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Older Babies – More Active Mothers? How Maternal Labor Supply Changes as the Child Grows

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Abstract

Female labor market activity is dependent on the presence and the age of a child, but how do the determinants develop in magnitude and significance with the child's age? Using German SOEP data from 1991 to 2006 for mothers with young children, the change in maternal labor supply when the child is one, two, and three years old is explicitly addressed. According to the tobit regression results for precise working hours, maternal labor supply becomes increasingly responsive to economic incentives – mainly to imputed wages – as the child grows.

JEL-Classification: J13, J22, D13

1. Introduction

The current debate about maternity leave policies in Germany centers around the topic of maternal labor supply. Based on the aim of fostering fertility and the child's well-being, it is intended to facilitate the work-life balance of mothers. As the question of mothers' (re)entry into the labor market naturally comprises the timing of (re)entry, it is of great relevance to consider the development of maternal labor supply as the child grows. Thus it is of interest what determines if mothers return to the labor market and how much they work? Most of all: do these factors change with the age of the baby? For example, do mothers always respond to higher wages?

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German mothers reduce their labor supply dramatically in the context of childbirth, although maternal labor supply increased over the past decades in Germany as in most other industrial countries.[1] Geyer / Steiner (2007), for example, find that mothers' employment rate drops by almost 60 percentage points in the year of giving birth. This appears huge in comparison to 30 percentage points in the UK, 16 percentage points in Denmark and six percentage points in Italy (ibid. 17). As one reason for this dissimilarity, the generosity of the German maternity leave policy has repeatedly been cited (Sonderhof, 2007; Schönberg / Ludsteck, 2007; Beblo et al., 2006) as it comprises a three year period of job protection ("Elternzeit", i.e. parental leave) for previously employed mothers[2] as well as different kinds of benefit payments (maternity benefit, transfer payments, child allowance). A reform of maternity benefits came into effect in 2007 and childcare policies are under way with the aim of facilitating the combination of motherhood with work. Against the background of current reforms, and keeping in mind that the timing of the (re)entry is one important component of fostering maternal employment, it is thus indispensable to analyze its development and determinants in the first few years after childbirth.

Previous studies frequently focus on the participation decision (Schönberg / Ludsteck, 2007; Bender et al., 2003; Voicu / Buddelmeyer, 2003) or solely distinguish between full-time and part-time work (Ondrich et al., 1999; Kreyenfeld / Hank, 2000).[3] Instead, due to large variations in working hours, the present paper uses a continuous specification of working hours (as also done by Geyer / Steiner, 2007) in order to capture labor supply most precisely. As working hours are naturally censored from below a tobit model is employed. Precise actual working hours are provided by the SOEP data where the waves from 1991 to 2006 are used.

For the study of maternal labor supply it is a decisive question at what point in time mothers' employment is observed. Several studies pool over all mothers and simply control for the age of the (youngest) child (Geyer / Steiner, 2007; Geisler / Kreyenfeld, 2006). Their approach attempts to explain long-term effects of childbirth, whereas here a more short-run perspective on the

1 See for example Jaumotte (2003); Gornick et al. (1998); Geyer / Steiner (2007) and for data on Germany: Statistisches Bundesamt (1999).

2 In 1992 the job protection period during which a mother can return to a comparable job at her previous employer was extended from 18 to 36 months (see for example Sonderhof, 2007). This however does not affect the present analysis. A precise summary of the German regulation can be found in Kreyenfeld (2001) and Schönberg / Ludsteck (2007). The effects of the prolonged maternity leave period on the child are analyzed by Dustmann / Schönberg (2008).

3 Geisler / Kreyenfeld (2006) estimate participation rates for different hours categories, but limit their subsequent regression to odds ratios for full-time employment. Djurdjevic (2005) also uses different hours categories.

first few years after birth is adopted. Pooling over the age of the child as the previously mentioned studies do, however, is incapable of detecting potential non-linearities in participation and working hours after birth as indicated for example by Geyer / Steiner (2007, 9), Geisler / Kreyenfeld (2006) and Städtner (2004). Simple inclusion of the age of the youngest child as one of the explanatory variables does not solve the problem, which, however, is addressed explicitly in the present study, thereby contributing to the literature.

The results clearly confirm the non-linear development of the coefficients for labor supply in the first few years after childbirth. More specifically, the wage, which is imputed to account for the inherent non-observability for non-employed mothers, increases in importance as well as the partner's earnings. This important result suggests that mothers grow increasingly responsive to economic incentives. Simultaneously, the labor force participation before birth is strongly correlated with post-birth working hours. Moreover, higher educated mothers and those living in the East of Germany clearly display higher labor supply, whereas surprisingly no such interrelation seems to hold for the availability of informal daycare.

The remainder of this paper is organized as follows. Section two sketches the theory behind maternal labor supply. Next, the data are described and descriptive statistics presented. Part four discusses the regression results. Finally, section five provides some concluding remarks.

2. Theoretical Background

The classical labor supply model (Becker, 1965) can be extended to explicitly account for the effect of the age of the child a mother has (Leibowitz et al., 1992). Transferring this model to the framework of a labor supply model with home production (as developed by Gronau, 1977) involves that home production subsumes childcare, which otherwise has to be bought on the market.[4] Hence the mother's hourly net wage is reduced by the price of childcare. Leibowitz et al. (1992) observe that „younger children require more intensive supervision" (ibid. 117) and from this they follow that the hourly cost of childcare decreases as the child grows (also Weber, 2004). This in turn raises maternal labor force participation unambiguously as the child grows whereas time in home production is reduced (due to assuming a concave home production function). However, working hours depend on the sum of the opposing income and substitution effect and are thus undetermined from theory, except if a constant amount of leisure is assumed.

One crucial assumption of Leibowitz et al. (1992) is the constancy of the market wage rate. In contrast, the depreciation of human capital leads to a

[4] This extension is described in more detail in Sommerfeld (2008).

reduction of the market wage the longer the mother stays out of the labor force as is endorsed empirically for example by Beblo et al. (2006) and Görlich / de Grip (2007).[5] This partly counteracts the increase in the net market wage caused by the reduced childcare costs in particular for mothers who (re-)enter the labor market very late after childbirth.

The previous approach is based on decreasing childcare costs as the child grows, but Leibowitz et al. (1992) acknowledge that the costs also depend on childcare availability. Poor childcare availability is a crucial problem in Germany.[6] Geisler / Kreyenfeld (2006) report childcare availability rates as low as 5 % for up to three year-olds in West Germany for the year 2005. van Ham / Büchel (2004) find a discouragement effect from poor childcare availability on maternal labor supply which according to Kreyenfeld / Hank (2000) is more important than the cost of childcare. However, apart from formal daycare, informal daycare is often available at the cost of a childminder. Alternatively grandparents or other relatives sometimes stand by to guard the child. This will be captured in the following regression by the distance to the grandparents living closest to the child as also analyzed in Weber (2004) and Lauer / Weber (2003). Finally it should be noted that the responsiveness to childcare costs and availability is largely influenced by personal preferences for childcare by the mother herself in contrast to external childcare.[7] In the Western part of Germany more than the majority of mothers believes that small children would suffer from mother's employment (Geisler / Kreyenfeld, 2006, 8].[8] Preferences and the acceptance of external child-care probably also change as the child grows, underlining the need for crucial inspection of the development of maternal labor supply over the age of the youngest child.

3. Data and Descriptive Statistics

The data is drawn from the German Socio-Economic Panel (SOEP) from 1991[9] up to the wave 2006, which includes among many other variables pre-

5 One recent Swedish project tries to counteract this effect, see Bergemann / van den Berg (2008).

6 Geisler / Kreyenfeld (2006); Kreyenfeld / Hank (2000); Kreyenfeld (2001, 2000); Bender et al. (2003); Ham / Büchel (2004).

7 Blau et al. (2005, 122) explain how the value of non-market time depends on tastes.

8 In 1992 74 % of West-German mothers strongly or tentatively agreed to the statement that „A small child will certainly suffer if the mother is employed." This percentage reduced to 62 % in 2004 and totaled 51 % and 29 % in East Germany in the two respective years (ibid.).

9 However, no births from before 1992 are considered in order to avoid bias from the policy change in that year which increased the maximum time of job protection from 18 to 36 months (Kreyenfeld, 2001; Sonderhof, 2007). 1991 data is only used for pre-birth information.

cise information on actual working hours. Taking advantage of the panel dimension of the SOEP, pre-childbirth information is constructed from the wave preceding the year of childbirth in analogy to Lauer and Weber (2003, 10). The possibility that a mother may give birth to another child is taken into account by always employing the age of the *youngest child.*

The present analysis studies 'only' mothers whereas some other papers include non-mothers as a comparison group (Haan, 2005) and a few control for self-selection into motherhood (Lauer / Weber, 2003 follow the approach from Hotz / Miller, 1988; also see Djurdjevic, 2005). In contrast, the procedure employed here has the advantage of allowing all coefficients to vary freely in comparison to non-mothers. Some other studies limit the sample to married women (Geyer / Steiner, 2007; Blau / Kahn, 2007) or women who were working before birth (Weber, 2004; Bender et al., 2003; Ondrich et al., 1999). However, as pointed out by Lauer and Weber (2003), the restriction to previously employed women likely introduces a problematic self-selection bias. Therefore this study is *not* limited to the mentioned subgroups but adequate controls are included.

In order to limit the sample of women to those in childbearing age, only mothers who are between 18 and 47 years at childbirth are included. Births by younger or older mothers are very rare and their labor supply decisions will be influenced to a very large extent by education or retirement plans.[10] For the same reason, namely incomparable labor force participation decisions, women in education or in an apprenticeship as well as pensioners and disabled are also dropped from the sample. The remaining mothers are on average about 30 years old and more than one third of mothers in the sample bears their first child ever.

In order to describe the data, first of all note the large variation in working hours (see figure 1 in the appendix). Despite some peaks at 10, 20, 30, and 40 weekly hours there is a lot of variation in between those standard working hours. For this reason a tobit model will be employed later. However, to facilitate the descriptive analysis of changes in maternal labor supply it is helpful to group working hours so as to represent different types of employment. Therefore, figure 2 documents the share of mothers not working, working in minor employment (1 – 15 hours), two distinct part-time categories (15 – 25 hours and 25 – 35 hours) and full-time (35 hours and more). It pictures the large magnitude to which the event of childbirth reduces female employment, in particular for first-time mothers. In addition, it depicts a continuous increase in all employment categories except in minor employment which plateaus at the level of age two, suggesting that low working hours may serve as a stepping stone for higher working hours. In general, part-time work is clearly

[10] Comparable age groups have been used in the literature, for example by Lauer / Weber (2003), Geisler / Kreyenfeld (2006) and Geyer / Steiner (2007).

preferred to full-time work after childbirth which is also supported by the study of Geisler / Kreyenfeld (2006) on the basis of Microcensus data. The next section will deepen the empirical analysis in a multivariate regression analysis.

4. Estimation and Results

As has been shown, there is a large variation in the quantity of labor supply as measured by precise hours of work. Therefore, and also due to natural data censoring at zero, a tobit regression model is employed. This underlines the focus of this paper on the quantity of work instead of participation in employment, but also allows for the analysis of the latter (albeit under the constraint that the determinants are assumed to be the same for participation as for working hours). Different regressions are run for separate points in time when the baby is one, two, or three years old (table 1).[11] In fact, the regression results in tables 1 and 2 are based on a single regression in which all explanatory variables are interacted with the age of the child. The underlying model reads as follows:

$$(1) \qquad hours_i = \beta'_{age1} X_i * D_{age1} + \beta'_{age2} X_i * D_{age2} + \beta'_{age3} X_i * D_{age3} + \epsilon_i$$

where X_i contains an intercept and the covariates (some of them taken from at least 10 months before childbirth) and the D_{age} denote dummies for age one, two, and three of the child. This fully interacted procedure is identical to running three separate regressions, thus allowing all coefficients and the constant to vary freely between the three years. Most of all, it easily permits testing and adapting the standard errors to the panel structure by clustering them on the individual level.[12] For interpretation two distinct average marginal effects are reported: The first relates to the effect on the actual working hours which takes into account that some mothers may switch from non-employment into employment in relation with the change in the respective covariate.[13] The second reported marginal effect reports the change in the probability of working.[14] For comparison, the employment probability of a mother who has another child between four and six years and was not employed before birth is 10.8 %,

[11] During the first twelve months after childbirth only 11.8 % of mothers are working at all, so inclusion of working hours from that age was not feasible here. Moreover, all multivariate analyses are weighted by the inverse sampling probability.

[12] This is necessary as a mother is usually observed at three different points in time. The standard errors allow for heteroscedastiticy as well as autocorrelation on the individual level.

[13] It is calculated as $\frac{\delta E(y_i|x_i)}{\delta x_k} = \beta_k \cdot \Phi\left(\frac{x'_i\beta}{\sigma}\right)$, see for example Wooldridge (2002, 523).

[14] It is computed as $\frac{\delta P(y_i>0|x_i)}{\delta x_k} = \frac{\beta_k}{\sigma} \cdot \phi\left(\frac{x'_i\beta}{\sigma}\right)$, see for example Verbeek (2004, 220).

27.8 %, and 44.3 % at age one, two, and three of the newborn, respectively. In contrast, these employment probabilities amount to 49.7 %, 67.8 %, and 62.5 % respectively for a mother who has no other child and had a whitecollar job before giving birth.[15]

First, the economic incentives as measured by the imputed hourly wage[16] and partner's earnings[17] are significantly related to mothers' working hours in the expected direction. Hence, maternal labor supply is higher when the potential wage increases, but lower when the partner earns more. However and most interestingly, as the detailed results show, at age one of the baby mothers' labor supply is not significantly related to these covariates, but only from age two on, implying that money does not matter at age one. This new insight indicates that women grow increasingly responsive to this type of economic incentive as the child grows. Potential explanations for this could be that poor childcare availability, breastfeeding, or preferences against external childcare may often hinder women from being employed in the first year, so that the potential wage plays no significant role. More generally, norms or traditions for mothers to stay at home appear to be stronger than economic incentives for working. This is to my knowledge the first study to analyze this effect for Germany, whereas for the U.S. Leibowitz et al. (1992) find to the contrary that the predicted wage is already significant three months after childbirth. The difference in the results is not surprising when keeping in mind the large differences between the institutional backgrounds in the U.S. and Germany.

Next, the occupation before childbirth is also strongly correlated to labor supply thereafter. The direction of the coefficients, which has to be interpreted in light of the reference category of previously non-employed mothers, shows that labor force participation before birth is decisive for a re-entry thereafter. Positive state dependence has also been found for example by Städtner (2004), Voicu / Buddelmeyer (2003) and Haan (2005) who finds a strong effect on the extensive, but only a modest if any effect on the intensive margin of labor supply (ibid.) leading to the same conclusion as the present analysis: Participation before birth matters more than hours. In more detail the present results show that self-employed and civil servants display the largest labor supply. For the latter, the higher labor supply could be due to favorable working hours and good part-time work opportunities as argued by Bender et al. (2003, 14).

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15 Moreover, both reference mothers are between 28 and 32 years old, have completed an apprenticeship, are married and live in the West of Germany. Their potential wages and the available partner incomes correspond to the unconditional average.

16 Wages are imputed because they are unobservable for non-employed mothers. In order to control for self-selection into employment, the Heckman two-step procedure is employed and the results are reported in Sommerfeld (2008) [table 1].

17 When the mother is single or the information on the partner not observed in the SOEP, the partner's income is set to zero and instead the indicator „Partner's earnings missing" set to one.

Care has to be taken when the other covariates are analyzed as some of them do not only work directly, but also through the imputed wage. For the education variable the direct and the indirect effect through the imputed wage oppose. Hence, as expected from Human Capital Theory, mothers with a higher educational degree supply more labor to the market. Similarly, age also works mainly through the imputed wage and in the direction as expected from Human Capital Theory. Thus, younger mothers tend to enter the labor market somewhat more frequently after childbirth as also found by Weber (2004).

The largest point estimate apart from the pre-birth occupation is given by the region of residence where mothers living in the East of Germany work much more. However, this correlation is again partly offset by the negative effect of this covariate on the imputed wage. The higher labor supply of East German mothers is explained by the tight labor market which goes along with fear of job loss and a much better childcare provision. Along the same lines, van Ham / Büchel (2004) point out that a discouragement effect from poor childcare infrastructure might be at work in West Germany. Moreover, in the German Democratic Republic (GDR) in the 1980s it was common that mothers took up full-time work again one year after childbirth (Geisler / Kreyenfeld, 2006) so that historically grown attitudes could also play a role.

Surprisingly, first-time mothers seem not to behave significantly different from mothers who already have another child between four and six years old (reference category), except at age two of the child. Confirming the expectation, mothers provide more labor with every month that the child grows (captured by the variable for the relative babyage which runs from one to 12 months because the years of age are already captured by the interaction dummy). This is not the case in the paper of Lauer / Weber (2003), however, they consider participation instead of working hours as the dependent variable.

It is also astonishing that the proxies for informal childcare (i.e. distance to the closest grandparents, i.e. parents or in-laws)[18] prove seldomly individually significant, but still they are jointly significant at the 5 %-level. Correspondingly, Kreyenfeld / Hank (2000) neither find a significant effect of the distance to the grandparents nor of the childcare provision rate. The controls for marriage and foreign nationality prove not significant here.

In a nutshell, the positive correlations of post-birth labor supply with the imputed wage, the pre-birth occupation, and the region of residence stand out, as well as the indirect effect of education through the imputed wage.

[18] This variable is constructed from the question where the father and the mother live. Then information from the woman and her partner are combined to find the nearest grandparents of the child.

5. Conclusion

This paper investigates how maternal labor supply changes as the child grows. Specifically, changing working hours during the first few years after childbirth are extensively characterized. The focus of this paper is on how the determinants of maternal labor supply develop in magnitude and significance while allowing for a non-linear evolution as suggested by the literature (Leibowitz et al., 1992; Geyer / Steiner, 2007). As put forward from theory, continuously increasing labor supply after birth is also endorsed empirically, both in a bivariate and a multivariate framework.

Similar to previous findings for Germany, female labor supply drops dramatically at childbirth to about 12 % and only picks up slowly thereafter (Geyer / Steiner, 2007; Lauer / Weber, 2003). Participation and not working hours is the driving force for the recovery of maternal labor supply after childbirth. According to the bivariate analysis, mothers with only one child exhibit a stronger labor force attachment than mothers with more children.

The econometric approach allows for free variation of the coefficients at different ages of the child and the results confirm the necessity for proceeding this way. The central finding is that the economic incentives given by the imputed wage and partner's earnings matter only from age two on. Put differently, monetary incentives appear not always relevant for mothers, but instead poor childcare availability or traditions could drive women into non-employment, so that the potential wage seems to play no significant role at age one. Moreover, the effects of education and age are mainly driven through imputed wages. Additionally, labor force participation and the occupation before birth are tightly related to working hours thereafter as well as the region of residence.

These findings deserve further investigation, not least due to the topicality of the subject in Germany. For example, what role does the new „Elterngeld" (parenting benefit) play for the responsiveness to work incentives? Moreover, it would be interesting to analyze a longer time horizon or monthly data if these were available in a suitable dataset. Finally, it is obvious that the next step consists of trying to find a causal explanation for the changing work behavior of mothers after childbirth.

References

Beblo, M. / *Bender,* S. / *Wolf,* E. (2006): The wage effects of entering motherhood – A within-firm matching approach, ZEW Discussion Paper, 06 – 053.

Becker, G. S. (1965): A theory of the allocation of time, The Economic Journal 75 (299), 493 – 517.

Bender, S. / *Kohlmann,* A. / *Lang,* S. (2003): Women, work, and motherhood: Changing employment penalties for motherhood in West Germany after 1945 – A comparative analysis for cohorts born in 1934 – 1971, MPIDR Working Paper, 2003 – 006.

Bergemann, A. / *van den Berg,* G. J. (2008): From giving birth to paid labor: The effects of adult education for prime-aged mothers, IZA Discussion Paper, 3600.

Blau, F. D. / *Ferber,* M. A. / *Winkler,* A. E. (2005): The Economics of Women, Men, and Work. Pearson – Prentice Hall, 5th edition.

Blau, F. D. / *Kahn,* L. M. (2007): Changes in the labor supply behavior of married women: 1980 – 2000, Journal of Labor Economics 25 (3), 393 – 438.

Djurdjevic, D. (2005): Women's labour supply after childbirth: An empirical analysis for Switzerland, Darmstadt Discussion Papers in Economics, 144.

Dustmann, C. / *Schönberg,* U. (2008): The effect of expansions in maternity leave coverage on children's long-term outcomes, IZA Discussion Paper, 3605.

Geisler, E. / *Kreyenfeld,* M. (2006): Müttererwerbstätigkeit in Ost- und Westdeutschland. Eine Analyse mit den Mikrozensen 1991 – 2002, Zeitschrift für Familienforschung 18 (3), 333 – 360.

Geyer, J. / *Steiner,* V. (2007): Short-run and long-term effects of childbirth on mother's employment and working hours across institutional regimes: An empirical analysis based on the European Community Household Panel, IZA Discussion Paper, 2693.

Görlich, D. / *de Grip,* A. (2007): Human capital depreciation during family-related career interruptions in male and female occupations, Kiel Working Papers, 1379.

Gornick, J. C. / *Meyers,* M. K. / *Ross,* K. E. (1998): Public policies and the employment of mothers: A cross-national study, Social Science Quarterly 79 (1), 35 – 54.

Gronau, R. (1977): Leisure, home production and work: the theory of allocation of time revisited, Journal of Political Economy 85 (6), 1099 – 1123.

Haan, P. (2005): State dependence and female labor supply in Germany: The extensive and the intensive margin, DIW Discussion Paper, 538.

Hotz, J. V. / *Miller,* R. A. (1988): An empirical analysis of life cycle fertility and female labor supply, Econometrica 56 (1), 91 – 118.

Jaumotte, F. (2003): Female labour force participation: Past trends and main determinants in OECD countries, OECD Economics Department Working Papers, 376.

Kreyenfeld, M. (2000). Educational attainment and first births: East Germany before and after unification, MPIDR Working Paper, 011.

Kreyenfeld, M. (2001): Employment and Fertility – East Germany in the 1990s, PhD thesis, Max-Planck Institute for Demographic Research, Rostock.

Kreyenfeld, M. / *Hank,* K. (2000): Does the availability of child care influence the employment of mothers? Findings from Western Germany, Population Research and Policy Review 19, 317 – 337.

Lauer, C. / *Weber,* A. M. (2003): Employment of mothers after childbirth: A French – German comparison, ZEW Discussion Paper, 03 – 50.

Leibowitz, A. / *Klerman,* J. A. / *Waite,* L. J. (1992): Employment of new mothers and child care choice. Differences by children's age, The Journal of Human Resources 27 (1), 112 – 133.

Ondrich, J. / *Spieß,* C. K. / *Yang,* Q. / *Wagner,* G. (1999): Full time or part time? German parental leave policy and the return to work after childbirth in Germany, Research in Labor Economics 18, 41 – 74.

Schönberg, U. / *Ludsteck,* J. (2007): Maternity leave legislation, female labor supply, and the family wage gap, IZA Discussion Paper, 2699.

Sommerfeld, K. (2008): Older babies – more active mothers? How maternal labor supply changes as the child grows, SOEPpapers on Multidisciplinary Panel Data Research, 143.

Sonderhof, K. (2007): Effekte der Verlängerung des Erziehungsurlaubes auf die berufliche Weiterbildung bei jungen Frauen, Leibniz Universität Hannover mimeo.

Statistisches Bundesamt (1999): Die Erwerbsbeteiligung im Familienzusammenhang und ausgewählte Einflußfaktoren – Ergebnisse des Mikrozensus 1997, Wirtschaft und Statistik 1, 28 – 38.

Städtner, K. (2004): (Re-)entry into the labor force after first childbirth – An analysis for Austria, Mimeo.

van Ham, M. / *Büchel,* F. (2004): Females' willingness to work and the discouragement effect of a poor local childcare provision, Applied Economics Quarterly 4, 363 – 377.

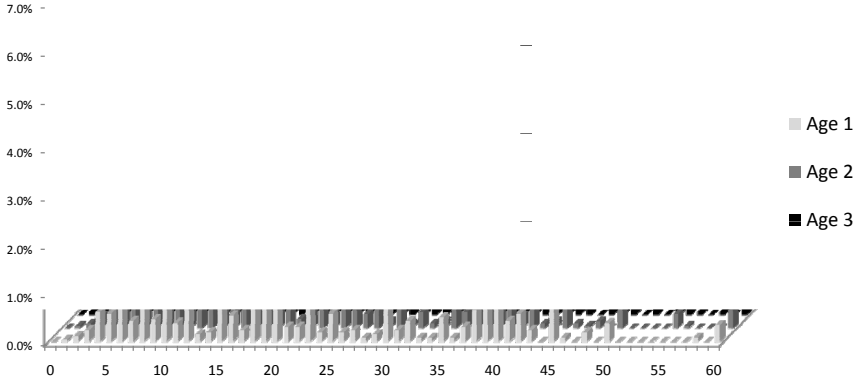
Verbeek, M. (2004): Modern Econometrics, John Wiley & Sons, West Sussex, 2nd edition.

Voicu, A. / *Buddelmeyer,* H. (2003): Children and women's participation dynamics: Direct and indirect effects, IZA Discussion Paper, 729.

Weber, A. M. (2004): Wann kehren junge Mütter auf den Arbeitsmarkt zurück? Eine Verweildaueranalyse für Deutschland, ZEW Discussion Paper, 04 – 08.

Wooldridge, J. M. (2002): Econometric Analysis of Cross Section and Panel Data, The MIT Press.

Appendix



Zero working hours excluded from graph.

Figure 1: Working hours at age 1, 2, and 3 of the baby

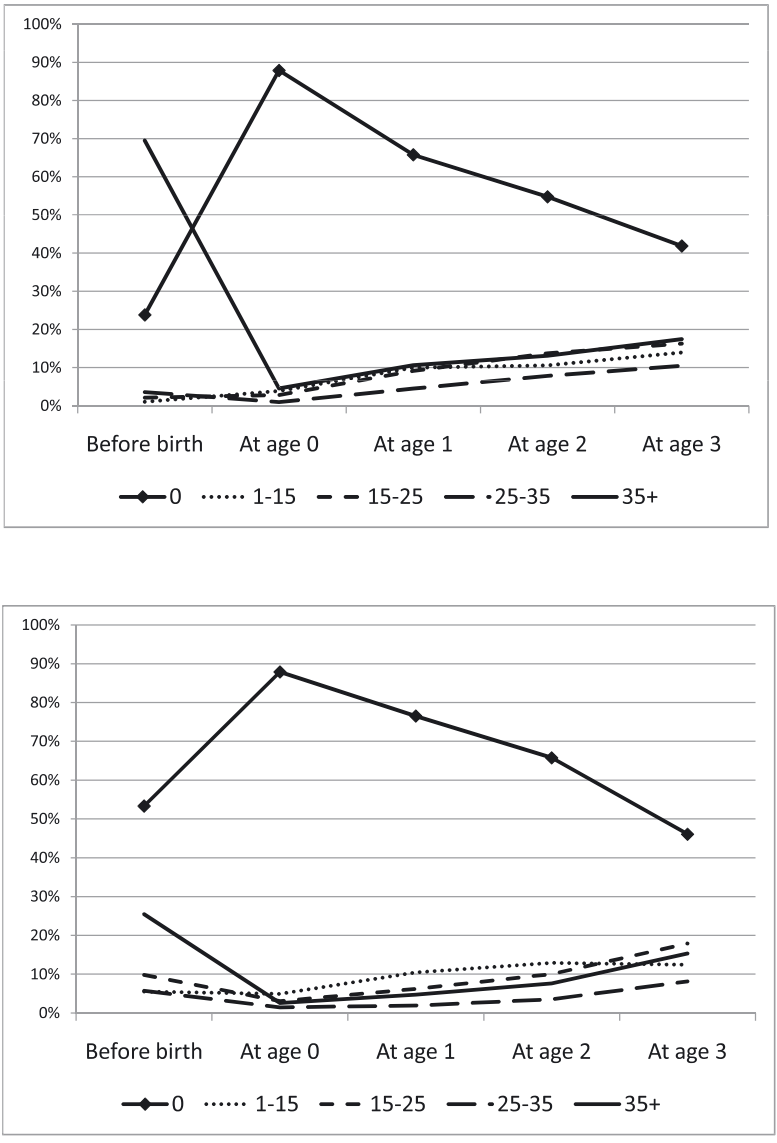


Figure 2: Grouped working hours for first-time mothers (above) and mothers with more than one child (below)

Table 1

Regression with interactions for separate ages: coefficients and significance

	At age 1		At age 2		At age 3	
	Coef.	*p*-value	Coef.	*p*-value	Coef.	*p*-value
Imputed hourly wage	9.918	(0.271)	17.34	(0.041)	28.68	(0.001)
Squared imputed wage	–0.0962	(0.735)	–0.356	(0.192)	–0.809	(0.002)
Partner's earnings	–0.00109	(0.129)	–0.00177	(0.012)	–0.00328	(0.000)
Partner's earnings missing	–11.34	(0.008)	–6.678	(0.074)	–4.058	(0.320)
Before birth blue collar	12.18	(0.007)	17.44	(0.000)	13.43	(0.001)
Before birth self-employed	42.45	(0.000)	37.45	(0.000)	38.08	(0.000)
Before birth white collar	23.16	(0.000)	23.59	(0.000)	11.77	(0.001)
Before birth civil service	40.64	(0.000)	36.48	(0.000)	22.12	(0.000)
Before birth not available	42.89	(0.008)	34.22	(0.001)	15.26	(0.069)
No professional training	11.62	(0.179)	14.10	(0.076)	9.342	(0.247)
University degree	–14.24	(0.223)	–20.03	(0.054)	–29.20	(0.008)
Age 18 – 22	15.63	(0.031)	16.71	(0.019)	20.01	(0.004)
Age 23 – 27	9.572	(0.022)	10.98	(0.002)	6.333	(0.122)
Age 33 – 37	–3.835	(0.320)	–5.212	(0.131)	–4.688	(0.238)
Age 38 – 47	–14.78	(0.017)	–11.85	(0.053)	–10.04	(0.236)
Currently living in East	30.91	(0.091)	50.54	(0.002)	60.09	(0.001)
No other child = first birth	1.057	(0.715)	–5.189	(0.050)	–5.600	(0.278)
Another child up to 3	–0.523	(0.875)	–5.174	(0.122)	–14.03	(0.058)
Another child 7 – 12	–2.886	(0.329)	–10.05	(0.000)	–6.278	(0.026)
Another child 13 – 15	–6.005	(0.238)	–2.014	(0.719)	–6.412	(0.265)
Another child 16+	7.684	(0.092)	6.283	(0.241)	–5.433	(0.318)
Twin birth	10.67	(0.088)	10.77	(0.029)	11.78	(0.060)
Baby age in months (1 – 12)	1.065	(0.001)	1.095	(0.000)	–0.157	(0.698)
Parents in same house	–5.000	(0.181)	–1.891	(0.547)	–5.629	(0.150)
Parents in neighborhood	0.456	(0.883)	4.240	(0.164)	1.903	(0.543)
Parents in another town	–1.033	(0.755)	–3.373	(0.253)	3.532	(0.336)
Parents far away	2.662	(0.489)	–4.285	(0.305)	4.283	(0.337)
Parents abroad	9.097	(0.244)	10.08	(0.155)	–0.497	(0.943)
Married	1.324	(0.698)	–2.462	(0.497)	–1.143	(0.810)
Foreign nationality	0.149	(0.973)	1.044	(0.814)	1.186	(0.761)
Constant	–120.2	(0.059)	–149.8	(0.013)	–198.4	(0.001)
Observations	3742					

Tobit regression for a fully interacted model. The displayed coefficients therefore refer to interactions with age one, two, and three of the child in the respective columns. See section 4 for further explanation. Standard errors adjusted for clustering on the individual level.

The reference group consists of women who were not working before birth, possess a professional degree, are between 28 and 32 years old, live in the Western part of Germany, have another child betwen 4 and 6 years of age and parents or parents in law living in the same town.

Year dummies have been controlled for.

Table 2

Regression with interactions for separate ages: marginal effects

	ME on actual variable			ME on $P(y > 0)$		
	Age 1	Age 2	Age 3	Age 1	Age2	Age3
Imputed hourly wage	4.129	**7.211**	**11.949**	.134	**.235**	**.389**
Squared imputed wage	–.040	–.148	**–.337**	–.001	–.005	.011
Partner's earnings	.000	**–.001**	**–.001**	.000	**.000**	**.000**
Partner's earnings missing	**–4.72**	–2.777	–1.692	–.154	–.091	–.055
Before birth blue collar	**5.069**	**7.254**	**5.599**	**.165**	**.236**	**.182**
Before birth self-employed	**17.664**	**15.581**	**15.874**	**.575**	**.508**	**.517**
Before birth white collar	**9.638**	**9.815**	**4.905**	**.314**	**.320**	**.160**
Before birth civil service	**16.917**	**15.183**	**9.219**	**.551**	**.495**	**.300**
Before birth not available	**17.859**	**14.244**	**6.361**	**.581**	**.464**	**.207**
No professional training	4.835	5.870	3.893	.157	.191	.127
University degree	–5.927	–8.342	**–12.171**	–.193	–.272	**–.396**
Age 18 – 22	**6.501**	**6.957**	**8.341**	**.212**	**.227**	**.272**
Age 23 – 27	**3.981**	**4.570**	2.639	**.130**	**.149**	.086
Age 33 – 37	–1.595	–2.169	-1.954	–.052	–.071	–.064
Age 38 – 47	**–6.144**	–4.935	–4.184	**–.200**	–.161	–.136
Currently living in East	12.850	**21.041**	**25.031**	**.419**	**.686**	.815
No other child = first birth	.440	**–2.161**	–2.332	.014	**–.070**	–.076
Another child up to 3	–.217	–2.155	–5.845	–.007	–.070	.190
Another child 7 – 12	–1.200	**–4.184**	**–2.615**	–.039	**–.136**	**–.085**
Another child 13 – 15	–2.497	–.839	–2.671	–.081	–.027	–.087
Another child 16+	3.196	2.617	–2.264	.104	.085	–.074
Twin birth	4.438	**4.487**	4.908	.145	**.146**	.160
Baby age in months (1 – 12)	**.443**	.456	–.065	**.014**	.015	–.002
Parents in same house	–2.079	–.788	–2.347	–.068	–.026	–.076
Parents in neighborhood	.190	1.766	.793	.006	.058	.026
Parents in another town	–.430	–1.405	1.472	–.014	–.046	.048
Parents far away	1.107	–1.785	1.785	.036	–.058	.058
Parents abroad	3.785	4.201	–.207	.123	.137	–.007
Married	.551	–1.026	–.476	.018	-.033	–.016
Foreign nationality	.062	.435	.494	.002	.014	.016
Constant	–50.017	**–62.412**	**–82.620**	–1.630	**–2.032**	**–2.691**

Tobit regression for a fully interacted model. The displayed coefficients therefore refer to interactions with age one, two, and three of the child in the respective columns. See section 4 for further explanation.

Standard errors adjusted for clustering on the individual level. The reference group consists of women who were not working before birth, possess a professional degree, are between 28 and 32 years old, live in the Western part of Germany, have another child betwen 4 and 6 years of age and parents or parents in law living in the same town.

Year dummies have been controlled for.