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## Article

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## Changes in Women's Wages after Parental Leave

By Jan Ondrich, C. Katharina Spiess and Qing Yang\*

### Abstract

In 1986 German parental leave and benefit policy was expanded by extending the potential duration of leave from six to ten months and paying maternity benefits to all new mothers. The potential duration has increased four times since 1986 and stood at three years in 1992. This study uses differenced log-wage regressions to examine the effect of taking maternity leave on wage growth for two 5-year periods, 1984–1989 and 1989–1994. Taking leave negatively affected wage growth in both periods. Estimates imply that each month of maternity leave reduced wage growth by 1.5 percent over five years.

*JEL Classification: J 16, J 22*

### 1. Introduction

Public policy regarding parental leave should take into account several stylized facts. Parental leave and benefit policies generally encourage the continued labor force attachment of mothers, and in the absence of such policies the demands of infant care can result in a mother's complete withdrawal from the labor market. For the employer these policies enable the retention of human capital, saving the costs of hiring and training new workers. Parental leave and benefit policies also have their costs, however. Job protection increases labor market inflexibility and benefits paid by the firm increase the cost of labor. Since mothers take the parental leave in most cases rather than fathers, these policies may result in wage discrimination against women of childbearing age.

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National legislation concerning parental leave has not always been passed in countries with the largest fraction of mothers who work. Although the employment-to-population rate for wives with children under six has been historically higher in the United States than in Germany, the first national legislation on parental leave in Germany took effect in 1979, whereas the Family and Medical Leave Act (FMLA) of 1993 represents the first U.S. legislation concerning parental leave.

Ruhm (1998) reports low coverage rates for maternity leave in the pre-FMLA period in the United States. He gives two possible explanations: market imperfections limit the provision of paid and unpaid parental leave; and most workers believe that the costs of entitlements exceed the benefits. To examine the second point, Gruber and Krueger (1991), Gruber (1994), and Anderson and Meyer (1995) studied the consequences of employer mandates and determined the conditions for firms passing on the costs associated with parental leave to employees by reducing wages. They conclude that if workers place a lower value on benefit compensation than on wages, then the introduction of an employer mandate will result in a wage decline smaller than the costs of the benefits and a decline in total surplus. Ruhm points out that this conclusion is misleading if either the costs associated with parental leave are financed out of government revenues (which is true in European nations for the most part), or when dynamic considerations are taken into account.

Several studies (for example, Mincer/Polachek, 1974; Mincer/Ofek, 1982; and Corcoran/Duncan/Ponza, 1983) find that time out of the labor force has a negative effect on wages. Dalto (1989) and Spalter-Roth and Hartmann (1990) find that women are out of work for less time and receive higher wages if employers voluntarily provide leave after childbirth. Waldfogel (1997) uses both log-wage regression and differenced log-wage regression to examine the effects of employment continuity over childbirth on women's wages for two young cohorts from the National Longitudinal Survey of Young Women and the National Longitudinal Survey of Youth data sets. She finds two reasons why employment continuity is associated with higher wages in both cohorts. First, women maintaining employment continuity start with higher wages; second, women who return to their previous employer have greater work experience and job tenure.

Turning to the case of Sweden, the first important paper on work interruptions is by Gustafsson (1981), who replicates the Mincer and Polachek (1974) study using data on private-sector white-collar workers. Her two-stage least-squares results produce a significantly negative coefficient for time out of the labor force on log wages. A more recent study by Albrecht, Edin, Sundstrom, and Vroman (1999) uses the Swedish Family and Work data set to estimate the depreciation effect of employment interruptions on wages. They conclude that job interruptions in the form of home time (time spent out of the labor force)

and time spent unemployed have a significant negative effect on women's wages while time spent on parental leave has none.

Moving finally to the case of Germany, Mavromaras and Rudolph (1997) examine gender wage discrimination upon re-employment using the official micro-statistics of the German Employment Office. They find that although total discrimination upon re-employment declines over time, the portion directly attributable to hiring has increased. They suggest that these results are due to employers switching to discriminatory hiring practices. (For Mavromaras and Rudolph, hiring discrimination occurs when starting wages offered to equally qualified individuals systematically differ by gender.) More recently, Beblo and Wolf (2000) use the 1998 cross-section of the German Socio-Economic Panel (GSOEP) to examine the hours and participation decisions, as well as wage outcomes, of 560 women aged 30 to 55. Beblo and Wolf find that a three-year break starting at age 30 leads to a wage loss of about 1.2 marks per hour.

The study by Mavromaras and Rudolph excludes from consideration employment interruptions due to parental leave, while the study by Beblo and Wolf does not distinguish parental leave from other types of employment interruption. Yet it is possible that parental leave will have a stronger effect than other types of employment interruption on the subsequent wage growth of the mother. Germany has virtually universal parental leave and benefit coverage-exclusions exist only for the self-employed and those without a job contract. In 1986 the German federal government expanded its maternity leave and benefit policy in several ways. It extended the potential duration of the leave from 6 to 10 months and also started paying child-rearing benefits to new mothers who did not work before childbirth. The potential duration has increased four times since 1986 and stood at 18 months in 1991 and three years in 1992.

Although the German employer is not liable for maternity benefits except for a short interval at childbirth, the increase in the potential duration poses other problems. During the parental leave the firm must cover the position of the mother on leave with a temporary worker, whose contract, in principle, ends when the mother returns to work. If the firm cannot create a new position for the temporary worker, she must leave the firm and her accrued firm-specific human capital (up to three years since 1992) goes to waste. Moreover, since the temporary worker assumes that her job will terminate when the mother returns, it is likely that the temporary worker will leave the firm before the actual return of the mother to accept permanent employment elsewhere. This aggravates the firm's problem of keeping the position filled.

Thus, while the employer's mandate for parental benefits may not be a severe burden for a firm with an employee absent on leave, the (uncertain) costs of hiring and training temporary workers must be added to the leave costs to

the firm. It is plausible that firms try to recoup these costs from the returning mother by reducing her future wage growth.<sup>1</sup>

This study uses the GSOEP to examine the effect of parental leave taken on the wage growth of a German mother. This is accomplished using differenced log-wage regressions for two periods, 1984–1989 and 1989–1994. Mothers in the first period have the shorter potential durations of parental leave of 6, 10, or 12 months, while mothers in the second period have longer potential durations of 15 months, 18 months or three years.

The differenced log-wage regressions include controls for differences in quadratics in age, education, years of labor force experience, and job tenure. The regressions also include both the woman's labor force characteristics between, but not including, the first and last years of the interval and separate variables for her characteristics in the first and last years.

## 2. Parental Leave and Benefit Policies in Germany

### Maternity Leave and Benefit Policy before 1986

Employed mothers in Germany have been eligible for maternity leave and benefits since 1979. The German mother-protection law (*Mutterschutzgesetz*), the only federal legislation in effect until 1986, contains four important regulations providing employed women with protection against dismissal during pregnancy and four months after delivery; prohibiting work for new mothers for a period of eight weeks after childbirth – the “*Mutterschutz*” (mother protection) regulation; entitling mothers engaged in paid work (excluding self-employed mothers) to a protected maternity leave of four months, from the end of the mother-protection period (eight weeks after childbirth) until the child is six months old; and entitling mothers to a maternity benefit for the six months after childbirth.

From 1979 to 1985 the benefit amount was based on average income earned in the three months of work immediately before the birth of the child. The range in the initial eight-week mother-protection period was from a minimum of DM 3.50 to a maximum of DM 25 per day. The employer paid the difference between the maternity benefit and the average income earned by the mother in the three months of work before childbirth. The mother-protection period ends two months after childbirth; from that point on, the maximum benefit was DM 17 per work day.

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<sup>1</sup> Another possibility is that firms will reduce the wage growth of all women likely to have children. We feel that this behavior is more likely over time, but less likely immediately after the law change.

### Parental Leave and Child Rearing Benefit Policy since 1986

Beginning in 1986 there were major changes in German parental leave and benefit policy. In 1985 the German Parliament passed the federal child-rearing benefit law (*Bundeserziehungsgeldgesetz*). With this law the job of one of the working parents became protected for a period of ten months after the birth of a child. Benefit provision also changed. A parent who stayed at home to care for the newborn child became entitled to a child-rearing benefit independent of that parent's previous employment status. The entitlement period lasted until the child was ten months old. The benefit amount for each of the first six months, including the two-month mother-protection period, became DM 600; the new mother continued to receive the employer supplement provided by the mother-protection law. From the seventh month on, the amount of the child-rearing benefit paid for each child depended on annual net family income two years before the birth of the child. The child-rearing benefit is tax-free and its receipt does not require German citizenship.

The next major change in federal parental leave and benefit laws occurred in 1988. Both the benefit entitlement period and the parental leave period increased from 10 to 12 months, giving the new mother 10 months of protected leave after the mother-protection period ends. There were further increases in the total period of benefit entitlement and parental leave from 12 to 15 months in 1989, and from 15 to 18 months in 1990. The parental leave period was lengthened again in 1992 – one parent at a time could now obtain parental leave with job protection until the third birthday of a child. For the first time however, the period of entitlement for the child-rearing benefit was not lengthened in tandem with the parental leave – entitlement for the benefit remained at 18 months. The next change in the law increased the eligibility period for the child-rearing benefit from 18 to 24 months in 1993 without changing the potential duration of parental leave. In 1994 legislation introduced an upper limit on net annual family income for receipt of the child-rearing benefit for the first six months after the birth of the child.

### 3. Methodology

The starting point for the estimation methodology is the specification of a Mincer-type relationship between log wages and relevant human capital covariates at two time points,  $t$  and  $t + k$ .

For a given individual, the log-wage regression can be written as

$$(1) \quad \ln w_j = \alpha_j + \beta'X_j + \varepsilon_j, \quad \text{for } j = t, t + k$$

where  $X_j$  is the vector of covariates consisting of levels and squares of age, education, years of labor force participation, and years of job tenure,  $\beta$  is the

coefficient vector,  $\alpha_j$  is the cumulative effect to time  $j$  of other non-random determinants of wages inclusive of a permanent component (an individual-specific fixed effect), and  $\varepsilon_j$  is a random disturbance.

Subtracting the level of each variable at  $t$  from its level at  $t + k$  and letting  $\Delta$  stand for the difference operator yields

$$(2) \quad \Delta \ln(w) = \Delta\alpha + \beta' \Delta X + \Delta\varepsilon ,$$

where  $\Delta\alpha = \alpha_{t+k} - \alpha_t$  is parameterized as

$$(3) \quad \Delta\alpha = \delta + \gamma' Z .$$

In equation (3),  $\delta$  is an intercept representing the pure effect of the time  $k$  between observations and  $Z$  is a vector of variables describing the work interruptions between time  $t$  and  $t + k$ . Combining equations (2) and (3) yields the estimating equation

$$(4) \quad \Delta \ln(w) = \delta + \gamma' Z + \beta' \Delta X + \Delta\varepsilon .$$

Because we are interested in the effect of work interruptions within a five-year interval, we control for work interruptions in the boundary years to isolate the effect of interruptions starting before or ending after the interval in question. Therefore, variables describing work interruptions in the years  $t$  and  $t + k$  are added to the right-hand side of equation (4). The vector  $Z$  also includes controls for occupation, change in occupation between  $t$  and  $t + k$ , and state of residence.

The regression results for the model in equation (4) are to be used to predict the wage ratio  $s_{t,t+k} = w_{t+k}/w_t$  for the women in the sample. The regression function from equation (4) is in fact an unbiased predictor of  $\ln(s_{t,t+k})$ , since  $\ln(w_{t+k}/w_t) = \Delta \ln(w)$ . If we assume that the regression model in equation (4) is normal, i.e., disturbances are independent and normally distributed variables with mean zero and variance  $\sigma^2$ , it can be shown that  $\exp[\delta + \gamma' Z + \beta' \Delta X + (\sigma^2/2)]$  is an unbiased predictor of  $s_{t,t+k}$ , and, therefore,  $(\exp[\delta + \gamma' Z + \beta' \Delta X + (\sigma^2/2)] - 1)$  is an unbiased predictor of the wage growth rate,  $s_{t,t+k} - 1$ , between  $t$  and  $t + k$ . Finally, the change in the wage growth rate due to a unit increase in covariate  $Z_j$  with coefficient  $\gamma_j$  is  $s_{t,t+k} \gamma_j$ . An unbiased predictor for this change in the wage growth rate is  $\gamma_j \exp[\delta + \gamma' Z + \beta' \Delta X + (\sigma^2/2)]$ . All predictors will be evaluated at estimated parameter values.

#### 4. Data and Variables

The data on women's wages and socio-economic variables come primarily from the English Language Public Use File of the GSOEP (see Wagner/Burkhauser/Behringer, 1993), but are augmented by variables from the German version of the GSOEP (see Wagner/Schupp/Rendtel, 1994). Wage data come from the 1984 through 1994 waves of the GSOEP. The sample is restricted to women between the ages of 16 and 45 who are not self-employed. The first period of analysis covers the years 1984 through 1989, while the second period of analysis covers the years 1989 through 1994.

To ensure that the results are not being driven by observations on women with a weak attachment to the labor force, observations are excluded from the estimation if the woman reports working less than 10 hours per week in either boundary year. To minimize the effect of potential measurement error in the wage rate, the observation is excluded if the woman reports a wage rate greater than DM 200 per hour in either boundary year.<sup>2</sup> The final samples consist of 759 women for the period from 1984 to 1989 and 769 women for the period from 1989 to 1994. Sample means and standard deviations of the regressors are presented in Table 1. In the earlier period, 680 women work for at least 6 months in each boundary year, while the number is 665 for the second period. The hourly wage-rate mean for the lower boundary year in the earlier period is DM 13.72, while for the upper boundary year it is DM 17.90. The corresponding numbers for the later period are DM 15.88 and DM 22.29.

#### 5. Results

We present the results for two differenced log-wage regressions for each of the two time periods in Table 2. These regressions include only those women who work for at least 6 months in each boundary year.<sup>3</sup> The first regression for each time period includes state fixed effects, while the second does not. Occupation and change in occupation variables are constructed from one-digit ISCO occupation codes. Aside from variables previously mentioned, the specifications also include additional covariates (none of which turns out to have a significant coefficient) giving the number of births, the number of months of non-employment for each of the boundary years and the number of births (between but not including boundary years) in which the mother took a leave lasting no longer than the mother-protection period ("birth with minimal leave").

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<sup>2</sup> Deleting observations from the bottom decile of wages in each boundary year did not alter the main results.

<sup>3</sup> The results for the regressions estimated on the full samples are available from the authors on request.



Table 1

**Variable Means and Standard Deviations: 1984 to 1989 Period  
and 1989 to 1994 Period**  
(standard deviation in parenthesis)

	1984 to 1989 Period			1989 to 1994 Period		
	1984	1989	Difference	1989	1994	Difference
<i>Differenced Variable</i>						
Age	31.033 (8.271)	35.883 (8.298)	4.850 (0.358)	30.905 (8.210)	35.745 (8.225)	4.840 (0.367)
Age Squared	1,031.36 (520.390)	1,356.34 (601.768)	324.974 (85.303)	1,022.43 (515.913)	1,345.28 (596.397)	322.848 (84.442)
Education	11.503 (2.212)	11.660 (2.240)	0.157 (0.657)	11.618 (2.162)	11.791 (2.150)	0.173 (0.644)
Education Squared	137.215 (61.407)	140.962 (62.747)	3.747 (17.626)	139.657 (59.760)	143.644 (59.950)	3.987 (16.113)
Labor Force Experience	12.640 (7.309)	17.431 (7.374)	4.791 (0.516)	12.644 (7.502)	17.391 (7.582)	4.748 (0.532)
Labor Force Experience Squared	213.130 (211.878)	358.132 (282.322)	145.001 (73.950)	216.074 (218.678)	359.873 (291.317)	143.798 (75.540)
Job Tenure	6.277 (5.646)	9.662 (6.540)	3.386 (3.209)	6.476 (5.987)	9.531 (7.170)	3.055 (3.497)
Job Tenure Squared	71.231 (120.273)	136.076 (173.980)	64.845 (73.925)	77.734 (121.553)	142.171 (186.192)	64.437 (80.342)
<i>Level Variable</i>						
Change in Occupation		0.209 (0.407)		0.203 (0.402)		
Months of Leave <sup>a)</sup>		0.933 (3.085)		1.336 (4.673)		
Post-Leave Non-Employment Months <sup>a)</sup>		0.476 (3.226)		0.265 (1.988)		
Other Non-Employment Months <sup>a)</sup>		1.560 (5.600)		0.809 (3.472)		
Births with Minimal Leave		0.022 (0.148)		0.012 (0.119)		

<sup>a)</sup> This variable does not include months in boundary years.

Finally, each specification has an indicator for whether a missing wage rate in the upper boundary year is filled with a value from the succeeding or preceding year.

Table 2

**Log Wage Difference Regressions: 1984 to 1989 Period  
and 1989 to 1994 Period**  
(t-statistic in parenthesis)

	1984 to 1989 Period		1989 to 1994 Period	
	Model 1 <sup>a)</sup>	Model 2	Model 3 <sup>a)</sup>	Model 4
<i>Differenced Variable</i>				
Age	0.149 (1.560)	0.160 (1.695)	0.188 (2.345)	0.198 (2.493)
Age Squared	-0.001 (-3.737)	-0.001 (-3.541)	-0.0002 (-0.713)	-0.0003 (-0.783)
Education	0.737 (4.724)	0.743 (4.840)	0.428 (2.747)	0.440 (2.835)
Education Squared	-0.024 (-4.324)	-0.024 (-4.448)	-0.014 (-2.531)	-0.015 (-2.616)
Labor Force Experience	-0.063 (-0.791)	-0.072 (-0.913)	-0.154 (-2.265)	-0.161 (-2.392)
Labor Force Experience Squared	0.0003 (0.725)	0.0003 (0.720)	-0.0005 (-1.277)	-0.0004 (-1.141)
Job Tenure	0.008 (1.060)	0.007 (0.954)	-0.007 (-1.173)	-0.008 (-1.130)
Job Tenure Squared	-0.000 (-0.759)	-0.000 (-0.693)	-0.000 (-0.164)	-0.000 (-0.234)
<i>Level Variable</i>				
Intercept	0.202 (0.794)	0.158 (0.634)	0.426 (2.124)	0.407 (2.064)
Change in Occupation	0.031 (0.657)	0.037 (0.814)	-0.013 (-0.343)	-0.015 (-0.408)
Months of Leave	-0.012 (-2.004)	-0.012 (-1.968)	-0.011 (-2.655)	-0.011 (-2.653)
Post-Leave Non-Employment Months	0.004 (0.465)	0.003 (0.390)	-0.020 (-2.066)	-0.021 (-2.170)
Other Non-Employment Months	-0.006 (-1.146)	-0.006 (-1.141)	-0.013 (-2.667)	-0.013 (-2.822)
Births with Minimal Leave	0.084 (0.761)	0.079 (0.717)	-0.013 (-0.123)	-0.006 (-0.061)
R <sup>2</sup>	0.143	0.138	0.096	0.082
Adjusted R <sup>2</sup>	0.099	0.107	0.049	0.047

<sup>a)</sup> Model includes state fixed effects.

The number of months of leave taken is hypothesized to have a negative effect on log wages. For the 1984–1989 period, the coefficient estimate for this variable is in fact negative, and is significant at the 5 percent level based on a one-tailed test in both regressions. We calculated the marginal effect of a month of parental leave on the wage growth rate of women at 6, 10, 12, and 20 months in Table 3. The remaining covariates were set at their sample means. The marginal effects are consistently in the range of -1.5 percent. This means that a year of parental leave lowers the woman's wage growth rate over 5 years from a predicted mean of 53 percent to 35 percent.

*Table 3*  
**Effects of Marginal Month on Wage Growth Rate:  
 1984 to 1989 Period**

Month	Model 1	Model 2
6	-0.017	-0.016
10	-0.016	-0.015
12	-0.015	-0.015
20	-0.014	-0.014

Point estimates of the coefficient for months of leave for the 1989–1994 period are virtually identical to those for the earlier period from 1984 to 1989. In both models the estimate of the coefficient for months of leave is significantly negative at the 1 percent level. We calculated the marginal effect of a month of parental leave on the wage growth rate of women at 6, 10, 12, and 18 months of leave in Table 4. Again, the remaining covariates were set at their sample means. The marginal effects for months of parental leave are uniformly in the range of -1.5 percent. This means that a year of parental leave will lower the wage growth rate from a predicted mean of 56 percent to 38 percent. Eighteen months of leave will virtually cut the wage growth rate in half, from 56 to 29 percent.

The effect of parental leave seems robust to a wide variety of specifications in both halves of the interval. An extra month of parental leave appears to decrease the growth rate of wages by 1.5 percentage points for a five-year interval. In the absence of affordable and generally available day care (see Kreyenfeld et al., 2001), a working prospective mother with no option but to take the full extent of leave, should she have a child, must make a difficult decision concerning career versus family. If she remains with her employer after an eighteen-month leave, she can expect a wage growth rate over five years that is close to half that of women who take only the leave defined by the mother-protection law.

Table 4

**Effect of Marginal Month on Wage Growth Rate:  
1989 to 1994 Period**

Leave Month	Model 3	Model 4
6	-0.015	-0.015
10	-0.014	-0.014
12	-0.014	-0.014
18	-0.013	-0.013
Post-Leave Non-Employment Month <sup>a)</sup>		
1	-0.023	-0.024
6	-0.021	-0.022

<sup>a)</sup> Assuming leave of 18 months.

## 6. Conclusions

This study examines the effect of parental leave taken by German mothers on their wage growth for the period from 1984 to 1994 using differenced log-wage regression to remove the individual-specific permanent component for log wages. The ten-year period was divided into two five-year periods. Over a wide variety of specifications, the estimated marginal effect on the wage growth rate of an extra month of parental leave was -1.5 percent for both of the five-year periods. The estimated marginal effect implies that a year of parental leave cuts the five-year wage growth rate by one-third and 18 months of leave cuts the growth rate by one-half.

One important goal of parental or maternity leave policy is to make it easier for women to combine work with starting a family. Federal parental leave policy in Germany has focused on providing job protection to new mothers for longer periods of time. The longer periods of potential leave mean that, initially, the new mother is insulated from the general scarcity of affordable day care in Germany. But eventually, the new mother who wants to work must return to work. The situation she faces at work on her return may be a critical factor in her decision to start a family. The empirical work in this study suggests that a working woman who has no option but to take the full parental leave, should she have a child, must make a difficult decision concerning career versus family.

Since 2001 a parent on parental leave can work part time (not exceeding 30 hours per week) without a change in his or her leave status and it is possible for a mother and a father to be on parental leave simultaneously. It would be interesting to see how these changes in the parental leave policy will affect mother's wage growth.

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