfavorable changes regarding family benefits and child-care provision. In Table 2 I additionally present a detailed evolution of the maternity leave benefit available for the Polish families from the transition times until now. In general, the length of the maternity leave tends to be extending over that time. Moreover, just recently (1st January 2010) the paternity leave for fathers has been additionally introduced.

In addition to maternity leave benefit parents are entitled to the following family benefits (Balcerzak – Paradowska, 2003):

1. Child care benefits – in case of the closure of family service establishment, illness, childbirth both parents are entitled to take leave from work up to 60 days per year with 80% coverage of their remuneration.
2. Child raising leave and allowance – continuation of maternity leave, but not paid. Its possible duration is up to three years. During the child raising leave the allowance

[14] Due to the increasing poverty and in consequence financial pressures, the government decided to cut the expenses on family benefits. The decision might have been additionally influenced by the fact that gender issues were not of high priority of any of the post-communist governments in Poland (Balcerzak-Paradowska, 2003).

might be granted on the basis of the average earnings from last 6 working months (the average earnings must be lower than the predefined amount).

3. Family allowance – monthly allowance granted on the basis of the family's monthly income.
4. Benefits from the alimony fund – provided to parents who are not able to collect the alimony imposed by court and who satisfy income criteria.
5. Benefits for pregnant women and women raising children.
6. Tax relief on children – granted based on the age of the children; the amount of tax relief is subject to the number of children and a pre-specified amount equal to the double sum of tax-free income.

Since most benefits are granted on the basis of the monthly income of the family, they are not accessible for all families. Consequently, a sharp decline in the governmental spending on those benefits (from 1.7 percent of GDP to 1.1 in 1990-98), as well as in the percentage of the family benefits in households' budget (from 3.8 percent to 1.4 percent in 1939-1999) is observed, (Fultz et al., 2003). Moreover, the introduction of means-tested eligibility criteria might have raised low paid women's incentives to drop from the labor market. Fultz and Steinhilbe (2003) call attention to the fact that the difference in the child raising benefits and minimum wage is relatively small, that makes many (especially low skilled) women to give up their paid jobs and stay dependent on the state. Moreover, high restrictions on the benefits claim together with the emergence of *"private maternalism"* certainly cause serious problems for Polish mothers to balance the paid work with family and child rearing responsibilities.

2.3. Implications of the transition changes as regards family benefits and Polish culture on the motherhood penalty in Poland

The changes in the family benefits provision and the availability of child-care establishments have important implications for the possible size of the motherhood penalty in Poland.

Moreover, the direction in which family benefits have evolved is also important regarding the comparison of the result with those of previous studies.

In general, the policies that are based on the reduction in the provision of the benefits and limited assistance in enhancing balance between child rearing and paid jobs, might have caused some women to leave the labor market and stay at home. Such policies are referred to as "refamilialization" policies, as opposed to "defamilialization" policies, which aim to balance the work and family (Saxonberg and Szelewa, 2007). As Saxonberg and Szelewa note, "defamilialization" policies can be seen nowadays among the Western EU countries. They also state that if the communist countries chose to move towards those policies they could have taken the leadership in their promotion. Therefore, the communist family policies are considered as being much ahead of the Western family policies of those times (Pascall and Kwak, 2005). After the collapse of communist, transition countries have, however, shifted towards lower provision of family benefits, whereas Western economies moved towards greater gender equality and enhancing women's participation in the labor market. This fact indicates that although the economies have experienced different history paths, the results regarding the motherhood penalty in a post-communist period may be well compared with already existing studies of Western countries. This is because most of the studies analyzing cost of motherhood in Western economies are based on long panel datasets, which do not cover times of greater gender equality promotion (1960s-1980s).

The changes after the transition concerning childcare and family benefits have several implications for the potential cost of motherhood in Poland. First of all, the closure of family service establishments and the means-tested eligibility criteria might have induced mothers to stay at home to take care of children. As a result, the employment rate of women has declined, that suggests the possibility of mothers' high selection into working. Moreover, the strict eligibility criteria together with the overall decrease in employment might have also led to

many families being unable to afford to have children. In addition, the movement towards "refamilialization" policies, which do not encourage women to balance working and child rearing activities, implies that Polish women may face high costs of being working mother. Also, strict abortion law might additionally increased the cost of motherhood, since some women may not be able to afford a child.

On the other hand, the decrease in the fertility rates and the increase in the age of women having their first child implies that working women who decide to have a child might have already established their position in the labor market, in the form of higher experience accumulation, and in consequence may face a lower penalty of their motherhood.[15] What is more, the unique attitude towards family and motherhood in Polish society may decrease the cost of motherhood, because women with small children may be treated differently from their childless colleagues (i.e. in more understanding way). Consequently, the investigation of the motherhood penalty in the post transition period in Poland is an important and interesting issue, since little can be inferred based on the presumptions.

An interesting point would be to compare the size of the motherhood penalty during the communist times or early transition and more recent times. However, due to the data unavailability little can be done on that. I will thus investigate the magnitude of the motherhood penalty, i.e. the effect of children on women's wages, in Poland in the recent times (2003-2009) and expect to find a similar, if not higher, effect to Western countries.

[15] In the middle 1990 the average age of giving birth to child was app. 23, in 2000 - 24.54, in 2005 - 25.74 and in 2008- 26.02, (*Sytuacja Demograficzna Polski, Raport 2008-2009, Main Statistical Office,* GUS, 2009).

3. Dataset

The data used in the analysis come from the dataset on Polish households and individuals called *Social Diagnosis 2000-2009 – Objective and Subjective Quality of Life in Poland*.[16] The dataset consists of observations on five years: 2000, 2003, 2005, 2007 and 2009. It has a panel structure of the data both at the household and individual level (the so-called panel sample of households and panel sample of persons). The sampling assumes that all the households (individuals) from the previous year will be followed successive years and in addition each year new set of households will be included (each year the number of the new households differs). Since some of the households (individuals) drop from the sample and new households (individuals) are additionally selected each year, the dataset in consequence forms an unbalanced panel. The total number of the interviewed households and individuals, as well as females and mothers, is shown in Table 3. From the table it is apparent that the number of the households and individuals is increasing each year, e.g. in 2003 there were 6 625 individual respondents, whereas in 2009 almost four times as many, 26 178. However, the percentage of the sample which is interviewed successive years is relatively high; in case of individual observations it ranges around 60 percent.[17]

For the empirical analysis below I use the data on individuals who are defined as the members of the household who are at least 16 years old. I further restrict the sample to women aged 18-40. The lower age bound is chosen following Simonsen and Skipper (2006), who choose it in order to exclude those individuals who are between two types of their educational level (e.g. high school and university). Moreover, both the lower and upper age bounds are justified by

[16] *Diagnoza Społeczna 2000-2009 - Warunki i Jakość Życia Polaków*
[17] It has to be noted, that not only the individuals from previous year are followed but also from earlier years, therefore the total percentage of repeated observations is higher.

woman's fertility period.[18] Importantly for the empirical analysis, the measure on personal net monthly income from paid work (measured in 2005 prices) is available only from 2003. This essentially means, that the time period used by me is shortened to 2003-2009. In consequence, I use a sample of 12 911 individuals-years (5 115 women observed in different years), out of which 5 307 are mothers and 7 604 are non-mothers.

The status of motherhood is not directly identified in the dataset. Therefore I recognize this measure based on the type of the household and the questions referring to the personal feelings on one's children. The type of the household includes the following:

- Married without children
- Married with 1 child
- Married with 2 children
- Married with 3 and more children
- Not complete family (e.g. single mother with children)
- Multiple family (e.g. several generations)
- Not family and single (household consisting of 1 person)
- Not family and living together

Then I analyze several questions referring to the individual's feeling on children, e.g.:

- *During the last months did you feel you lose the control over your children?*
- *During the last months did you have to listen complaints about your children (from the neighbors, school, other parents)?*

[18] The analysis has been conducted also for the sample of women aged 24-40, in order to exclude university students. The results do not differ much: the difference in the estimates ranges from 0 to 2 percent, i.e. the negative effects found for the sample aged 24-40 are approximately 0-2% lower (in absolute value) than the effects obtained from the sample of women aged 18-40. The study presents the results based on the sample of women aged 18-40 due to the larger sample size and higher significance level of the results. Moreover, the results are sensitive to the upper age bound; when the sample of women aged 18-50 is considered, much lower effects are found.

- *How much are you satisfied with your children?*

Those questions allow for the answer *not applicable,* which means that the interviewed person does not have dependent children. Finally, I cross-check above answers with the type of the household and identify whether the individual has children or not (variable *Children*).

I next identify those household members who are children in order to obtain the age of the child one has. To do so I use the measure on the relationship with the head of the family (i.e. son/daughter) and define the age of the youngest, second, third, and other children. For the multiple family households, I can however identify only the child of the first generation (or put it differently, the child of the head of the family and the head of the household).[19] Similarly, the number of children was obtained from the age of children and the type of the household introduced above. The summary statistics on those measures as well as other variables are shown in Table 4. As already pointed, the sample consists of 12 911 women, out of which 41.1% have children. The majority of women have either one or two children - 14% and 17% respectively. The highest number of children is in their age of 7 to 12 (18.26%) and younger (0 to 3 – 11% and 3 to 7- 14.49%).

The simple comparison of the subsamples of mothers and non-mothers is presented in Table 6. Several interesting findings can be inferred from this table. Firstly, there are significant differences among the characteristics of two groups: mothers are older, less educated and tend to live in the small cities or villages if compared with non-mothers. Secondly, significantly more mothers work part time. However, the most interesting patterns occur as regards the employment and wages. The mean wages of mothers and non-mothers are comparable, and only slightly higher for mothers. The difference is however not statistically different from zero. The observed percentage of working women is higher for mothers (64.85%) than for

[19] This is because the observations could only be sorted by the household's id number. Since the id of the family is not provided I could not establish who is whose child in the multiple family household, except for the first generation.

non-mothers (49.54%); the difference between them is statistically significant (t-Statistics equals to -17.07). The proportion of working women represents, however, the ratio of the working women to all women. This measure is misleading, since all women include studying, and thus not working, individuals. Since mothers tend to be older and less educated, non-mothers are more likely to be still studying (in the university). In consequence the percentage of working non-mothers is lower than the percentage of working mothers. When the studying individuals are considered as inactive, the situation changes. The employment rates of mothers and non-mothers equal to 58.13% and 64.07%, respectively. The fact that more non-mothers are actually working has important implications on the estimation strategy used to account for the effect of children on women's wages. It is interesting to know whether women who become mothers differ in their employment status before and after giving birth to a child. The data regarding that issue are shown in Table 5. Surprisingly the inflows (from unemployment into employment) and outflows (from employment into unemployment) are rather balanced. This suggest that women who are working are comparably likely to remain out of the labor market when they become mothers as are not working women to enter the labor market once they are mothers. It is not surprising that some women drop out of the labor market once they are mothers. The high percentage of women who actually start working when they become mothers is however striking and may suggest that some women cannot afford not to work when the child is present. The problem of the selection into working is further discussed in the next chapter that presents the problems involved in the estimations and methods used.

4. Methodology – estimation strategy

The estimation of the motherhood penalty carries the problem of two selection processes:

1. selection to the motherhood;
2. selection into employment.

Undoubtedly, women tend to select themselves into the motherhood, since not all the women decide to have children. The decision whether to have a child might be caused by several factors including unobserved characteristics that might be correlated with the wage rate (e.g. career-orientation: a woman who is more career oriented cares more about her professional career; in consequence she might be more likely to earn higher wages and postpone the decision of having children). Women's selection into employment in turn is considered as a key problem in the applied labor economics research. In the present setting the selection into employment is subject not only to women but also to their parental status, i.e. the problem occurs when the sample of working mothers is non-random. The problem of women's selection into the working has been tried to be overcome with the Heckit procedure due to Heckman (1976, 1979). Although the idea of Heckman correction is very clear, it is however hardly used because of its assumptions: the approach requires an exclusion restriction, i.e. the variable that affects selection (is correlated with the employment) but does not have the effect on the outcome variable (is uncorrelated with wages). Both the problem of the selection into the working and motherhood might be dealt with the Heckman procedure as long as there is an appropriate exclusion criteria.[20]

[20] Simonsen and Skipper (2004) as an exclusion criteria for the motherhood selection use the number of siblings a woman has. They provide evidence that the variable is correlated with the motherhood decision. Additionally, they claim, that the number of siblings might by only indirectly influencing the wage level, through the education. Consequently, conditional on the information on the education, the number of siblings should be uncorrelated with the error term in the wage equation.

The present study does not apply Heckman selectivity correction due to the insufficient information provided by the dataset (in case of the motherhood selection) and lack of an appropriate exclusion restriction (in case of working selection). Consequently, I start the investigation of the motherhood penalty with the use of the OLS estimation knowing that it carries substantial bias stemming from the selection processes. I then proceed with the fixed effects estimation that allows to deal with the bias of the motherhood selection that is based on unobservable characteristics. Thirdly, I introduce matching procedure and estimate the average treatment effect on the treated regarding the dataset both as a cross section and panel data. Finally, I try to correct my estimates for the selection into employment. To do so I use the approach of Lee (2009) and estimate the bounds (upper and lower) of the effect that take into account the excess proportion of non-mothers that are working when compared with mothers. Below I will discuss each of the methodology used by me in turn.

4.1. The OLS and Fixed Effects estimations

The problem of two selection processes discussed above makes the simple estimation of the motherhood penalty with the use of ordinary least squares, OLS, biased. On the one hand only women who earn sufficiently high wages (whose wage is above the reservation wage) will actively participate in the labor market. On the other hand, some women may be willing to give up their job when they become mothers. The estimation with the use of the OLS would still carry valuable information on the size of the motherhood penalty if the sign of the bias can be establish. However, the sign of the bias is ambiguous: it is not clear which mothers tend to give up their paid job for the home making and child-related activities. Moreover, the selection into motherhood makes it even more complicated. Firstly, among working women those women who have children may be less career-oriented, and thus earn lower wages, than the childless one. Secondly, however, those women who achieve professional success (career-

oriented) might be more likely to achieve personal success in the form of the family (the husband and children) as well.

Nevertheless, the foundation of the motherhood penalty research forms the OLS estimation: e.g. Hill (1979), Moore and Wilson (1982), Waldfogel (1995), and most of those empirical studies find significant motherhood penalties. Such estimation formulates a starting point and provides a benchmark for the comparison with the fixed effects results that account for the unobserved heterogeneity of mothers and non-mothers.

As a result, the following equation is being estimated:

$$ln(wage)_{it} = \beta_1 + \beta_2(children)_{it} + \beta_3(married)_{it} + \beta_4(divorced)_{it} + \sum_{i=5}^{k}(human\ capital\ controls)_{it} + \sum_{k+1}^{l}(job\ characteristics\ controls)_{it} + \sum_{l+1}^{m}(HH's\ resources)_{it} + v_{it}.$$ [21]

The parameter of interest, indicating the motherhood penalty defined as the decline in wages from having at least one child, is β_2. The effect of children on women's wages is obtained gradually by the inclusion of successive control variables. I begin with the simple model of three right hand side variables: a dummy variable equal to 1 if the woman has at least one child and dummy variables indicating marriage (relationship) and divorce.[22] The selection of successive control variables is dictated by the existing theories on the motherhood penalties discussed in Chapter 1. Therefore, the following groups of control variables are added: human capital controls (human capital theory), job characteristics controls (compensating wage differentials theory) and households' resources controls (work effort theory). In addition, in all of the equations year fixed effects are included. Human capital controls include 4 levels of

[21] The OLS models additionally include controls for the size of the place of residence.
[22] The simplest model's specification includes additionally year fixed effects that are also present in all further model's specifications.

education (*University*, *Bachelor and Secondary*, *High School*, *Vocational training*; the omitted category is *Primary school and no less*), potential experience and potential experience squared.[23] Job characteristics control for part-time working schedule, sector of work (private, public) and occupation.[24] The households' resources involve dummy variable indicating multiple family household and the measure of husband's earnings, since it might be expected that higher number of household's members may decrease women's cost of having a child (e.g. *free* child care provided by the grandmother) and higher husbands earnings may assure the provision of paid child-care and no need for second salary. On the other hand, higher number of households' members might increase the cost of the mother, since she might additionally take care of older members in the household. Similarly, husband who has higher salary may contribute less to home responsibilities making women exert more effort (work-effort theory), (Andersen et al., 2003).

Next, the above equation is estimated taking into account the number of children a woman has *(Specification II).* The dummy variable *Children* is thus replaced with the total number of children *(No. children)*. Further, following Budig and England (2001) and Korenman and Neumark (1992), I investigate the possibility of non-linear relationship and decompose the total number of children into 3 dummy variables: *One child*, *Two children, Three and more children; (Specification III).* Since, it might be expected that the highest penalty occurs among mothers with very small children, I also estimate the equations with the detailed vector of total number of children variable that consists of 3 age groups: the youngest children (age 0

[23] Five educational groups are defined as follows: *Primary and less* – completed or uncompleted primary school education and no education; *High school* – completed high school education or secondary vocational education; *Vocational training* – completed vocational school (without secondary school certificate); *Bachelor and secondary* – bachelor degree or completed post-secondary education; *University* – master or higher degree obtained.

[24] Occupational dummies are defined from the occupational codes and combined in larger groups. In consequence 9 occupational dummies are defined: *Business* (managerial and business occupations), *Health* (health and associate professions), *Technical* (technical and associate professions), *Teaching* (teaching and social work professions), *Administration* (administration and associate professions, legislation, clerks), *Services*, *Elementary* (elementary occupations and assemblers), *Agriculture*, *Other* (not listed). In the estimated equations the omitted group is *Agriculture.*

to 3), pre-school age children (age 3 to 7), school age and older children (age 7 and more); *(Specification IV).*

As already discussed the OLS method would be biased if the selection into working takes place and the selection into motherhood is caused by other unobserved characteristics that differ among mothers and non-mothers (e.g. career-orientation). Therefore, in order to reduce the bias stemming from unobserved heterogeneity, I proceed with the estimation of the fixed effects model. Fixed effects model allows to correct not only for the selection into the motherhood based on unobservable characteristics, but also for the possibility of a spurious correlation between motherhood and wages discussed in Chapter 1. The fixed effects model would thus eliminate the time invariant unmeasured heterogeneity between mothers and non-mothers. Since assuming that the decision of giving birth to a child is non-random, there are differences in those women who decide to become mothers and those who not. This unmeasured individual effect, a_i that is correlated with the variable of interest (e.g. *children*), is represented in the error term which now takes the form of: $v_{it} = a_i + u_{it}$. The fixed effects estimation will thus capture the heterogeneity bias present in the OLS estimation. The time-invariant unobserved characteristics may include individual perception and life plans, taste for affluence, life model instilled by the family in the early years and other unmeasured human capital (Budig and England, 2001). However, there might be also unmeasured time-varying components, which will not be accounted for by the fixed effects model. Such unmeasured time-varying components could include women's changing attitude towards having children that is dictated by her fertility period or changing attitude towards employment caused by motherhood.

Similarly to the OLS estimation, the fixed effects model is also performed by the successive inclusion of the control variables and the estimation of four specifications discussed above.

4.2. The estimation of the average treatment effects on a matched sample

The OLS and fixed effects estimations presented in previous subsection serve as the basic tools in the motherhood penalty research. The OLS estimation requires least on the dataset but provides biased estimates. The fixed effects model in turn deals with the unobserved heterogeneity of mothers and non-mothers but requires a rich dataset of panel data (i.e. there has to be enough *switchers* – women who become mothers).

The matching procedure in turn is a new approach that has been just recently introduced in the motherhood penalty research. The two studies of Simonsen and Skipper (2004, 2006) are the first that present the matching procedure and provide estimates of direct and indirect effects of motherhood on women's wages.[25] The same methodology is also used by Nivorozhkina and Nivorozhkin (2008) who provide an identical analysis for Russia. All of those studies use cross-sectional matching estimator, because of the dataset's structure. The dataset used in this study is different, since some of the observations are also observed in the successive years. The advantage of my dataset is that I have information on the pre-treatment characteristics. As a result, I provide the matching estimators regarding the sample both as a pooled cross-section and panel data, decreasing the bias, arising from the motherhood selection by the construction of the matched comparison group.

In the next subsection I will briefly present the assumptions that are required in order to perform the matching procedure together with their relevance for the present setting. In subsection 4.2.2 I will discuss the details of the matching procedure applied when the treatment (motherhood) is already observed. In the next subsection I will describe the matching based on pre-motherhood characteristics, i.e. when the treatment is not yet a certain

[25] The first study provides more rigorous econometric framework of the estimation of the effects. The studies are based on Danish data and provide the estimate of a direct effect of -0.015 and indirect effect (through lost experience, child-related career breaks, etc.) of -0.065.

event. In both of the subsections I will also present detailed estimations, that are performed on the matched samples in order to estimate the average treatment effect on the treated.

4.2.1. An overview of cross-sectional matching procedure

The matching approach has developed from the evaluation literature that aims to identify the impact of the treatment (W_i) on the outcome (Y_i). In the present setup the treatment is being a mother, i.e. having at least one child, W_i=1, and the outcome variable is a logarithm of real net monthly wage. The goal, similarly to previous methods, is to compare two outcomes for the same individual once she is treated (mother) and not (non-mother). According to the fundamental problem of the evaluation literature, called by Holland (1986) the fundamental problem of causal inference, we can observe at most one of those outcomes, since the individual can be either treated or not, but not both. In this particular setting this means that we do not observe the outcome for the same woman with and without children in the same unit of time. Since both positions of the individuals are not observed, the econometric literature mainly focuses on the estimation of the average treatment effect (Imbens and Wooldridge, 2009):

$$\tau_{ATT} = E[Y_i(1) - Y_i(0) \mid W_i = 1] = E[Y_i(1) \mid W_i = 1] - E[Y_i(0) \mid W_i = 1].^{26}$$

The problem thus is to obtain the unobserved (counterfactual) mean outcome. The issue is proposed to be overcome with the use of the matching procedure, which conditioning on observables, $\boldsymbol{X}$, selects an *adequate* unobserved outcome using the outcomes of few nearest untreated persons. The *adequate* outcome is thus chosen so that to eliminate the observed differences between treated (mothers) and untreated (non-mothers). The matching based on

[26] Here the average treatment effect on the treated is considered since the goal is to compare wages of women who are actually mothers and those who are not, contrary to population average treatment effect that would reflect whether women who do not have children would be penalized in the form of lower wages if they had decided to become mothers.

observed characteristics may be performed as long as the following assumptions are satisfied (Simonsen and Skipper, 2004):

1) Conditional independence assumption (Rosenbaum and Rubin, 1983): $E[Y_i(0)|\boldsymbol{X}, W_i = 1] = E[Y_i(0)|\boldsymbol{X}, W_i = 0] = E[Y_i(0)|\boldsymbol{X}]$;
2) Common support assumption:
   $0 < \Pr(W_i = 1|\boldsymbol{X}) < 1$.[27]

The first assumption implies that conditioning on some observable characteristics the expected outcome of mothers if they had no children is the same as the expected outcome of non-mothers. The assumption will be met as long as women do not consider their motherhood in connection with wages. The second assumption in turn assures that there is a woman without the child that is comparable to each mother.

Conditioning on observable characteristics may cause problems when the dimension of the conditioning set is high. However, if the assumptions are satisfied, the dimension of the set of the conditioning covariates $\boldsymbol{X}$, may be reduced by the application of the propensity score, i.e. the conditional probability of being treated: $e(x) = \Pr(W_i = 1 \mid \boldsymbol{X})$; (Rosenbaum and Rubin, 1983). The propensity score is thus changing the conditional independence assumption to:

$$E[Y_i(0)|\, e(x), W_i = 1] = E[Y_i(0)|e(x), W_i = 0].$$

Finally, the above assumption together with the common support are the only assumptions required to perform propensity score matching to estimate average treatment effect on the treated (Heckman, Ichimura and Todd, 1998).

[27] As noted by Simonsen and Skipper (2004) these assumptions are weaker than the standard assumptions of *unconfoundedness* and *overlap (common support*), that are generally referred to as *strong ignorability* assumptions (Rosenbaum and Rubin, 1983). This is because the *ignorability* assumptions are generally strong when the parameter of interest is the average treatment effect on the treated.

Consequently, I perform two kinds of propensity score matching which differ by the time framework in which the matching is performed. I firstly consider the treatment as being a mother (i.e. having at least one child) and perform matching on the observed characteristics of mothers and non-mothers. This application of the matching approach does not, however, assure that the CIA assumption is met. Therefore, I further proceed with the matching based on pre-motherhood characteristics that include the wage rate observed before motherhood occurs and hence satisfies the CIA assumption.

4.2.2. Propensity score matching based on the observed characteristics of mothers and non-mothers

Since my dataset consists of observations on four years, I cannot simply apply the cross-sectional matching procedure (due to the possible time-specific effects). Therefore, I perform the procedure for each year separately and provide the estimate of the average treatment effect on the treated for the pooled treated and untreated subsamples. The treatment is defined as being a mother, i.e. having at least one child. In order to estimate the average treatment effect on the treated I hence perform the following steps:

1) Identify in each year *t*, *t* = 2003,2005,2007,2009, mothers (W_i=1) and non-mothers (W_i=0), where non-mothers are women who never become mothers in all of those years;
2) In each year estimate the propensity score by a probit model. Following Simonsen and Skipper (2006) I estimate the probit model of the form:

$$mother_i = \alpha_1 + \alpha_2 age + \alpha_3 age^2 + \sum_{i=4}^{k} type\ of\ education_i + \sum_{k+1}^{l} level\ of\ education_i + \sum_{l+1}^{m} place\ of\ residence_i + u_i$$

where the type of education includes eight specializations: *Mathematical and Technical*, *Services*, *Humanistic science and Pedagogy*, *Economics and finance*,

Production, *Other* and *No specialization.* The level of education includes the dummy variables introduced in Chapter 3 and the *place of residence* are also dummy variables indicating the size of the city, defined as shown in Table 4.

3) Use the estimated propensity score to match the treated (mothers) with their untreated (non-mothers) analogues.[28] Simple nearest neighbor with replacement is used in the matching procedure. Moreover, the common support is assured when matching is performed.[29] The balance in the covariates of treated and untreated is checked by performing balancing tests, i.e. testing whether the mean of characteristics' variables is different among matched treated and untreated units (Rosenbaum and Rubin, 1985).
4) Construct the subsamples of treated (mothers) and their matched pairs for each year. Then the final sample is constructed by merging the subsamples, and the average treatment effect on the treated (τ_{ATT}) is being estimated by:

$$\ln(\text{wage})_i = \alpha_1 + \tau_{ATT}(mother)_i + \sum \alpha_i \boldsymbol{X} + u_i;$$

where $\boldsymbol{X}$ denotes observed characteristics of the individuals.

In general, the above procedure leads to the construction of a new sample that consists of mothers and non-mothers, who conditioning on observable characteristics, $\boldsymbol{X}$, are comparable. The procedure in the end thus brings down to the comparison of wages of mothers and non-mothers, who in terms of their observable characteristics are in the best possible extent similar to each other. It therefore reduces the bias resulting from the selection into motherhood.

4.2.3. Propensity score matching based on pre-motherhood characteristics

The cross-sectional matching estimator introduced above indeed tries to deal with the selection into motherhood, however only on characteristics observed once the individual is treated. The better time of comparing and matching the individuals would certainly be before

[28] The matching is performed with the use of *psmatch2* command in Stata software, (Leuven and Sianesi, 2003).
[29] The common support is assured by dropping treatment observations whose propensity score is higher than the maximum or less than the minimum propensity score of the controls.

the treatment, because the matched pairs would be selected based on the observed characteristic in the time when the treatment is not yet a certain event. Therefore, matching done on pre-treatment characteristics should further reduce the bias arising from the motherhood selection.

Moreover, since the individuals are observed before and after the treatment the unobserved time invariant differences between treated and untreated may be additionally eliminated by double differencing. I provide the estimates that account for unobserved heterogeneity using both diff-in-diff (for two time period) and fixed effects (when in more than two periods the individual is observed). Hence, the diff-in-diff will provide the estimate of the effect of the first (one) child on women's wages, whereas the fixed effects model will allow for the possibility of having more than one child afterwards.

As a result, I construct a sample of matched mothers and non-mothers based on their pre-treatment characteristics for each of the years in the sample, i.e. I construct a new panel sample consisting only of those women who became mothers in the observed time-period and their matched pairs. The procedure differs from the presented above cross-sectional matching in the treatment group definition and the time framework in which the matching is performed. In particular, the treatment is defined as becoming a mother (of 1 child) in one of the next years (mother-to-be). The woman who is treated in one year, might have more than 1 child afterwards once she is still observed in the sample.[30] The control group consists of non-mothers, i.e. women who have never become mothers in all of those years. The propensity score is being estimated for each subsample of treated, that are treated in different years (i.e. for non-mothers in 2003 and mothers in 2005; non-mothers in 2005 and mothers in 2007; and

[30] For the effect of the first child the individuals are observed just in two time periods: before and after the birth of a child.

non-mothers in 2007 and mothers in 2009).[31] In consequence I estimate three probit regressions for the propensity score estimation. The propensity score includes all the variables used in the previous matching as well as the logarithm of real monthly wage. All of the variables in the propensity score estimation are observed before the treatment takes place (i.e. in 2003 for mother-to-be in 2005, in 2005 for mother-to-be in 2007, in 2007 for mother-to-be in 2009). The inclusion of wage level before the treatment takes place assures that the CIA assumptions is met. Once, the matching is performed for all subsamples of treated women, the final sample is constructed by merging the subsamples for all the years. The final sample has thus a panel structure, consisting only of those women who are changing their parental status (mother-to-be) and women who never become mothers and that are observed in the multiple years.

4.3. The estimation of the bounds of the effects

The estimation of the effect of children on women's wages is a very complex issue due to the high selection both to motherhood and employment. Due to the possibility that the sample of working mothers may be non-random, the estimated effects that correct for the motherhood selection may still be biased. The estimates might therefore be underestimated if women who are facing high penalty of being mothers tend to exit from the labor market once they are mothers. Similarly, if those women who earn high wages are more likely to drop from the labor market when they are mothers, then the estimated effects would be overestimated.

Since the selection to the working is difficult to deal with unless the dataset is rich enough to provide valid exclusion restriction, in most of the studies it is rather ignored by admitting that it exists. Mostly, when the selection into the working is considered it is corrected by the Heckman selection model that as an exclusion criteria uses the age of the youngest child and

[31] The number of women who are becoming mothers from 2003 to 2007 is reflected in the sample of women who are becoming mothers from 2005 to 2007, since the individual who is observed in all three years will become mother 1 year before.

partner's earnings (Gronau, 1974; Harkness and Waldfogel, 1999; Davies and Pierre, 2005) as well as women's marital status (Gangl and Zielfe, 2009). Korenman and Neumark (1992) additionally to husband's earnings include income from alimony or child support and weeks the husband spent unemployed in the previous time period. The exclusion criteria are, however, highly questionable: husband's earnings are more than likely to be correlated with women's wages, since people tend to choose the spouse from similar social group, e.g. within education, age, place of origin, etc., which means that they have similar human capital endowment. Similarly, the age of the youngest child, might both influence women's decision to participate in the labor market, as well as her wage through work-effort theory (young child demands more attention and time devoted, therefore also more effort, that decreases the productivity and in consequence the wage).

In this study, in order to account for the selectivity into employment different approach is adapted. In particular, I calculate the bounds of the effect following Lee (2009), i.e. I determine the worst-best scenario based on the observed employment rates of mothers and non-mothers.

The method of Lee (2009) brings down to the determination of the excess proportion of untreated (non-mothers) that would not be working if they become treated (mothers) and trimming the lower and upper bound of the outcome (wage) distribution by the calculated proportion. This is true, because the observed distribution of working non-mothers consists of: 1) a distribution of those who would have been working irrespective of the treatment (motherhood) and 2) a distribution of those who are working because they are non-mothers and would not be working had they become mothers. Since it is unknown which women remain out of the labor market when they become mothers, the worst-best scenario can be established assuming that they are either at the very top or at the very bottom of the observed

wage distribution. The excess proportion of working non-mothers that would not be working once they became mothers is expressed by:

$$\hat{p} = \frac{\left(\frac{\sum S*(1-D)}{\sum(1-D)} - \frac{\sum S*D}{\sum D}\right)}{\frac{\sum S*(1-D)}{\sum(1-D)}}.$$

Parameter *D* denotes the treatment assignment (*D*=1 for mothers; *D*=0 for non-mothers) and *S* indicates whether the individual is observed working or not (*S*=1 if working; *S*=0 if not). When the trimming proportion is determined, the value of the point at the wage distribution that *cuts* from below an above i.e. the p_{th} and $(1\text{-}p)_{th}$ quantile, may be calculated:

$$\widehat{y_q} \equiv \min\left\{y: \frac{\sum S*(1-D)*1[Y \leq y]}{\sum S*(1-D)} \geq q\right\}$$

Then the mean of the outcome distribution of non-mothers that would remain working if they became mothers (after trimming) is calculated both for the best situation (women who earn least drop from labor market) and worst situation (women who drop earn the highest wages).

Finally, the upper and lower bound are calculated, by comparing the mean wage of non-mothers that would still be working had they been mothers and the observed mean wage of mothers:

$$\widehat{\Delta^{LB}} = \frac{\sum Y*S*(1-D)*1[Y \leq \widehat{y_{1-p}}]}{\sum S*(1-D)*1[Y \leq \widehat{y_{1-p}}]} - \frac{\sum Y*S*D}{\sum S*D}$$

$$\widehat{\Delta^{UB}} = \frac{\sum Y*S*(1-D)*1[Y \geq \widehat{y_p}]}{\sum S*(1-D)*1[Y \geq \widehat{y_p}]} - \frac{\sum Y*S*D}{\sum S*D}.$$

The estimation of the bounds of the effect will however not indicate whether the estimated effects are the true one. Still, it will carry valuable information, since it will reveal whether the estimated effects represent best, moderate or worst scenario of working selection.

5. Results

The following chapter presents the main empirical findings regarding the effect of children on women's wages in the post-communist times in Poland. The results are presented in three subsections. The first subsection discusses the effects of having children (i.e. having at least one child) with the use of the OLS, fixed effects and matching estimations. Subsection two discusses the possibility of non-linear relationship between the number of children and the wage level. Firstly, the effect of having an additional child is investigated by regressing total number of children on women's wages both by the OLS and the fixed effects models. Then, the non-linear relation is pursued by the decomposition of total number of children into three groups. Additionally, estimates of the effects by the age of children are presented. This subsection is thus devoted to answering the question of what kind of mothers (i.e. with how many children and of what age) carry the highest cost of their motherhood. Finally, subsection three provides correction for the employment selectivity bias by the estimation of upper and lower bounds of the effect.

5.1. The main findings of the effect of children on women's wages

Column 1 in Table 7 presents the OLS estimation results of the effect of having at least one child on women's wages controlling for various factors.[32] The coefficients are negative and range from around 6 percent to 3.5 percent depending on the controls included. Controlling for human capital measures reduces the estimates of 6.6% from the gross model to 4%. However, human capital controls include the measure on the potential experience, not the actual one. The potential experience does not control for the time off the labor market and consequently it is overestimated when a woman decides to remain for some time out of the labor market. As shown by Anderson et al. (2003) the estimated effects would be further

[32] The table represents the main findings; for the detailed estimation output see the notes that refer the specific number of the table.

reduced if the actual experience, instead of the potential one, was used. Therefore, we should expect the estimated coefficients to be even smaller (in absolute value) if the actual work experience could be used. The next inclusion of occupational controls is justified by the sex-segregation and choosing mother's friendly jobs that in general pay less. Working part-time as well as occupational segregation only slightly reduce the negative effect of 4%, which leads to the conclusion that occupational segregation explains little the existence of the motherhood penalty. The inclusion of household's resources results in the estimated effect of 5.7%. The coefficient on husband's earnings is positive and significant, which suggests that the higher the men's earnings, the higher the wage of the women. The dummy variable indicating multiple family household is not significant and very small in magnitude.

The results from the fixed effects estimation differ significantly, which suggests that there is high unobserved heterogeneity between mothers and non-mothers. The obtained coefficients are much more negative: the difference in wages between women who have children and childless ones is on average equal to 13%. This value is relatively high if compared with existing studies of Western economies. Moreover, once the husband's wage is controlled, the estimated effect of having at least one child is equal to 19% lower wages of mothers. The fact, that the fixed effects model provides higher coefficients (in absolute value) on the children variable, suggests that there is a positive bias arising from the unmeasured differences among mothers and non-mothers (in other words the unmeasured effects between mothers and non-mothers related to the wage level are positively correlated with the motherhood). This suggests that those women who decide to have children have larger unobserved potential to earn higher wages. This is an interesting finding, that is further confirmed by other specifications of fixed effects estimations: in all of the regressions the fixed effects coefficients are more negative than the OLS estimates.

I next move to the results that were obtained from the matching procedure. The estimated average treatment effect on the treated based on the pooled cross sectional data equals to negative 4.2% (Table 18) and is very similar to OLS results. The motherhood probits for each of the four years are presente. The probability of being a mother significantly increases with the age, but decreases with the education and living in a big city (more than 500 thousands inhabitants). Conditioning on other covariates does not change the estimated effect much. The finding from cross-sectional matching that is based on observed characteristics in the time of the treatment is consistent with the OLS estimates and suggests that the cross-sectional matching procedure accounts for similar bias resulting from the selections as the simple OLS estimation. Therefore I conclude, that the effect of having at least one child based on cross-sectional estimations is equal to about 4%.

The average treatment effect estimated on the matched sample that uses pre-motherhood characteristics is presented in Table 20. The motherhood probits estimated for three subsamples of mothers-to-be are shown in Table 24. Similarly to cross-sectional matching based on observed characteristics of mothers and non-mothers, the probability of becoming a mother increases with the age and decreases with the education (however only for the subsample of non-mothers in 2003 that are mothers in 2005) and size of the place of living. The coefficients are however much less significant, presumably due to the smaller sample size. The estimated treatment effect based on the matched sample is equal to negative 21.8%. The effect is astonishingly high and differs drastically from the treatment effect obtained from the matching performed on the propensity score that does not account for the observed characteristics and the wage level before the motherhood. Holding additionally other factors constant, results in the decline of the effect, but only slight: from 18.1 to 15.5%. I also control for marital status that was not included in the probit regression due to the possibility of being affected by the treatment. Once marital status is controlled for the estimated effect does not

change much and equals -15.3%. I additionally perform fixed effects model on the matched sample to account for unobservable time-invariant characteristics. Despite the fact that the treated and controls were matched based on the propensity score that includes lagged wage rate, it does not assure that the individuals do actually have the same wage before. Therefore there still might be differences in the wage level before the motherhood that might be caused by women's unobserved potential to earn higher wage. The coefficients from the treatment effect estimation are shown in Table 21. The estimated effect is much lower and equal -13.2%. Conditioning on other covariates does not influence much the primary value.[33] Hence, the estimated average treatment effect of being a mother is basically equal to the effect from fixed effects model. The fact that both the cross-sectional matching as well as matching with fixed effects provide results that are very similar to OLS and fixed effects estimation suggests that neither of the methods is superior to the other and results are consistent.

Finally, I also perform the estimation of the effect of the first child on women's wages based on the pre-motherhood matching. Firstly, simple average treatment effect indicates that first child reduces the wage rate of mothers by around 30% (ATT equal to 30.2 - Table 22). This is very high effect, but from the previous estimations it is clear that is suffers from the bias. In order to correct for the bias I perform diff-in-diff estimation. Table 23 presents the results: as expected the effect is smaller and amounts for -18%. When other covariates are fixed the effect is further reduced (around negative 15%), but becomes statistically insignificant.

To summarize, I found that OLS model provides a negative effect of having at least one child equal to 4%. The finding is additionally confirmed by cross-sectional matching performed on the propensity score estimation based on observed characteristics in the time of the treatment. Fixed effects model accounts for unmeasured heterogeneity between mothers and non-

[33] Since I use fixed effects I cannot control for educational groups as in the OLS estimation, therefore I control for potential experience, that is a function both of the age and the length of the education.

mothers and indicates a penalty of around 13%. Moreover, matching performed on the propensity score estimation based on observed characteristics before motherhood is a certain event as well as the pre-motherhood wage level results in the negative effect of 20%. Finally, when unobserved differences are taken into account, the matching with the fixed effects estimation reports the effect of around 13%. Hence, I conclude that women who are having at least one child bear a motherhood penalty of 13% lower wages when compared with childless women of the same observed attributes and unobserved potential and career orientation. Additionally, the first child reduces the earnings of its mother even more: by 18%.

5.2. Nonlinear effects of children on women's wages

The first insight on the motherhood penalty presented above reveals that indeed Polish women experience lower wages once they become mothers. In this subsection I try to assess which mothers tend to bear the highest cost of their motherhood. To do so, I estimate the effect of children by total number of children and their age. The effect of additional child might however be nonlinear, therefore I further proceed with the detailed vector of total number of children: *One child, Two children* and *Three children and more*.

In Table 12 full Specification II of the equations is presented, whereas in Table 7 column 3 the main results of the effect of total number of children are reported. The model with marital status controls yields a high penalty of 8.4%. Controlling for human capital measures, similarly to previous results, reduces the motherhood penalty by 52% - to 4%. The inclusion of the size of the place of residence controls drives the penalty upon down to 3.1%. Column 4 of Table 12 shows that part-time working schedule is an important factor in the determination of women's wages. As previously, occupational segregation does not explain the existence of the motherhood penalty. Adding to the model household's resources, which include

husband's wage, does not change the estimated negative effect of having additional child, which equals to 2% .

The effect of total number of children with the use of the fixed effect estimation ranges around 9% (full estimation output and main results are reported in Table 13 and Table 7 respectively). The finding is present regardless the control variables included in the regressions. The negative effect of 9% is relatively high and indicates that controlling for various characteristics as well as unobserved time invariant measures the effect of having each additional child reduces women's earnings by 9 percent.

The OLS estimation results of the nonlinear effect of children on women's wages are presented in Table 8 (full estimation output presented in Table 14). From the table it is apparent that the effect is still monotonic, but not necessarily linear. The gross model (no controls except of the marital status) provides estimates of 4.7% for one child, 12.2% for two children and large 31.9% for three and more children. The inclusion of human capital controls reduces the estimated effects in case of two and three or more children: to 8.9% and 15.6% respectively. Controlling for other factors does not influence the negative effect of one child, which is always around 5%. The inclusion of job characteristics controls drives the penalty on two children down to approximately 6%, and on three children and more to 8.5%. Therefore, occupational segregation as well as part-time working schedule, that were found to not explain the effects of total number of children, are important factors that partially explain the motherhood penalty of two and more children. The fact that the effects of one and two children tend to converge, to around 6%, implies that it does not make big difference (regarding the wage level) whether the women has one or two children. The difference though occurs when she has three or more children (negative 9-12%).

Table 8 also presents estimates from the fixed effects model of the same specification as above. The results differ significantly, once again indicating that unobserved heterogeneity between mothers and non-mothers explain significant part of the motherhood penalties. The negative effect of 5% in case of one child found in OLS, is increased to negative and significant 16% once job characteristics are controlled for. Similarly, the effect of two children is much higher – 22%. Having three and more children results in even larger decline in wages, however the effect is not statistically significant. With the use of the fixed effects model it is also visible, that the effects tend to converge, however not that apparently as in the OLS estimation.

Finally, I try to argue who bears the motherhood penalty in terms of the age of the children. Table 9 provides both the OLS and fixed effects estimation results of the effect of the number of children in each of the three age groups: 0-3, 3-7 and 7-18 years old (full specification presented in Table 16 and Table 17, respectively). The OLS gross model indicates the highest negative effects of oldest children, which is not consistent with the work-effort hypothesis. Controlling for human capital, as well as for the place of residence, results in 5.4% and 4.9 % penalties for additional child aged 0-3 and 3-7. The effect of additional oldest child (age 7-18) at the same time is equal to only 2.7%. Therefore, the cost of being a mother of very small children does not differ much from that of kindergarten aged children. The cost however is reduced once the child is older, which is an evidence for work-effort theory. Moreover, the inclusion of job-characteristics controls drives the estimates on all three variables down. Adding household's resources controls, which may serve as proxies for the help the woman is provided, shows that there is a higher negative effect of 6% in case of additional baby (age 0-3). The coefficients on children age 3-7 and 7-18 are not significant once household's resources are controlled for, which indicates that indeed a woman bears the highest cost of her motherhood when she has very small children. In the fixed effects model no significant

effects are found, which is possibly caused by the little variation between women in the amount of children, who are in different age groups, across the time. However, based on the previous results, it might be expected that accounting for unmeasured differences between mothers and non-mothers would increase the OLS estimates of the effect of children of any age.

5.3. Employment selectivity bias – estimating the bounds of the effect

The estimation of the bounds of the effect of children on women's earnings should be begun with the proper definition of the treatment (mothers) and control (non-mothers) groups. The trimming procedure should be thus applied to the sample of women who are becoming mothers as opposed to the sample of all women (i.e. women with and without children). This is because not all the childless women will eventually have children. Therefore applying the trimming procedure to the wage distribution of all childless women would not be correct.[34] In addition, the difference in the employment rates of such defined groups might not necessarily arise from motherhood (as already shown non-mothers are more educated and tend to live in the bigger cities, where the employment rate might be higher than in the villages and small cities).

In order to control for the differences in the employment rates that might be caused by other factors than motherhood, as well as for the selection into motherhood, one should define as non-mothers women who are not mothers, but who eventually will be observed as mothers. Therefore the bound's estimation should be applied to the sample of mothers-to-be, since we will observe the same women before and after their motherhood. Consequently, the change in the employment rate will certainly reflect the shift that is caused by motherhood.

[34] This is because we don't know which women from the observed sample of childless women will eventually be mothers. Consequently, we also don't know where those women who eventually will have children are situated in the observed wage distribution of non-mothers.

Table 25 reports the estimates of the bounds that were found based on the sample of women who eventually become mothers. The employment rates reflect the proportion of employed individuals to all individuals who are not currently enrolled in the school. The employment rate of mothers is lower than non-mothers: 59.56% and 64.35%, respectively. The difference in the employment rates implies a trimming proportion of 7.44% of non-mothers observations. The trimming proportion represents the percentage of non-mothers that would not be working when they became mothers. The p_{th} quantile of non-mothers wage distribution is equal to 6.0512 and the mean after trimming the distribution below that value, is equal to 6.8601. The value of 6.8601 indicates the wage level of non-mothers if they became mothers, assuming that those women who earn least (trimming lower tail of the distribution) would drop from the labor market. The upper bound of the motherhood effect on women's wages is thus equal to negative 13.76%. Similarly, the symmetric procedure provides the lower bound of -31.38%. The trimming proportion is equal to 92.56%, and the quantile value is 7.5792. The estimated width of the bounds is large and equals to 17.63%.

It has to be, however, noted that such definition of the treatment and control groups provides just the approximation of the actual bounds. This is because non-mothers are observed in the years 2003, 2005 and 2007, whereas mothers in 2005, 2007 and 2009. Working mothers can thus have slightly higher experience than working non-mothers (due to the time passing). If we assume that the mean of mothers wages would be lower if the experience was considered, then the bounds would "moved" towards zero, but the width would remain the same.

Still, the bounds provided suggest that the estimated effect of approximately 13%, which was found with the fixed effects as well as matching on pre-motherhood characteristics, is more likely to present the best scenario. Even when the possible influence of the accumulated experience is considered, the effect is still likely to remain in the upper part of the bound's width. The fact, that the estimated effect is likely to be close to the upper bound suggests that

the selection into working is important factor when analyzing the motherhood penalty. Eventually, it has to be additionally considered that those women who earn higher wages are more likely to remain in the labor market once they become mothers. This finding is confirmed by the simple estimation of the probability of being employed after giving birth to a child on the observed wage rate before motherhood occurs (Table 26). The positive and significant coefficient on the wage rate before motherhood occurs indicates, that the selection into working does take place: women with higher wages are more likely to remain employed after becoming mothers.

Conclusion

The study provides evidence on the existence of the motherhood penalty in the post-communist times (2003-2009) in Poland. Several estimation strategies have been considered to account for the motherhood selection. In addition bounding approach has been adapted to provide the bounds of the effect that exploits the potential problem of non-random sample of working individuals.

In general the results suggest that the motherhood penalty in the form of lower wages of mothers does exist in Poland. The estimated effects based on simple OLS estimation range from negative 6% to 3.5%. The effects found by performing matching in the time when the motherhood is already observed is equal to 4% which is consistent with the finding of OLS estimation. Consequently, I conclude that cross-sectional matching does not significantly reduce the bias from the motherhood selection that is present in OLS estimates.

The findings from the fixed effects estimation indicate that working Polish mothers earn on average 13% lower wages than working non-mothers. The effect is even higher (19%) when the husband's wage is additionally controlled for. The higher estimated negative effect of children indicates positive selection on unobservables: those women who have larger potential to earn higher wages are more likely to be mothers. This striking result is confirmed by all the fixed effects models specification. This positive selection, together with the fact that relatively high percentage of women tend to start working once they become mothers, indicates that indeed the cost of motherhood is high and not all the women may afford to have a child. The effect found from the matching based on pre-motherhood characteristics equals negative 22%, but once the unobserved differences are controlled for it reduces to 13%. Hence, the finding is consistent with the effect from fixed effects model. Additionally,

performing difference-in-difference estimation on matched sample I found an effect of the first child that is equal to 18% lower wage rate of mothers than that of childless women.

A closer inspection of the effect of children on women's wages reveals that there is not much difference in the cost of the motherhood of women's of several children. The fact that the inclusion of successive control variables makes the effects of having one and two children converge suggests that the differences between the cost of raising one and two children is not relevant. However, the significant difference occurs for three children and more: the estimated effects are the largest for mothers of three (and more). The last specification of the model (by the age of the children) not surprisingly reveals that women of pre-school aged children bear the highest cost of their motherhood.

The estimation of the bounds of the effect that try to assess its validity in terms of possible non-random sample of working women, implies that the negative effect of having at least one child (13%) is likely to present the best scenario. This means that mothers' selection into working should be of particular concern when interpreting the results. If the estimates could be corrected for the working sample selection, we could expect to find even more negative effects regarding all of the model's specifications.

As a result, the findings of my study reveal several interesting facts:

1. There is a positive selection into motherhood: women who have unobserved potential to earn higher wages are more likely to become mothers;
2. There is not much difference in the motherhood penalty of mothers of one and two children; slight difference occurs in case of three and more children;
3. There is a positive selection into working: women who earn higher wages are more likely to be observed working once they are mothers.

The findings are interesting in the framework of the present situation of Polish women at the labor market and the provision of child-care and family benefits. The fact that women who earn lower wages are more likely to drop out of the labor market may be caused by the high *price* of their child rearing. The limited access to child-care establishments and the emergence of so called "*private maternalism"* may make low paid women to give up their job. This is because the cost of the child care provided by them may be lower relative to the cost of child-care provided by the market. In addition, the means-tested eligibility criteria of the family benefits imply that for those women who earn low wages it might be *worth* not to work, since the difference between the minimum wage from the paid work and child raising benefits is low (Fultz et al., 2003). Moreover, positive selection into the motherhood suggests that the cost for working mother to bring up a child is indeed high and in consequence not all the women can afford it.

In general, the effects presented in the study are higher than most of the motherhood penalties found for Western economies and are comparable to the effects obtained for Germany (Beblo et al., 2009) and Great Britain (Davies and Pierre, 2005; Gangl and Ziefle, 2009). Further research should concentrate on the changes in the size of the motherhood penalty before and after the fall of communism in order to assess the validity of the argument that the post-communism emergence of "*private maternalism"* may drive high negative effects of motherhood. However, in order to do that data on pre-transition period are needed. Moreover, the investigation of the set of the countries that have experienced a similar recent history path to Poland (e.g. Hungary, Czech and Slovak Republics) might permit to assess whether found effects are country-specific or similar high negative effects of children on women's wages are present in other post-communist economies.

TABLES

Table 1 Family benefits available in Poland, 1970-1989

Benefits/Services for parents	Services for children	Help for families
1. Unpaid maternity leave up to three years together with creditioning pension entitlements during the leave (1970-1979). Childcare allowance during the maternity leave (1980-1989) and paternity leave and allowance from 1984. 2. Maternity lump-sum grant available for all the women giving birth to a child. 3. Maternity allowance equalized for women working in different positions. 4. Alimony fund for women who were in financial need.	1.Pre-school education: pre-school departments at primary schools and pre-school centers. 2.Compulsory education for six-year-old children. 3. Family services – crèches and kindergartens – maintained by the workplaces.	1.Preferential credits for young couples for the purchase of long-term necessities. 2.Workplaces help to pay off the debts during the martial law and until 1985.

Source: Own work based on Pascall and Kwak (2005).

Table 2 Changes in the maternity leave and allowance from 1989

Benefit	Provision in 1989	Changes in the provision after 1989
Maternity leave	Length: • 16 weeks on the birth of first child • 18 weeks on the birth of second child and all successive • 26 weeks in the case of multiple birth Coverage: 100% of employee's remuneration for the last 3 months prior the leave	**1st January – 31st December 2000** • 20 weeks on the birth of first and all successive children • 30 weeks in case of multiple birth **1st January 2001 – 13th January 2002** • 26 weeks on the birth of first and all successive children • 36 weeks in case of multiple birth **13th January 2002 – 18th December 2006** • 16 weeks on the birth of first child • 18 weeks on the birth of second child and all successive • 26 weeks in the case of multiple birth **19th December 2006 – 31st December 2008** • 18 weeks on the birth of first child • 20 weeks on the birth of second child and all successive • 28 weeks in the case of multiple birth **1st January 2009 – 31st December 2009** • 20 weeks on the birth to one child • 31 weeks on the birth to two children • 33 weeks on the birth to three children • 35 weeks on the birth to four children • 37 weeks on the birth to five and more children **1st January 2010 – 31st December 2011** As above plus additional leave: • 2 weeks on the birth to one child • 3 weeks on the birth to two or more children Paternity leave – 1 week

Source: Adapted from Balcerzak-Paradowska (2003) and the official website of Polish Social Insurance Board[35]

[35] www.zus.pl

Table 3 Dataset structure

	Round 1	Round 2	Round 3	Round 4	Round 5
	2000	**2003**	**2005**	**2007**	**2009**
No. of households	3 006	3 962	3 858	5 532	12 381
No. of household's members	9 996	13 701	12 738	18 021	37 841
No. of individual respondents	6 625	9 597	8 790	12 641	26 178
No. of female respondents	3 556	5 166	4 690	6 945	14 542
No. of working females	1 487	2 099	2 020	2 984	6 149
No. of working females with wage info	---	1 880	1 757	2 627	5 179
No. of mothers	1 392	2 402	2 095	2 984	5 966
No. of working mothers	805	1 396	1 251	1 836	3 768
No. of working mothers with wage info	---	1 231	1 093	1 616	3 136
No. of female respondents age 18-40	1180	1 869	1 628	2 467	4 765
No. of working females age 18-40	579	924	889	1 436	2 772
No. of working females age 18-40 with wage info	---	810	745	1 256	2 304
No. of mothers age 18-40	493	901	746	1 237	2 416
No. of working mothers age 18-40	274	536	482	811	1 586
No. of working mothers age 18-40 with wage info	---	458	407	704	1 306

Table 4 Descriptive statistics of chosen variables, sample of women aged 18-40

Variable	Obs.[a]	Mean	Std. Dev	Min	Max
Age	32 232	28.2654	5.9475	19	39
Family structure					
Have children	12 911	0.4110	0.4920	0	1
No children	12 911	0.5890	0.4920	0	1
Married	12 127	0.4797	0.4996	0	1
Single	12 127	0.4779	0.4995	0	1
Widow	12 127	0.0063	0.0794	0	1
Divorced	12 127	0.0247	0.1553	0	1
Separated	12 127	0.0039	0.0621	0	1
One child	10 709	0.1429	0.3500	0	1
Two children	10 709	0.1686	0.3744	0	1
Three children and more	10 709	0.0687	0.2530	0	1
Child age 0-3	10 709	0.1100	0.3129	0	1
Child age 3-7	10 709	0.1449	0.3520	0	1
Child age 7-12	10 709	0.1826	0.3863	0	1
Child age 12-15	10 709	0.1019	0.3025	0	1
Child age 15-18	10 709	0.0621	0.2413	0	1
Child age 18-25	10 709	0.0190	0.1367	0	1
Education[b]					
Primary and less	12 113	0.1308	0.3372	0	1
High school	12 113	0.1970	0.3977	0	1
Vocational training	12 113	0.3964	0.4892	0	1
Bachelor and secondary	12 113	0.1099	0.3128	0	1
University	12 113	0.1659	0.3720	0	1
Residence					
City 500th and more	32 232	0.1019	0.3025	0	1
City 200-500th	32 232	0.1181	0.3227	0	1
City 100-200th	32 232	0.0745	0.2625	0	1
City 20-100th	32 232	0.1919	0.3938	0	1
City less than 20th	32 232	0.1365	0.3433	0	1
Village	32 232	0.3773	0.4847	0	1
Job characteristics					
Part time	6 330	0.2090	0.4066	0	1
S. public	6 041	0.3064	0.4610	0	1
S. private	6 041	0.6933	0.4612	0	1

Occupations[c]					
Business	5 997	0.1221	0.3274	0	1
Technical	5 997	0.0250	0.1562	0	1
Health	5 997	0.0629	0.2427	0	1
Teaching	5 997	0.1184	0.3231	0	1
Administration	5 997	0.1487	0.3559	0	1
Services	5 997	0.2561	0.4365	0	1
Agriculture	5 997	0.1057	0.3075	0	1
Elementary	5 997	0.0989	0.2985	0	1
Other	5 997	0.0612	0.2397	0	1
Wages and employment					
ln(wage)	5 119	6.9674	0.6101	4.5035	9.9415
Employment	11 985	0.5627	0.4961	0	1

a The difference in the sample size for some of the observations stems from the fact that *age* and *residence* measures are provided for all of the household's members, whereas other measures are based on individual questioners.

b Educational groups are defined as follows: *Primary and less* – completed or uncompleted primary school education and no education; *High school* – completed high school education or secondary vocational education ; *Vocational training* – completed vocational school (without secondary school certificate); *Bachelor and secondary* – bachelor degree or completed post-secondary education; *University* – master or higher degree obtained

c Occupation groups are defined as follows: *Business* (managerial and business occupations), *Health* (health and associate professions), *Technical* (technical and associate professions), *Teaching* (teaching and social work professions), *Administration* (administration and associate professions, legislation, clerks), *Services*, *Elementary* (elementary occupations and assemblers), *Agriculture*, *Other* (not listed). In the estimated equations the omitted group is *Agriculture.*

Table 5 The percentage inflows and outflows from the employment of women who are becoming mothers in the next years, sample of women aged 18-40

		Mother 2005	
		E	**UE**
Non-mother 2003	**E**	**71.11%**	28.89%
	UE	31.03%	**68.97%**

		Mother 2007	
		E	**UE**
Non-mother 2005	**E**	**73.02%**	26.98%
	UE	32.35%	**67.65%**

		Mother 2009	
		E	**UE**
Non-mother 2007	**E**	**67.74%**	32.26%
	UE	42.42%	**57.58%**

E – Employed
UE – Unemployed

Table 6 Comparison of the subsamples of mothers and non-mothers, sample of women aged 18-40

	NON-MOTHERS		MOTHERS				
Variable	Obs.	Mean	Obs.	Mean	Difference in Means	SE	t-stats
Age	7 604	25,0789	5 307	32,3356	-7,2567	0,0860	**-84,3625**
Relationship							
Married	6 860	0.1913	5 265	0.8553	-0.6640	0.0068	**-97.8337**
Single	6 860	0.7907	5 265	0.0707	0.7200	0.0061	**119.0069**
Widow	6 860	0.0026	5 265	0.0112	-0.0086	0.0016	**-5.4425**
Divorced	6 860	0.0079	5 265	0.0467	-0.0389	0.0031	**-12.5393**
Separated	6 860	0.0015	5 265	0.0070	-0.0056	0.0012	**-4.4914**
Education							
Primary and less	6 834	0.1564	5 277	0.0976	0.0588	0.0060	**9.8046**
High school	6 834	0.4352	5 277	0.3464	0.0888	0.0089	**9.9945**
Vocational training	6 834	0.1257	5 277	0.2890	-0.1633	0.0074	**-22.0130**
Bachelor and secondary	6 834	0.1162	5 277	0.1018	0.0144	0.0057	**2.5354**
University	6 834	0.1665	5 277	0.1652	0.0013	0.0068	0.1870
Residence							
City 500th and more	7 604	0.1032	5 307	0.0767	0.0265	0.0051	**5.2543**
City 200-500th	7 604	0.1174	5 307	0.1036	0.0138	0.0056	**2.4733**
City 100-200th	7 604	0.0709	5 307	0.0678	0.0030	0.0045	0.6721
City 20-100th	7 604	0.1846	5 307	0.1858	-0.0012	0.0070	-0.1658
City less than 20th	7 604	0.1332	5 307	0.1441	-0.0109	0.0062	**-1.7629**
Village	7 604	0.3906	5 307	0.4219	-0.0313	0.0088	**-3.5620**
Job characteristics							
Part time	3 034	0.1997	3 295	0.2176	-0.0179	0.0102	**-1.7487**
S. Public	2 889	0.3119	3 151	0.3015	0.0104	0.0119	0.8737
S. Private	2 889	0.6878	3 151	0.6982	-0.0104	0.0119	-0.8759
Wages and employment							
ln(wages)	2 242	6.9525	2 876	6.9792	-0.0266	0.0170	-1.5634
Working[a]	4 648	0.5813	5 200	0.6407	0.0594	0.0098	**6.0473**
Employed[b]	4 660	0.6723	5 199	0.6261	0.0462	0.0096	**4.8119**

[a] Denotes the proportion of working individuals to the total number of individuals
[b] Denotes the proportion of employed individuals to the total number of individuals who are currently not enrolled in school

Table 7 OLS and Fixed effects coefficients from Specification I (Children dummy variable) and Specification II (total number of children), sample of working women aged 18-40, dependent variable logarithm of real monthly wage

	Effect of *Children* *(dummy)*		**Effect of *No. Children* *(total number)***	
Control variables in the model	**OLS**	**FE**	**OLS**	**FE**
Marital status controls	-0.066***	-0.082	-0.084***	-0.086*
	(0.025)	(0.069)	(0.013)	(0.047)
Human capital	-0.042*	-0.107^{+}	-0.040**	-0.091*
Controls	(0.025)	(0.069)	(0.014)	(0.049)
Job-characteristics	-0.037	-0.134*	-0.029**	-0.088^{+}
controls	(0.025)	(0.081)	(0.014)	(0.056)
Occupational controls	-0.035	-0.127^{+}	-0.020^{+}	-0.087^{+}
	(0.024)	(0.085)	(0.013)	(0.057)
Households resources	-0.057**	-0.190*	-0.021	-0.118*
controls	(0.028)	(0.114)	(0.014)	(0.063)

Notes: Full estimation outputs are presented in Table 10, Table 11 (specification I), Table 12 and Table 13 (specification II).

Marital Status controls: dummy variables *Married, Divorced*.

Human Capital Controls*: Potential experience, Potential Experience Squared*, 4 Education Levels: *University, Bachelor and Secondary, High School, Vocational Training*. Omitted category is *Primary and less*.

Job-Characteristics Controls: *Part-time working schedule, Sector of work.*

Occupational Controls: Occupational dummies: *Business, Health, Technical, Teaching, Administration, Services, Elementary, Agriculture, Other*. Omitted category is *Agriculture.*

Household's resources controls: *Husband's wage, Multiple family* dummy.

Cluster-robust standard errors in parenthesis; *** significance at 0.01, ** at 0.05, * at 0.1, $^{+}$ nearly significant at 0.1. Year fixed effects included in all of the regressions.

Table 8 OLS and Fixed effects coefficients from Specification III – estimation by the number of children, dependent variable logarithm of real monthly wage, dependent variable logarithm of real monthly wage; sample of women aged 18-40

	Effect of One *Child*		**Effect of *Two Children***		**Effect of *Three Children and more***	
Control variables in the model	**OLS**	**FE**	**OLS**	**FE**	**OLS**	**FE**
Marital status controls	-0.047	-0.076	-0.122***	-0.164^{+}	-0.319***	-0.320*
	(0.033)	(0.090)	(0.033)	(0.106)	(0.049)	(0.179)
Human capital Controls	-0.049^{+}	-0.107	-0.089**	-0.182*	-0.156**	-0.322*
	(0.032)	(0.091)	(0.035)	(0.107)	(0.054)	(0.185)
Job-characteristics controls	-0.050^{+}	-0.166^{+}	-0.065*	-0.219*	-0.120**	-0.295
	(0.032)	(0.110)	(0.035)	(0.127)	(0.056)	(0.215)
Occupational controls	-0.057*	-0.168^{+}	-0.058*	-0.227*	-0.085*	-0.302
	(0.030)	(0.115)	(0.033)	(0.129)	(0.051)	(0.217)
Households resources controls	-0.075**	-0.193	-0.079**	-0.259*	-0.093*	-0.401
	(0.034)	(0.129)	(0.037)	(0.142)	(0.055)	(0.255)

Notes: Full estimation outputs are presented in Table 14 and Table 15.

Marital Status controls: dummy variables *Married, Divorced*.

Human Capital Controls*: Potential experience*, *Potential Experience Squared*, 4 Education Levels: *University, Bachelor and Secondary, High School, Vocational Training*. Omitted category is *Primary and less.*

Job-Characteristics Controls: *Part-time working schedule, Sector of work.*

Occupational Controls: Occupational dummies: *Business, Health, Technical, Teaching, Administration, Services, Elementary, Agriculture, Other*. Omitted category is *Agriculture.*

Household's resources controls: *Husband's wage, Multiple family* dummy.

Cluster-robust standard errors in parenthesis; *** significance at 0.01, ** at 0.05, * at 0.1, $^{+}$ nearly significant at 0.1. Year fixed effects included in all of the regressions.

Table 9 OLS and Fixed effects coefficients from Specification IV – estimation by the age of children women aged 18-40; dependent variable logarithm of real monthly wage

	Effect of *No. children 0-3*		Effect of *No. children 3-7*		Effect of *No. children 7-18*	
Control variables in the model	**OLS**	**FE**	**OLS**	**FE**	**OLS**	**FE**
Marital status controls	-0.025	-0.029	-0.074**	-0.063	-0.094***	-0.098*
	(0.039)	(0.059)	(0.029)	(0.057)	(0.014)	(0.057)
Human capital Controls	-0.052^{+}	-0.046	-0.034	-0.084	0.002	-0.104*
	(0.035)	(0.060)	(0.027)	(0.060)	(0.014)	(0.059)
Job-characteristics controls	-0.054^{+}	-0.046	-0.049*	-0.082	-0.027*	-0.064
	(0.035)	(0.069)	(0.027)	(0.070)	(0.015)	(0.066)
Occupational controls	-0.037	-0.056	-0.046^{+}	-0.077	-0.028*	-0.055
	(0.037)	(0.070)	(0.028)	(0.071)	(0.016)	(0.068)
Households resources controls	-0.062	-0.056	-0.035	-0.027	-0.014	-0.084
	(0.038)	(0.080)	(0.030)	(0.075)	(0.016)	(0.075)

Notes: Full estimation outputs are presented in Table 16 and Table 17.

Marital Status controls: dummy variables *Married, Divorced*.

Human Capital Controls*: Potential experience, Potential Experience Squared*, 4 Education Levels: *University, Bachelor and Secondary, High School, Vocational Training*. Omitted category is *Primary and less.*

Job-Characteristics Controls: *Part-time working schedule, Sector of work.*

Occupational Controls: Occupational dummies: *Business, Health, Technical, Teaching, Administration, Services, Elementary, Agriculture, Other*. Omitted category is *Agriculture.*

Household's resources controls: *Husband's wage, Multiple family* dummy.

Cluster-robust standard errors in parenthesis; *** significance at 0.01, ** at 0.05, * at 0.1, $^{+}$ nearly significant at 0.1. Year fixed effects included in all of the regressions.

Table 10 Specification I: OLS estimates of the effect of children on women's wages, sample of working women aged 18-40, dependent variable logarithm of real monthly wage

VARIABLES	(1) ln(wage)	(2) ln(wage)	(3) ln(wage)	(4) ln(wage)	(5) ln(wage)	(6) ln(wage)	(7) ln(wage)
Children	-0.066***	-0.042*	-0.041*	-0.037	-0.035	-0.034	-0.057**
	(0.025)	(0.025)	(0.024)	(0.025)	(0.024)	(0.024)	(0.028)
Married	0.122***	0.008	0.020	0.027	0.049**	0.047**	-1.848***
	(0.025)	(0.023)	(0.023)	(0.024)	(0.023)	(0.023)	(0.265)
Divorced	0.334***	0.241***	0.209***	0.204***	0.175***	0.175***	0.189***
	(0.050)	(0.045)	(0.044)	(0.045)	(0.044)	(0.044)	(0.045)
University		0.800***	0.743***	0.755***	0.525***	0.510***	0.522***
		(0.046)	(0.046)	(0.052)	(0.054)	(0.054)	(0.056)
Bach. and Secondary		0.525***	0.489***	0.491***	0.326***	0.312***	0.324***
		(0.046)	(0.046)	(0.050)	(0.052)	(0.052)	(0.054)
High School		0.343***	0.325***	0.332***	0.238***	0.227***	0.239***
		(0.044)	(0.044)	(0.047)	(0.047)	(0.047)	(0.049)
Vocational train.		0.145***	0.156***	0.155***	0.130***	0.116**	0.110**
		(0.043)	(0.043)	(0.046)	(0.045)	(0.045)	(0.047)
Pot. Experience		0.044***	0.043***	0.043***	0.041***	0.040***	0.035***
		(0.005)	(0.005)	(0.006)	(0.005)	(0.005)	(0.006)
Pot. Experience^2		-0.139***	-0.135***	-0.134***	-0.121***	-0.118***	-0.086***
		(0.024)	(0.024)	(0.025)	(0.024)	(0.024)	(0.026)
City 500th plus			0.187***	0.000	0.000	0.000	0.201***
			(0.038)	(0.000)	(0.000)	(0.000)	(0.043)
City 200-500th			0.058	-0.130***	-0.132***	-0.133***	0.079**
			(0.036)	(0.037)	(0.036)	(0.037)	(0.039)
City 100-200th			0.000	-0.198***	-0.209***	-0.215***	0.000
			(0.000)	(0.040)	(0.038)	(0.039)	(0.000)
City 20- 100th			-0.027	-0.215***	-0.196***	-0.199***	0.015
			(0.033)	(0.036)	(0.035)	(0.036)	(0.038)
City less 20th			-0.042	-0.226***	-0.205***	-0.208***	0.016
			(0.033)	(0.037)	(0.035)	(0.036)	(0.039)
Village			-0.122***	-0.315***	-0.227***	-0.227***	0.005
			(0.030)	(0.033)	(0.031)	(0.032)	(0.034)
S. private				0.019	0.089***	0.086***	0.087***
				(0.020)	(0.023)	(0.024)	(0.024)
Part time				-0.150***	-0.149***	-0.144***	-0.147***

Table 10 cont.

				(0.025)	(0.025)	(0.025)	(0.027)
Occ. Business					0.710***	0.696***	0.559***
					(0.053)	(0.054)	(0.058)
Occ. Health					0.558***	0.555***	0.444***
					(0.055)	(0.056)	(0.060)
Occ. Technical					0.598***	0.605***	0.475***
					(0.066)	(0.067)	(0.071)
Occ. Teaching					0.560***	0.554***	0.424***
					(0.059)	(0.060)	(0.063)
Occ. Administration					0.459***	0.448***	0.346***
					(0.050)	(0.051)	(0.054)
Occ. Elementary					0.354***	0.349***	0.267***
					(0.047)	(0.048)	(0.050)
Occ. Services					0.299***	0.291***	0.182***
					(0.046)	(0.046)	(0.051)
Occ. Other					0.321***	0.317***	0.228***
					(0.048)	(0.049)	(0.052)
Multifamily HH						-0.013	0.008
						(0.024)	(0.031)
Husband's wage							0.256***
							(0.036)
Constant	6.780***	6.130***	6.177***	6.391***	6.010***	6.066***	5.986***
	(0.024)	(0.048)	(0.055)	(0.064)	(0.075)	(0.078)	(0.082)
Observations	5,076	5,045	5,045	4,570	4,488	4,340	3,595
R-squared	0.065	0.224	0.247	0.248	0.309	0.303	0.341

Notes :1. Cluster-robust standard errors in parenthesis; *** significance at 0.01, ** at 0.05, * at 0.1.

2. Year fixed effects included in the regressions

3. *Children* is a dummy variable equal to 1 if women has at least one child, 0 if no child.

4. Education groups are defined as follows: *University* – master or higher degree obtained; *Bachelor and secondary* – bachelor degree or completed post-secondary education; ; *High school* – completed high school education or secondary vocational education ; *Vocational training* – completed vocational school (without secondary school certificate); Omitted category *Primary school or less*.

5. Occupational dummies are defined as follows: *Business* (managerial and business occupations), *Health* (health and associate professions), *Technical* (technical and associate professions), *Teaching* (teaching and social work professions), *Administration* (administration and associate professions, legislation, clerks), *Services*, *Elementary* (elementary occupations and assemblers), *Agriculture*, *Other* (not listed). Omitted category is *Agriculture.*

Table 11 Specification I: Fixed effects estimates of the effect of children on women's wages, sample of working women aged 18-40, dependent variable logarithm of real monthly wage

VARIABLES	(1) ln(wage)	(2) ln(wage)	(3) ln(wage)	(4) ln(wage)	(5) ln(wage)
Children	-0.082	-0.107	-0.134*	-0.127	-0.190*
	(0.069)	(0.069)	(0.081)	(0.085)	(0.114)
Married	0.095*	0.077	0.104	0.096	-1.490**
	(0.055)	(0.054)	(0.072)	(0.074)	(0.625)
Divorced	0.223**	0.222**	0.225**	0.255**	0.302**
	(0.105)	(0.102)	(0.112)	(0.119)	(0.133)
Pot. Experience		0.026	0.027	0.028	0.034
		(0.017)	(0.018)	(0.019)	(0.023)
Pot. Experience^2		-0.147**	-0.145**	-0.137**	-0.216***
		(0.058)	(0.066)	(0.068)	(0.084)
S. private			0.022	0.039	0.076*
			(0.038)	(0.040)	(0.043)
Part time			-0.103***	-0.097**	-0.109**
			(0.040)	(0.040)	(0.043)
Occ. Business				0.140	0.073
				(0.136)	(0.158)
Occ. Health				0.050	-0.020
				(0.142)	(0.159)
Occ. Technical				0.193	0.117
				(0.170)	(0.203)
Occ. Teaching				0.176	0.059
				(0.138)	(0.162)
Occ. Administration				0.136	0.099
				(0.138)	(0.167)
Occ. Elementary				0.104	-0.010
				(0.128)	(0.133)
Occ. Services				0.087	0.010
				(0.128)	(0.149)
Occ. Other				0.142	0.020
				(0.138)	(0.147)
Husband's wage					0.206**
					(0.085)
Constant	6.631***	6.578***	7.099***	6.949***	6.580***
	(0.048)	(0.097)	(0.156)	(0.210)	(0.208)
Observations	5,076	5,058	4,581	4,499	3,731
R-squared	0.180	0.185	0.186	0.190	0.224
Number of individuals	3,840	3,833	3,598	3,548	2,998

Notes: 1. Cluster-robust standard errors in parenthesis; *** significance at 0.01, ** at 0.05, * at 0.1.,
2. Year fixed effects included in the regressions.
3. *Children* is a dummy variable equal to 1 if women has at least one child, 0 if no child.
4. Occupational groups defined as in table 1.

Table 12 Specification II: OLS estimates of the effect of children on women's wages by total number of children, sample of working women aged 18-40, dependent variable logarithm of real monthly wage

VARIABLES	(1) ln(wage)	(2) ln(wage)	(3) ln(wage)	(4) ln(wage)	(5) ln(wage)	(6) ln(wage)	(7) ln(wage)
No. Children	-0.084***	-0.040**	-0.031**	-0.029**	-0.020	-0.021	-0.021
	(0.013)	(0.014)	(0.014)	(0.014)	(0.013)	(0.013)	(0.014)
Married	0.215***	0.042*	0.038	0.044*	0.054**	0.052**	-1.647***
	(0.026)	(0.025)	(0.024)	(0.025)	(0.024)	(0.025)	(0.284)
Divorced	0.422***	0.268***	0.227***	0.227***	0.186***	0.184***	0.189***
	(0.057)	(0.051)	(0.051)	(0.052)	(0.049)	(0.050)	(0.051)
University		0.819***	0.770***	0.794***	0.550***	0.533***	0.539***
		(0.051)	(0.051)	(0.056)	(0.058)	(0.058)	(0.059)
Bach. and Secondary		0.517***	0.490***	0.511***	0.337***	0.320***	0.338***
		(0.050)	(0.050)	(0.054)	(0.056)	(0.056)	(0.057)
High School		0.341***	0.328***	0.344***	0.248***	0.236***	0.242***
		(0.048)	(0.047)	(0.051)	(0.051)	(0.051)	(0.052)
Vocational train.		0.146**	0.160***	0.167***	0.145**	0.129**	0.128***
		(0.046)	(0.046)	(0.049)	(0.049)	(0.049)	(0.049)
Pot. Experience		0.044***	0.043***	0.042***	0.040***	0.039***	0.034***
		(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Pot. Experience^2		-0.130***	-0.128***	-0.123***	-0.115***	-0.110***	-0.079***
		(0.026)	(0.026)	(0.027)	(0.026)	(0.026)	(0.027)
City 500th plus			0.000	0.189***	0.000	0.211***	0.206***
			(0.000)	(0.042)	(0.000)	(0.042)	(0.044)
City 200-500th			-0.133***	0.063	-0.132***	0.081**	0.083**
			(0.038)	(0.039)	(0.037)	(0.038)	(0.040)
City 100-200th			-0.183***	0.000	-0.203***	0.000	0.000
			(0.040)	(0.000)	(0.041)	(0.000)	(0.000)
City 20- 100th			-0.204***	-0.014	-0.188***	0.020	0.009
			(0.036)	(0.038)	(0.037)	(0.038)	(0.040)
City less 20th			-0.216***	-0.016	-0.186***	0.022	0.027
			(0.037)	(0.038)	(0.037)	(0.037)	(0.040)
Village			-0.292***	-0.109**	-0.217***	-0.008	0.011
			(0.034)	(0.035)	(0.033)	(0.034)	(0.036)

Table 12 cont.

S. private				0.030	0.098***	0.097***	0.092***
				(0.021)	(0.025)	(0.026)	(0.026)
Part time				-0.140***	-0.135***	-0.129***	-0.129***
				(0.027)	(0.027)	(0.027)	(0.028)
Occ. Business					0.735***	0.722***	0.598***
					(0.061)	(0.062)	(0.065)
Occ. Health					0.580***	0.580***	0.481***
					(0.063)	(0.065)	(0.066)
Occ. Technical					0.625***	0.635***	0.525***
					(0.073)	(0.075)	(0.076)
Occ. Teaching					0.578***	0.578***	0.471***
					(0.068)	(0.070)	(0.069)
Occ. Administration					0.481***	0.471***	0.389***
					(0.058)	(0.060)	(0.061)
Occ. Elementary					0.362***	0.357***	0.290***
					(0.055)	(0.056)	(0.057)
Occ. Services					0.297***	0.288***	0.212***
					(0.054)	(0.055)	(0.058)
Occ. Other					0.300***	0.295***	0.230***
					(0.056)	(0.057)	(0.059)
Multifamily HH						0.000	0.000
						(0.000)	(0.000)
Husband's wage							0.227***
							(0.038)
Constant	6.727***	6.121***	6.339***	6.160***	5.993***	5.810***	5.918***
	(0.025)	(0.053)	(0.059)	(0.070)	(0.084)	(0.086)	(0.087)
Observations	4,219	4,192	4,192	3,814	3,752	3,608	3,191
R-squared	0.084	0.245	0.265	0.266	0.331	0.325	0.351

Notes:1. Cluster-robust standard errors in parenthesis; *** significance at 0.01, ** at 0.05, * at 0.1.

2. Year fixed effects included in the regressions.

3. *No.Children* denotes total number of children the woman has.

4. Educational and occupational groups defined as in table 1.

Table 13 Specification II: Fixed effects estimates of the effect of children on women's wages by total number of children, sample of working women aged 18-40, dependent variable logarithm of real monthly wage

VARIABLES	(1) ln(wage)	(2) ln(wage)	(3) ln(wage)	(4) ln(wage)	(5) ln(wage)
No. Children	-0.086*	-0.091*	-0.088	-0.087	-0.118*
	(0.047)	(0.049)	(0.056)	(0.057)	(0.063)
Married	0.094	0.074	0.105	0.105	-0.440
	(0.073)	(0.074)	(0.097)	(0.093)	(0.564)
Divorced	0.351**	0.350**	0.378**	0.414**	0.393**
	(0.141)	(0.136)	(0.155)	(0.161)	(0.166)
Pot. Experience		0.040**	0.035*	0.033	0.032
		(0.020)	(0.021)	(0.022)	(0.024)
Pot. Experience^2		-0.151**	-0.144*	-0.127	-0.172*
		(0.069)	(0.078)	(0.080)	(0.091)
S. private			0.015	0.044	0.061
			(0.043)	(0.045)	(0.047)
Part. time			-0.095**	-0.085**	-0.091**
			(0.044)	(0.043)	(0.046)
Occ. business				0.199	0.098
				(0.148)	(0.157)
Occ. Health				0.161	0.082
				(0.144)	(0.155)
Occ. Technical				0.309	0.212
				(0.191)	(0.218)
Occ. Teaching				0.192	0.084
				(0.151)	(0.163)
Occ. Administration				0.244	0.158
				(0.154)	(0.169)
Occ. Elementary				0.196	-0.002
				(0.134)	(0.131)
Occ. Services				0.093	0.027
				(0.138)	(0.148)
Occ. Other				0.141	-0.026
				(0.146)	(0.147)
Husband's wage					0.067
					(0.076)
Constant	7.200***	6.532***	7.039***	6.373***	6.523***
	(0.066)	(0.114)	(0.172)	(0.192)	(0.203)
Observations	4,219	4,204	3,824	3,762	3,323
R-squared	0.183	0.189	0.200	0.210	0.227
Number of individuals	3,266	3,260	3,057	3,019	2,698

Notes: 1. Cluster- robust standard errors in parenthesis; *** significance at 0.01, ** at 0.05, * at 0.1.,
2. Year fixed effects included in the regressions.
3. *No.Children* denotes total number of children the woman has.
4. Occupational groups defined as in table 1.

Table 14 Specification III: OLS estimates of the effect of children on women's wages by the number of children, sample of working women aged 18-40, dependent variable logarithm of real monthly wage

VARIABLES	(1) ln(wage)	(2) ln(wage)	(3) ln(wage)	(4) ln(wage)	(5) ln(wage)	(7) ln(wage)
One child	-0.047	-0.049	-0.050	-0.050	-0.057*	-0.075**
	(0.033)	(0.032)	(0.032)	(0.032)	(0.030)	(0.034)
Two children	-0.122***	-0.089**	-0.065*	-0.065*	-0.058*	-0.079**
	(0.033)	(0.035)	(0.035)	(0.035)	(0.033)	(0.037)
Three children and more	-0.319***	-0.156**	-0.120**	-0.120**	-0.085*	-0.093*
	(0.049)	(0.054)	(0.056)	(0.056)	(0.051)	(0.055)
Married	0.194***	0.050*	0.057**	0.057**	0.073**	-0.358***
	(0.029)	(0.027)	(0.028)	(0.028)	(0.026)	(0.099)
Divorced	0.396***	0.276***	0.239***	0.239***	0.207***	0.222***
	(0.059)	(0.053)	(0.054)	(0.054)	(0.052)	(0.054)
University		0.821***	0.797***	0.797***	0.554***	0.588***
		(0.051)	(0.056)	(0.056)	(0.058)	(0.060)
Bach. and Secondary		0.516***	0.510***	0.510***	0.338***	0.370***
		(0.050)	(0.054)	(0.054)	(0.056)	(0.058)
High School		0.340***	0.343***	0.343***	0.249***	0.268***
		(0.048)	(0.051)	(0.051)	(0.051)	(0.053)
Vocational train.		0.148**	0.168***	0.168***	0.146**	0.152***
		(0.046)	(0.049)	(0.049)	(0.049)	(0.050)
Pot. Experience		0.044***	0.042***	0.042***	0.042***	0.039***
		(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Pot. Experience^2		-0.132***	-0.126***	-0.126***	-0.122***	-0.102***
		(0.026)	(0.027)	(0.027)	(0.026)	(0.027)
City 500th plus			0.000	0.000	0.000	0.194***
			(0.000)	(0.000)	(0.000)	(0.042)
City 200-500th			-0.126**	-0.126**	-0.131***	0.076**
			(0.039)	(0.039)	(0.037)	(0.039)
City 100-200th			-0.189***	-0.189***	-0.203***	0.000
			(0.042)	(0.042)	(0.041)	(0.000)
City 20- 100th			-0.202***	-0.202***	-0.187***	-0.001
			(0.038)	(0.038)	(0.037)	(0.038)
City less 20th			-0.202***	-0.202***	-0.183***	0.019

Table 14 cont.

			(0.038)	(0.038)	(0.036)	(0.038)
Village			-0.298***	-0.298***	-0.220***	-0.004
			(0.035)	(0.035)	(0.033)	(0.035)
S. private			0.031	0.031	0.098***	0.095***
			(0.021)	(0.021)	(0.025)	(0.026)
Part time			-0.141***	-0.141***	-0.136***	-0.127***
			(0.027)	(0.027)	(0.027)	(0.028)
Occ. Business					0.727***	0.670***
					(0.060)	(0.063)
Occ. Health					0.575***	0.535***
					(0.063)	(0.066)
Occ. Technical					0.619***	0.550***
					(0.074)	(0.075)
Occ. Teaching					0.572***	0.541***
					(0.067)	(0.070)
Occ. Administration					0.477***	0.455***
					(0.058)	(0.061)
Occ. Elementary					0.358***	0.332***
					(0.054)	(0.057)
Occ. Services					0.294***	0.265***
					(0.054)	(0.057)
Occ. Other					0.298***	0.271***
					(0.056)	(0.059)
Husband's wage						0.060***
						(0.013)
Constant	6.781***	6.121***	6.348***	6.348***	5.991***	5.783***
	(0.026)	(0.053)	(0.069)	(0.069)	(0.085)	(0.087)
Observations	4,201	4,175	3,803	3,803	3,741	3,305
R-squared	0.084	0.247	0.268	0.268	0.332	0.342

Notes: 1. Cluster-robust standard errors in parenthesis; *** significance at 0.01, ** at 0.05, * at 0.1.
2. Year fixed effects included in the regressions.
3. *One child, Two children, Three children and more* are dummy variables.
4. Educational and occupational groups defined as in table 1.

Table 15 Specification III: Fixed effects estimates of the effect of children on women's wages by the number of children, sample of working women aged 18-40, dependent variable logarithm of real monthly wage

VARIABLES	(1) ln(wage)	(2) ln(wage)	(3) ln(wage)	(4) ln(wage)	(5) ln(wage)
One child	-0.076	-0.107	-0.166	-0.168	-0.193
	(0.090)	(0.091)	(0.110)	(0.115)	(0.129)
Two children	-0.164	-0.182*	-0.219*	-0.227*	-0.259*
	(0.106)	(0.107)	(0.127)	(0.129)	(0.142)
Three children and more	-0.320*	-0.322*	-0.295	-0.302	-0.401
	(0.179)	(0.185)	(0.215)	(0.217)	(0.255)
Married	0.092	0.077	0.115	0.115	0.107
	(0.073)	(0.074)	(0.096)	(0.093)	(0.142)
Divorced	0.350**	0.352**	0.381**	0.419**	0.397**
	(0.139)	(0.136)	(0.158)	(0.165)	(0.166)
Pot. Experience		0.038*	0.036*	0.033	0.033
		(0.020)	(0.021)	(0.022)	(0.023)
Pot. Experience^2		-0.150**	-0.150**	-0.131*	-0.165*
		(0.067)	(0.076)	(0.078)	(0.088)
S. private			0.013	0.041	0.050
			(0.043)	(0.045)	(0.048)
Part. time			-0.103**	-0.094**	-0.098**
			(0.044)	(0.043)	(0.045)
Occ. business				0.203	0.117
				(0.150)	(0.165)
Occ. Health				0.158	0.105
				(0.147)	(0.160)
Occ. Technical				0.310	0.232
				(0.193)	(0.224)
Occ. Teaching				0.193	0.098
				(0.153)	(0.171)
Occ. Administration				0.248	0.176
				(0.158)	(0.178)
Occ. Elementary				0.191	-0.004
				(0.136)	(0.137)
Occ. Services				0.098	0.051
				(0.140)	(0.153)
Occ. Other				0.161	-0.004
				(0.147)	(0.151)
Husband's wage					-0.011
					(0.018)
Constant	7.196***	6.548***	6.563***	6.399***	6.526***
	(0.068)	(0.117)	(0.135)	(0.201)	(0.215)
Observations	4,201	4,186	3,812	3,750	3,313
R-squared	0.181	0.187	0.201	0.211	0.226
Number of individuals	3,256	3,250	3,050	3,012	2,693

Notes: 1. Cluster-robust standard errors in parenthesis; *** significance at 0.01, ** at 0.05, * at 0.1.,
2. Year fixed effects included in the regressions.
3. *One child, Two children, Three children and more* are dummy variables.
4. Occupational groups defined as in table 1.

Table 16 Specification IV: OLS estimates of the effect of children on women's wages by the age of children, sample of working women aged 18-40, dependent variable logarithm of real monthly wage

VARIABLES	(1) ln(wage)	(2) ln(wage)	(3) ln(wage)	(5) ln(wage)	(6) ln(wage)	(7) ln(wage)	(8) ln(wage)
No. Children 0-3	-0.025	-0.052	-0.058	-0.054	-0.037	-0.044	-0.062
	(0.039)	(0.035)	(0.035)	(0.035)	(0.037)	(0.036)	(0.038)
No. Children 3-7	-0.074**	-0.034	-0.063**	-0.049*	-0.046	-0.025	-0.035
	(0.029)	(0.027)	(0.027)	(0.027)	(0.028)	(0.026)	(0.030)
No. Children 7-18	-0.094***	0.002	-0.038**	-0.027*	-0.028*	-0.015	-0.014
	(0.014)	(0.014)	(0.016)	(0.015)	(0.016)	(0.015)	(0.016)
Married	0.208***	0.141***	0.052**	0.047*	0.051*	0.059**	-0.374***
	(0.026)	(0.024)	(0.025)	(0.025)	(0.026)	(0.025)	(0.101)
Divorced	0.424***	0.379***	0.272***	0.230***	0.229***	0.188***	0.194***
	(0.057)	(0.050)	(0.052)	(0.051)	(0.052)	(0.050)	(0.051)
University		0.788***	0.814***	0.766***	0.792***	0.547***	0.578***
		(0.049)	(0.051)	(0.051)	(0.057)	(0.059)	(0.061)
Bach. and Secondary		0.484***	0.513***	0.486***	0.509***	0.333***	0.362***
		(0.049)	(0.051)	(0.050)	(0.055)	(0.056)	(0.059)
High School		0.332***	0.338***	0.325***	0.343***	0.246***	0.262***
		(0.047)	(0.048)	(0.048)	(0.051)	(0.052)	(0.054)
Vocational train.		0.172***	0.143**	0.156***	0.165***	0.143**	0.148***
		(0.047)	(0.046)	(0.046)	(0.050)	(0.049)	(0.051)
Pot. Experience			0.046***	0.044***	0.043***	0.041***	0.038***
			(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Pot. Experience^2			-0.143***	-0.140***	-0.132***	-0.123***	-0.106***
			(0.027)	(0.026)	(0.028)	(0.026)	(0.028)
City 500th plus				0.000	0.190***	0.000	0.197***
				(0.000)	(0.042)	(0.000)	(0.042)
City 200-500th				-0.133***	0.063	-0.132***	0.077**
				(0.038)	(0.039)	(0.037)	(0.039)
City 100-200th				-0.184***	0.000	-0.204***	0.000
				(0.040)	(0.000)	(0.041)	(0.000)
City 20- 100th				-0.203***	-0.013	-0.188***	0.001
				(0.036)	(0.037)	(0.037)	(0.038)
City less 20th				-0.216***	-0.016	-0.186***	0.017
				(0.037)	(0.038)	(0.036)	(0.038)
Village				-0.291***	-0.107**	-0.218***	0.000

Table 16 cont.

				(0.033)	(0.034)	(0.033)	(0.035)
S. private					0.030	0.098***	0.095***
					(0.021)	(0.025)	(0.026)
Part time					-0.139***	-0.134***	-0.126***
					(0.027)	(0.027)	(0.028)
Occ. Business						0.734***	0.676***
						(0.061)	(0.064)
Occ. Health						0.580***	0.538***
						(0.063)	(0.066)
Occ. Technical						0.625***	0.554***
						(0.073)	(0.075)
Occ. Teaching						0.577***	0.543***
						(0.068)	(0.071)
Occ. Administration						0.480***	0.453***
						(0.058)	(0.061)
Occ. Elementary						0.360***	0.332***
						(0.055)	(0.057)
Occ. Services						0.296***	0.264***
						(0.054)	(0.057)
Occ. Other						0.299***	0.269***
						(0.056)	(0.059)
Husband's wage							0.060***
							(0.013)
Constant	6.726***	6.327***	6.120***	6.339***	6.158***	5.994***	5.789***
	(0.025)	(0.050)	(0.053)	(0.059)	(0.070)	(0.085)	(0.087)
Observations	4,219	4,203	4,192	4,192	3,814	3,752	3,314
R-squared	0.084	0.227	0.246	0.266	0.267	0.331	0.342

Notes: 1. Cluster-robust standard errors in parenthesis; *** significance at 0.01, ** at 0.05, * at 0.1.
2. Year fixed effects included in the regressions.
3. *No. children 0-3, No. children 3-7, No. children 7-18* denote total number of children in each of the age groups.
4. Educational and occupational groups defined as in table 1.

Table 17 Specification IV: Fixed effects estimates of the effect of children on women's wages by the age of children, sample of working women aged 18-40, dependent variable logarithm of real monthly wage

VARIABLES	(1) ln(wage)	(2) ln(wage)	(3) ln(wage)	(4) ln(wage)	(5) ln(wage)
No. Children 0-3	-0.029	-0.046	-0.046	-0.056	-0.056
	(0.059)	(0.060)	(0.069)	(0.070)	(0.080)
No. Children 3-7	-0.063	-0.084	-0.082	-0.077	-0.027
	(0.057)	(0.060)	(0.070)	(0.071)	(0.075)
No. Children 7-18	-0.098*	-0.104*	-0.064	-0.055	-0.084
	(0.057)	(0.059)	(0.066)	(0.068)	(0.075)
Married	0.082	0.066	0.100	0.101	0.085
	(0.073)	(0.075)	(0.098)	(0.094)	(0.145)
Divorced	0.356**	0.354**	0.379**	0.414**	0.390**
	(0.138)	(0.134)	(0.154)	(0.160)	(0.158)
Pot. Experience		0.041**	0.037*	0.034	0.031
		(0.020)	(0.022)	(0.022)	(0.024)
Pot. Experience^2		-0.157**	-0.154*	-0.137*	-0.156*
		(0.070)	(0.079)	(0.081)	(0.091)
S. private			0.012	0.042	0.056
			(0.043)	(0.045)	(0.046)
Part. time			-0.099**	-0.089**	-0.092**
			(0.043)	(0.043)	(0.045)
Occ. business				0.194	0.105
				(0.147)	(0.158)
Occ. Health				0.164	0.108
				(0.144)	(0.155)
Occ. Technical				0.306	0.220
				(0.190)	(0.220)
Occ. Teaching				0.192	0.085
				(0.150)	(0.164)
Occ. Administration				0.239+	0.161
				(0.153)	(0.170)
Occ. Elementary				0.193+	-0.006
				(0.134)	(0.131)
Occ. Services				0.090	0.038
				(0.137)	(0.147)
Occ. Other				0.133	-0.026
				(0.147)	(0.147)
Husband's wage					-0.011
					(0.081)
Constant	7.198***	6.529***	7.010***	6.357***	6.481***
	(0.069)	(0.113)	(0.172)	(0.190)	(0.199)
Observations	4,219	4,204	3,824	3,762	3,323
R-squared	0.183	0.189	0.199	0.209	2,698
Number of individuals	3,266	3,260	3,057	3,019	0.224

Notes: 1. Cluster-robust standard errors in parenthesis; *** significance at 0.01, ** at 0.05, * at 0.1.

2. Year fixed effects included in the regressions.

3. *No. children 0-3, No. children 3-7, No. children 7-18* denote total number of children in each of the age groups.

4. Occupational groups defined as in table 1.

Table 18Average treatment effect estimations using cross-sectional matching procedure, sample of working women aged 18-40, dependent variable logarithm of real monthly wage

VARIABLES	(1) ln(wage)	(2) ln(wage)	(3) ln(wage)	(4) ln(wage)	(5) ln(wage)	(6) ln(wage)
Mother	-0.042***	-0.039**	-0.035**	-0.047***	-0.043*	-0.035
	(0.016)	(0.015)	(0.016)	(0.016)	(0.025)	(0.025)
Age		0.158***	0.133***	0.106***	0.102**	0.098**
		(0.040)	(0.040)	(0.038)	(0.040)	(0.042)
Age^2		-0.002***	-0.002***	-0.002***	-0.001**	-0.001**
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
University		0.586***	0.538***	0.330***	0.320***	0.277***
		(0.058)	(0.069)	(0.070)	(0.068)	(0.070)
Bach. And Secondary		0.237***	0.183**	0.004	-0.001	-0.034
		(0.064)	(0.073)	(0.074)	(0.071)	(0.072)
High School		0.185***	0.156**	-0.003	-0.005	-0.026
		(0.060)	(0.063)	(0.064)	(0.060)	(0.061)
Vocational train		-0.224***	-0.210***	-0.307***	-0.303***	-0.314***
		(0.063)	(0.071)	(0.072)	(0.067)	(0.068)
F. Math			0.318***	0.200***	-0.056	0.225***
			(0.038)	(0.036)	(0.035)	(0.041)
F. Humanistic			0.231***	0.141***	-0.120***	0.161***
			(0.042)	(0.042)	(0.034)	(0.046)
F. Inne			0.212***	0.110**	-0.172***	0.110**
			(0.049)	(0.048)	(0.043)	(0.050)
F. Services			0.261***	0.203***	-0.101**	0.183***
			(0.040)	(0.037)	(0.045)	(0.040)
F. no specialization			0.201***	0.132***	-0.149***	0.127***
			(0.043)	(0.040)	(0.041)	(0.047)
F. Econ&Finance			0.283***	0.254***	0.000	0.296***
			(0.041)	(0.039)	(0.000)	(0.045)
F. Production			0.000	0.000	-0.278***	0.000
			(0.000)	(0.000)	(0.044)	(0.000)
				(0.046)	(0.049)	(0.050)
Cities dummies				YES	YES	YES
Married					-0.144***	-0.153***
					(0.031)	(0.031)
Divorced					-0.237***	-0.247***
					(0.059)	(0.056)
Husband's wage					0.015***	0.017***
					(0.005)	(0.005)
Part time						-0.011
						(0.044)
S. private						-0.059***
						(0.020)
Constant	6.938***	4.014***	4.180***	5.001***	5.366***	5.203***
	(0.024)	(0.640)	(0.652)	(0.619)	(0.665)	(0.697)
Observations	5,496	5,496	5,496	5,496	4,835	4,667
R-squared	0.051	0.221	0.244	0.322	0.339	0.342

Notes: 1. *** significance at 0.01, ** at 0.05, * at 0.1.
2. Year fixed effects included in the regressions.

Table 19 Propensity score estimation - motherhood probit estimates, dependent variable being a mother in year T (T=2003, 2005, 2007, 2009); independent variables are observed in time T

VARIABLES at time T	Mother T=2003	Mother T=2005	Mother T=2007	Mother T=2009
Age	0.794***	0.840***	0.753***	0.636***
	(0.152)	(0.165)	(0.116)	(0.081)
Age^2	-0.010***	-0.010***	-0.009***	-0.008***
	(0.002)	(0.003)	(0.002)	(0.001)
F. Services	---	0.342	-0.168	0.120
		(0.313)	(0.198)	(0.123)
F. Math	-0.433	---	0.205	0.244*
	(0.276)		(0.208)	(0.135)
F. Econ&Finance	-0.287	0.104	0.193	0.188
	(0.238)	(0.269)	(0.207)	(0.122)
F. Production	-0.221	-0.021	-0.134	-0.007
	(0.224)	(0.313)	(0.231)	(0.168)
F. Human	-0.329	-0.249	0.046	0.195*
	(0.247)	(0.274)	(0.182)	(0.107)
F. Other	-0.376*	-0.164	0.156	---
	(0.224)	(0.280)	(0.221)	
F. No Specialization	---	0.106	---	---
		(0.646)		
University	0.310	-1.201*	-1.332***	-1.365***
	(0.795)	(0.689)	(0.294)	(0.207)
Bach. and Secondary	0.696	-0.762	-0.776**	-1.129***
	(0.799)	(0.693)	(0.306)	(0.214)
High School	1.128	-0.238	-0.579**	-0.698***
	(0.791)	(0.667)	(0.263)	(0.189)
Vocational train.	0.849	-0.693	-0.623**	-0.588***
	(0.789)	(0.662)	(0.301)	(0.215)
City 500th plus	-0.133	-0.485**	-0.407**	-0.415***
	(0.218)	(0.229)	(0.164)	(0.110)
City 200-500th	---	0.065	-0.152	-0.201*
		(0.216)	(0.144)	(0.106)
City 100-200th	---	---	-0.155	---
			(0.193)	
City 20-100th	-0.187	---	0.021	---
	(0.185)		(0.157)	
City less 20th	0.089	0.234	0.032	0.017
	(0.204)	(0.199)	(0.147)	(0.109)
Village	-0.328*	-0.024	-0.023	-0.067
	(0.168)	(0.158)	(0.115)	(0.083)
Constant	-14.540***	-14.801***	-12.791***	-11.053***
	(2.437)	(2.544)	(1.743)	(1.201)
Observations	696	674	1,184	2,288

Notes: 1. *** significance at 0.01, ** at 0.05, * at 0.1

Table 20Average treatment effect estimations using pre-motherhood characteristics in the matching procedure, sample of working women aged 18-40, dependent variable logarithm of real monthly wage

VARIABLES	(1) ln(wage)	(2) ln(wage)	(3) ln(wage)	(4) ln(wage)	(5) ln(wage)	(6) ln(wage)	(7) ln(wage)
Mother	-0.218**	-0.181**	-0.189**	-0.162*	-0.153*	-0.155	-0.257**
	(0.094)	(0.087)	(0.093)	(0.088)	(0.088)	(0.098)	(0.105)
Age		0.127*	0.146*	0.092	0.095	0.102	0.137*
		(0.069)	(0.074)	(0.073)	(0.074)	(0.074)	(0.071)
Age^2		-0.002	-0.002	-0.001	-0.001	-0.001	-0.002
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
University		1.006***	1.270***	1.159***	1.159***	1.077***	0.670*
		(0.224)	(0.299)	(0.314)	(0.315)	(0.314)	(0.352)
Bach. And Secondary		0.771***	1.043***	0.946***	0.941***	0.878***	0.445
		(0.221)	(0.286)	(0.304)	(0.305)	(0.301)	(0.346)
High School		0.588***	0.819***	0.722***	0.718**	0.668**	0.237
		(0.223)	(0.260)	(0.274)	(0.275)	(0.274)	(0.333)
Vocational train.		0.465*	0.877***	0.779**	0.778**	0.692**	-0.007
		(0.251)	(0.321)	(0.319)	(0.320)	(0.319)	(0.345)
F. Production			0.000	0.000	-0.371	-0.301	0.000
			(0.000)	(0.000)	(0.255)	(0.257)	(0.000)
F. No specialization			0.449*	0.360	0.000	0.000	-0.196
			(0.245)	(0.254)	(0.000)	(0.000)	(0.306)
F. Econ&Finance			0.368*	0.314*	-0.049	0.001	0.053
			(0.202)	(0.182)	(0.223)	(0.218)	(0.178)
F. Services			0.083	0.034	-0.329*	-0.287	0.002
			(0.112)	(0.133)	(0.185)	(0.183)	(0.144)
F. Math			-0.204	-0.197	-0.558*	-0.434	-0.202
			(0.279)	(0.247)	(0.325)	(0.307)	(0.201)
F. Humanistic sc.			0.082	0.036	-0.327	-0.247	-0.117
			(0.206)	(0.191)	(0.215)	(0.205)	(0.171)
F. Other			0.265	0.163	-0.200	-0.131	-0.063
			(0.205)	(0.171)	(0.171)	(0.169)	(0.190)
City dummies				YES	YES	YES	YES

Table 20 cont.

Married					-0.028	-0.028	-0.609**
					(0.059)	(0.062)	(0.292)
Divorced					-0.193	-0.197	-0.275*
					(0.136)	(0.128)	(0.141)
Part time						-0.130	-0.121
						(0.128)	(0.169)
Husband's wage							0.083**
							(0.038)
Constant	7.437***	3.932***	3.081***	4.125***	4.453***	4.698***	4.467***
	(0.079)	(0.965)	(1.095)	(1.135)	(1.101)	(1.109)	(1.156)
Observations	338	337	335	335	334	321	277
R-squared	0.156	0.353	0.407	0.439	0.440	0.432	0.478

Notes: 1. *** significance at 0.01, ** at 0.05, * at 0.1.
2. Year fixed effects included in the regressions.

Table 21 Fixed effects estimation: average treatment effect estimations using pre-motherhood characteristics in the matching procedure, sample of working women aged 18-40, dependent variable logarithm of real monthly wage

VARIABLES	(1) ln(wage)	(2) ln(wage)	(5) ln(wage)	(6) ln(wage)	(7) ln(wage)
Mothers	-0.132*	-0.125*	-0.138*	-0.139*	-0.182*
	(0.071)	(0.072)	(0.073)	(0.078)	(0.097)
Pot. Experience		-0.016	-0.019	-0.018	-0.021
		(0.029)	(0.029)	(0.031)	(0.038)
Pot.Experience^2*100		-0.059	-0.038	-0.030	-0.040
		(0.101)	(0.104)	(0.108)	(0.133)
Married			0.078	0.074	0.029
			(0.095)	(0.105)	(0.223)
Divorced			-0.225	-0.222	-0.136
			(0.315)	(0.322)	(0.361)
Part time				-0.058	-0.052
				(0.075)	(0.088)
Husband's wage					-0.010
					(0.034)
Constant	6.743***	6.884***	6.866***	6.867***	7.719***
	(0.045)	(0.157)	(0.161)	(0.168)	(0.324)
Observations	338	333	332	319	274
R-squared	0.262	0.267	0.272	0.274	0.259
Number of individuals	118	118	118	118	110

Notes: 1. *** significance at 0.01, ** at 0.05, * at 0.1.
2. Year fixed effects included in the regressions.

Table 22 Average treatment effect of the first child, estimation using matched treated and controls from the matching procedure performed on pre-motherhood characteristics, sample of working women aged 18-40, dependent variable logarithm of real monthly wage

VARIABLES	(1) ln(wage)	(2) ln(wage)	(3) ln(wage)	(4) ln(wage)	(5) ln(wage)	(6) ln(wage)	(7) ln(wage)
Mother	-0.302***	-0.274***	-0.283***	-0.266***	-0.269***	-0.248**	-0.331***
	(0.088)	(0.100)	(0.097)	(0.094)	(0.097)	(0.103)	(0.115)
Age		0.137*	0.152*	0.104	0.103	0.122	0.146*
		(0.075)	(0.079)	(0.083)	(0.081)	(0.088)	(0.082)
Age^2		-0.002	-0.002	-0.001	-0.001	-0.002	-0.002
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
University		0.789***	1.254***	1.141***	1.143***	1.033***	1.206***
		(0.227)	(0.316)	(0.336)	(0.339)	(0.367)	(0.343)
Bach. and secondary		0.619***	1.095***	0.983***	0.985***	0.873**	0.952***
		(0.234)	(0.312)	(0.331)	(0.335)	(0.358)	(0.332)
High School		0.361	0.775***	0.676**	0.679**	0.596**	0.674**
		(0.240)	(0.263)	(0.274)	(0.277)	(0.297)	(0.299)
Vocational train.		0.390	1.019***	0.891***	0.897***	0.802**	0.665*
		(0.238)	(0.333)	(0.338)	(0.341)	(0.374)	(0.375)
F. Production			0.000	0.000	0.000	0.000	-0.542
			(0.000)	(0.000)	(0.000)	(0.000)	(0.355)
F. No specialization			0.733***	0.573**	0.583**	0.501	0.000
			(0.242)	(0.267)	(0.271)	(0.307)	(0.000)
F. Econ&Finance			0.561**	0.444*	0.449*	0.483*	-0.287
			(0.244)	(0.248)	(0.250)	(0.263)	(0.319)
F. Services			0.183	0.091	0.099	0.088	-0.446
			(0.162)	(0.176)	(0.181)	(0.185)	(0.311)
F. Mathematics			-0.009	-0.062	-0.058	0.024	-0.369
			(0.260)	(0.264)	(0.267)	(0.274)	(0.415)
F. Humanistic sc.			0.198	0.094	0.104	0.143	-0.579**
			(0.256)	(0.257)	(0.260)	(0.271)	(0.290)
F. Other			0.458*	0.309	0.318	0.345	-0.324
			(0.242)	(0.245)	(0.247)	(0.259)	(0.277)
City dummies				YES	YES	YES	YES
Married					-0.004	-0.022	-0.467
					(0.069)	(0.069)	(0.355)
Divorced					-0.117	-0.125	-0.217
					(0.141)	(0.142)	(0.189)
Part time						-0.083	0.029
						(0.170)	(0.231)
Husband's wage							0.066
							(0.048)
Constant	6.767***	4.001***	2.851**	3.869***	3.876***	4.125***	4.217***
	(0.089)	(1.127)	(1.232)	(1.297)	(1.262)	(1.335)	(1.323)
Observations	236	235	234	234	233	225	191
R-squared	0.210	0.354	0.423	0.451	0.452	0.433	0.477

Notes: 1. *** significance at 0.01, ** at 0.05, * at 0.1.
2. Year fixed effects included in the regressions.

Table 23 Difference-in-difference estimation: average treatment effect the first child, estimation using matched treated and controls from the matching procedure performed on pre-motherhood characteristics, sample of working women aged 18-40, dependent variable logarithm of real monthly wage

VARIABLES	(1) ln(wage)	(2) ln(wage)	(3) ln(wage)	(4) ln(wage)
Mothers	-0.181*	-0.146	-0.134	-0.179
	(0.097)	(0.106)	(0.107)	(0.154)
Pot. Experience		-0.046	-0.046	-0.061
		(0.054)	(0.053)	(0.095)
Pot.Experience^2*100		0.002	0.022	-0.021
		(0.246)	(0.248)	(0.353)
Married			0.103	-0.163
			(0.127)	(0.792)
Divorced			-0.269*	-0.679
			(0.156)	(0.596)
Part time				0.166
				(0.285)
Husband's wage				0.055
				(0.114)
Constant	7.384***	7.136***	7.124***	7.424***
	(0.115)	(0.265)	(0.264)	(0.421)
Observations	236	235	234	192
R-squared	0.101	0.092	0.102	0.178
Number of individuals	118	118	118	105

Notes: 1. *** significance at 0.01, ** at 0.05, * at 0.1.
2. Year fixed effects included in the regressions.

Table 24 Propensity score estimation - motherhood probit estimates, dependent variable mother-to-be (for 2003-2005;2005-2007;2007-2009); Independent variables are observed one period before the change in the motherhood status; sample of women aged 18-40

Variables observed before the treatment (T-1)	Mother-to-be 2003-2005	Mother-to-be 2005-2007	Mother-to-be 2007-2009
Age	0.647	0.435	0.485
	(0.413)	(0.458)	(0.366)
Age^2	-0.012	-0.007	-0.006
	(0.007)	(0.008)	(0.006)
ln(wage)	0.325	-0.204	-0.174
	(0.438)	(0.383)	(0.272)
F. Production	---	0.085	0.199
		(0.842)	(0.670)
F. Humanistic sc.	1.517	-0.843	0.079
	(1.136)	(0.746)	(0.427)
F. Other	-0.219	-0.152	-0.236
	(1.005)	(0.768)	(0.628)
F. Services	-0.989	-0.442	0.198
	(0.905)	(0.911)	(0.477)
F. Econ. & Finance	0.554	0.371	0.262
	(1.005)	(0.688)	(0.456)
University	-3.271***	0.245	0.674
	(1.059)	(0.917)	(0.427)
Bach & Secondary	-2.435**	0.038	0.661
	(1.044)	(0.929)	(0.536)
High School	-1.128	-0.181	---
	(0.753)	(0.840)	
Vocational train.	---	-0.874	0.954**
		(0.998)	(0.451)
Village	-0.022	0.957	0.481
	(0.532)	(0.615)	(0.321)
City less 20th	1.121**	0.556	---
	(0.550)	(0.748)	
City 20-100th	-0.197	1.597**	0.645
	(0.592)	(0.693)	(0.397)
City 500th plus	-0.001	1.102	0.793*
	(0.668)	(0.685)	(0.409)
Constant	-10.814*	-7.328	-9.471*
	(6.312)	(6.467)	(5.721)
Observations	122	133	210

Notes: 1. Omitted categories for all probit regressions: *Primary and less education, No specialization, City 100-500th*. For regression (1) and (3) other groups are additionally omitted due to the collinearity.
2. *** significance at 0.01, ** at 0.05, * at 0.1.

Table 25 Estimation of the upper and lower bounds of the effect of motherhood on women's wages, sample of not studying women (aged 18-40) who are becoming mothers

Mothers	
Number of individuals	408
Number of working mothers	243
Proportion (empl. rate)	0.5956
Mean wage for employed (I)	6.9976
Nonmothers	
Number of individuals	460
Number of working non-mothers	296
Proportion (empl. rate)	0.6434
Mean wage for employed (II)	6.7573
p	0.0744
pth quantile value	6.0512
Trimmed mean (from below) (III)	6.8601
1-p	0.9256
1-pth quantile value	7.5792
Trimmed mean (from above) (IV)	6.6837
Upper bound =(III)-(I)	**-0.13755**
Lower bound =(IV)-(I)	**-0.31385**

Table 26 Employment selectivity: Probit estimation of the probability of being employed after becoming mother; sample of not studying women (aged 18-40) who are becoming mothers

VARIABLES	Employed after (dummy)
Wage before	**1.745*** **
	(0.431)
Age	-0.598
	(0.453)
Age^2	0.012
	(0.007)
University	0.091
	(0.991)
Bach. and Secondary	-0.634
	(1.015)
High school	-0.542
	(0.988)
Vocational	-0.216
	(0.958)
Married	-0.362
	(0.398)
City 500th plus	1.951***
	(0.684)
City 200-500th	0.457
	(0.849)
City 20-100th	0.766
	(0.656)
City less 20th	1.009
	(0.764)
Village	1.716***
	(0.644)
F. Mathematics	1.160
	(1.112)
F. humanistic sc.	-0.598
	(0.821)
F. Other	-0.239
	(0.898)
F. Production	-1.385
	(0.859)
F. Econ&Finance	-0.126
	(0.796)
F. Services	-0.422
	(0.803)
Constant	-3.620
	(6.143)
Observations	118

Notes: 1. *** significance at 0.01, ** at 0.05, * at 0.1.
2. Year fixed effects included in the regression

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