# The Motherhood Wage Gap: Does Timing Matter? (preliminary paper)

Andrea Siebert[1]

June 28, 2016

[1]Institute for Spatial and Housing Economics, University of Muenster, Phone: 0251-83-22979, E-Mail: siebert@insiwo.de.

**Abstract**

Although we have observed an increase in gender equality on the labour market, like rising participation rates of women, and a narrowing of the gender wage gap, there is substantial evidence of a wage penalty for women once they have children. In order to shed light on the effect of motherhood timing on career outcomes, this paper investigates whether postponing the first birth mitigates the negative effect of having children on wages. Using data from the German Socio-Economic Panel (GSOEP) for the years 1991-2013, I estimate a fixed-effects model that allows to reveal the underlying mechanisms of the motherhood wage penalty. To control for factors that simultaneously influence childbirth and wages, I include measures for changes in wage growth before childbirth. Since the age at first birth is time-invariant, I allow the motherhood wage gap to vary by age at first birth. Additionally, I test for self-selection into the labour market. The results indicate that a postponement of the first birth narrows the motherhood wage gap and thus, has a positive influence on female wages. Nevertheless, the results indicate that high-productive women who give birth later in life self-select out of the labour force.

# 1 Introduction

The gender wage gap in Germany narrowed sharply in the last decades and then levelled off at a current amount of about 20 percent. Among the industrial countries the gender wage gap in Germany is comparable high. There is strong evidence that the decrease of the gender wage gap can be explained by a convergence of education between women and men, and by the increasing labour force participation of women. One of the main sources of the current remaining differences is assumed to be vertical segregation (Ponthiuex and Meurs, 2015). Vertical segregation describes the concept that women and men follow different career paths: at the beginning of their working life women and men are relatively equal. But due to family responsibilities women face more interruptions of the working life and fewer promotions than men. This traditionally results in slower wage growth and thus, in lower wages. Vertical segregation results from supply as well as demand side factors. Women's preferences for family or cultural and social norms concerning women's role in childcare can lead to higher interruption rates and longer episodes out of the labour force. Both factors are well known to have a negative influence on wages. On the demand side, statistical discrimination leads to lower promotion rates of women. If employers expect women to interrupt their careers with higher probability than men they put less effort to promote them. The hypothesis of vertical segregation assumes that above all family responsibilities and - more specific- children are the driving factor of the gender wage gap. Hence, by investigating how wages differ by motherhood status, one will learn more about the driving forces of the gender wage gap, that is still a often and controversy discussed subject in politics and public. Waldfogel (1998) provides a literature overview of the motherhood wage gap - the difference in wages between women with children and women without children. She observes that the motherhood wage gap increased in the last decades. At the same time, one can observe a postponement of fertility: Women are getting older and older when they give birth to their first child. Today, the average age at first birth is 29 whereas it was 24 in 1970 (Federal Statistical Office, 2012). While late motherhood is often associated with disadvantages especially concerning health risks, giving birth early in life is often seen as a career harming factor for women. The aim of this paper is to investigate whether a delay of motherhood timing increases women's wages and career opportunities. With regard to the demographic change, Germany faces a high challenge in the next years. Given the ageing of the population, politicians should

have an effort to encourage women to participate in the labour market. Nevertheless, developing one own career and having children is still often seen as a conflict of interest for women.

Employing a fixed-effects approach, I estimate the change in wages and wage growth after a change in motherhood status. This approach controls for unobserved heterogeneity that is due to time-invariant factors and allows to investigate the channels through which motherhood influences wages. To investigate the role of fertility timing, I allow the effects of motherhood to vary by age at first birth. I additionally focus on female migrants because based on the different fertility behaviour of migrant women, I expect that the effect of motherhood is stronger for migrants.

The identification of the causal effect of fertility timing is challenging, because young and old mothers may differ in respect to their productivity and labour market attachment. Additionally, results may be biased by reverse causality, because fertility timing can be controlled by women and may depend on the anticipation of future career outcomes. To deal with the problem of reverse causality I control for employment history and wage growth before having the first child, assuming that women can't fully anticipate future wages. I extract my sample from the German Socio-Economic Panel (GSOEP), which provides very detailed information about the employment and birth history of women. My sample covers women who have their first child between 1984 and 2013. The rest of the paper is structured as follows: In the next section I present a literature overview with a focus on results for Germany. Then I present the empirical methodology, the data and empirical results. I conclude with a discussion of the results.

# 2 Theoretical consideration and literature overview

I first want to discuss the channels through which motherhood may affect wages. Different possible effects of motherhood on the wage path of women are illustrated in figure 1.[1] In this scenario, the "old" woman has her first child at an age of 29 and the "young" woman at an age of 24; both are out of the labour force for one year.

The black line represents the wage path of a woman before having a child and how it would have continued if she wouldn't had a child. The dashed lines represent possible

[1] The illustration is inspired by Miller (2011) and Mincer and Ofek (1982).

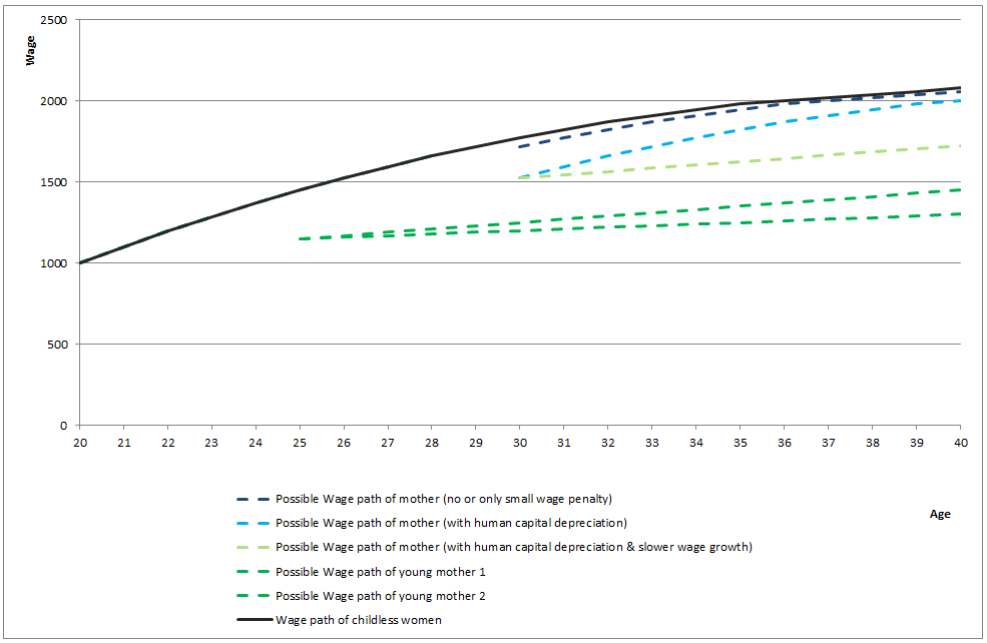


**Figure 1:** Effects of motherhood on wage outcomes.

wage paths after returning to the labour market. If we assume that a woman re-enters the labour market at the same wage at which she left it (dark blue line), she experiences a wage loss because she foregoes any wage growth during this episode. Nevertheless, this wage loss is quite small and she can catch up to her former wage path. This loss in experience is smaller the shorter the period of maternity leave is. If we in contrast assume that a career interruption leads to a depreciation of skills - what is represented by the light blue line - then women re-enter the labour market at a lower wage than they had before. It seems reasonable that the magnitude of the productivity loss increases the longer the woman is out of the labour force (see for instance Mincer and Ofek (1982)). The other possible channel through which women may experience a motherhood penalty is through slower wage growth once they are mothers. This is illustrated by the green line and is called "mommy track" because mothers are on the slower career path than childless women. In this case, the returns to experience are smaller than they would have been and women can't catch up to their former wage path. Reasons for a slower wage growth can be manifold: It can be demand or supply side factors or a combination of both. If employers for instance believe that the probability to again interrupt the career after a first interruption increases, they may have less effort to promote mothers. On the supply side, mothers may invest less in their career and in the development of their skills once they are mothers (see for instance Miller (2011)). Of course, a combination of the first and the third effect (black and green line) is possible, too: Although human capital

depreciation is not given, women may find themselves on the "mommy track" after labour market re-entry. In figure 1 possible effects of motherhood timing are included, too. The magnitude of the motherhood wage penalty may differ by age at first birth. For instance, the depreciation of human capital may be lower for older mothers if they can protect their human capital from depreciation better than young mothers. Additionally, older mothers may already established a career or have been promoted before having children so that motherhood does not affect their growth in wages as much as it affects younger mothers. All these considerations support the hypothesis that postponing the first birth may be a mean to attenuate the motherhood penalty. However, the opposite is possible, too. To give an example, having children early in life and working at the same time may send positive signals to employers (Smith et al., 2013), because being a young and working mother may be associated with high motivation and resilience. Because they send these positive signals, young mothers may have a better change to get promoted than older mothers. What is additionally illustrated in figure 1 is that, even if the magnitude of the motherhood wage penalty does not differ by fertility timing, there is a permanent wage gap between young and old mothers in the presence of human capital depreciation. Following these consideration it can be summarized that although arguments in favour of a benefit from fertility delay predominate, the effect of timing is an empirical question.

One of the earliest studies analysing the family gap is that of Waldfogel (1998). She observes that the family gap increased in the last decades while the gender wage gap decreased. Like the gender wage gap, the (raw) family wage gap may reflect differences in human capital variables like education and experience as well as unobserved heterogeneity. Mothers may differ systematically from women without children concerning characteristics that may also be correlated with wages and productivity but that can't be observed (Waldfogel, 1998). This is why the common approach to estimate the effect of motherhood on wages is to employ a panel data model that deletes bias that are due to time-invariant individual characteristics.[2] Datta Gupta and Smith (2002) find that the negative effect of the number of children on earnings of Danish women vanishes after controlling for time-constant heterogeneity. This is evidence for the assumption that women without children and mothers differ regarding constant characteristics and that a cross-section analysis would overestimate the family wage gap. Gangl and Ziefle (2009) compare the

[2]For a literature overview until 1998 see Waldfogel (1998)

motherhood wage penalty in Britain, Germany and in the USA, finding a wage gap from 17.9 percent (in Germany) to 9.3 percent (USA) even in a fixed-effects framework. After controlling for work history, the motherhood wage gap in Britain and the USA becomes insignificant, whereas the German wage gap is still about 10 percent. A similar result for Germany is found by Felfe (2012). Exploring first differences she finds a 10 percent wage gap and additionally a change in job amenities after childbirth. Her results show that being a mother has a negative effect on working hours and, if women change their employer after re-entering the labour market, they have a more flexible work schedule and less night work.

Usually, explanatory variables that are used to measure the family wage gap are a dummy for being a mother or not, or the number of children. But these variables tell little about the underlying mechanisms that explain why woman have lower wages once they have a child. Thus, a lot of studies concentrate on the effect of taking maternity leave on wages. One of the earliest studies is by Mincer and Ofek (1982) who analyse the effects of career interruptions for married women in the USA. Their estimates for the (short-run) wage loss after re-entering the labour force amounts between 5.9 and 8.9 percentage per year of interruption. Papers using German data also find that each additional year out of the labour force due to parental leave increases the wage gap for German mothers (Ejrnæs and Kunze, 2013; Schoenberg and Ludsteck, 2014; Kunze, 2003; Beblo et al., 2008; Ondrich et al., 2002). Most of theses studies use changes in parental leave laws, that occurred quite often in Germany in recent years, to control for endogeneity in the duration of parental leave. Interestingly, Kunze (2003) shows that the wage drop after parental leave per each year is higher than the wage drop after an interruption due to other reasons. Ejrnæs and Kunze (2013) for Germany and Miller (2011) for the USA further find that the returns to experience decrease after giving birth. Thus, wage growth is slower for mothers. This means further that the motherhood wage difference increases with years since the first birth.

We can see from the literature that parental leave episodes are correlated with high labour market penalties for women and that mothers seem to follow a slower career path than women without children. I now want to investigate if - besides the motherhood penalty - there is also a penalty of being a young mother compared to postpone the birth of the first child. Whereas late motherhood is often associated with disadvantages like having fewer years with children (Wilde et al., 2010), higher health risks and a decreasing

opportunity of becoming a mother at all (Miller, 2011), it is interesting to analyse if economic benefits of delay "offset" these disadvantages.

Empirical literature that deals with the effect of the timing of the first birth is rare. One main empirical problem is that fertility and career plans often are made simultaneously. The identification of the causal effect of the timing of first birth on career outcomes is therefore difficult. I discuss the empirical identification problem in more detail in the next chapter and now concentrate on empirical findings. The most empirical studies are based on US data and find a positive effect of postponing the first birth on wages and on other labour market outcomes (Taniguchi, 1999; Amuedo-Dorantes and Kimmel, 2005; Caucutt et al., 2002; Wilde et al., 2010; Miller, 2011; Troske and Voicu, 2012; Herr, 2016). Miller (2011) finds that the younger a women is at the birth of her first child, the higher is her wage penalty afterwards. Additionally, fertility delay has a positive effect on lifetime earnings, average wages and working hours. One study that focuses not on wages but on labour supply as the dependent variable is that by Troske and Voicu (2012). They find that a delay of the first birth reduces the negative effect of children on labour supply. This effect is larger for high-skilled women. Wilde et al. (2010) also find that especially well educated women benefit from a delay of the first birth. Herr (2016) argues that not age at first birth but relative timing is the correct measure to estimate the effect of fertility timing on wages. She defines relative timing as the years of participation in the labour market before having the first child. She distinguishes between women who give first birth prior to entering the labour market and women who already worked before having the first birth. She argues that by not distinguishing between these two populations the estimates of a delay would be underestimated. However, if we only look on the population of mothers who have the first birth after labour market entry, it doesn't matter if we use age at first birth or relative timing as the explanatory variable. Herr (2016) finds that the wage 20 years after labour market entry is higher if women delay the first birth, but only for mothers who have the first child after labour market entry. She finds further that there is no wage difference for women who give birth shortly before and shortly after labour market entry. In her paper, Herr (2016) also derives a simple theoretical model of optimal fertility timing: She assumes that utility depends positively on income and negatively on costs of fertility delay. Optimal fertility timing further depends on the the difference in wage growth before and after motherhood (hence, the magnitude of the motherhood penalty) and on taste for early motherhood. After maximising utility, the optimal fertility

timing is later the higher the wage penalty after motherhood, and earlier the higher the taste for early motherhood.

Only a few studies deal with non-American data: Frühwirth-Schnatter et al. (2014) use Austrian, administrative data and classify women into different groups concerning their career path after giving birth: women with low wages and a quick return to the labour market, women with high wages and a quick return, women with a late return, women who remain out of the labour force and a highly mobile group. Additionally, they regress the probability to be in one group on the age at first birth and some other controls. The results indicate that the delay of motherhood increases the probability to be out of the labour force as well as to be in the high-wage-cluster, relative to the probability to be in the low-wage-cluster. Thus, old mothers seem to have a higher productivity but also have a lower probability to work at all. Smith et al. (2013) analyse individual and firm-specific characteristics in determining the promotion probability for Danish women. They find that the delay of fertility has a positive effect in the probability to be promoted to a vice president. When looking at the probability of being promoted to a CEO (conditional on being a vice president before), they find a negative effect of the age at first birth. This would support the hypothesis that young mothers who succeeded in establishing a career send positive signals and hence, have better chances of becoming further promoted. For Germany, Fitzenberger et al. (2013) explore a dynamic treatment approach using data from the GSOEP to estimate the causal effect of the first birth on employment and investigate, whether this effect varies by age at first birth. They find that there is a drop in employment after birth that accounts for 20 percentage points even five years after birth. The magnitude of the effect is similar for different age-at-first-birth-groups, so that a delay doesn't reduce the negative effect of a childbirth. This is in contrast to studies for other countries (see above). Nevertheless, the authors point out that they do not present causal evidence for the timing of first birth.[3] Additionally, a reason for the divergent evidence may be the special institutional setting in Germany, that gives women a high incentive to stay out of the labour market for a long time.

The literature overview shows that the German evidence is somewhat different from other countries regarding the family penalty as well as regarding the effect of timing. The family gap in Germany seems to be comparable high. The reason is often supposed to

[3] Additionally, the approach is slightly different from that of the previously presented U.S.-studies.

be the inflexible institutional settings in Germany. However, the evidence for the effect of fertility timing is small. Whereas Fitzenberger et al. (2013) investigates the role of timing on employment rates, Ejrnæs and Kunze (2013) shortly go into the role of timing on wages. But there is no study that especially focuses on how the magnitude of the motherhood wage penalty differs by fertility timing. Additionally, I investigate whether the motherhood wage penalty and the effect of fertility timing is different for female migrants. Giving that migrants on average have other fertility behaviour than natives and that they still have lower wages, one can expect that female migrants face higher motherhood penalties than native mothers.

# 3 Method

As we have seen from the graphic analysis in figure 1 in the presence of human capital depreciation, young mothers have lower "terminal" wages even if the magnitude of the motherhood penalty does not differ between young and old mothers. Thus, in a first step I analyse the effect of motherhood timing on career outcomes at an age of 40. The following model is estimated:

$$\ln y = \beta_0 + \beta_1 A1B + \beta_2 X + \mu \tag{1}$$

I estimate equation (1) for different career outcomes ($y$): the wage, the probability to participate in the labour market as well as the probability to work in part time compared to work in full time employment. Additionally, I control for a selection bias by employing a Heckman two step estimator. The exclusion restrictions are the net monthly income of the spouse, whether the woman lives alone in the household or with other household members like partner or parents and whether the woman lives in a owner-occupied house or not. $X$ includes control variables that are related to the age at 40.

The above model has two disadvantages: First, it lacks in explaining the underlying mechanisms that lead to a wage benefit to fertility delay. Second, unobserved heterogeneity between young and old mothers may create bias in the estimates of the age of first birth coefficients. To reveal the mechanisms through which motherhood and motherhood timing affects wages, a fixed-effects model is estimated, with the log of real gross hourly wage as the dependent variable. The fixed-effects estimator is used instead of simple OLS

because it deletes bias due to time-invariant heterogeneity. This approach is common in the empirical literature on the motherhood wage penalty. I assume that unobserved characteristics like for instance ability (see e.g. Miller (2011)) have an effect on wages as well as on fertility. I assume further that they are time-invariant and thus, deleted by the fixed-effects transformation. This leads to the following model:

$$\ln w_{it} = \beta_0 + \beta_1 AGE_{it} + \beta_2 AGE_{it}^2 + \beta_3 X_{it} + \beta_4 M_{it} + \alpha_i + \varepsilon_{it} \tag{2}$$

The age-wage relationship is assumed to be non-linear: wages increase at a negative marginal rate during the life-cycle; hence I include age and age squared into the model. Due to the fixed-effects framework, the vector $X$ only includes variables that (may) change over the years: $X$ combines years of schooling, a control variable for a change of the employer, the region (living in East or West Germany), the marital status, tenure, working part time and working in a female occupation. Finally, a dummy variable is included to estimate the difference in wages between mothers and non-mothers with the same age and characteristics, represented by $M$. $\alpha_i$ represents the fixed effects and $\varepsilon_{it}$ is the idiosyncratic error.

Because this model does not help to explain the underlying mechanisms through which motherhood affects wages, I amplify the model as follows:

$$\begin{aligned} \ln w_{it} = \beta_0 + \beta_1 AGE_{it} + \beta_2 AGE_{it}^2 + \beta_3 X_{it} \\ + \beta_{4.1} M * AGE_{it} + \beta_{4.2} M * MAT_{it} + \alpha_i + \varepsilon_{it} \end{aligned} \tag{3}$$

where the coefficient $\beta_{4.1}$ related to the interaction of the dummy variable for motherhood status and age, represents the change in wage growth after becoming a mother; the interaction of $M$ and $MAT$ is the aggregated duration of maternity leave in months that the woman takes after the birth of her first child.

A disadvantage of the fixed-effects model is that all time-invariant variables are dropped by the transformation. Thus, because age at first birth is constant over time, it can only be included via interaction terms. This is why I construct interaction terms between the age at first birth and the duration of maternity leave as well as between the age at first birth and age after the first birth. The final model looks as follows:

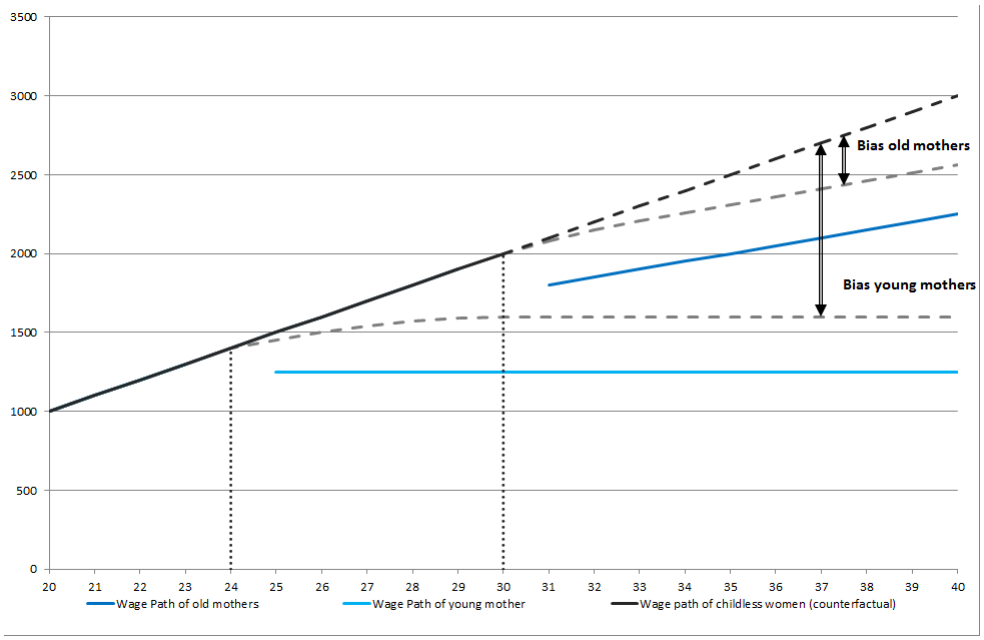


**Figure 2:** Sources of estimation bias

$$\ln w_{it} = \beta_0 + \beta_1 AGE_{it} + \beta_2 AGE_{it}^2 + \beta_3 X_{it} + M(\beta_{4.1} AGE_{it} + \beta_{4.2} MAT_{it} + A1B(\beta_{5.1} AGE_{it} + \beta_{5.2} MAT_{it})) + \alpha_i + \varepsilon_{it} \quad (4)$$

To allow for more heterogeneity, I also let the duration of maternity leave and wage growth after first birth vary by occupation and employment status. As seen from estimates by Goldin (2014) for the USA, the penalty of a career interruption differs highly by occupations. One can assume that mothers face more disadvantages in male dominated occupations than in female occupations.

Because the birth of a first child is a cutting event in one's life, women have a great effort to plan and control it (Wilde et al., 2010). Thus, it is realistic that the decision to have a child and the decision on the timing depends on expected career outcomes. If women expect a career break in the future or if they assume that they are on the highest level of their career, they may decide to have a child at this time. Hence, the career outcomes we observe after the woman has become a mother, do not necessarily reflect the causal effect of motherhood nor the causal effect of motherhood timing. The possible sources of bias are illustrated in figure 2.

In this example I assume a linear wage growth in the years before the first birth; this is represented by the black line. The dashed lines represent the unobservable, counter factual wage paths of young respectively old mothers. The "old" mother in this example has her first child at an age of 30 and the "young" mother at an age of 24. Both are assumed

to stay out of the labour force for one year. The blue lines represent the realised wage paths after re-entered the labour market. If women anticipate that wage growth declines in the future (gray lines) than the (negative) effect of motherhood would be overestimated because even without children, women would have experienced a flatter wage growth. We see from this figure, that the bias is higher for younger mothers: Women may have the first child in earlier ages because their wage path is in general flatter than the wage path of older mothers. Not only the effect of motherhood itself but also the effect of motherhood delay would be overestimated because it only reflects reverse causality.

However, one can assume that women can't fully anticipate their future career development (also see Herr (2016)) and hence, that they base their fertility decision on recent changes. Fortunately, changes in the slope on wage growth or in other career outcomes shortly before the birth of the first child can be observed in the panel data. Hence, if we assume that wage growth declines just before giving birth or becoming pregnant and control for this in the econometric estimation, we can partly capture the bias. Nevertheless, the effect of fertility timing may still be overestimated. The best approach to deal with the problem of reverse causality would be an IV-estimation. To be able to run an IV-estimation, one have to find a variable that only effects motherhood timing but not future wages. Miller (2011) proposes fertility shocks as instrument variables. She assumes that fertility shocks drive a wedge between the planned and actual fertility timing. Shocks can be the event of a miscarriage before the first birth or becoming pregnant while using contraception. Nevertheless, these instruments are widely criticized. One of the critical points is that both variables are strongly affected by measurement errors (Wilde et al., 2010). Miller (2011) finds that the IV-estimates of fertility delay are significantly positive and only marginally smaller than the OLS-estimates, indicating that the bias is not really large. By focusing on the development in wages in the years prior to birth one can find evidence whether fertility timing is exogenous (what means, in this context, that it is independent from anticipation of future wages). If timing is not exogenous I expect to see wage growth declining shortly before the first birth. To test this, additional to the above described main model, I analyse wage growth in the five years before birth separately for young and old mothers.

# 4 Data

I extract my sample from the German Socio-Economic Panel (GSOEP), which is a yearly repeated Panel study containing about 20000 individuals per year. The GSOEP gives very detailed information about the employment and birth history of women. The birth history is continued for each new born child in every year. Information about the sum of all kids born until 2013 as well as their sex, birth year and birth month are available. For some children the month of birth is not observed, so I randomly imputed the birth month to not lose these observations. Given the information about year and month of birth of the first child as well as of the mother, I can calculate exact age at first birth. The employment or activity status is observable on a monthly basis. This allows me to calculate the exact length of maternity leave (in months) as well as the length and the type of employment periods before and after maternity leave. The dependent variable in the above described models is real gross hourly wage. The quality of the wage data in the GSOEP is quite high. Nevertheless, it is only reported when the person is currently employed. Thus, whether we observe a wage depends on the employment status in the month when the interview takes place. If a women is currently on maternity leave, she is not asked for her wage although she may worked in the year of her first birth. This may cause some inaccuracies especially when analysing the growth in wages prior to the first birth. The dummy variable for mother takes the value one if the woman is mother at the time of the interview. A disadvantage of the GSOEP is that the sample size is not large enough to undertake an analysis separately for different educational groups. My sample covers the years 1984 until 2013. I separate my sample into two subsamples: the mother sample and the control sample. In the mother sample I included all women who had their first child between 1984 and 2013 and were observed around the birth of the first child (2356 individuals). The control sample includes women who don't have any children up to the year 2013. Thus, the control sample includes women who remained childless throughout their whole life as well as young women who don't have children, yet (10263 individuals). Because East Germany is included since 1991 and the observation number for East German migrants is quite small, the sample is restricted to women who live in West Germany. A lot of studies restrict their sample to women who are full time employed. Nevertheless, in Germany, a lot of women work part time or in a so called "Minijob" around the birth of the first child. In my sample, there are only about 100

women who worked full time before as well as directly after the period of maternity leave. Because of the small sample size of full time working women and because I'm interested in the effect of part time work on wages and the motherhood wage gap, I include all working women in my sample. Women are defined to work part time if they work less than 31 hours per week, full time workers work more than 30 and less than 60 hours a week. I constructed the dummy variable for female occupation by calculating the share of female and respectively men workers in an occupation (based on 2-digit isco 88 codes). A female occupation has a share of at least 60 percent of female workers and an occupation is accordingly defined as a male occupation if more than 60 percent of all workers are men[4]. Based on this definition, I make out 14 male and 9 female occupation. Three occupations have a nearly equal share of women and men. Women are defined as migrants, if they or their parents are foreign born. Thanks to an over representation of migrants in the GSOEP the case number for migrants is quite high (3942 female migrants). To gain estimates that represent the German population, descriptive statistics are weighted by sample weights. Because only women are included in the mother sample who participate in the GSOEP around the first childbirth, the sample automatically only includes female migrants who have their first child while living in Germany. Thus, mothers of migrant origin that are included in the mother sample migrated to Germany at young ages and not before 1962. Descriptive statistics of the variables of main interest are shown in table 1 and 2. For the descriptive statistics I grouped mothers into young (age at first birth 21-27) and old (age at first birth 28-34) and pooled the data, so that table 1 and 2 show means over all years. Statistics for the whole mother sample as well as for the control sample are shown in the Appendix. We see that the average duration of maternity leave is higher for old mothers. This is somehow surprising if we assume that opportunity costs are higher for older mothers. Additionally, old mothers are somewhat better educated and the average real gross hourly wage is about 11.4 Euro whereas it is only 9.9 Euro for young mothers. The share of part time workers is higher within the group of old mothers.

Do migrants differ concerning their characteristics? Overall, there are not much differences in the mean of the variables: wages and years of schooling are nearly equal. However, I like to point out some interesting points: The duration of leave of old mothers with a migration background is lower than that of all old mothers in the sample. The

[4]See also Kunze (2003) and Gangl and Ziefle (2009).

share of women in the young mother sample is higher among migrants: about 64 percent of migrants belong to the young mother sample whereas it is only 55 percent for natives, indicating that on average, female migrants have their first child in earlier years.

In table 3 the activity spells directly before and after maternity leave are shown. As we see, about 55 percent of the young mothers and 48 percent of the old mothers worked full time and only a small share worked part time before the birth of the first child. Surprisingly, a large share were housewives even before giving birth. Not surprisingly, the share of women who return to full time work directly after maternity leave is quite small and it is smaller for old mothers. On the contrary the share of women that works part time and the share of housewives increases. Especially the share of housewives on all old mothers is high. Overall, less than 50 percent return to paid work directly after the end of maternity leave. Looking inly on migrants, we see that they have a high share of full time workers before the birth of the first child. Migrants who postpone their first birth beyond 28 are often housewives after the birth of the first child.

**Table 1:** Summary statistics for young mothers sample

| | **Mean** | **Std. Dev.** | **Min.** | **Max.** | **Mean (Migrants)** |
|---|---|---|---|---|---|
| lnincphdef | 2.296 | 0.601 | -0.996 | 5.686 | 2.315 |
| a1b | 25.318 | 1.796 | 21.002 | 27.923 | 25.321 |
| alter | 31.721 | 8.491 | 16.246 | 56.663 | 29.536 |
| alter2 | 1078.331 | 559.875 | 263.946 | 3210.646 | 920.528 |
| matdur | 19.107 | 13.962 | 1 | 121 | 20.093 |
| motherage | 24.663 | 17.661 | 0 | 56.663 | 21.453 |
| pgbilzt | 11.124 | 1.508 | 7 | 18 | 10.607 |
| fam | 0.614 | 0.487 | 0 | 1 | 0.645 |
| plant | 6.082 | 3.063 | 1 | 11 | 5.671 |
| pgerwzt | 4.964 | 5.417 | 0 | 34.6 | 4.262 |
| parttime | 0.534 | 0.499 | 0 | 1 | 0.519 |
| oeff | 0.188 | 0.391 | 0 | 1 | 0.126 |
| femaleoccup | 0.815 | 0.388 | 0 | 1 | 0.924 |
| Observations | 6839 | | | | 1754 |

Source: GSOEP 1984-2013

Note: Young (old) mothers are defined as having first child with 21-27 (28-34) years.

**Table 2:** Summary statistics for old mothers sample

| | Mean | Std. Dev. | Min. | Max. | Mean (Migrants) |
|---|---|---|---|---|---|
| lnincphdef | 2.448 | 0.556 | -0.871 | 6.26 | 2.417 |
| a1b | 30.625 | 1.706 | 28 | 33.999 | 30.679 |
| alter | 32.466 | 8.524 | 16.496 | 60.496 | 32.666 |
| alter2 | 1126.7 | 593.23 | 272.103 | 3659.712 | 1149.778 |
| matdur | 26.199 | 23.519 | 1 | 100 | 21.618 |
| motherage | 18.963 | 20.313 | 0 | 60.496 | 19.3 |
| pgbilzt | 12.516 | 2.374 | 7 | 18 | 12.255 |
| fam | 0.517 | 0.5 | 0 | 1 | 0.447 |
| plant | 7.18 | 2.976 | 1 | 11 | 7.651 |
| pgerwzt | 5.918 | 6.585 | 0 | 38.3 | 5.992 |
| parttime | 0.397 | 0.489 | 0 | 1 | 0.401 |
| oeff | 0.293 | 0.455 | 0 | 1 | 0.42 |
| femaleoccup | 0.777 | 0.416 | 0 | 1 | 0.816 |
| Observations | 5650 | | | | 994 |

Source: GSOEP 1984-2013

Note: Young (old) mothers are defined as having first child with 21-27 (28-34) years.

**Table 3:** Employment Status around childbirth

| | Young Mothers | | Old Mothers | |
|---|---|---|---|---|
| | All | Migrants | All | Migrants |
| Employment Spell before Maternity Leave | | | | |
| Full Time | 54.73 | 59.26 | 48.18 | 71.08 |
| Part Time | 5.49 | 3.62 | 6.99 | 0.43 |
| Mini Job | 0.27 | 0 | 2.19 | 0.04 |
| Housewives | 18.87 | 23.88 | 26.95 | 6.94 |
| Observations | 4,954 | 1,674 | 4,392 | 898 |
| Employment Spell after Maternity Leave | | | | |
| Full Time | 11.04 | 21.00 | 8.96 | 8.25 |
| Part Time | 22.59 | 33.94 | 33.66 | 20.28 |
| Mini Job | 1.16 | 1.89 | 2.15 | 7.44 |
| Housewives | 39.47 | 38.45 | 44.70 | 55.15 |
| Observations | 4,843 | 1,624 | 4,051 | 835 |

Source: GSOEP 1984-2013

Note: Young (old) mothers are defined as having first child with 21-27 (28-34) years.

Percentages sum up to 100 when including shares of other status like unemployed or in school.

# 5 Estimation Results

The first table (table 4) shows the estimates of the age at first birth on career outcomes at an age of 40.

**Table 4:** Estimation results : Determinants of career outcomes at an age of 40

| | wage (1) Coeff./ Std.Error | in lab. force (2) Coeff./ Std.Error | part time (3) Coeff./ Std.Error | wage (4) Coeff./ Std.Error | wage (full time) (5) Coeff./ Std.Error |
|---|---|---|---|---|---|
| A1b | 0.0182** | -0.0849*** | 0.0433* | 0.0282** | 0.0325* |
| | (0.0075) | (0.0211) | (0.0239) | (0.0122) | (0.0176) |
| Dur. of Mat. leave | -0.0028* | -0.0009 | 0.0044 | -0.0021 | 0.0005 |
| | (0.0014) | (0.0035) | (0.0055) | (0.0016) | (0.0033) |
| Years of schooling | 0.0754*** | 0.0987*** | -0.0630 | 0.0740*** | 0.0500** |
| | (0.0114) | (0.0318) | (0.0387) | (0.0145) | (0.0251) |
| Family Status | 0.0585 | -0.2019 | 0.4671* | 0.0907 | 0.1714 |
| | (0.0689) | (0.2908) | (0.2741) | (0.0739) | (0.1384) |
| Plant Size | 0.0418*** | | | | |
| | (0.0089) | | | | |
| Year of birth | -0.0018 | 0.0178 | -0.0127 | -0.0049 | -0.0060 |
| | (0.0053) | (0.0135) | (0.0178) | (0.0060) | (0.0128) |
| Nr. of kids | 0.0235 | -0.3889*** | 0.3274*** | -0.0317 | -0.0439 |
| | (0.0357) | (0.0873) | (0.1238) | (0.0567) | (0.0923) |
| Tenure | 0.0138*** | | | | |
| | (0.0034) | | | | |
| Part Time | -0.0448 | | | | |
| | (0.0656) | | | | |
| Fem. occup. | -0.0152 | | | | |
| | (0.0691) | | | | |
| Spous. income | | -0.0002*** | 0.0004*** | | |
| | | (0.0001) | (0.0001) | | |
| Living alone | | -0.5250* | 0.2690 | | |
| | | (0.3155) | (0.3142) | | |
| Owner | | 0.3024** | -0.2411 | | |
| | | (0.1367) | (0.1864) | | |
| Constant | 4.3245 | -31.8158 | 23.5037 | 10.5602 | 13.1376 |
| | (10.3723) | (26.4768) | (34.9682) | (11.8749) | (25.1082) |
| Mills ratio | | | | 0.0283 | -0.2722 |
| | | | | (0.2241) | (0.1690) |
| R-squared | 0.2428 | | | | |
| Observations | 393 | 572 | 403 | 572 | 571 |

Source: GSOEP 1984-2013

Significance levels : $*$ : 10% $**$ : 5% $***$ : 1%

We can see that fertility delay has a positive effect on wages and on the probability to work in part time employment compared to work in full time. However, the probability to work at all compared to be out of the labour force is negatively affected by a fertility delay. A postponement of one year leads to a wage benefit by about 1.8 percentage. The magnitude of the effect is similar to the ones in Miller (2011). The estimates also fit to

the results by **?**, who find that older mothers have a higher probability to earn high wages after labour market return but also a higher probability to be out-of-the labour force.

Table 4 shows further that the higher the income of the spouse, the lower the probability to work at all and the higher the probability to work less than 31 hours. If mothers live alone (without partner or other persons that may take care of the child) they have a higher probability to be out of the labour force. If women live in owner-occupied houses, the probability to work is higher, maybe because they have to work to pay the mortgage (see Fortin).

In column (4) and (5) the wage estimates are corrected for a sample selection bias. In column (4) I controlled for the selection into the labour market without distinguishing between full and part time work. In column (5) I controlled for a selection into full time work and, hence, the wage regression is only estimated for women who work full time. Although the coefficient on the age at first birth variable changes (becomes larger), the inverse mills ratio is insignificant indicating that there is no sample selection. Nevertheless, the negative coefficient in column (5) indicates negative sample selection what means that women with low wages work in full time employment at an age of 40. The unbiased effect of fertility timing is higher. That means that if fertility timing and productivity are positively correlated but high-productive women select into part time or inactivity, the observed effect of fertility timing on wages is underestimated.

In table 5, we see the estimates from the fixed-effects regression for the sample of mothers. In the first specification, I estimate the motherhood wage gap without including age at first birth. Results indicate that wage growth is by an amount of 0.9 percentage points per year smaller once a woman has a child. In column 2 and 3 of table 5 I allow the duration of maternity leave as well as wage growth to vary by age at first birth. In column 2 I assume that wage is linear with respect to age and in column 3 I additional include age at square. The results show that wage growth is smaller after entering motherhood but that this effect declines by each year of motherhood delay. To give a numerical example, according to the results women have to postpone the first birth to an age of 46 to fully offset the negative effect of being a mother on wages. The effect of the duration of maternity leave on wages becomes insignificant and does not vary by age at first birth. In column 4 I allow for more heterogeneity in the motherhood wage penalty by including interactions with working part time and working in a female occupation. Wage growth of mothers is even smaller when women are working in part time employment. The interactions with

female occupation are not significant. Of further interest is the fact that working in part time employment (compared to working in full time employment) is positively correlated with hourly wages across all specifications[5]. This may be due to reserve causality: those women with a sufficient high wage rate can afford to reduce their working hours. Working in a female occupation has a negative influence on the wage rate. To summarize the results of table 5 we can say that mothers experience a lower wage growth than they would have had if they remained childless. This difference is smaller the older a women is when she gives first birth and higher if she works in part time employment after returning to the labour market.

I assume that young and old mothers experience the same wage growth before motherhood. Results indicate that wages increase with increasing age and than decline slightly even before motherhood. When additionally letting the rate of wage growth differ by age at first birth, we see that the motherhood wage gap increases but the return to fertility delay increases. This indicates that older mothers have a flatter wage profile before motherhood than younger mothers and that the motherhood wage penalty a woman experiences after re-entering the labour market is higher for younger mothers. Thus, when we assume that young and old mothers are homogeneous concerning their rate of wage growth in the years before motherhood, we would underestimate the negative effect of giving birth early in live. We can conclude from that result, that women postpone the birth of the first child until they established a career and that fertility timing is at least partly driven by expectations. So if women postpone their fertility until a threshold age they can fully offset the negative motherhood effect. However, this "critical" point is beyond an age of 40 and I assume that this is not the desired fertility timing for a lot of mothers.

[5] A scatter plot show that hourly wages are extreme high for women who work less than 10 hours a week. Nevertheless, when restricting the definition of part time employment to women who work more than 10, results do not change.

**Table 5:** Estimation results : Fixed-Effects regression for the mother sample

| | Coeff./ Std.Error | Coeff./ Std.Error | Coeff./ Std.Error | Coeff./ Std.Error | Coeff./ Std.Error |
|---|---|---|---|---|---|
| Age | 0.1473*** | 0.0230*** | 0.1614*** | 0.1612*** | 0.1819*** |
| | (0.0083) | (0.0025) | (0.0088) | (0.0086) | (0.0182) |
| Age squared | -0.0017*** | | -0.0019*** | -0.0019*** | -0.0019*** |
| | (0.0001) | | (0.0001) | (0.0001) | (0.0001) |
| Age*A1b | | | | | -0.0007 |
| | | | | | (0.0005) |
| Dur. of mat. leave | -0.0012 | 0.0043 | 0.0013 | -0.0018 | 0.0003 |
| | (0.0009) | (0.0083) | (0.0077) | (0.0082) | (0.0083) |
| *A1b | | -0.0001 | -0.0001 | 0.0000 | -0.0001 |
| | | (0.0003) | (0.0003) | (0.0003) | (0.0003) |
| Mother*Age | -0.0093*** | -0.0021 | -0.0273*** | -0.0278*** | -0.0365*** |
| | (0.0010) | (0.0062) | (0.0060) | (0.0062) | (0.0088) |
| *A1b | | -0.0003 | 0.0006*** | 0.0006*** | 0.0009*** |
| | | (0.0002) | (0.0002) | (0.0002) | (0.0003) |
| Year of schooling | 0.0780*** | 0.1168*** | 0.0749*** | 0.0748*** | 0.0749*** |
| | (0.0109) | (0.0118) | (0.0109) | (0.0106) | (0.0106) |
| Family Status | 0.0141 | 0.1160*** | 0.0047 | 0.0012 | 0.0025 |
| | (0.0170) | (0.0168) | (0.0171) | (0.0168) | (0.0168) |
| Plant Size | 0.0107*** | 0.0127*** | 0.0107*** | 0.0102*** | 0.0102*** |
| | (0.0032) | (0.0034) | (0.0032) | (0.0032) | (0.0032) |
| Tenure | 0.0115*** | 0.0114*** | 0.0112*** | 0.0106*** | 0.0106*** |
| | (0.0017) | (0.0018) | (0.0017) | (0.0017) | (0.0017) |
| Part time | 0.1673*** | 0.2204*** | 0.1683*** | 0.4055*** | 0.4088*** |
| | (0.0200) | (0.0200) | (0.0199) | (0.0436) | (0.0441) |
| *Dur. of mat. leave | | | | -0.0011 | -0.0012 |
| | | | | (0.0013) | (0.0013) |
| *Mother*Age | | | | -0.0084*** | -0.0085*** |
| | | | | (0.0013) | (0.0013) |
| Public Service | 0.0595*** | 0.0566*** | 0.0550*** | 0.0567*** | 0.0563*** |
| | (0.0206) | (0.0211) | (0.0205) | (0.0205) | (0.0206) |
| Fem. occup | -0.0705** | -0.0861*** | -0.0700** | -0.1235*** | -0.1236*** |
| | (0.0303) | (0.0324) | (0.0301) | (0.0351) | (0.0350) |
| *Dur.of mat-leave | | | | 0.0015 | 0.0015 |
| | | | | (0.0017) | (0.0017) |
| *Mother*Age | | | | 0.0021 | 0.0022 |
| | | | | (0.0013) | (0.0013) |
| Constant | -1.3009*** | 0.1960 | -1.4924*** | -1.4870*** | -1.5041*** |
| | (0.1669) | (0.1488) | (0.1700) | (0.1673) | (0.1685) |
| R-squared | 0.2115 | 0.1619 | 0.2144 | 0.2271 | 0.2273 |
| Observations | 13324 | 13324 | 13324 | 13324 | 13324 |
| Individuals | 1569 | 1569 | 1569 | 1569 | 1569 |

Source: GSOEP 1984-2013

Significance levels : $*$ : 10% $**$ : 5% $***$ : 1%

**Table 6:** Estimation results : Determinants of wages five years before the first birth

| Years before motherhood | Young Mothers | Old Mothers |
|---|---|---|
| | Coeff./Std.Error | Coeff./Std.Error |
| Five | Reference | |
| Four | 0.1304*** | -0.0125 |
| | (0.0416) | (0.0264) |
| Three | 0.2740*** | 0.0312 |
| | (0.0461) | (0.0306) |
| Two | 0.3400*** | 0.0831*** |
| | (0.0521) | (0.0311) |
| One | 0.4340*** | 0.1410*** |
| | (0.0599) | (0.0344) |
| R-squared | 0.3570 | 0.1087 |
| Observations | 1876 | 1826 |
| Individuals | 669 | 552 |

Source: GSOEP 1984-2013
Significance levels : $*$ : 10% $**$ : 5% $***$ : 1%

# 6 Estimation results for female migrants

Fertility rates of foreigners are -although differences declined in the last decades - higher than those of German natives (Schmid, Kohl). Theories predict different patterns: ....

In table I show some fertility patterns for migrants and natives. We see that age at first birth is with an average of 26.54 years lower for migrant mothers than for native mothers. If we distinguish by first-generation and second-generation migrants, we find that women who are foreign born have an slightly lower age at first birth (25.99 years). Additionally, by only looking at Turkish migrants (the biggest migrant group in Germany), we see that they give first birth in even younger ages (22.42 years). 63 percentage of migrant mothers were married at first birth whereas the share is 73 percentage for natives. Concerning labour market participation, migrants and natives differ, too: 55 percentage of migrant mothers and 71 of native mothers work at an age of 40. As I mentioned earlier, because my sample is restricted to migrants who had their first child in Germany, age at immigration among the mother sample is smaller than among the control sample. Of all migrant mothers in my sample, 70 percent were younger than 20 when they arrived in Germany. What is already found by Wolf (2014) can be confirmed by the SOEP data: the younger a woman is at her immigration to Germany, the earlier she has her first child. As it is shown in table, the mean age at first birth of migrants who immigrated in young ages is 25 whereas it is 29 for migrants who immigrated with 20 years or older. Hence, age at

immigration is supposed to be an important determinant for fertility patterns of migrants.

**Table 7:** Fertilit and labour market statistics for migrants and natives

| | **Mean or Perc.** | **N** | **Mean or Perc.** | **N** |
|---|---|---|---|---|
| Age at first birth | 26.54 | 9876 | 28.5535 | 25004 |
| A1B (1. Generation) | 25.997 | 6576 | | |
| A1B (Turkish) | 22.42 | 2777 | | |
| A1B (age at immigration <20) | 24.8 | 4910 | | |
| A1B (age at immigration >=20) | 29.08 | 1155 | | |
| Married at first birth | 64 | 9876 | 73 | 34905 |
| In labour force at age 40 | 55.25 | 281 | 74 | 1,168 |

Source: GSOEP 1984-2013

Given the different fertility and labour market outcomes of migrants, I run the fixed-effects regression separately for female migrants to control if the motherhood wage penalty as well as the effect of fertility delay differs for migrants. What we can see from table 9 is that the duration of maternity leave has a positive effect on wages. This is in sharp contrast to former results that indicate that the length of maternity leave has a negative effect on wages. The wage penalty that is reflected by a slower wage growth of mothers is, however, larger. This leads to an contradictory picture of the effect of motherhood on wages for migrants. Concerning fertility timing, we can observe that the benefit to fertility delay is somewhat larger. The other effects are similar to the ones of the whole mother sample.

Because in the above regression, all migrants - first as well as second generation migrants as well as migrants from different countries of origin - are included, I further subdivide the migration group. As Wolf (2014) already points out, the group of immigrants that comes to Germany is not homogeneous, so I expect different effects when running the regression separately. Because case numbers for groups that are distinguished by country of origin are too small (less than 100) I estimated the main model (specification 4) separately for first and second generation migrants.

We see from the results that there is not motherhood wage penalty nor an effect of fertility timing for first generation migrants. On the other hand, results for second generation migrants suggest that each month of maternity leave has a positive effect on wages that is narrowed by fertility delay. Contradictory, wage grows at a lower rate after motherhood. The magnitude of the negative effect on wage growth of motherhood is relatively large. Of course, estimates can be biased by a selection bias. Nevertheless, motherhood seems to affect migrant differently. What leads to the presented and somewhat ambivalent

**Table 8:** Estimation results : Fixed-Effects regression for female migrants

| | Coeff./ Std.Error | Coeff./ Std.Error | Coeff./ Std.Error | Coeff./ Std.Error |
|---|---|---|---|---|
| Age | 0.1825*** | 0.0346*** | 0.1943*** | 0.1931*** |
| | (0.0180) | (0.0048) | (0.0203) | (0.0205) |
| Age squared | -0.0022*** | | -0.0023*** | -0.0023*** |
| | (0.0003) | | (0.0003) | (0.0003) |
| Dur. of mat. leave | -0.0011 | 0.0401** | 0.0363** | 0.0423** |
| | (0.0018) | (0.0188) | (0.0179) | (0.0199) |
| *A1b | | -0.0014** | -0.0014** | -0.0015** |
| | | (0.0007) | (0.0006) | (0.0007) |
| Mother*Age | -0.0096*** | -0.0074 | -0.0398*** | -0.0438*** |
| | (0.0020) | (0.0134) | (0.0123) | (0.0126) |
| *A1b | | -0.0001 | 0.0011** | 0.0012*** |
| | | (0.0005) | (0.0004) | (0.0004) |
| Years of schooling | 0.0740*** | 0.1087*** | 0.0700*** | 0.0684*** |
| | (0.0173) | (0.0192) | (0.0170) | (0.0169) |
| Family Status | -0.0230 | 0.0818** | -0.0363 | -0.0352 |
| | (0.0332) | (0.0337) | (0.0338) | (0.0339) |
| Plant Size | 0.0180*** | 0.0234*** | 0.0173*** | 0.0178*** |
| | (0.0062) | (0.0068) | (0.0062) | (0.0061) |
| Tenure | 0.0062** | 0.0063* | 0.0055* | 0.0059* |
| | (0.0030) | (0.0034) | (0.0030) | (0.0030) |
| Part time | 0.2011*** | 0.2509*** | 0.2024*** | 0.3857*** |
| | (0.0393) | (0.0400) | (0.0392) | (0.0759) |
| *Dur. of mat. leave | | | | 0.0008 |
| | | | | (0.0028) |
| *Mother*Age | | | | -0.0081*** |
| | | | | (0.0025) |
| Public Service | 0.1263*** | 0.0896** | 0.1225*** | 0.1221*** |
| | (0.0344) | (0.0350) | (0.0342) | (0.0345) |
| Fem. occup | -0.1346** | -0.1368** | -0.1413** | -0.1420* |
| | (0.0582) | (0.0607) | (0.0585) | (0.0732) |
| *Dur of mat. leave | | | | -0.0034 |
| | | | | (0.0041) |
| *Mother*Age | | | | 0.0017 |
| | | | | (0.0027) |
| Constant | -1.8180*** | -0.0306 | -1.9526*** | -1.9479*** |
| | (0.3025) | (0.2502) | (0.3232) | (0.3279) |
| R-squared | 0.2918 | 0.2368 | 0.2952 | 0.3030 |
| Observations | 2982 | 2982 | 2982 | 2982 |
| Individuals | 388 | 388 | 388 | 388 |

Source: GSOEP 1984-2013

Significance levels : $*$ : 10% $**$ : 5% $***$ : 1%

results, is worthy to be analysed in further research.

**Table 9:** Estimation results : Fixed-Effects regression for female first and second generation migrants

| | Coeff./Std.Error | Coeff./Std.Error |
|---|---|---|
| alter | 0.2108*** | 0.1699*** |
| | (0.0306) | (0.0273) |
| alter2 | -0.0025*** | -0.0020*** |
| | (0.0004) | (0.0004) |
| matdur | 0.0076 | 0.1219*** |
| | (0.0236) | (0.0283) |
| inta1b2 | -0.0002 | -0.0047*** |
| | (0.0008) | (0.0010) |
| motherage | -0.0242 | -0.0781*** |
| | (0.0152) | (0.0175) |
| inta1b4 | 0.0005 | 0.0026*** |
| | (0.0005) | (0.0006) |
| pgbilzt | 0.0569*** | 0.1004*** |
| | (0.0205) | (0.0286) |
| fam | -0.1018** | 0.0170 |
| | (0.0417) | (0.0503) |
| plant | 0.0062 | 0.0314*** |
| | (0.0082) | (0.0088) |
| west | 0.0000 | 0.0000 |
| | (.) | (.) |
| pgerwzt | 0.0029 | 0.0117*** |
| | (0.0041) | (0.0040) |
| parttime | 0.3257*** | 0.4744*** |
| | (0.1075) | (0.1070) |
| int2 | -0.0023 | 0.0044 |
| | (0.0033) | (0.0047) |
| int22 | -0.0045 | -0.0131*** |
| | (0.0035) | (0.0031) |
| oeff | 0.1251** | 0.0937** |
| | (0.0527) | (0.0429) |
| femaleoccup | -0.0705 | -0.2202** |
| | (0.1143) | (0.0975) |
| int1 | -0.0054 | 0.0048 |
| | (0.0055) | (0.0067) |
| int12 | 0.0019 | -0.0006 |
| | (0.0038) | (0.0038) |
| $_cons$ | -2.0665*** | -1.9693*** |
| | (0.5165) | (0.4060) |
| R-squared | 0.2612 | 0.3779 |
| Observations | 1678 | 1303 |
| Individuals | 230 | 157 |

Source: GSOEP 1984-2013

Significance levels : $*$ : 10% $**$ : 5% $***$ : 1%

# 7 Conclusion

Since motherhood and the participation in the labour market still creates a trade-off for a lot of women, it is worthy to analyse, whether we can find empirical evidence for a motherhood wage penalty. The literature overview shows that in Germany compared to other countries, women face high wage penalties after having the first child. My results support this evidence. Nevertheless, my results also indicate that a postponement of the first birth narrows the wage gap for mothers. However, according to my results, women have to postpone the first birth beyond an age of 45 - an age at which the probability of pregnancy is very low and health risks are high - to fully offset the negative effects of motherhood. Young mothers interrupt their career in a period of high wage growth and do not seem to catch up to the high wage path after returning to the labour market.

As I said before, the effect of fertility timing may still be biased due to unobservable influences. Nevertheless, there is strong evidence that the birth of a child, especially when women are at the beginning of their career, negatively affects wages. Mothers who have a migration background have greater benefits of fertility delay. However, the results show an ambivalent and contradictory picture, so that further research on the motherhood penalty of especially female migrants is needed.

Results show further that working in part time employment and wages are positively correlated. But working part time after first birth also means that wages grow at slower rate indicating that although part time work provides more flexibility, it seems to be a barrier to promotion and to reaching high wage positions. Giving that more women work in part time than in full time employment after re-entering the labour market, this may be the reason for the existing "glass ceiling". Nevertheless, we still don't know whether the observations are driven more by demand or supply side factors. Do employer's really discriminate against women or do women invest less in their skill and career development?

# References

**Amuedo-Dorantes, Catalina and Jean Kimmel**, ""The Motherhood Wage Gap for Women in the United States: The Importance of College and Fertility Delay"," *Review of Economics of the Household*, 2005, *3* (1), 17–48.

**Beblo, Miriam, Stefan Bender, and Elke Wolf**, "Establishment-level wage effects of entering motherhood," *Oxford Economic Papers*, 2008.

**Caucutt, Elizabeth M., Nezih Guner, and John Knowles**, "Why Do Women Wait? Matching, Wage Inequality, and the Incentives for Fertility Delay," *Review of Economic Dynamics*, October 2002, *5* (4), 815–855.

**Ejrnæs, Mette and Astrid Kunze**, "Work and Wage Dynamics around Childbirth," *Scandinavian Journal of Economics*, 07 2013, *115* (3), 856–877.

**Felfe, Christina**, "The motherhood wage gap: What about job amenities?," *Labour Economics*, 2012, *19* (1), 59–67.

**Fitzenberger, Bernd, Katrin Sommerfeld, and Susanne Steffes**, "Causal effects on employment after first birth — A dynamic treatment approach," *Labour Economics*, 2013, *25* (C), 49–62.

**Frühwirth-Schnatter, Sylvia, Christoph Pamminger, Andrea Weber, and Rudolf Winter-Ebmer**, "When Is the Best Time to Give Birth?," IZA Discussion Papers 8396, Institute for the Study of Labor (IZA) August 2014.

**Gangl, Markus and Andrea Ziefle**, "Motherhood, labor force behavior, and women's careers: An empirical assessment of the wage penalty for motherhood in britain, germany, and the united states," *Demography*, May 2009, *46* (2), 341–369.

**Goldin, Claudia**, "A Grand Gender Convergence: Its Last Chapter," *American Economic Review*, 2014, *104* (4), 1091–1119.

**Gupta, Nabanita Datta and Nina Smith**, "Children and Career Interruptions: The Family Gap in Denmark," *Economica*, November 2002, *69* (276), 609–29.

**Herr, Jane Leber**, "Measuring the effect of the timing of first birth on wages," *Journal of Population Economics*, 2016.

**Kunze, Astrid**, "The Timing of Working Career and Depreciation of Human Capital due to different Types of Interruptions," IZA Discussion Paper 509 2003.

**Miller, Amalia**, "The effects of motherhood timing on career path," *Journal of Population Economics*, July 2011, *24* (3), 1071–1100.

**Mincer, Jacob and Haim Ofek**, "Interrupted Work Careers: Depreciation and Restoration of Human Capital," *The Journal of Human Resources*, 1982, *17* (1), 3–24.

**Ondrich, Jan, C. Katharina Spiess, Qing Yang, and Gert G. Wagner**, "The Liberalization of Maternity Leave Policy and the Return to Work after Childbirth in Germany," 2002.

**Ponthiuex, Sophie and Dominique Meurs**, "Gender Inequality," in "Handbook of Income Distribution" 2015.

**Schoenberg, Uta and Johannes Ludsteck**, "Expansions in Maternity Leave Coverage and Mothers' Labor Market Outcomes after Childbirth," *Journal of Labor Economics*, 2014, *32* (3), 469 – 505.

**Smith, Nina, Valdemar Smith, and Mette Verner**, "Why Are So Few Females Promoted into CEO and Vice President Positions? Danish Empirical Evidence, 1997?2007," *Industrial and Labor Relations Review*, April 2013, *66* (2), 380–408.

**Taniguchi, Hiromi**, "The Timing od Childbearng and Women's Wages," *Journal of Marriage and Family*, 1999.

**Troske, Kenneth R. and Alexandru Voicu**, "The effect of the timing and spacing of births on the level of labor market involvement of married women," *Empirical Economics*, 2012, *45* (1), 483–521.

**Waldfogel, Jane**, "Understanding the "Family Gap" in Pay for Women with Children," *Journal of Economic Perspectives*, Winter 1998, *12* (1), 137–156.

**Wilde, Elizabeth Ty, Lily Batchelder, and David T. Ellwood**, "The Mommy Track Divides: The Impact of Childbearing on Wages of Women of Differing Skill Levels," NBER Working Papers 16582, National Bureau of Economic Research, Inc December 2010.

# 8 Appendix

**Table 10:** Summary statistics for mother sample

| | Mean | Std. Dev. | Min. | Max. | N |
|---|---|---|---|---|---|
| Log of real gross hourly wage | 2.345 | 0.595 | -1.435 | 6.386 | 9425 |
| Age | 29.963 | 7.395 | 16.337 | 54.086 | 9425 |
| Age squared | 952.444 | 471.019 | 266.89 | 2925.322 | 9425 |
| Duration of maternity leave | 26.579 | 20.315 | 1 | 100 | 4068 |
| Mother*Age | 16.631 | 18.375 | 0 | 54.086 | 9425 |
| Education | 12.01 | 2.269 | 7 | 18 | 9425 |
| Family Status | 0.472 | 0.499 | 0 | 1 | 9425 |
| Plant Size | 6.881 | 2.991 | 1 | 11 | 9425 |
| West Germany | 0.835 | 0.371 | 0 | 1 | 9425 |
| Tenure | 4.989 | 5.572 | 0 | 38.3 | 9425 |
| Part Time | 0.37 | 0.483 | 0 | 1 | 9425 |
| Public service | 0.262 | 0.44 | 0 | 1 | 9425 |
| Female occupation | 0.817 | 0.387 | 0 | 1 | 9425 |

Source: GSOEP 1991-2013

**Table 11:** Summary statistics for the control sample

| | Mean | Std. Dev. | Min. | Max. | N |
|---|---|---|---|---|---|
| Log of real gross hourly wage | 2.373 | 0.664 | -3.15 | 6.356 | 25797 |
| Age | 39.742 | 18.162 | 14.582 | 98.333 | 45645 |
| Age squared | 1909.253 | 1792.236 | 212.629 | 9669.31 | 45645 |
| Education | 12.094 | 2.923 | 7 | 18 | 40523 |
| Family Status | 0.207 | 0.405 | 0 | 1 | 46227 |
| Plant Size | 6.390 | 3.124 | 1 | 11 | 25587 |
| West Germany | 0.861 | 0.346 | 0 | 1 | 46644 |
| Tenure | 8.705 | 8.681 | 0 | 47.9 | 26794 |
| Part time | 0.49 | 0.5 | 0 | 1 | 45160 |
| Public service | 0.294 | 0.456 | 0 | 1 | 25576 |
| Female occupation | 0.852 | 0.355 | 0 | 1 | 23007 |

Source: GSOEP 1991-2013