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Women, Work, and Motherhood:[1]

Changing Employment Penalties for Motherhood in West Germany after 1945 – A Comparative Analysis of Cohorts Born in 1934-1971

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Abstract:

This paper deals with the effects of entry into motherhood on women's employment dynamics. Our analysis is based on the complete lifetime working- and income histories of a 1% sample of all persons born between 1934 and 1971 and employed in West Germany sometime between 1975 and 1995. We use the records of women who were employed before the birth of their first child. We apply a semi-parametric hierarchical Bayesian modeling approach simultaneously including several time scales and further covariates whose effects we estimate by MCMC techniques. We investigate short-term consequences of entry into motherhood and their changes over different birth cohorts and thereby take into account the employment histories before the birth of the first child. We conduct two models differentiating between the simple return to the labor market and the return for at least a certain period in order to measure subsequent employment stability. Our results indicate that a higher extent of employment experience, a stronger attachment to the labor market and an employment in white collar jobs reduces the employment penalty for mothers after the birth of their first child.

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1 Introduction

In recent literature, the consequences of giving birth to children have been identified as a 'motherhood penalty' (Budig & England 2001; Harkness & Waldfogel 1999). The birth of children leads mothers very often not only to leave the labor market for the (necessary) period of delivery but they also tend to expand this period and thereby reduce their lifetime work period. This results in a loss of human capital and of monetary resources. These two consequences are interdependent since the income level of women is mainly dependent on their labor market experience (Hill 1979). In this paper, we direct our attention to the consequences of the interruption of the labor market participation of women due to the birth of their first child. We analyze the duration of the (temporary) withdrawal from the labor force and the timing and the propensity of mothers to return to the labor market after they have given birth to their first child.[2] At the same time we investigate how stable the employment after the birth of the first child is. It is important to take into account that in West Germany the maternity leave regulations have changed a lot during the past decades, which might have implications on the duration of the interruption of the labor force participation. However, it is an open question whether prolonged leave periods (supported by job guarantees like in West Germany) indeed lead to better starting conditions when a woman returns to the labor market or not. Longer leave periods might hold mothers back from returning to the labor market but on the other side they could have strong incentives to go back (early) due to lower losses in human capital. Previous results for West Germany were very heterogeneous, partially because they were usually based only on the timing of the birth of children but not on the age, i.e. the birth cohort of the mother. Therefore, we try to disentangle the effects of distinct regulations and potential differences between certain birth cohorts. In order to achieve this goal, we use a semi-parametric Bayesian method that allows a unified treatment of multiple time scales, linear and nonlinear effects of covariates. We use German register data (IAB employment sample) that are process-produced on a daily basis (the information on the maternity leave is on a monthly basis) and allow us to trace back women's labor market and fertility histories in the past.

[2] We further plan to do analyses with regard to the economic opportunity costs of entering motherhood in a follow-up paper. Due to time restrictions and due to the complexity of the data, we here consider exclusively the interruption of employment connected to childbearing.

Maternity Leave Regulations and the Return to the Labor Market: Previous results

It has often been mentioned that family leave policies play an important role for the duration of absence from the labor market and also for the propensity of reentering the labor market (Gustafsson, Wetzels, Vlasblom & Dex 1996; Macran, Joshi & Dex 1996; Rönsen & Sundström 1996; Stier, Lewin-Epstein & Braun 2001; Waldfogel 1998; Waldfogel, Higuchi & Abe 1999). Especially in cross-country comparisons it has been shown that the amount of time granted for leave and the way in which the leave is administered (e.g. whether there is a job guaranty from the employer, allowance for interruption of leave, sharing leave, etc.) can influence the labor force behavior of mothers. A comparison between family leave policies in Britain, Japan and the U.S. (Waldfogel, Higuchi & Abe 1999) revealed that maternity leave coverage increases significantly the probability of job return after childbirth in the U.S. and in Japan while a job guaranty does not give British women a higher propensity to return to the labor market if one takes into account pre-natal commitment to the labor market. Macran, Joshi & Dex (1996) compare the job return behavior of two cohorts of women in Britain who gave birth to children under different maternity leave regulations and find that there is a trend towards shorter employment gaps in the younger cohort. Joshi, Macran & Dex (1996) find that the effects of maternity leave are not homogenous within one cohort in Britain. Comparisons between Britain, Germany and Sweden (Gustafsson et al. 1996) as well as between Sweden and Norway (Rönsen & Sundström 1996) show that a longer maternity leave leads to a higher proportion of mothers reentering the labor market but it also leads to a longer duration of the time out of the labor market. German mothers (55%) hold an intermediate position between British mothers, who return fastest after the birth of the first child to the labor market but with the lowest proportion (47%) and Swedish mothers, who return most slowly to the labor market with the highest proportion (80%).

Institutional regulations in West Germany

In West Germany[3], the family policy has been directed towards a reduction of the negative consequences of childbearing for mothers by continuously expanding maternity leave, parental leave and child benefits, family allowances and childrearing benefits (Kreyenfeld

[3] It has to be kept in mind that some of the regulations for West Germany are forced by European Law established by the European Union. Moreover, changes in regulations in the West German pension scheme might have effects on mothers' return to the labor market.

2001). Especially since the end of the 1970s, several new features have been introduced and later extended.

Table 1: Family Policies in West Germany

	1950s/1960s	1970s	1980s	1990s
Child Benefits *) ("Kindergeld") (in DM)	**1955** 25 for 3rd+ child **1961** b) 25 for 1st child 40 for 2nd+ child	**1970** b) 25 for 1st child 60 for 2nd-4th child 70 for 5th+ child **1975** 50 for 1st child 70 for 2nd child 120 for 3rd+ child	**1981** 50 for 1st child 120 for 2nd child 240 for 3rd+ child **1983** b) 50 for 1st child 100 for 2nd child 220 for 3rd+ child 240 for 4th+ child	**1990** b) 50 for 1st child 130 for 2nd child 220 for 3rd child 240 for 4th+ child **1996** a) 200 for 1st child 200 for 2nd child 300 for 3rd child 350 for 4th+ child **2000** a) 270 for 1st child 270 for 2nd child 300 for 3rd child 350 for 4th+ child
Maternity Leave c) ("Mutterschaftsurlaub")	**1952** Paid leave for 6 weeks before and 6 weeks after childbirth (Amount: equivalent to sick pay) **1965** Paid leave for 6 weeks before and 8 weeks after childbirth			
Parental Leave c) ("Erziehungsurlaub" "Elternzeit" (since 2001))		**1979** 6 months after childbirth	**1986** 10 months **1988** 12 months **1989** (June) 15 months	**1990** (June) 18 months **1992** 3 years
Childrearing Benefit *) b) ("Erziehungsgeld") (in DM)		**1979** c) Equivalent to sick pay (for 6 months after childbirth)	**1986** 600 (for 10 months) **1988** 600 (for 12 months) **1989** (June) 600 (for 15 months)	**1990** (June) 600 (for 18 months) **1993** 600 (for 24 months) **2001** 600 (for 24 months) or 900 (for 12 months)

Notes: (1) *) Monthly a) Child benefits *or f*amily allowance can be used b) Income related c) only working mothers
(2) Source: BMA (1994, 2000); Frerich/ Frey (1996); Lampert (1996); Wingen (1997)

Source: Kreyenfeld 2001:48f (extract).

In Table 1 we can see that maternity leave has been supplemented over the years by parental leave from 6 weeks before and after childbirth in 1952 up to 6 weeks before and 36 months after childbirth in 1992. During the same time, the economic support by the state has been

increased. Since the middle of the 1970s, the birth of a first child has been promoted by child benefits independently from the income of the parents (Lampert 1996). The amount has been stable until the beginning of the 1990s.
Parallel to the introduction of parental leave, childrearing benefit was established. In the beginning (1979) this was granted only to women who were employed; since 1986 mothers do not have to be employed to get childrearing benefits. It is important to note that this grant is paid only if the mother does not continue working full-time (more than 19 hours per week) after the birth of the child. The amount of money paid as childrearing benefit has been stable since 1986; the period covering the payments have been adjusted to the duration of the periods of parental leave.

Beyond these regulations, the daycare policies in West Germany are rather unfavorable for working mothers. Since the introduction of the kindergarten in the 1970s, the facilities have been extended up to coverage of 78% in 1990 (Kreyenfeld 2001:44). Nevertheless, the opening hours are very strict and not compatible with full-time working hours of mothers. Moreover, childcare facilities for children under the age of three (usual entry age into kindergarten) and for elementary school children (starting with six years) practically do not exist.

This overview of the family policies suggests that the most important change took place in 1979 with the introduction of parental leave and a childrearing benefit for mothers who have been employed before the birth of their child. The next important change happened in 1986 by the extension of the parental leave to ten months and the improvement of the childrearing benefit to 600 German Marks. The effects on women's return to the labor market in West Germany have been analyzed in several papers (Braun & Klein 1995; Klein & Lauterbach 1994; Lauterbach & Klein 1995; Ondrich, Spiess & Yang 1996; Ondrich, Pischner, Spiess & Wagner 1999; Ondrich, Spiess, Yang & Wagner 1999). The results indicate that the probability for returning to work increases at the end of the particular leave regulation. Nevertheless, the cumulative return rates declined during the period in which the extension of parental leave took place (1984 to 1991). One of the reasons given for this outcome is that women with a longer leave return to a labor market that has changed a lot during their absence. Therefore, one can assume that a longer absence from the labor market (even if it is covered by an employment guaranty during the leave) results in a penalty on motherhood that is not compensated by maternity leave regulations. These findings are contradictory to the

results by Gustafsson et al. (1996), who describe that longer duration of absence leads to a slower re-entry into the labor market but a higher proportion of women re-entering the labor market.

2 Database

In order to cope with problems of low number of cases, heterogeneous birth cohorts (like in databases as the GSOEP or the German Family Survey) or the lack of reliability in self-reported retrospective event histories (Auriat 1993) we need data that allow us to trace back or follow up cohorts for a long period on a very detailed level (i.e. with regard to the beginning and the ending of employment periods and leave periods). Therefore, we use German register data that are process-produced on a daily basis (the information on the maternity leave is on a monthly basis). The empirical basis for our analyses is the IAB (Institute for Employment Research) employment sample together with a supplementary file that allows for tracing back women's labor market and fertility histories in the past. The matched file contains a 1% random sample of the total German population having been gainfully employed at least for one day between 1975 and 1995 (for details see Bender, Haas & Klose 2000). The information on the employment status refers to employment spells that employers report to the Federal Employment Service and covers all persons who have paid contributions to the pension system or who have been covered by the pension system through contributions by the unemployment insurance or by being a parent. It is possible to distinguish between different types of 'non-active' periods, i.e. unemployment, maternity leave, illness, disability, full-time education and non-employment. The dataset covers information on socioeconomic variables (education, real log daily wages, labor force experience, occupational status, attachment to the labor market and stability of employment) which have been proven to be relevant for the return to the labor market of mothers in West Germany (Gustafsson et al. 1996; Klein & Braun 1995; Klein & Lauterbach 1994; Lauterbach & Klein 1995; Ondrich, Pischner, Spiess & Wagner 1995; Ondrich, Spiess & Yang 1996). Thereby we will be able to identify socioeconomic effects and disentangle them from cohort and period effects. Most analyses on the re-entry of mothers in the labor market focus on the impact of these characteristics on the duration of being out of the labor force, neglecting effects of calendar time and birth cohorts at all or reducing the analysis to only some selected cohorts. Given the detailed calendar time and a large amount of different cohorts, our goal is the analysis of the duration of women who are not in the labor force after

giving birth to their first child. So we want to investigate temporal and cohort effects jointly with the impact of other covariates. Careful incorporation and estimation of temporal and cohort effects into duration models is not only of interest in itself, it is also necessary to prevent biases in estimating the effect of personal characteristics, previous employment status, maternity leave regulations, etc. Therefore, the data we use are very suitable for detailed analyses of employment and fertility patterns of women of different cohorts in West Germany.[4]

We restrict our analyses to women who have given birth to at least one child and have been working right before the birth of their first child (i.e. 2 months before the birth since then the obligatory maternity leave period starts). The aim is to capture the extent of women continuing their employment and the timing of their re-entry to the labor market after the birth of the first child. Thereby, we can analyze which effects the birth of the first child has on the labor force participation of women. We treat non-entry into the labor market and ending at the observation window (end of December 1995) as well as the birth of a second child as the censoring event since we focus on the return to the labor market after the first birth.[5] Previous research has shown that the employment behavior of women varies according to the parity (Even 1987; Gustafsson et al. 1996; Macran, Joshi & Dex 1996). For Germany, Lauterbach & Klein (1995) have identified the employment break at the transition to motherhood as the most important event for the further employment behavior of women whereas disruptions related to the birth of further children or those related to the start of the marriage were not crucial.

For our analyses certain groups of women are excluded[6], i.e.

- Civil servants or self-employed persons who are not in the dataset due to the definition of the register database. Nevertheless, the sample represents still about 80% of all German women on the labor market.

[4] For first descriptive analyses with these data see Prinz (1997) and for an analysis of the wage penalties of heterogeneous employment biographies see Beblo & Wolf (2002).

[5] Further analyses with regard to the return to the labor market after the 2nd birth and higher parities still have to be done.

[6] Due to the nature of the data we do not have any information on the household composition, i.e. the household income, the marital status and part time or full time employment. Moreover, due to the wide range of cohorts under review, it is obvious that some selection effects and censoring effects might take place. On the one hand, the youngest cohorts have a higher chance to be right censored, because for them the birth of the child is much closer to the end of the observation window. On the other hand, the older cohorts we are analyzing presumably are selected in a way that they have a strong commitment to the labor market. This restriction is not problematic since we analyze a very specific population, i.e. women who had (before the birth of their first child) a commitment to the labor market and had invested in their career.

- Women who have been recorded as employed outside West Germany due to a problematic recognition of employment spells from abroad. Therefore, women who have been employed in East Germany or are German but have been living abroad (e.g. ethnic Germans in Eastern Europe) are not in the sample.
- Women who have not the German citizenship are excluded due to different patterns of immigrants in their fertility behavior and labor force participation in West Germany (Henning & Kohlmann 1999; Kane 1987; Mayer & Riphahn 2000).

For our multivariate analyses we have drawn two independent random 15%-subsamples, i.e. 5.504 women and 155.640 observations (model without time requirement), resp. 5.744 women and 199.447 observations (model for re-employment for at least 6 months after the birth of the first child).[7]

In the following we take into account all cohorts from 1934 to 1971, distinguish impacts of socio-economic variables as well as period effects (i.e. policy regulations) and analyze the propensity of return and the timing of return to the labor market for those women (model I) and take into account job stability after the re-entry (model II). For these aims, we use Bayesian semi-parametric discrete time duration models described in the next section.

3 Method: Semi-parametric Bayesian discrete-time duration models

Traditional parametric duration models are not flexible enough for the identification and separation of cohort and period effects. Without any rather informative prior knowledge about specific forms of nonlinear effects, a very large number of parameters have to be introduced, making estimation either very unreliable or even impossible due to divergence or nonexistence of estimates. In this situation, non- or semi-parametric approaches that do not assume certain parametric forms of various nonlinear and temporal effects are needed.

So, we use a semi-parametric Bayesian method that allows a unified treatment of multiple time scales, linear and nonlinear effects of covariates. It has been developed in the context of generalized additive mixed regression models.

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[7] Due to restrictions in the software program it is not possible to include all cases simultaneously. Further analyses have shown that the use of a 30%-subsample gives similar results as the ones depicted in section 4.

Since the timing of births is measured in months, we use a discrete-time duration model (e.g. Fahrmeir and Tutz, 2001, Ch. 9) to analyze in the next section the determinants of the propensity to return to work. Let $D \in \{1,\ldots d,\ldots\}$ denote the time (in months) to return to work after the birth of the first child. In addition to duration time D, a sequence of possibly time-varying covariate vectors $x_d = (x_{d1},\cdots,x_{dk})$ is observed. Let $x_d^* = (x_1,\cdots,x_d)$ denote the history of covariates up to month d. Then the discrete hazard function is given by

$$\lambda\left(d,x_d^*\right) = P\left(D = d \middle| D \geq d, x_d^*\right) \quad d = 1,2,\ldots,$$

that is the conditional probability to return to work being in month d, given the interval is reached and given the history of covariates.

For a sample of women i, $i,\ldots,n$, let D_i denote duration times and C_i, right censoring times. Duration data are usually given by $(d_i,\delta_i,x_{id_i}^*)$, $i = 1,\ldots,n$, where $d_i = \min(D_i,C_i)$ is the observed discrete duration time, $\delta_i = 1$ if $D_i < C_i$, $\delta_i = 0$ else, is the censoring indicator, and $x_{id_i}^* = (x_{id}, d = 1,\cdots,d_i)$ is the covariate sequence. We assume that censoring is noninformative and occurs at the end of the interval, so that the risk set R_d includes all women who are censored in the interval d. We define binary event indicators y_{id}, $i \in R_d$, $d = 1,\cdots,d_i$, by

$$y_{id} = \begin{cases} 1 \; if \; d = d_i, \; and \; \delta_i = 1 \\ 0 \; else. \end{cases}$$

For $i \in R_d$, the hazard function for a woman i can then be modeled by binary response models

$$pr\left(y_{id} = 1 \middle| x_{id}^*\right) = h(\eta_{id}), \qquad (1)$$

with appropriate predictor η_{id} and response function $h: R \to (0,1)$. In other words, we model the conditional probability of returning to work, given current duration d and possibly time-varying covariates. Common choices for binary response models are probit or logit models.

We prefer a probit model, because in this case estimation of our models can be considerably facilitated by considering latent utility representations of such models, see Albert & Chib (1993), Fahrmeir & Lang (2001) and Brezger, Kneib & Lang (2002) for details.

The traditional form of the predictor is

$$\eta_{id} = f_1(d) + z'_{id}\gamma, \tag{2}$$

where the sequence $f_1(d), d = 1,2,\ldots,$ of parameters represents the baseline effect, and the design vector z_{id} is some appropriate function of covariates. In our application however, additional flexibility is needed to account for nonlinear covariate effects such as period and cohort effects.

We extend the predictor (2) to a more general semiparametric form by including possibly nonlinear effects of calendar time t, birth cohort k and income w leading to a predictor of the form:

$$\eta_{id} = f_1(d) + f_2(t_{id}) + f_3(k_i) + f_4(w_i) + z'_{id}\gamma \tag{3}$$

The functions f_1, f_2, f_3 and f_4 represent possibly nonlinear smooth effects of duration time, calendar time, birth cohort and wage. The term $z'_{id}\gamma$ contains the usual fixed effects of socio-economic covariates, such as education, occupational status, etc.

A variety of competing methods are now available for modeling and estimating the possibly nonlinear functions f_1, f_2, f_3, f_4, see Fahrmeir & Tutz (2001, Ch. 5) or Hastie, Tibshirani & Friedman (2001) for an overview. In this paper we use a Bayesian approach recently developed by Lang & Brezger (2003) based on P-splines (Eilers & Marx 1996). Estimation is carried out by Markov Chain Monte Carlo (MCMC) methods for drawing random samples from the posterior distribution of the unknown functions, see e.g. Gilks, Richardson & Spiegelhalter (1996) for an introduction to Bayesian inference based on MCMC techniques. For estimation we use the software program BayesX (Lang & Brezger 2001) which is available free of charge at http://www.stat.uni-muenchen.de/~lang/. It is the only software package available to the authors that is able to deal with the huge database we used.

4 Multivariate results

In the following we analyze determinants of the propensity and the timing of the return to the labor market of German women in West Germany with at least one child who have been employed two months before the birth of the first child. The event to be analyzed is the first birth. Censoring occurs in two cases: (i) A woman has given birth to a first child and then has never re-entered the labor market or (ii) a woman has given birth to a child but afterwards has given birth to (at least) another child.

In our models, we analyze the effects of birth cohorts (1934 to 1971), the period effects (calendar time from 1954 to 1995), wage effects (real log daily wages during the employment period before the birth of the first child) and the duration time (on a monthly basis) until re-entry into the labor market.

Since we have a very long time frame analyzing birth cohorts from 1934 to 1971, for comparability reasons we could not use the standard concept of number of years of employment before the birth of the child (Even 1987; Gustafsson et al. 1996; Joesch 1994; Ondrich, Spiess & Yang 1996). In order to take into consideration specific exposure times of different birth cohorts, we calculated the proportion of the time women actually spent on the labor market of the total available time (including employment periods, unemployment periods[8], non-employment [e.g. being a housewife], illness and disability periods). Since the distribution of this variable is not even, we use dummy variables distinguishing three groups of labor market experience (see below): Women who have spent up to 50% of their time before childbirth in employment, women who have been employed 51-75% of the time and women who were on the labor market for more than 75% of the time before the birth of the first child.

Due to the long period under observation we cannot compare directly the income levels over the different birth cohorts. Therefore, we use the log of the real daily wages during the employment period before the childbirth in order to erase effects of inflation.

[8] Since most of the spells in non-employment were unemployment spells, the rates for employment and unemployment are complementary. Therefore, we did not include unemployment experience in our analysis.

We include the following categorical covariates in the analysis (effect coding):

- Vocational training:

  Without vocational training, with vocational training (reference category)
- University degree:

  University degree, without university degree (reference category)
- Having been employed ten months before the birth, i.e. at the time of conception:

  Yes, no (reference category)
- Occupational status before childbirth:

  White-collar workers, blue-collar workers (reference category)
- Percentage of time spent in employment before childbirth (but after vocational or university training if available)

  less than 51%, between 51% and 75 %, or more than 75% (reference category)

Table 2: Descriptive measures for the total sample

Variables	Mean	Std.dev
Status after having the first child		
Censored	18.36%	
Going back to work	58.46%	
Getting a second child (censored)	23.18%	
Year of birth (birth cohort)	54.80	9.55
Calendar Time		
Re-employment without time requirement	84.53	10.42
Re-employment for at least 6 months	85.04	10.24
Duration Time		
Re-employment without time requirement	28.69	35.49
Re-employment for at least 6 months	34.83	39.08
Log wage	4.26	.47
Vocational training		
- No vocational training	12.94%	
- Vocational training	83.23%	
- University	3.83%	
Employed at time of conception		
- Yes	83.45%	
- No	16.55%	
Occupational status before childbirth		
- Blue collar worker	51.99%	
- White collar worker	48,01%	
Percentage of time spent in employment before childbirth		
- < 51 %	7.13%	
- 51 to 75%	13.99%	
- > 75%	78.89%	
Censored cases	41.54%	
# of women	37,485	

We carry out two analyses. In the first model we do not take into account whether the women stay on the labor market for a longer period once they have entered it after the birth of their first child (model I – without time requirement). In the second model we take into account only those women who have stayed employed for at least six months in order to capture job stability (model II – working for at least six months after the birth of the first child).

The duration time between the birth of the first child and the re-employment increases between model I and model II, which means that some women are returning to the labor market but do not stay employed longer than six months. The same argument holds for the increasing calendar time.

We estimate probit models with predictor (3) and use P-splines of degree 3 with second order random walk penalty for the unknown functions f_1, f_2, f_3, f_4 and diffuse Priors for fixed effects parameters for two independent random 15%-subsamples, see Lang & Brezger (2001) for more details.

Results for Fixed effects

Tables 3 and 4 contain posterior means, standard deviations, medians and quantiles of fixed effects of the categorical covariates for re-employment without time requirements and for re-employment for at least 6 months.

In both cases, the *educational background* of the women has a significant effect on the propensity of the return to the labor market. Women who have attended vocational training in both models have a lower propensity to re-enter the labor market than women who have university training or no vocational training. Moreover, if one takes into account the stability of the re-employment we get a significant positive effect of having no vocational training. It is fair to assume that women without any formal training on the job market need to go back to earn money. On the other side, women without any vocational training usually have jobs for which they do not have to meet any requirements and therefore it might be easier for them to find a job and be employed for a longer time. In general, these results are contradictory to microeconomic assumptions concerning the loss of human capital as a result of interruptions

of labor force participation (Mincer & Ofek 1982). For Germany, inconsistent results can be found in the literature: Klein & Lauterbach (1994) as well as Lauterbach (1994) show that the educational degree of women has an effect on the labor market participation of mothers at the time of the birth and in the subsequent months. On the other hand, Lauterbach & Klein (1995) find that there are no differences of education on the duration of career interruptions and Braun & Klein (1995) receive positive but insignificant effects of the educational level on the re-entry rate into employment. One reason for rather weak effects in our model might be that we cannot measure schooling but exclusively vocational training. Moreover, since the educational level generally is closely related to the birth cohort one belong, its effect might be captured by the measurement of birth cohort and log wage (see below).

Having been employed at the time of the conception (i.e. 10 months before the birth of the first child) increases the propensity of returning to the labor market significantly in both models. We conclude that a stronger attachment to the labor market before the birth results in a higher return probability afterwards. Women who have been employed only shortly (i.e. two months) before the birth of the first child but do not have a long job career or show only a fragmentary career reenter the labor market at a lower probability.

Another reason might be that between 1979 and 1985 the childrearing benefit was only paid to mothers who were employed before the birth of a child. This might have lead a certain percentage of women to enter employment for a brief period before the childbirth in order to be entitled to receive childrearing benefits. Anyhow, the percentage of women not having been employed ten months before the birth but having been employed two months before it has not changed during the years until 1985 (23.6%). Only after 1985, when the childrearing benefit was paid to all mothers, this percentage grew slightly up to 36.6%, which does not indicate a strategy of gaining childrearing benefits.

The *proportion of time spent on the labor market* prior to the birth of the child but after vocational or university training measures experience on the labor market.
In both models, women who have spent less than 50% of their time being employed before the birth of their first child have a lower propensity to re-enter it after the birth of the child compared to women who have a longer employment experience. Women who have been employed for at least 76% of their time prior to the birth of their first child have a higher propensity for re-entering the labor market after this event. Still, the question is whether the

amount of the non-employment periods before the birth is voluntary chosen or whether it is a result of the conditions on the labor market. Even if we can not measure job orientations of the women under review we can confirm with our results that less job experience leads to a lower propensity of having a job after the birth and also having a stable employment relationship while more job experience leads to a higher propensity of return to a job after the first birth and a more stable employment relationship.

We differentiate in our analyses between *white-collar workers and blue-collar workers*. In both models we find that having been employed as a non-manual worker before the birth of the first child increases the propensity of returning to the labor market in comparison to women who have been employed as manual workers. The reasons for this difference may be several. On the one side, it is obvious that white-collar workers have a more stable employment situation (Becker 1991; Klein & Braun 1995), especially since the introduction of parental leave in 1979 including the job guarantee. Besides longer periods of notice for white-collar workers and therefore a higher job security, also more favorable standard working hours make it to a certain extent easier for them to combine labor market activity with childcare. Since manual workers additionally are more exposed to physical strain and have a lower earnings profile or have a higher income at the cost of shift work, the incentives to return to the labor market are clearly stronger for white-collar workers. We expect that this effect would be even more accentuated if we could control for the place of occupation (public service or private sector) since literature (Becker 1991) indicates that the consequences of employment interruption are related especially to the occupational sector.

Table 3: Model I - Fixed effects for re-employment without time requirement

	Mean	Std.Dev	2.5% Quantile	Median	**97.5% Quantile**
No Vocational training	.004	.02	-.04	.004	.05
Vocational training	-.04	.02	-.07	-.04	-.01
University	.04	.03	-.03	.04	.10
Employment at conception	.17	.01	.15	.17	.20
No employment at conception	-.17	.01	-.15	-.17	-.11
White collar	.13	.01	.12	.13	.15
Blue collar	-.13	.01	-.15	-.13	-.11
- 50% employed	-.07	.03	-.12	-.07	-.02
- 51-75% employed	.03	.02	-.01	.03	.07
- >75% employed	.04	.02	.00	.04	.07

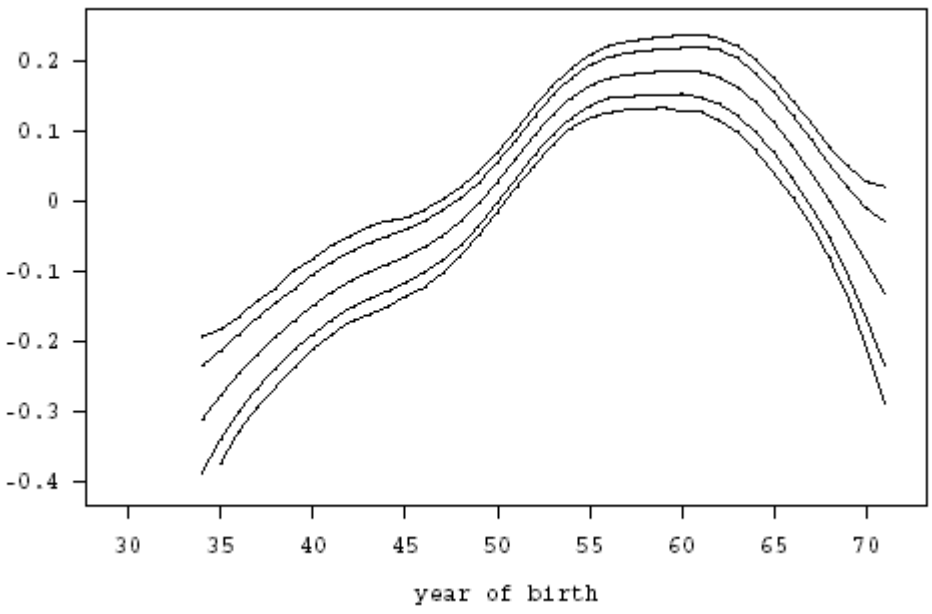
Table 4: Model II - Fixed effects for re-employment for at least 6 months after birth of first child

	Mean	Std.Dev	2.5% Quantile	Median	**97.5% Quantile**
No Vocational training	.08	.02	.04	.08	.12
Vocational training	-.05	.02	-.08	-.05	-.02
University	-.03	.03	-.09	-.03	.02
Employment at conception	.17	.01	.15	.17	.20
No employment at conception	-.17	.01	-.20	-.17	-.15
White collar	.14	.01	.12	.14	.16
Blue collar	-.14	.01	-.16	-.14	-.12
- 50% employed	-.06	.02	-.11	-.06	-.01
- 51-75% employed	.02	.02	-.01	.02	.06
- >75% employed	.04	.02	.01	.04	.07

Birth cohort effects

Figures 6 a and b plot the cohort effects for re-employment without any time requirements (model I) and for re-employment of at least 6 months (model II). Both functions incline slowly up to the birth cohorts in the end of the 1950s and then again slowly decline. Until then, in general the older the birth cohort the longer stays a woman out of the labor force and the lower the risk of re-entering it. Anyhow, this effect is not linear and the course of the hazard rates differs between the two models. In Figure 6a, the propensity and the timing for birth cohorts up to 1945 to re-enter the labor market increases slowly, especially for the cohorts from 1945 to 1955 an extreme rise in the propensity shows up. If one considers only stable re-employment after the birth of the first child (Figure 6b), the slope increases much faster in the early birth cohorts but then slows down for the birth cohorts of 1940 to 1947. Only after that a steep increase takes place that ends – likewise in the model without time requirement – with the birth cohorts in the end of the 1950s.

Figure 6a: Model I - Estimated nonparametric function: Birth cohort, Re-employment without time requirement[9]

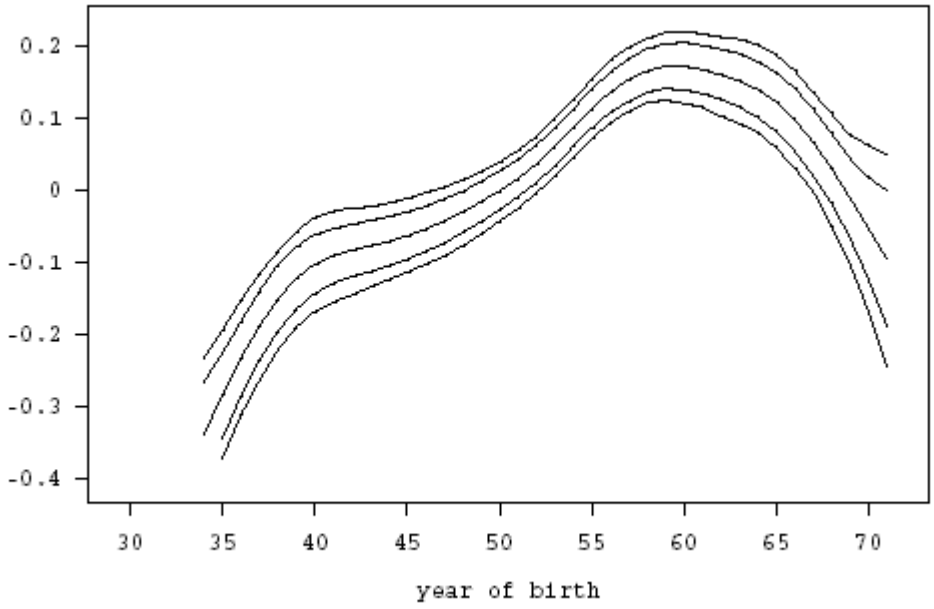


Source: IABS-Supplement File; calculations by the authors

[9] In figure 6a and all of the following figures the hazard rate and the 80% and 95% confidence intervals are depicted.

Lauterbach (1994) analyzed West German birth cohorts 1929-31, 1939-41 and 1949-1951 and found an increasing propensity for women to reenter the labor market. However, as one can see from our results, this increase is not linear over the cohorts and it varies among the cohorts if one considers the stability of the re-employment. In both models, cohorts since the end of the 1950s tend to interrupt their occupational career for a longer time and have a lower probability of returning to the labor market. This result is similar to the findings of Ondrich, Spiess, Yang & Wagner (1999) who found a declining cumulative return rate during the period between 1984 and 1991.

Figure 6b: Model II - Estimated nonparametric function: Birth cohort, re-employment for at least 6 months



Source: IABS-Supplement File; calculations by the authors

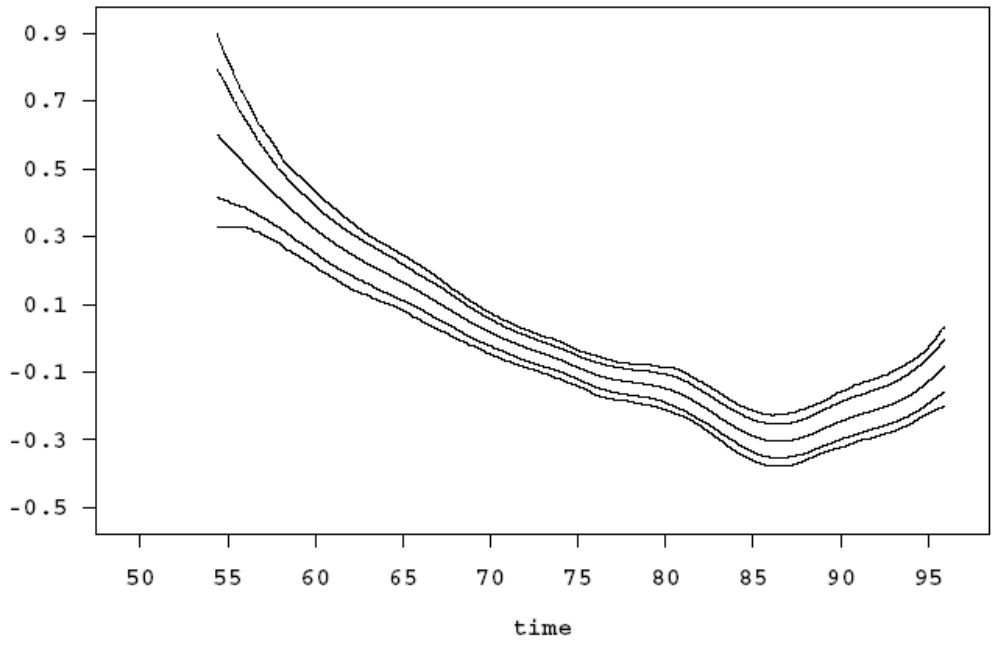
We can assume that the birth cohorts starting from the end of the 1950s have given birth to their children exactly during this period. One of the possible explanations of this result might be that the younger cohorts contain of a higher percentage of censored cases, i.e. women are not long enough in the observation window in order to return to the labor market. Macran, Joshi & Dex (1996) find for Great Britain that women who intend to have more children return to employment after the birth of a first child at a faster speed. Another reason might be that women of the birth cohorts 1960 and later have been concerned by the increase of the unemployment rates in the 1980s and 1990s in West Germany and therefore had difficulties to successfully return to (and stay in) the labor market. Lauterbach & Klein (1995) and Lauterbach (1994) find incoherent results when analyzing the effect of unemployment rates

on the return rate. Due to the fact that most of the first births of these cohorts beginning in the end of the 1950s have taken place after the introduction and prolonging of parental leave it might be that also this has lead women to a reluctant return behavior as Ondrich, Pischner, Spiess & Wagner (1999) assume.

Calendar time effects

Figures 7 a and b depict the hazards for the return to the labor force without any time requirements and for re-employment of at least 6 months. In general, we observe declining transition rates until the middle of the 1970s. At this point, very distinct differences between the two models emerge. If one considers model I (re-employment without any time requirement), the propensity of mothers re-entering the labor market drops in an almost linear way. Only in the middle of the 1970s a brief stabilization period takes place but in the early 1980s a further decrease happens with an absolute minimum in 1986. Afterwards an increase takes place. According to that development one could assume that period effects, e.g. maternity leave regulations or labor market conditions have small effects on the return propensity of mothers of a first child. The interruption of the downward trend in the return propensity in 1976 could be a result of the changed legislation.

Figure 7a: Model I - Estimated nonparametric function: Calendar time, re-employment without time requirement

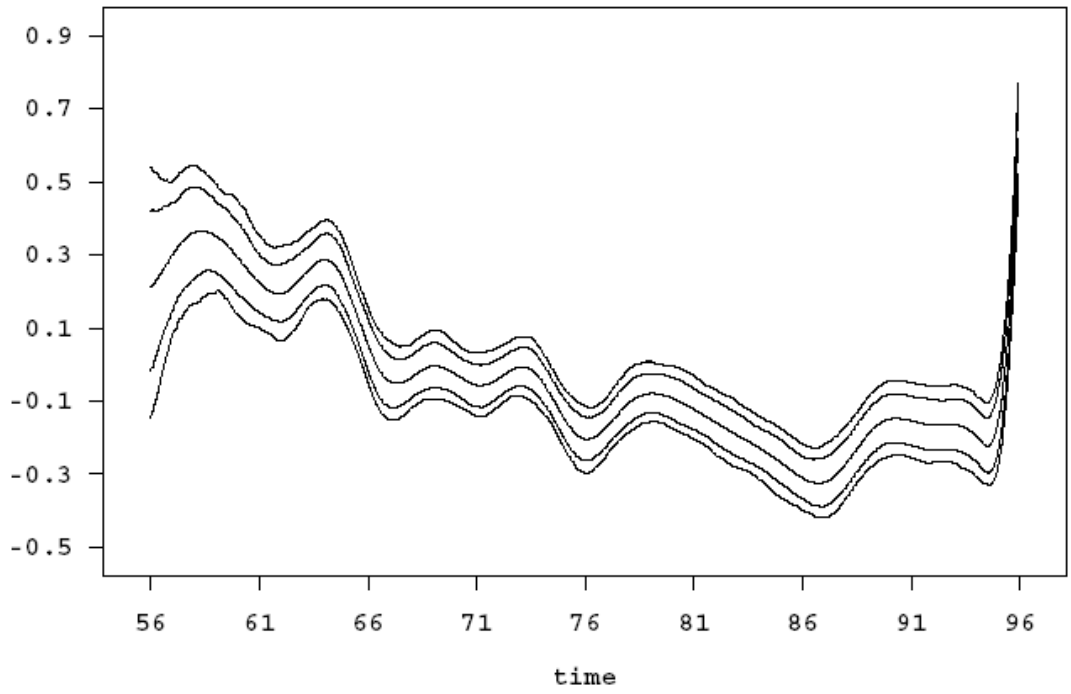


Source: IABS-Supplement File; calculations by the authors

Since 1975 child benefits were paid independently from the income of the parents (see Table 1). Therefore, the re-entry of the mother into the labor market and therefore a higher parental income did not prevent the parents anymore from getting child benefits. The decrease in the propensity to return to the labor market in the beginning of the 1980s can be traced back to the introduction of the parental leave and an increase of the leave (from 8 weeks to 6 months) in 1979. Anyhow, the change in 1986 (10 months leave) is not reflected in a reduced propensity for mothers' return to the labor market.

If one considers the stability of the re-employment of mothers after the birth of their first child, a much more detailed picture emerges (Figure 7b). A first strong reduction in the probability of return to the labor market takes place in 1967, shortly after the recession period in West Germany in 1966. Apparently, women had great difficulties to *enter and keep* a stable job during this (short) economic crisis in West Germany. The second (and more dramatic) decline in the propensity to return to the labor market took place in 1976. The reason for this strong tendency is not clear. As in model 1, a trend for a faster return to the labor market after 1976 shows up. Again, the increase in the leave in 1979 has a negative impact on the return propensity of mothers in the early 1980s; the increase in 1986 does not have such an effect.

Figure 7b: Model II - Estimated nonparametric function: Calendar time, re-employment for at least 6 months



Source: IABS-Supplement File; calculations by the authors

One reason for the latter result might be the expansion of the part-time labor market that took place in West Germany in the 1980s (Engelbrech 1989) and which might have been conducive for the return to the labor market[10]. In addition, the increasing unemployment in the 1980s might have caused women to try to re-enter to the labor market in order to keep their jobs.

From both models it becomes clear that the enhanced maternity leave in 1979 did not have an immediate effect but rather a delayed effect. In general, it is striking that in both models the propensity and the timing to return to the labor market has been decreasing since the early 1960s, mostly without any changes in maternity leave. This indicates that not only due to period effects the tendency for re-employment of mothers has reduced during our observation window. Moreover, it becomes quite obvious that period effects like unfavorable labor market situations, changes in maternity leave regulations and general economic crises appear to show their effects not on the mere return probability but rather on the stability of the re-employment.

Wage effects

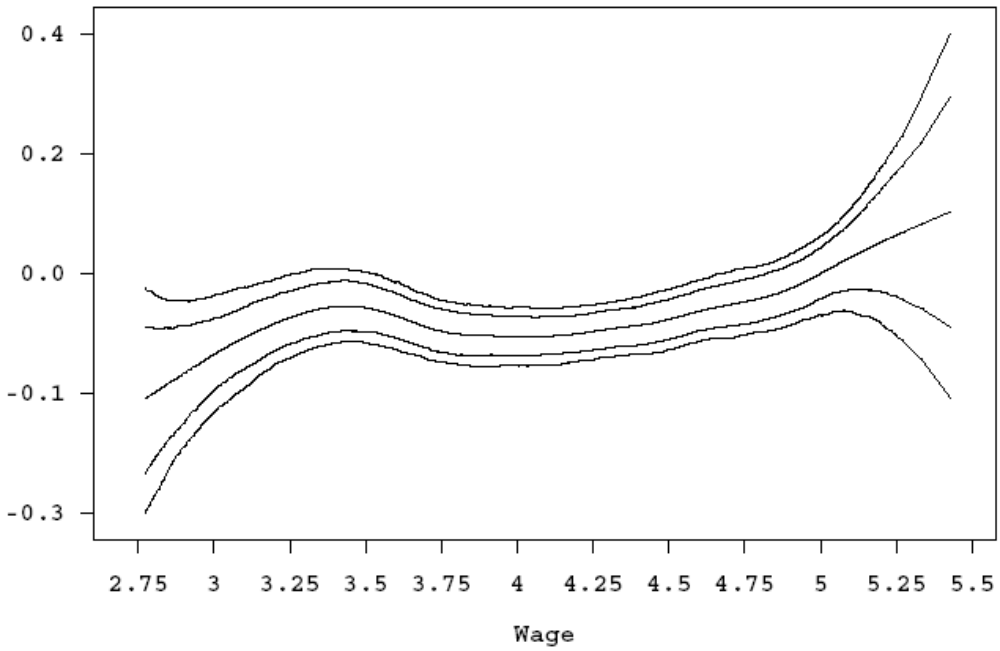
Again, we see in figure 8a and 8b some differences between the two models. In model I there is not much variation of the hazard of returning to the labor force with regard to different wage levels. There is a slight tendency for a u-shaped course of the hazard, women with very low wages and women with very high wages showing a higher propensity and a faster speed to return to the labor market than women with an intermediate wage level before the birth of their first child.

If one considers the stability of the re-employment (Figure 8b) it becomes clear that the variation of the hazard does not follow a rigid pattern. Only women with a high wage level tend to return to the labor market with a higher propensity. However, this latter result is consistent with usual assumptions from microeconomic theory concerning the opportunity costs of childbearing. Nevertheless, we have to take into account that we are not able to control for the complete economic situation of the mother since we do not know her marital status and the income level of a potential partner. Ondrich, Pischner, Spiess & Wagner (1999)

[10] Since we cannot differentiate between full and part time employment in our data for the whole period under observation we could not test for this hypothesis.

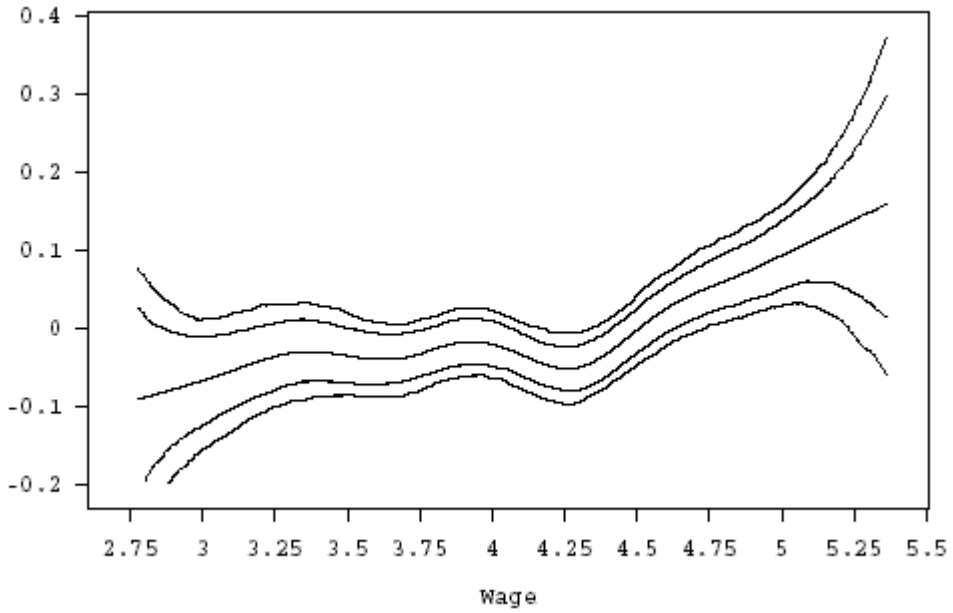
e.g. found for West Germany that a high household income (net of the wife's earnings) reduces women's probability to return to the labor market.

Figure 8a: Model I - Estimated nonparametric function: Wage, re-employment without time requirement



Source: IABS-Supplement File; calculations by the authors

Figure 8b: Model II - Estimated nonparametric function: Wage, Re-employment for at least 6 months



Source: IABS-Supplement File; calculations by the authors

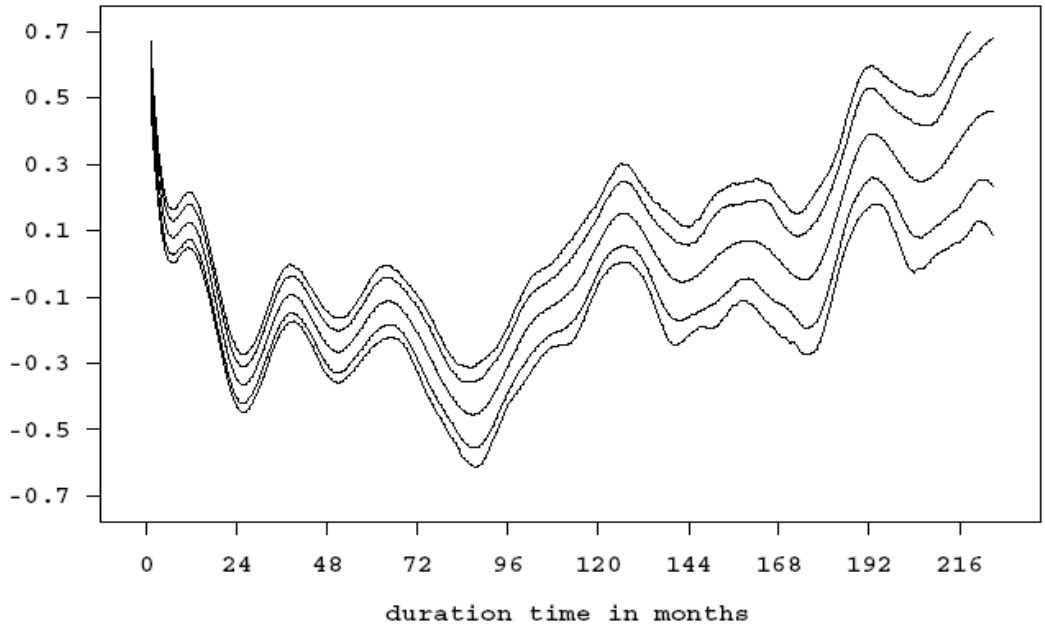
Duration dependence effect

In figure 9a and b we depict the hazards of women to come back to the labor market after a certain number of months. The time scale on the x-axis is equivalent to the age of the first child the mothers have given birth to. The two transition rates for the different models are similar, even if in the case for mothers who have been employed for at least six months after the birth of their child the peaks of the hazards are more pronounced.

It is obvious that the time passed since the birth of the first child (and thereby the start of the interruption of the labor force) has an impact on the propensity of the women to return to work. In the first 6 months after the birth the probability of re-entry to the labor market is decreasing tremendously which relates to the fact that all births occurring up to the end of 1985 were protected only by leave up to 6 months at maximum (until June 1979: 8 weeks). Having arrived at a stationary minimum six months after the birth, the propensity increases again to a maximum at app. 12 months. Then again the propensity of returning to the labor force is declining strongly to a minimum at 24 months (two years). After that it increases again in a wavelike way with a local maximum at 39 months (three years) and an absolute minimum at 76 months (model I) or 72 months (model II). In both figures the probability then increases again in order to stabilize on a higher level at 120 months (model II) or 126 months (model I) after the birth of the child. After that, not much variation in the hazards occurs anymore.

The course of the hazards implies that there are certain ages of the first child that typically lead women in Germany to re-enter the labor force at higher rates. It is obvious that women tend to go back to the labor market after the end of maternity leave (according to the different regulations, especially after 6 and 12 months). One can speculate and argue that there is a certain proportion of women who very fast find childcare facilities (private or public) during the first 12 months. In both models the first child being two years old leads women not to re-enter the labor market, presumably because of the lacking childcare facilities. Women who did not succeed to find childcare facilities at the end of the first year apparently have big difficulties to combine family and work. If one does not take into account the stability of the re-employment (model I), the child being between three and six years old leaves relatively good opportunities to re-enter the labor market.

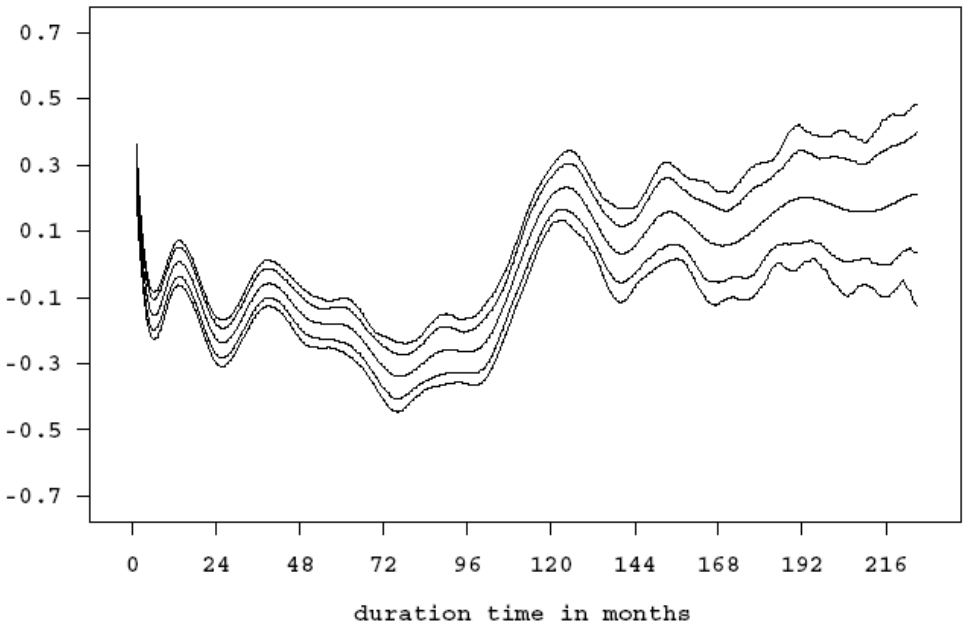
Figure 9a: Model I - Estimated nonparametric function: Duration time, re-employment without time requirement



Source: IABS-Supplement File; calculations by the authors

If one considers the stability of the employment (model II), a different picture emerges: there is a decreasing tendency to return to the labor market for those mothers.

Figure 9b: Model II - Estimated nonparametric function: Duration time, re-employment for at least 6 months



Source: IABS-Supplement File; calculations by the authors

In the literature it has been described that there is a higher availability of kindergarten than of child care facilities for children under three years and school children in West Germany but that the opening hours of kindergarten facilities often are incompatible with the working hours of mothers (Kreyenfeld 2001). Therefore, we suppose that kindergarten facilities work fine especially for mothers in flexible work relations while they collide with stable jobs. In both models it is obvious that the first child entering the school (at the age of six years) marks a decreased propensity to go back to the labor market. This is due to the fact that most of the German elementary schools are no all-day schools, which leaves the problem of childcare in the afternoon to the mothers. The first child being in elementary school, the propensity of the labor market return increases again in both models and cumulates at the age of approximately ten years of the child. This is somehow surprising since the age of ten years usually marks the transition to secondary schools that are very strictly segregated into three types. One could assume that this might be not a good period to reduce childcare since the choice of the respective school (academic secondary school vs. intermediate secondary school vs. lower secondary school) and the success in this educational career determines much of the child's later job and career. Apparently, mothers tend to assume that ten years old children are old enough to care for themselves.
Additionally, pension authorities charge ten years after the birth of a child during which non-employment of mothers does not reduce their pension entitlements. Women therefore have an incentive to return to the labor market ten years after the start of their maternity leave at the latest. However, one has to take into consideration that this regulation does not affect all birth cohorts of women in our analysis (Polster 1998).

Comparable information for West Germany (Klein & Braun 1995) shows that on the one side the longer the period of interruption of participation in the labor force the lower the probability of returning to the labor market. On the other side they find that the older the youngest child the higher the probability of returning to the labor force. Since in our case the period of interruption is identical with the age of the first ('youngest') child, we find a somehow different result indicating that there are certain peaks for the propensity of a return to the labor market but not a constantly declining or increasing risk of return. Lauterbach (1994) analyzed for West Germany whether the number of children below 10 years has a significant effect on the job re-entry rate of mothers or not. Similarly to our results he found that the higher the number of children below 10 years the slower the re-entry rate of the mothers. One of the problems for women to re-enter the labor market is also the low

availability of part-time employment, especially before the 1980s (Engelbrech 1989). The expansion of the part-time labor market in the 1980s led to an increase of employed mothers with young children. Therefore, the relatively low re-employment probability for women with children between three and nine years reflects also a general low employment rate of mothers with young children needing more care than older children.

7. Conclusion

In this paper we analyzed the timing and the propensity of women to return to employment after the birth of their first child.

In the literature up to now, for West Germany this has been investigated mostly by using survey data not allowing for a detailed analysis of a broad range of cohorts and not being able to analyze the stability of re-employment. In order to overcome those problems we used German employment register data and presented a Bayesian approach for semi-parametric modeling with particular emphasis on nonlinear effects.

In the analyses we concentrated on West-German women who had given birth to at least one child and who had been employed two months before the birth of their child. We found out that the employment experience and the attachment to the labor market had a positive impact on the propensity of the re-entry into the labor market. The occupational status moreover played an important role. Simultaneously taking into account nonlinear effects we found an increasing probability of the return to the labor market the younger the birth cohort (up to cohort 1959) was. We observed non-linear effects especially for the calendar time and the duration since the exit from the labor market (equivalent to the age of the first child). We could show that the change of the leave regulation in 1979 decreased the propensity and postponed the timing of the return to the labor force. For the age of the first child, several peaks could be observed which were connected to the availability of childcare and the independence of children from their parents. Especially those results show that the method we applied is very promising and sensible to use in the context of our research topic. Alternative methods would not have been able to identify these patterns without any rather informative prior knowledge about specific forms of nonlinear effects.

With regard to the job stability after the re-entry into the labor market it is obvious that especially the stability before the employment break was important. Those women who have stayed at least for half a year in their first job moreover showed a very specific re-entry

timing which was much more dependent on the age of the child than on the actual leave regulation. This implies that women with a strong labor force attachment who are more successful in returning to the labor market (in terms of job stability) not necessarily react to changes in leave regulations but react much more to the need of childcare which is dependent on the age of the child.

We can conclude that the 'employment penalty' (i.e. the risk of not or very late re-entering the labor market and thereby losing human capital and income) has been reduced over the birth cohorts in West Germany (up to the birth cohort 1959). Nevertheless, this is apparently very much related to the age of the child. The stability of re-employment has also been increased, especially by the job guaranty connected to parental leave since 1979. It is obvious that the extent of the employment penalty with regard to job stability is much more receptive to political and economic developments on the societal level. In general, women who had a higher extent of experience on the labor market, who had a strong attachment to it before the birth of their child and who are employed in rather 'secure' white-collar jobs are less concerned by this penalty.

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