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Abstract

The author examines the extent to which mothers are willing to trade wages for non-wage job attributes within the context of maternity leave. The key aspect of this framework is that mothers can decide whether and when to return to their guaranteed job. In contrast to previous studies that analyze the job search of employed workers, in this framework one does not need to observe the wage/amenity offer process. It is the first study of its kind to estimate mothers' marginal willingness to pay (MWP) for job amenities directly. The author derives the MWP for job amenities from duration data and uses data from the German Socio-Economic Panel and the Qualification and Career Survey to estimate mothers' leave-length decisions by a discrete duration method. The MWP for amenities is inferred through the estimated response of the leave length with respect to the amenities and the wage. Results indicate that mothers are willing to sacrifice a significant fraction of their wage to reduce hazards and to enjoy a flexible work schedule.

Keywords

Marginal Willingness to Pay, Maternal Labor Supply, Discrete Duration Models

THE WILLINGNESS TO PAY FOR JOB AMENITIES: EVIDENCE FROM MOTHERS' RETURN TO WORK

CHRISTINA FELFE*

The author examines the extent to which mothers are willing to trade wages for non-wage job attributes within the context of maternity leave. The key aspect of this framework is that mothers can decide whether and when to return to their guaranteed job. In contrast to previous studies that analyze the job search of employed workers, in this framework one does not need to observe the wage/amenity offer process. It is the first study of its kind to estimate mothers' marginal willingness to pay (MWP) for job amenities directly. The author derives the MWP for job amenities from duration data and uses data from the German Socio-Economic Panel and the Qualification and Career Survey to estimate mothers' leave-length decisions by a discrete duration method. The MWP for amenities is inferred through the estimated response of the leave length with respect to the amenities and the wage. Results indicate that mothers are willing to sacrifice a significant fraction of their wage to reduce hazards and to enjoy a flexible work schedule.

According to recent statistics from the Organisation for Economic Cooperation and Development (OECD), almost 40% of mothers in OECD countries are not participating in the labor force (OECD 2010). Among women with children younger than three, this percentage is even higher: 47% are inactive. Conversely, labor force participation among childless women is similar to that of all men (73% for women, 75% for men). Because a major challenge many industrialized countries face is the decline of the workforce relative to the total population and because career interruptions lead to human capital depreciation and, hence, to a loss in long-term income and career opportunities, it is crucial to understand mothers' preferences with respect to certain job attributes. Such understanding may allow us to activate some unused work potential. My research investigates how mothers' evaluation of job attributes influences their decisions about whether and when to return to work after childbirth. There is some evidence that unfavorable working conditions may be important deterrents to returning to work (Bratti et al. 2004, De Leire and Levy 2004). Yet we lack any direct measure of the extent to which mothers' work decisions are triggered by job features. This study is the first to provide a direct estimate of the extent to

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A data appendix with additional results and copies of the computer programs used to generate the results presented here are available from the author, christina.felfe@unisg.ch.

which mothers are willing to trade wages for certain job attributes, what I designate as mother's marginal willingness to pay (MWP).

This study is based on the German maternity leave system, which guarantees that a mother may return to her job after childbirth. It focuses on the time that mothers decide to spend out of the labor force after childbirth. The key hypothesis is that maternity leave will be shorter if a mother's job offers more attractive characteristics, such as higher wages and family-friendly conditions. For this reason I compare the effect of the amenities provided by the guaranteed job on mothers' leave length to the effect of the wage paid by the guaranteed job on mothers' leave length. This comparison allows me to infer what wage fraction mothers are willing to give up for the presence or avoidance of certain job amenities.

The advantage of using German data is Germany's generous parental leave system; in contrast to the United States, for instance, where women are entitled to a leave of only 12 weeks, German working mothers are entitled to a leave of 36 months. The period's remarkable length allows for sufficient variation in the chosen duration of maternal leave. More important, the fact that jobs are guaranteed for the whole period enables observation of all relevant alternatives that recent mothers weigh while on leave, which in this case are only staying at home or returning to their guaranteed job. Thus, in contrast to previous studies (e.g., Gronberg and Reed 1994) that focus on the job search of employed male workers to derive an estimate for workers' MWP, my study can overcome the limitation of not observing all potential job offers entertained by the worker. Because mothers may search for a new job while being on leave, I may likewise fail to observe possible external job offers. The data, however, demonstrate that mothers rarely change jobs during maternal leave (only 2% do so). The job guarantee during the maternal leave period is thus the key element in this strategy to estimate the MWP.

This study provides new insight into the price mothers are willing to pay to enjoy certain job amenities. Moreover, because the job guarantee combined with a long leave period allow observation of all relevant alternatives available to recent mothers, the study improves upon the existing empirical literature on the MWP for job-related amenities and provides an accurate measure of mothers' MWP for amenities.

Parental Leave Legislation

Germany is one of the OECD countries with the most generous parental leave systems. It consists of maternity protection, protected parental leave, and parental benefits.

The first component, maternity protection, regulated by the maternity protection law (*Gesetz zum Mutterschaftsurlaub*, enacted January 1st, 1979), is a period of six weeks before and of eight weeks after birth during which time mothers must not work but receive their net wage rate. The second, protected parental leave, allows mothers to choose between staying on leave

and returning to work during a certain period after giving birth. In theory, both parents are eligible to go on leave; in practice, however, fewer than 5% of the fathers do so. Since the parental leave is the true period during which a mother is free to decide about her labor force participation, my study focuses on this period.

The Federal Law of Parental Leave and Parental Benefit came into effect in 1986. It allows a woman to take some extra months off beyond the maternity protection period and keep the option to return to her former job; and the employer has to guarantee her a position comparable to her former one. The parental leave period, initially 10 months at the time of the law's passage in 1986, was subsequently extended until 1992 to a length of 36 months. A mother is eligible for parental leave if she has worked at least six months in the same job before childbirth. It is important to stress that the mother has to inform her employer as well as the social security agency about her leave plans six weeks before she gives birth. Hence, her decision about leave length is based entirely on pre-leave criteria.

This law also regulates maternity benefits, the third pillar of the maternity leave legislation. The government pays the benefit as long as the mother remains on leave. But since 1992 it has covered, at most, 24 months of the total parental leave period. Although before 1994 the parental benefit was not linked to household income, after that year it became dependent on the household income remaining after maternal earnings are deducted in the year before childbirth. Depending on the period, different income thresholds apply: in months 1 to 6, the income threshold for a two-parent household lies at 51,000€, and for a single-parent household at 38,000€. In case family income exceeds the allowance, a household loses all benefits. In months 7 to 24 the income thresholds are substantially lower (20,500€ for a two-parent household and 16,500€ for a single-parent household), but in case a household's income exceeds the respective threshold, the family only experiences a gradual reduction of the benefit. Since 2001, families can moreover choose between two different versions of the benefit: either a benefit of up to 300€ for 24 months or a benefit of up to 450€ for only 12 months (the income thresholds explained above apply).

Previous studies have shown that the leave legislation, especially the total leave length, affects mothers' work decisions (Ondrich et al. 2003; Schönberg and Ludsteck 2006). I thus consider only the years from 1992 to 2006, during which period the parental leave rules went unchanged.

A Model of Maternal Leave Length

Basic Theoretical Model

My theoretical model estimates the extent to which mothers are willing to trade wages for exposure to or avoidance of certain job attributes. I focus on several negative job characteristics, disamenities, that is, on the amount of

wages mothers are willing to give up in order to avoid such disamenities as work-related hazards and heavy workloads. In addition, I investigate different aspects of the work schedule, such as the number of hours worked per week, evening or night work, and rotating shifts. It is not clear a priori if aspects of the work schedule are beneficial for balancing work and family demands, if mothers are thus willing to sacrifice wages for a better work schedule, or if mothers prefer to trade wages to avoid specific aspects of the work schedule.

The parameter of interest, which measures the trade-off between wages and job attributes, is the marginal willingness to pay (MWP). I define the MWP as the wage a mother would be willing to give up to avoid a job disamenity, keeping her welfare constant:

$$(1) \quad E[MWP_i] \equiv E \left[\frac{dW_{i,0}}{dA_{i,0}^j} \right] = E \left[- \frac{\frac{\partial U_i}{\partial A_{i,0}^j}}{\frac{\partial U_i}{\partial W_{i,0}}} \right]$$

where $W_{i,0}$ represents the hourly wage rate, $A_{i,0}^j$ a specific job attribute, and U_i the utility of mother i . Assuming that the job attribute $A_{i,0}^j$ enters a mother's utility function negatively, while the wage enters it positively, the MWP for the job attribute $A_{i,0}^j$ is expected to be positive; that is, the mother would have to receive a wage compensation for exposure to this disamenity. The opposite is true for an amenity that enters a mother's utility function positively.

In the spirit of Gronberg and Reed (1994), I derive the MWP for job attributes from duration data. In particular, the identification strategy is based on the German maternity leave system and thus on the time a mother decides to spend out of the labor force. Assuming that maternity leave will be shorter if a mother's guaranteed job implies more attractive attributes, the MWP can be inferred by comparing the response of the leave length to the conditions implied by the guaranteed job to the response of the leave length to the wage offered by the guaranteed job. Before laying out the model that estimates a mother's decision about her leave length, I need to point out that her decision has to be made before childbirth and, thus, is entirely based on the information available at that time.

Let's now assume that a mother's utility in any month after childbirth is a function of her income, leisure (or home production), and job attributes if she is working. Let's furthermore suppose that a mother chooses the length of maternity leave, or the month when to return to work after childbirth, so as to maximize her expected discounted lifetime utility. At any month during the leave period, she can decide if she wants to stay on leave or return to her guaranteed job. Theoretically, a mother also has the option to search for a new job. Yet in practice, mothers see the job guarantee as a kind of insurance and thus rarely change jobs during their maternity leave (only 2% of the women represented in my data). Once the job guarantee expires after month 36, a mother has to start searching for a new job if she would

like to participate in the labor market again. A mother's optimization problem can thus be divided into two phases: phase 1, which lasts from month 1 to month 35 after childbirth and during which a mother can stay at home without losing the right to return to her guaranteed job; and phase 2, which starts in month 36, the point at which a mother loses her guaranteed job if she does not return to work.

I focus on the decision during phase 1 and thus on the decision of a mother who finds it optimal to return to work before maternity leave is fully exhausted. The specific decision a mother faces during phase 1 can be described as follows: a mother chooses when to go back to her guaranteed job in order to maximize her expected discounted lifetime utility; she can choose between returning at any time during the 35 months after childbirth or not returning at all. The decision in phase 2 can be characterized by a standard search problem and is described in the appendix. The results derived for the MWP in phase 1, a different optimization problem, are valid for phase 2 as well, as also shown the appendix.

Because of the job guarantee, a mother deciding about leave length in month 0 expects to face the same working conditions as before childbirth, and hence she has the same expected utility from returning to work irrespective of the month of her return: $E[U_{i,t}^{\text{Work}}]$. This utility is constant over time.¹ The expected utility gained from remaining on leave $E[U_{i,t}^{\text{Leave}}]$ is assumed to change over time, in particular, to decrease over time. This is because a mother's time spent at home might be worth less over time due to home productivity decreasing with the age of the child. In addition, the benefit paid during leave declines over time. As a result, once the utility from returning to work is greater than or equal to the utility derived from being on leave at a given month t , it remains higher for any month thereafter. Moreover, given human capital depreciation and possible disadvantageous treatment of mothers in the labor market, the characteristics of any alternative job offer are assumed inferior to the ones of the guaranteed job (e.g., Waldfogel 1997). Accordingly, if a mother decides to return to work during maternity leave, she returns only to her guaranteed job and then stays there for all remaining periods (until month 36).

The decision to return to work is thus a once-and-for-all decision; as soon as the utility of returning to work is greater than or equal to the utility of being on leave, a mother returns to her guaranteed job. As a result, it is sufficient to compare the period utilities of working in the guaranteed job and staying on leave to determine a mother's optimal month for returning to work (see the appendix for details). Accordingly, a mother's probability of returning to work at month t after childbirth, also called the hazard rate $\lambda(t)$, can be written as follows:

¹This assumption might be too restrictive: a mother may arguably consider that a longer leave implies a loss in career opportunities. In the empirical counterpart of the model I therefore relax this assumption by including average occupational wage growth as a determinant of mother's decision to return to work. In addition, I allow the effect of the job attributes to vary with the length of maternity leave.

$$(2) \quad \lambda_i(t) = \Pr(E[U_{i,t}^{\text{Work}}] - E[U_{i,t}^{\text{Leave}}] \geq 0) \quad \forall t \in \{1, 2, \dots, 35\}$$

The alternative utilities of a mother i for any month t of the leave period, before making any assumptions about functional forms, are defined as follows:

$$(3) \quad U_{i,t}^{\text{Leave}} = U(I_{i,0}; B(1(I_{i,0} \leq \bar{I}); t; yr); tL_{i,t}; X_i; \alpha_i^{\text{Leave}}; \varepsilon_{i,t}^{\text{Leave}})$$

$$(4) \quad U_{i,t}^{\text{Work}} = U(I_{i,0}; W_{i,0}; H_{i,0}; A_{i,0}^1; \dots; A_{i,0}^J; X_i; \alpha_i^{\text{Work}}; \varepsilon_{i,t}^{\text{Work}})$$

If a mother stays on leave (see equation (3)), she derives utility from available income and from being on leave directly. Available income while being on leave is determined by the benefit $B(1(I_{i,0} \leq \bar{I}); t; yr)$ and other sources of household income $I_{i,0}$. As indicated by the subscript 0, other income sources are considered at period 0 because the mother must make the decision about maternity leave length before childbirth and hence only information available before childbirth is taken into account. Similarly, the maternal benefit is calculated taking into account whether or not the available household income lies below a certain threshold, indicated by $1(I_{i,0} \leq \bar{I})$, before childbirth; this benefit varies according to the year of childbirth yr and the leave length t . I model the utility derived directly from being on leave by the direct dependence of the utility on the months t a mother has been already on leave. A mother's personal and professional characteristics, denoted by X_i , also influence her utility. Last, I incorporate individual heterogeneity with respect to the utility derived from having a baby in general, denoted by α_i^{Leave} , and in the different months after giving birth, indicated by $\varepsilon_{i,t}^{\text{Leave}}$.

If a mother decides to return to work, as represented by equation (4), she derives utility directly from available income and from the working conditions. In addition to other sources of income $I_{i,0}$, available income is now determined by a mother's labor income, which depends on the hourly wage rate $W_{i,0}$ and the hours worked $H_{i,0}$. Moreover, because of the job guarantee, a mother expects to be exposed to the same work conditions as before maternity leave; that is, her utility is determined by the set of amenities $A_{i,0}^1; \dots; A_{i,0}^J$. It is crucial to note that I assume that a mother considers all determinants of the utility derived from returning to work at period 0. This is because a mother has to declare her leave-length intentions prior to childbirth and hence can only consider information about the job available prior to childbirth when deciding about her future leave length; and because of the job guarantee, she expects to receive the same wage rate $W_{i,0}$ and to face the same job attributes $A_{i,0}^1; \dots; A_{i,0}^J$ no matter which month she returns.² The data I use in this study provide supportive evidence for this assumption (see Table 1); on average, job characteristics do not vary dramatically upon a mother's return, working hours being the only exception. The reason for the drop in working hours is that since 2001 mothers employed in a firm

²Note that this assumption is not completely in agreement with the findings of Ondrich et al. (2003).

Table 1. Comparison of Job Characteristics before and after Maternity Leave

	<i>Job characteristics previous to leave</i>	<i>Job characteristics posterior to leave</i>
Ln real gross wage	2.4278	2.3708
Hazards	8.8015	9.3647
Workload	39.7026	39.7704
Working hours	35.7102	27.2039
Work in the evening	0.2602	0.2504
Night work	0.1138	0.1008
Shift work	0.1396	0.1463

Notes: Column 1 shows the characteristics reported by a woman before going on leave and column 2 the ones reported by a mother conditional on having returned to work. The sample sizes is thus restricted to the women who are returning to work and whose job characteristics are observed both before and after leave (512 out of 1404 mothers).

with more than 15 employees have had the right to reduce their working hours upon their return to work. In fact, as the data demonstrate, 17.7% of all mothers in my sample use this right and reduce their working hours by at least 5 hours a week upon return to work during the leave period. Nevertheless, estimating the model using only those mothers whose hours stay constant upon their return reveals that the estimates are robust to the assumption that not only wages and amenities but also hours worked stay constant upon mother's return.

Evaluating the determinants of a mother's alternative utilities, represented by equations (3) and (4), reveals that the characteristics of a mother's guaranteed job influence the utility derived from returning to work but not the utility derived from staying on leave. Using the derivatives of the hazard rate with respect to the hourly wage rate and the amenity, it is then straightforward to derive the following equality:

$$(5) \quad E[MWP_i] = E \left[- \frac{\frac{\partial \lambda_i(t)}{\partial A_{i,0}^j}}{\frac{\partial \lambda_i(t)}{\partial W_{i,0}}} \right] = E \left[- \frac{\frac{\partial E[U_i^{\text{Work}}]}{\partial A_{i,0}^j}}{\frac{\partial E[U_i^{\text{Work}}]}{\partial W_{i,0}}} \right]$$

This equality $A_{i,0}^j$ establishes then the following result: the MWP for a specific job attribute can be expressed by the ratio of the marginal effect of the job attribute on the hazard rate and the marginal effect of the wage rate on the hazard rate. As a consequence, there exists an estimable empirical analogue to equation (5).

This result allows for predictions about the effect of the variables of interest: First, the MWP is inversely related to the marginal effect of the wage on the hazard rate; i.e., the higher the marginal increase in the probability of return to work due to higher wages, the less wage a mother is willing to sac-

rifice in order to avoid a negative job attribute. Second, assuming that a specific attribute $A_{i,0}^j$ enters the utility function negatively, a mother prefers to return to work later if her guaranteed job implies this condition. Thus, the higher the marginal disutility of a job attribute, the higher the wage compensation a mother would have to receive in order to accept exposure to this condition. The opposite is true for an amenity that affects a mother's utility positively.

This model is, of course, simplistic and ignores the possibility of a mother having another child during the leave period. But the main purpose of my study is to estimate the impact of the attributes implied by the guaranteed job on the decision to return to work, and explicitly incorporating the decision to have another child during the leave period would unnecessarily complicate the model. Nevertheless, as discussed in the appendix, the estimates are robust to allowing for the alternative option of a mother to have a second child.

Taken together, the assumption of no job search combined with the job guarantee, which implies the absence of any uncertainty regarding the job attributes and hence the utility derived from work, is the key element of the model that allows for an economic interpretation of the parameters and for an accurate derivation of mothers' MWP.

Implementation

In order to estimate the model, I need to make some assumptions about the functional form of the utility and the distribution of the shocks. For simplicity, I assume linear individual utility functions, so that the alternative utilities are as follows

$$(6) \quad U_{i,t}^{\text{Leave}} = \beta^I \ln I_{i,0} + \beta^B B(1(I_{i,0} \leq \bar{I}); t; yr) + \gamma_0(1 - \gamma_1 t) + \eta^{\text{Leave}} X_i + \alpha_i^{\text{Leave}} + \varepsilon_{i,t}^{\text{Leave}}$$

$$(7) \quad U_{i,t}^{\text{Work}} = \beta^I \ln I_{i,0} + \beta^W \ln W_{i,0} + \delta^H H_{i,0} + \sum_{j=1}^J \delta^{A^j} A_{i,0}^j + \eta^{\text{Work}} X_i + \alpha_i^{\text{Work}} + \varepsilon_{i,t}^{\text{Work}}$$

Let me briefly describe how I incorporate the different determinants of a mother's utility in the estimation procedure. In both scenarios, alternative income sources are measured in relative terms ($\ln I_{i,0}$). Similarly, a mother's wage, received if back to work, is included in relative terms $\ln W_{i,0}$. The benefit $B(1(I_{i,0} \leq \bar{I}); t; yr)$, received if on leave, is captured by a set of dummies for the different income categories and by a set of year and month dummies. All income-related coefficients β^I , β^W and β^B are expected to be positive because a higher disposable income is assumed to increase the utility.

The effect of being on leave on utility is assumed to be not only direct but also to change over time, which is captured by a decomposition of the leave coefficient: one general coefficient, γ_0 , and another one, γ_1 , which interacts

with the leave length t . This is the way I allow the utility of being on leave to decrease over time. This effect is controlled for by a set of month dummies.

Personal and professional characteristics X_i contain mother’s age, partnership, education, region of residence, the number of children, the sector in which the mother works, and the average wage growth in her occupation. The two latter variables are assumed to capture opportunity costs of not working, such as missed promotion opportunities or depreciation in human capital. Allowing the coefficient η to depend on a mother’s working status reflects the possibility that professional and personal features might influence the utility differently, depending on whether a mother is on leave or returns to work.

The main interest of this study lies in the job attributes to which a mother is exposed as soon as she returns to her guaranteed job. Thus, besides the hourly wage rate, measured in relative terms $\ln W_{i,0}$, and the hours worked per week $H_{i,0}$, a great variety of amenities, $A_{i,0}^1, A_{i,0}^2 \dots A_{i,0}^J$, are included in the regression. The respective coefficient δ^{A^j} is expected to be positive in the case of a desired job attribute, but negative in the case of an undesired job attribute.

Using the linear specification of the utility functions outlined in equations (6) and (7) and assuming both a normal distribution of the error terms $\varepsilon_i^{\text{Leave}}$ and $\varepsilon_{i,t}^{\text{Work}}$ with mean zero as well as an additional measurement error $v_{i,t}$ which follows a logistic distribution, the hazard in month t , can be written as follows:³

$$\begin{aligned} \lambda_i(t) &= \Pr(E[U_{i,t}^{\text{Work}}] - E[U_{i,t}^{\text{Leave}}] - v_{i,t} \geq 0) = \Pr(v_{i,t} \leq \beta^W \ln W_{i,0} + \delta^H H_{i,0} \\ &\quad + \sum_{j=1}^J \delta^{A^j} A_{i,0}^j - \beta^B B(1(I_{i,0} \leq \bar{I}); t; yr) - \gamma_0(1 - \gamma_1 t) + \eta X_i + \alpha_i) \\ (8) \quad &= \frac{e^{\beta^W \ln W_{i,0} + \delta^H H_{i,0} + \sum_{j=1}^J \delta^{A^j} A_{i,0}^j - \beta^B B(1(I_{i,0} \leq \bar{I}); t; yr) - \gamma_0(1 - \gamma_1 t) + \eta X_i + \alpha_i}}{1 + e^{\beta^W \ln W_{i,0} + \delta^H H_{i,0} + \sum_{j=1}^J \delta^{A^j} A_{i,0}^j - \beta^B B(1(I_{i,0} \leq \bar{I}); t; yr) - \gamma_0(1 - \gamma_1 t) + \eta X_i + \alpha_i}} \end{aligned}$$

where η and α_i summarize $(\eta^{\text{Work}} - \eta^{\text{Leave}})$ and $(\alpha_i^{\text{Work}} - \alpha_i^{\text{Leave}})$, respectively. As a result, the decision about the leave length can be estimated using a discrete logistic duration model; the likelihood function includes all months a mother stays on leave, modeled by $(1 - \lambda_i(t))$, and the month when she returns to work, expressed by $\lambda_i(t)$. For the estimation, I use all leave spells, following first (66.5%), second (24.5%), and further births. If the birth of a further baby lies within the maternity leave period after the birth of a previous baby, this spell is treated as a censored spell (10.5% of the spells in my data).

Note that the estimation of the coefficients is complicated by the fact that, even though they are observationally identical, mothers might differ systematically in their unobserved characteristics, represented by α_i . Because the composition of the sample of mothers who stay on leave changes

³The results are robust to different assumptions about the error distributions and are available upon request.

over time with respect to both observed and unobserved characteristics, ignoring this unobserved heterogeneity can lead to inconsistent estimators. Hence, I estimate the leave decision using a discrete logistic duration model and allow for unobserved heterogeneity introducing a log-normally distributed time-invariant individual component α_i .⁴

Combining equation (5) and equation (8) and being aware of the fact that the hourly wage rate is measured in relative terms, I calculate the expected MWP of mother i in absolute terms as follows:

$$(9) \quad E[MWP_i] = E \left[- \frac{\frac{\partial \lambda_i(t)}{\partial A_{i,0}^j}}{\frac{\partial \lambda_i(t)}{\partial W_{i,0}}} \right] = \frac{\delta^{A^j}}{\beta^W} W_{i,0}$$

The absolute MWP is the wage amount, measured in Euros, a mother is willing to sacrifice to enjoy a positive job amenity, or, the wage compensation a mother requires to accept exposure to a job disamenity. In order to get the relative MWP, i.e., the percentage of the wage a mother is willing to trade for a job attribute, I need to multiply the expression in equation (9) by the ratio of the specific amenity and the wage rate:

$$(10) \quad E[MWP_i]_{\%} = E \left[- \frac{\frac{\partial \lambda_i(t)}{\partial A_{i,0}^j} \frac{A_{i,0}^j}{W_{i,0}}}{\frac{\partial \lambda_i(t)}{\partial W_{i,0}}} \right] = \frac{\delta^{A^j}}{\beta^W} A_{i,0}^j$$

Note that the suggested estimation method corrects for only time invariant heterogeneity among mothers, which is independent of their individual observable characteristics. Hence, issues such as mothers sorting into occupations according to their personal preferences might not be tackled with this random-effect type model. So far, bear in mind, the estimated coefficients have to be interpreted as the causal effect of the characteristics of the guaranteed job on the leave length plus the preference of a mother for a certain type of job. Occupational sorting is discussed in more detail in the appendix.

⁴Given that the sample contains more than one leave spell for some mothers (10.5%), the random effect represents only mother-parity combinations. Thus, the baseline specification ignores potential correlation between some random effects. Yet, the estimation results are robust when restricting the sample to one parity per mother by dropping randomly one leave spell for all mothers who are observed twice in the sample.

I also estimate the model assuming different functional forms for the unobserved heterogeneity (e.g. gamma distribution, discrete mass points). The results, however, do not alter significantly and are available upon request.

Data

The German Socio-Economic Panel and the Qualification and Career Survey

For my analysis of mothers' MWP for job-related amenities, I use two datasets: the German Socio-Economic Panel (GSOEP) and the Qualification and Career Survey (QCS). The GSOEP is an annual survey of Germans and foreigners in East and West Germany that has followed its subjects continuously since 1984 (Wagner et al. 2007). My study uses waves 1992 to 2006, which correspond to the years during which the maternity leave period has remained unchanged. The QCS is a survey of employees carried out by the German Federal Institute for Vocational Training (Bundesinstitut für Berufsbildung) and the Institute for Employment Research (Institut für Arbeitsmarkt und Berufsforschung). There were four surveys launched in 1979, 1985/86, 1991/92, and 1998/99, each covering about 30,000 individuals. For my study, I use the latest cross-section because it lies within the time at which the sample of mothers took parental leave and it is the only cross-section that includes a 4-digit occupational code that allows a merging of the two datasets.

The GSOEP and the QCS have several features that make them especially suitable for the proposed methodology to estimate mothers' MWP for amenities. The GSOEP has detailed annual information on personal as well as on such professional characteristics as the individual's occupation, wage, and work schedule. Furthermore, it provides monthly information on fertility as well as professional activities, such as whether the individual is working or on maternity leave. This information allows me to construct maternity leave spells for each woman and to determine her occupation before childbirth. The QCS contains a great variety of occupational amenities, which complements the occupational information provided by the GSOEP. Details about the amenities contained in the QCS follow.

Because a substantial part of the information is reported retrospectively and thus, not all necessary information can be recovered for the last available wave, that of 2006, the sample of interest includes all women who gave birth during the period from 1992 to 2005 and were eligible for maternity leave. Eligibility for maternity leave is conditional on having worked at least six months in the same job. According to the Federal Statistical Office, in 2003, 90% of West German women qualified for maternity leave, while not even 65% of East German mothers did so. In spite of being less often eligible for maternity leave, East German women more often exercised their right to maternity leave: 95% of eligible women in East Germany took some leave, while in West Germany only 80% did so.

The data provided by the GSOEP suffer from two shortcomings: first, the monthly activity history is partly left censored, which complicates the derivation of mothers' eligibility for maternity leave. Relaxing the eligibility condition and treating as eligible every woman who is observed in an employment

contract for at least one month before giving birth, 85% of West German and 65% of East German women in the sample qualified for maternity leave in 2003. The second problem in the data is that activities are often simultaneously and sometimes incorrectly reported. If a woman states several parallel activities, I give preference to being on leave. According to the maternity protection law, women are not allowed to work in the first eight weeks after giving birth, but about 5% of the women reported working during the maternity protection period. Since I cannot be sure that these spells are misreported, I exclude all leave spells that are shorter than two months.

The final sample includes 1,404 leave spells (28,587 individual-month observations), which correspond to 1,256 women; in other words, 148 women in our sample are observed to give birth twice. The 1,404 leave spells belong to the birth of the first (66.5%), second (24.5%), third (7%), fourth (1.5%), and fifth child (0.5%). In 607 cases, the leave spell ends with the return to the guaranteed job, and 208 leave spells last for the whole parental leave period—indicating that these women did not exercise the right to return to work during the first three years after giving birth. The remaining 589 spells are right censored, thus we do not know whether and when they returned to work. That said, we observe high panel attrition, an issue I discuss further in the appendix.

Amenities

The GSOEP contains information on individual wages and work schedules, in particular working hours (including overtime), frequency of working in the evening (6 to 9 p.m.), during the night (9 p.m. to 6 a.m.), and in rotating shifts. The QCS provides information on additional, more specific job features that are not provided by the GSOEP: physical demands of the job; lifting heavy weight (>20 kg); lying down or kneeling; standing during most of the shift; whether or not the job is tiring for the eyes; whether or not the job exposes the worker to dust or smoke, a dirty working environment, extreme climate conditions, noise, and risks of injury. These job attributes can be matched with the sample of women on maternity leave by using the 4-digit occupational code of the Federal Statistical Institute that is contained in both datasets. Thus, the final sample contains information about the occupation in which a woman worked before giving birth, the individual wage, the personal work schedule, and the average occupational aspects of workloads and work hazards.

In order to create representative average occupational characteristics, I restrict the 1998/99 wave of the QCS to women of childbearing age (16 to 46 years), like the ones in the sample of interest. These women are engaged in 772 different occupations. For each occupation, I calculate the mean of every amenity. In the original QCS questionnaire, the women are asked if they are never, rarely, sometimes, often, or always exposed to the respective condition, which is coded into discrete values of 0 to 4. Averaging these discrete values for different occupations produces values that are close to being

continuous on a scale from 0 to 4. For interpretational convenience, I rescale the average occupational characteristics from 0 to 100: the occupation with the highest level of a certain condition takes the value 100 and the lowest level takes 0. An example might illustrate this ranking: blue-collar workers in the plastics industry are the ones most exposed to risks of injury and death (they all report the value 4), while secretaries are the least threatened by these dangers (they all report the value 0). Thus, the plastics industry gets the average value of 100 for risks of injury, while secretaries get 0.

The occupational characteristics are very detailed and specific. For the purpose of significance and plausible interpretation, I create two indices (unweighted averages), summarized as “workload” and “hazards,” according to the distinctions made in the literature on compensating wage differentials (see Rosen 1986 or Villanueva 2007).⁵ The following characteristics are included in each of the two indices: “workload” includes having a physically demanding job, lifting heavy weight (>20 kg), lying down or kneeling, standing all the time, and having a job that is tiring for the eyes. “Hazards” incorporates being exposed to dust or smoke, dirt or oil, extreme climate conditions, noise, and risks of injury. According to Cronbach’s Alpha, which is an estimate of internal consistency reliability and amounts to 0.7 for workload and 0.8 for hazards, the respective amenities within the two groups are sufficiently correlated among each other to represent reliable measures of workload and hazards.

Estimation Results

Variables and Summary Statistics

The first step of my analysis of mothers’ MWP for amenities is to estimate the model of mothers’ decisions about maternity leave length. The determinants of interest are wages, hours, and amenities. These characteristics belong to the job a mother holds before going on maternity leave and to which she can return during the whole leave period. An overview of these job features can be found in Table 2. For illustrative purposes, Table 3a provides a list of the top 10 jobs, ranked in descending order according to their level of hazards and workload. Table 3b introduces the most common occupations among recent mothers and displays the respective mean of the job attributes. As we can see in Table 2, the average hourly wage rate amounts to 11.2€. The nonpecuniary characteristics are grouped into the following three categories: work schedule, workload, and hazards. With respect to the work schedule we observe the following: women work on average 35.1 hours, which includes on average 2 hours overtime. Quite a few mothers work in the evening (20.6%), at night (9.0%), and in rotating shifts (14.0%). With respect to average occupational workload and hazards, Table 3a shows that

⁵Alternatively, I employ factor analysis. Estimation results using the resulting factors barely differ from our results and are available upon request.

Table 2. Summary Statistics of Occupational Characteristics

<i>Variable</i>	<i>Obs.</i>	<i>Mean</i>	<i>Std. Dev</i>	<i>Min</i>	<i>Max</i>
Real hourly gross wage	1404	11.1764	4.9073	1.0183	37.1945
Hazards	1404	10.5600	11.1743	0	100
Workload	1404	39.8958	14.2908	0	100
Working hours	1404	35.1045	11.2334	0	70
Work in the evening	1404	0.2058	0.4045	0	1
Night work	1404	0.0897	0.2859	0	1
Shift work	1404	0.1396	0.3467	0	1

Note: The sample consists of women who are eligible for maternity leave. It contains 28,587 observations.

Table 3a. Occupations Ranked in Descending Order according to Their Level of Disamenities

<i>Rank</i>	<i>Hazards</i>	<i>Workload</i>
1	plastics worker (100)	plastics worker (100)
2	agronomist (65)	glass producer (80)
3	chemistry lab worker (65)	agronomist (75)
4	glass producer (60)	industrial engineer (70)
5	industrial engineer (60)	animal breeder (68)
6	chemistry worker (57)	nurse (operations) (68)
7	ceramicist (55)	elderly care (67)
8	motorcar engineer (53)	horse breeder (65)
9	warehouse worker (52)	painter/lacquer (65)
10	carpenter (51)	car lacquer (65)

Notes: I rank the occupation in which the women of the sample (women who are eligible for maternity leave) are working in a descending order according to their level of disamenities. The occupation ranked number 1, the plastics industry, exposes its workers to the highest amount of environmental hazards, while an agronomist is exposed to the second highest amount, etc. In total there are 100 ranks available. The average level of hazards and workload are shown in parentheses.

Table 3b. Level of Hazards and Workload Involved in Most Common Occupations of Mothers

	<i>Ln(wage)</i>	<i>Hazards</i>	<i>Work-load</i>	<i>Working hours</i>	<i>Evening work</i>	<i>Night work</i>	<i>Shift work</i>
Nurse	2.45	10.61	64.04	33.94	0.52	0.46	0.55
Bank clerk	2.69	2.19	29.11	37.17	0.19	0.00	0.00
Sales person	2.12	6.97	48.94	30.82	0.10	0.00	0.12
Medical secretary	2.25	6.10	43.09	33.25	0.10	0.03	0.20
Secretary	2.41	2.17	23.42	36.46	0.12	0.03	0.06
Educator	2.31	16.67	53.17	37.38	0.41	0.12	0.18
Retail clerk	1.89	6.62	44.29	38.47	0.27	0.03	0.15
Hairdresser	1.57	11.55	43.37	35.56	0.00	0.00	0.09
Office clerk	2.03	2.15	23.14	37.02	0.03	0.00	0.03
Dental assistant	2.12	12.76	41.67	33.44	0.06	0.00	0.13

Table 4. Descriptive Statistics of Personal and Occupational Characteristics

<i>Variable</i>	<i>Mean</i>	<i>Std. Dev.</i>	<i>Min</i>	<i>Max</i>
Age	30.8697	4.5734	18	46
Partner (in %)	0.9330	0.2500	0	1
Education (in years)	12.0007	3.1835	1	18
West (in %)	0.8027	0.3981	0	1
East (in %)	0.1880	0.3909	0	1
Other income sources	32449	17413	0	219528
Low income	0.2457	0.4307	0	1
Intermediate income	0.3618	0.4807	0	1
High income	0.3832	0.4863	0	1
Avg. occ. wage growth	0.1804	1.7520	0	38.3239
Technology (in %)	0.0548	0.2278	0	1
Service (in %)	0.6218	0.4851	0	1
Manufacturing (in %)	0.1510	0.3582	0	1
Agriculture (in %)	0.0071	0.0841	0	1
Public admin. (in %)	0.0776	0.2677	0	1
Educational sector (%)	0.0719	0.2585	0	1

the industry that demands the highest workload and the highest level of hazards is the plastics industry. Mothers, however, work mostly in occupations that expose them to slightly better conditions (Table 3b). The most common occupation among mothers, nursing, exposes workers to only 10.6% of the hazards and 64.0% of the workload involved in the plastics industry. Notice, while the level of hazards nurses are exposed to corresponds to the average level of hazards (10.6) involved in mothers' occupations, the physical effort nurses have to exert (64.0) lies above the mean (39.9). Further, popular jobs among mothers, such as banking and retail, offer better conditions: the workload level is 29.1 and 48.9, and that of hazards 2.2 and 7.0, respectively.

Individual characteristics may play an important role in the leave decision. Table 4 gives an overview of the personal and household characteristics of the women in the sample. I control for age, partnership, education, income, previous children, and the average wage growth and the sector in which the woman has been working. The maternity leave decision is also influenced by institutions, such as the maternity benefit level or the childcare facilities. The benefit is proxied by other income sources I_{i0} and a set of year (1992 to 2005) and month dummies (36). The month dummies also account for the fact that the utility of being on leave may decline with the age of the child. Although childcare for children under the age of 3 is publicly available in East Germany, it is very scarce in West Germany; only 3% are actually covered by formal childcare. Hence, I control for this difference by including a dummy for East and West Germany.

Results

I estimate the leave decision by using a discrete duration model with a logistic hazard function and log-normally distributed random effects. Table 5

Table 5. Results for Coefficients of Job Characteristics

	Working ¹ 1	Working ² 2	Working ³ 3	Working ⁴ 4	Working ⁵ 5
Ln gross wage	0.481*** (0.0981) [0.0109]	0.554*** (0.122) [0.0119]	0.681*** (0.145) [0.0118]	0.705*** (0.147) [0.0126]	0.683*** (0.146) [0.0123]
Hazards	-0.016*** (0.00518) [-0.0004]	-0.014*** (0.00522) [-0.0003]	-0.0135** (0.00655) [-0.0002]	-0.0136** (0.00665) [-0.0002]	-0.0134** (0.00656) [-0.0002]
Workload	0.00375 (0.00380) [0.0001]	0.00424 (0.00386) [0.0001]	0.00367 (0.00492) [-0.0001]	0.00349 (0.00500) [-0.0001]	0.00361 (0.00494) [-0.0001]
Working hours	-0.00260 (0.00363) [-0.0001]	-0.00609 (0.00380) [-0.0001]	-0.00613 (0.00446) [-0.0001]	-0.00611 (0.00453) [-0.0001]	-0.00594 (0.00448) [-0.0001]
Work evenings	0.261** (0.126) [0.0064]	0.242* (0.128) [0.0056]	0.301** (0.153) [0.0058]	0.314** (0.157) [0.0062]	0.304** (0.155) [0.0061]
Night work	0.0352 (0.172) [0.0008]	-0.111 (0.176) [-0.0023]	-0.204 (0.208) [-0.0033]	-0.211 (0.211) [-0.0034]	-0.209 (0.208) [-0.0035]
Shift work	0.306** (0.129) [0.0077]	0.313** (0.132) [0.0076]	0.372** (0.157) [0.0074]	0.370** (0.160) [0.0076]	0.367** (0.158) [0.0076]
Rho	0.06044** (0.02557)	0.06415** (0.028385)	0.19266** (0.039845)	0.2080*** (0.039769)	0.1970*** (0.040834)
Observations	-4.854***	-5.858***	-6.057***	-6.483***	-6.200***

Notes: The coefficients are from a discrete logistic duration estimation with frailty (log-normal distributed individual permanent residual). Standard errors are shown in parentheses: *Statistically significant at the 10 level; **at the .05 level; ***at the .01 level. Marginal effects are displayed in brackets. Rho is the coefficient of the individual time-invariant error term.

¹Column 1: no further controls are included.

²Column 2: Additional controls: partner, age, age squared, education, birth order, region, and income.

³Column 3: Additional controls, besides the ones in model 2 are average occupational wage growth as well as sector, month, and year dummies.

⁴Column 4: I use $\log(t)$ for the baseline hazard.

⁵Column 5: I include t , t squared and t cubic for the baseline hazard.

displays the resulting coefficients of the individual wage, the different aspects of the personal work schedule, and the average occupational indices workload and hazards.⁶

Columns 1 to 3 compare the estimation results, controlling first for no variables other than mothers' job characteristics, then adding personal characteristics (age, education, partner, region, total household income, and birth order), and finally, average occupational wage growth, as well as dummies for sector, month, and year. I also repeat the estimation under different assumptions for the functional form of the baseline hazard: including, instead of month dummies, either the logarithm or a polynomial of the time being on leave (column 4 and 5, respectively). The results barely change with the different specifications. Thus, my discussion of the results focuses

⁶The full set of estimated coefficients is available upon request.

on the specification assumed in column 3, including the full set of control variables and using a nonparametric baseline hazard (month dummies).

The theory outlined above predicts that the higher the wage and, hence, the higher the opportunity costs of not working, the more likely a mother is to return to her job. The estimated coefficient of the ln of real gross wage confirms the prediction: Women who have a job that pays 10% more wage per hour are 0.1% more likely to return to work in a given month (at the 1% significance level).

The estimated coefficient of the hazards is also in line with the prediction of the model: Women who have been working under bad working conditions tend to stay significantly longer on maternity leave (at the 5% level): one standard deviation more hazards (which corresponds to 10.6 units and, for example, to the difference in hazards a secretary or a nurse are exposed to) reduces the likelihood to return to work by 0.2%. Estimating the model using as controls each of the different aspects included in the hazards index separately shows that the deterrent effect stems mainly from jobs exposing the women to dust, smoke, and other health risks.⁷ A test for joint significance of all components of the hazards index cannot be rejected (the χ^2 -statistic is 10.1).

The actual effect of workload is insignificant. Nevertheless, looking at the separate effects of the different aspects of workload reveals that working in an uncomfortable position, such as stooping or kneeling, has a significantly negative effect on returning to work. The hypothesis of joint significance of the different components of the workload index can, however, be rejected (the χ^2 -statistic is 1.7).

The work schedule influences the leave decision as follows: Mothers in jobs entailing on average 10 hours more per week are 0.1% less likely to work in a given month. Jobs requiring night work also are less attractive to mothers after childbirth (by 0.3%). But both effects are not significant. In addition, women who have jobs that involve working in the evening or in rotating shifts are significantly (at the 5% level) more likely to work in a given month (by 0.6% and 0.7% respectively).

The effects of personal characteristics on the leave-length decision are in line with the findings of previous studies; women who are older and have a partner, several children, and more financial resources are less likely to work soon after childbirth, while women who live in East Germany and who are highly educated tend to return to work earlier. Moreover, the estimated coefficients of the month dummies predict a decreasing utility from being on leave: Although during the first 12 months mothers are 0.7% to 1.9% more likely to return to work than right after childbirth, this probability increases to 2.8% to 5.5% during the second year after childbirth and to even 2.2% to 9.3% during the third year after childbirth. Testing for the presence of individual time-invariant heterogeneity, such as ability or preferences, reveals in addition a significant impact of these individual unobserved charac-

⁷The estimation results including all job characteristics separately are available upon request.

Table 6. Marginal Willingness to Pay for Amenities Associated with Work

	<i>Relative MWP (%)</i>	<i>Absolute MWP (€)</i>
Hazards	0.2169* (0.1148)	0.2149* (0.1137)
Physical demand	-0.2161 (0.2932)	-0.0582 (0.0790)
Working hours	0.3149 (0.2335)	0.0973 (0.0722)
Work evenings	-0.0803* (0.0455)	-4.7751* (2.7069)
Work nights	0.0234 (0.0242)	3.2345 (3.3447)
Shift work	-0.0725*** (0.0339)	-5.9103*** (2.7698)

Notes: Standard errors are shown in parentheses: *Statistically significant at the .10 level; **at the .05 level; ***at the .01 level. The relative MWP for amenities, displayed in column 1, is calculated according to equation (10), the absolute MWP, displayed in column 2, according to equation (9). The underlying coefficients are the ones shown in column 3 of Table 7.

teristics on the maternity leave-length decision (the estimated coefficient of the random effect is significant at 1%).

The elasticities of the hazard rate with respect to wages and the selection of amenities now make it straightforward to derive how much mothers are willing to pay for the exposure to or for the avoidance of these amenities. First, I introduce the relative MWP, which is the wage share mothers would be willing to sacrifice in order to reduce a negative job attribute by 1% (calculated according to equation (10) and shown in column 1, Table 6). Second, I discuss the absolute MWP, which is the amount of hourly pay in Euros mothers would sacrifice to reduce a disamenity by 1 unit (calculated according to equation (9) and shown in column 2, Table 6).

As can clearly be seen in Table 6, there is only a significant MWP for the job attributes that also significantly influence a mothers' leave decision: Mothers are willing to sacrifice a significant share of their wage for a decrease in hazards and for the avoidance of a rigid work schedule. For less hazardous work, in particular for 1% fewer health risks, recent mothers are willing to sacrifice 0.2% of their hourly wage rate (significant at the 10% significance level); that is, for an increase in job-related hazards by 1 percent, recent mothers would have to receive a wage compensation of 0.2%. The results also suggest that working in the evening or in rotating shifts is convenient for mothers: Mothers are willing to give up 0.1% of their hourly wage rate to be 1% more likely to work in the evening (significant at the 10% significance level) or in rotating shifts (significant at 5%).

These percentages translate into the following monetary values (see Table 6, column 2): to be exposed to 1 standard deviation more hazards (which corresponds to 10.6 units), mothers would have to receive a wage compensa-

tion of 2.30€ more per hour, which corresponds to 20.3% of women's average hourly prebirth wage rate (11.20€ per hour); to work in the evening, mothers are willing to sacrifice 4.80€ per hour and 5.90€ to work in rotating shifts. Thus the MWP for working in the evening corresponds to 42.7% of women's average hourly prebirth wage rate and to 52.9% for working in rotating shifts.

The reported estimates for mothers' MWP to avoid job-related hazards and to work in the evening or in rotating shifts are surprisingly high. Thus, in order to provide some support for my findings I first compare my findings with the MWP found for males, for instance, by Gronberg and Reed (1994) and Bonhomme and Jolivet (2008), and then provide further outside evidence on the prevalence of certain job-related amenities among the jobs of recent mothers. This allows me to put my findings in the context of the literature. Second, because stratification according to individual or institutional characteristics might shed some light on the determinants that trigger mothers' MWP, I analyze the impact of wages, hours, and amenities on the chosen leave duration and distinguish between mothers' regional, financial, and educational backgrounds.

The basic regression results with respect to job hazards reveal a high tendency among mothers to sacrifice a significant wage share to avoid job hazards (20.3% for a reduction by 1 standard deviation). This estimate lies slightly above previous findings for the MWP of male workers. Gronberg and Reed (1994), for instance, find a MWP of 13.4% for U.S. male workers; Bonhomme and Jolivet (2008) confirm this magnitude for workers from countries that are culturally similar to Germany (12.8% to 15.2% for workers from Austria, Denmark, and the Netherlands). The slightly higher MWP for good working conditions among mothers is, however, in line with findings of previous studies (DeLeire and Levy 2004) that observe a crowding of women, in particular of mothers, into safe jobs. Nevertheless, when I distinguish between mothers with different financial and educational background the results indicate that not all women are willing or able to sacrifice significant parts of their wage to reduce unpleasant or unhealthy conditions. Table 7a provides the absolute MWP to avoid hazards for mothers of different income and education groups. It shows a clear pattern: The more financial resources, the higher the wage share a mother is willing to give up to diminish these hazards; likewise, the more education a woman has, the bigger the accepted trade-off between wage and hazardous conditions. Moreover, when I focus on the education of a woman's partner, this confirms the trend associated with the intellectual background: The more educated a woman's partner, the more averse is a woman toward occupational hazards.

The MWP for a nonstandard work schedule among recent mothers might seem unexpectedly high at first glance. Bonhomme and Jolivet (2008), for instance, find a much lower MWP for a convenient work schedule among Dutch and Danish male workers (15.2% and 22.0%, respectively), but higher among French male workers (43.4%). Nevertheless, nonstandard work

Table 7a. Absolute MWP for Hazards for Mothers from Different Income and Education Groups

	<i>Absolute MWP (in €) to avoid hazards— Different income groups¹</i>	<i>Absolute MWP (in €) to avoid hazards— Diff. education groups²</i>	<i>Absolute MWP (in €) to avoid hazards— Partners' education²</i>
Low group	0.1798 (0.1843)	-0.2863 (0.1992)	0.1508 (0.2413)
Intermed. group	0.1912 (0.1548)	0.2657* (0.1477)	0.2122 (0.1441)
High group	0.2348 (0.1886)	0.7915* (0.4511)	0.6646 (0.3641)

Notes: Using the results of a discrete logistic duration estimation with lognormal frailty including interaction terms between the job characteristics and the income group or the education respectively, I can calculate the displayed absolute MWP for certain amenities according to equation (9). Standard errors are shown in parentheses. The results of the discrete duration model are available upon request. The income groups are created according to the income thresholds of the maternal benefit payment described in the section on parental leave. The educational levels correspond to the three school tracks offered in Germany: a lower one leading to a vocational training, an intermediate one, and a higher one allowing for university access.

schedules seem to be more widespread among parents. Presser (2005) elicits family reasons as the main predictor for nonstandard working hours and puts forward the persistently higher prevalence of unorthodox work schedules among workers with children. Hence, if a nonstandard work schedule helps parents to arrange childcare informally, we should be able to observe an increase in the compatibility of parents' work schedules around childbirth.

In order to give some more substance to this supposition, I construct a measure to indicate whether the partners work according to complementary schedules and hence, whether there is at least one person at home at any time of day. Using a logit regression and controlling for demographic characteristics of the couple, such as age, education, region, and having a child, I show that the presence of a child leads to increased complementarities in the work schedules, particularly in West Germany (15%). Furthermore, stratification of these results according to partner's education reveals that the higher the intellectual background, the more often childcare is coordinated: the more educated their partner, the higher mothers' MWP to work according to an unorthodox work schedule.⁸

Stratification of the estimate by East and West German women might help to further investigate the hypothesis that mothers appreciate a nonstandard work schedule as it allows them to coordinate the childcare informally with their partner. The coverage of childcare facilities for children under the age of three is very poor in West Germany, as only 3% of the children can be accommodated in formal daycare. In East Germany, however, public childcare is available for 30% of the children at this age. Hence, re-

⁸Results for both analyses supporting the findings for the MWP for an unorthodox work schedule are available upon request.

Table 7b. Absolute MWP for Working Schedule, East and West

	<i>Absolute MWP (in €)</i>	<i>Absolute MWP (in €)</i>
	<i>West Germany</i>	<i>East Germany</i>
Working hours	0.1624** (0.0760)	-0.4048 (0.2672)
Evening work	-6.8099** (2.9598)	5.3718 (6.0155)
Shift work	-5.7499** (2.8747)	-5.2708 (5.9815)

Notes: Using the results of a discrete logistic duration estimation with lognormal frailty including interaction terms between a dummy for East Germany and the job characteristics, I can calculate the displayed MWP for certain amenities according to equation 9. Standard errors are shown in parenthesis below. The results of the discrete duration model are available upon request.

gressions that control for interactions among the variety of job features and a dummy for East Germany could help shed some light on the outlined hypothesis. As can clearly be seen in Table 7b, only West German women have the tendency to sacrifice significant (at the 5% level) amounts of their wage in order to adjust the work schedule to their family life; they are willing to accept a reduction in the hourly wage rate of 0.20€ to work one hour per week less, 6.80€ to work in the evenings, and 5.80€ to enjoy rotating shifts. East German women, if anything, are willing to accept a cut in the hourly wage rate if they can extend their work week (significant at the 15% significance level). These sharp differences between East and West Germany support the hypothesis that mothers' high MWP for nonstandard work schedules can be attributed to family obligations. Because there is virtually no daycare for children younger than 3 in West Germany, the only chance West German mothers have to stay in the labor market while their child is younger than 3 is to arrange childcare informally by working during hours when the partner or another member of the extended family is not working and can take care of the child. The fact that the situation changes dramatically as soon as the child turns 3 years old—the coverage rate of kindergartens that accommodate children age 3 to 6 is above 90% throughout Germany—may also explain the difference between the findings of the present study and the findings of Felfe (2012), who shows that mothers generally work less at night.

It is possible that, despite the job guarantee, the situation at a mother's workplace may still change upon her return, in particular if she has been on leave for a long time. Indeed, Ondrich et al. (2003) hypothesize that in an effort to get the returning mother to seek employment elsewhere, employers may hire a new worker to replace the mother and hence may change the job conditions. Nevertheless, a comparison of the amenities before and after the maternity leave of the women who actually return to work (see Table 1) does not provide any evidence for major changes except for changes in working

Table 8a. MWP for Disamenities for Women Who Do Not Reduce Their Hours upon Return to Work

	<i>Absolute MWP (in €)</i>	<i>Std. Err.</i>
Hazards	0.2164	0.1998
Physical demand	-0.0150	0.1469
Working hours	0.4647**	0.2215
Work evenings	-3.6232	4.8774
Work nights	6.3461	4.6320
Shift work	-9.4642*	5.0075

Notes: Standard errors are shown in parentheses: *Statistically significant at the .10 level; **at the .05 level, ***at the .01 level. The absolute MWP for amenities, displayed in column 1, is calculated according to equation (9). The underlying coefficients stem from estimating the baseline specification, shown in equation (8), but using only the sample of women who are either observed to work the same number of hours when returning to work or who are not observed to return to work.

hours.⁹ The primary explanation for this drop in hours is the fact that since 2001 mothers employed by a company with at least 15 employees have the right to reduce their hours upon returning to work. My baseline specification accounts for this by including an interaction term between the legal reform in 2001 and the size of the company. The coefficient reveals that the right to work part time has a positive but not significant impact on the leave-length decision. In addition, I repeat the estimation using a sample that excludes all mothers who reduce their working hours upon their return to work (17.7%). As shown in Table 8a, the estimates for the relative MWP are robust to this sample restriction. Interestingly, mothers who are not observed to work fewer hours after maternity leave seem to be willing to accept a significant cut in wages to reduce their hours. Yet, the estimate is not significantly different from the estimate for the full sample.

Despite this evidence supporting the main findings of this study, one has to acknowledge that some dimensions of a job may be more discretionary than others. For instance, environmental hazards may be inherent to an occupation, while the physical demands made on a worker may depend on the employer. For example, it may be difficult to reduce the health risks a nurse is exposed to, but it may be relatively easy to compensate a nurse for the physical effort she has to make by allowing her to take regular breaks during the workday. That said, the absence of a significant MWP for physical demands may be explained by the fact that mothers anticipate possible adjustments in the workload once they return to work after maternity leave. Unfortunately, the lack of data describing the situation of a mother upon her return in more detail, make it impossible to prove the last hypothesis, and my explanation remains purely suggestive.

⁹Minor changes in workload and hazards are caused by changes in the reported occupational code.

Table 8b. Absolute MWP for Disamenities in the Different Years of Maternity Leave

	<i>Absolute MWP (in €) for year 1</i>	<i>Absolute MWP (in €) for year 2</i>	<i>Absolute MWP (in €) for year 3</i>
Hazards	0.2496 (0.1317)	0.2688* (0.1613)	0.3274 (0.2867)
Work evenings	-3.2395 (2.7580)	-6.6150 (3.8201)	-16.200 (10.6914)
Rotating shifts	-5.5810 (3.0808)	-9.5575** (4.0294)	-15.3528 (10.1812)

Notes: The table above is based on the results of a discrete duration estimation with lognormal frailty including interaction terms of the wage with dummies for each of the three years of maternity leave. Using equation (10) I can calculate the MWP for each amenity but depending on the year after giving birth. Standard errors are shown below in parentheses. The results of the discrete duration model are available upon request.

Last, it is possible that when deciding about the leave length, a mother may believe that a longer leave may lead to more human capital depreciation and thus to a loss in career opportunities. The main specification (see column 3, Table 5) includes occupational average wage growth as an additional control variable. Its coefficient is positive, which indicates an earlier return to a job that has more promotion possibilities, but insignificant. I also allow the impact of the different job attributes on the leave decision to vary over time. My estimate in which interaction terms between the job attributes and dummies for all three years of the leave period are included reveals that the MWP to diminish hazards and to enjoy an unorthodox schedule increases slightly, but not significantly over the years (Table 8b).

Conclusion

This study is, to my knowledge, the first to directly estimate mothers' marginal willingness to pay (MWP) for the avoidance of negative job attributes (disamenities). Using data on the German maternity leave system, it explores the idea that the higher the wage and the better the nonwage aspects of the job a mother is guaranteed, the shorter maternity leave is expected to be. I compare the impact of the wage offered by the guaranteed job on the mother's leave decision to the impact of the disamenities implied by the guaranteed job on the mother's leave decision, and this allows me to infer the wage share mothers are willing to trade to avoid disamenities.

The methodology of this study contributes to the existing methodologies that attempt to measure the MWP. In contrast to previous studies (Gronberg and Reed 1994 and Bonhomme and Jolivet 2008), which look at job tenure of male workers and hence, fall short in observing all job offers made to the workers, the current approach allows me to overcome the limitations of modeling an explicit wage-disamenity offer process. In the case of maternity leave, all relevant alternatives available to mothers while being on leave are

observable: staying at home or returning to the guaranteed job at some point during the 36-month period. The job guarantee is thus the key component of my strategy to estimate mothers' MWP.

Moreover, this study provides information about the relevance of different job aspects to mothers' decisions to participate in the labor force. My results show clearly that the work schedule is pivotal for mothers when deciding how long to stay at home after childbirth. A nonstandard work schedule seems to be attractive for recent mothers; they are willing to accept severe wage cuts to be able to work during the evening (42.7%) or in rotating shifts (52.9%). Nevertheless, examining differences between East and West Germany demonstrates that only West German mothers are willing to sacrifice wages for this type of work schedule. In contrast to East Germany, in West Germany there is virtually no daycare for children younger than three. Thus, the only chance West German mothers have to stay in the labor market while their child is younger than three is to arrange childcare informally by working during hours when the partner or another member of the extended family can take care of the child. As a result, increasing childcare availability may be the only policy that really facilitates mothers' return to the labor force.

My results also show that mothers are highly averse to hazards, such as health risks: They are willing to sacrifice 20.3% of their wage to improve their working conditions by 1 standard deviation. Yet, when my analysis distinguishes between mothers' financial and educational background, the results reveal that it is primarily high-income and highly educated women, as well as women with a high-educated partner, who are willing to cut wages in favor of safer workplaces. In other words, only mothers who can either afford to choose their job according to personal preference or who are aware of potential consequences of menial jobs display a significant MWP to avoid job-related hazards.

Last, my method and findings allow me to attach a monetary value to every job characteristic; hence, I am able to establish a ranking of occupations according to the price mothers would be willing to pay to enjoy the involved amenities. This ranking provides some indication of which jobs are the most family-friendly. In terms of the flexible work schedules, occupations like retail, specialized nursing, or air traffic control offer the most adequate schedules for new mothers. With respect to working conditions, working in retail seems again to be the most accommodating job for recent mothers. Likewise, hotel clerks and lawyers enjoy a very pleasant working atmosphere. Taking pay into consideration, the occupations that pay the most, in both monetary and nonmonetary terms, seem to be such professions as editors, gynecologists, or high school teachers.

APPENDIX

Optimization Problem in Phase 1

The decision during phase 1 (month 1 to month 35 after childbirth) is the decision problem of a mother who finds it optimal to return to work before maternity leave is fully exhausted. In particular the question confronting a mother is when to return to work in order to maximize her expected discounted lifetime utility. Thus, assuming that working in month 36 is optimal for a mother, her strategy is to start comparing the maximum discounted lifetime utility under the alternative options in month 35. In case it is preferable for her to stay on leave, she stays home until month 35 and the optimal month of return is month 36. In case it is preferable for her to work, she moves to period 34 and repeats the same procedure. Her optimization strategy for any month t in phase 1 is thus as follows:

(A.1)

where, $U_{i,t}^{\text{Work}}$ and $U_{i,t}^{\text{Leave}}$ represent the utilities derived from work and staying on leave, respectively, and β is the discount factor. The latter equality shows that it is sufficient to compare the period utilities of working in the guaranteed job and staying on leave. Thus, a mother's optimal strategy in phase 1 looks as follows:

$$(A.2) \quad t^* = \underset{t \in \{1,2,3,4, \dots, 35\}}{\text{arg min}} \{E[U_{i,t}^{\text{Work}}] - E[U_{i,t}^{\text{Leave}}]\} \text{ s.t. } E[U_{i,t}^{\text{Work}}] - E[U_{i,t}^{\text{Leave}}] \geq 0$$

Optimization Problem in Phase 2

If a mother stays on maternity leave through month 35, she enters phase 2: in other words, she faces the risk of losing the right to return to her former job if she stays on leave for one more month. In month 36, a mother's optimization problem is thus defined by:

$$(A.3) \quad V_{i,36} = \max\{E[V_{i,36}^{\text{Work}}]; E[V_{i,36}^{\text{Leave}}]\}$$

$$(A.4) \quad \text{where } V_{i,36}^{\text{Work}} = E[U_{i,36}^{\text{Work}} + \sum_{s=37}^T \beta^s U_{i,s}^{\text{Work}}]$$

$$(A.5) \quad V_{i,36}^{\text{Leave}} = \max_{s_i} \{U_{i,36}^{\text{Leave}} - c(s_i) + \beta[\pi(s_i) \max\{V_{i,37}^{\text{Leave}}; V_{i,37}^{\text{New Job}}\} + (1 - \pi(s_i))V_{i,37}^{\text{Leave}}]\}$$

where $V_{i,36}^{\text{Work}}$ represents the maximum expected discounted lifetime utility if a mother returns to her guaranteed job in month 36, and $V_{i,36}^{\text{Leave}}$ represents the maximum expected discounted lifetime utility if she chooses to stay at home. Since any alternative job offer is assumed to be inferior to the guaranteed job, a mother is expected to stay at her guaranteed job, if she decides to return to work before the job guarantee expires. As a consequence, the expected utility derived from working is constant for all following months (see equation (A.4)) and corresponds to the utility derived from her guaranteed job, indicated by $U_{i,36}^{\text{Work}}$. If a mother finds it yet optimal to stay on leave in month 36, from month 37 on she faces a standard job search problem (denoted by equation (A.5)): she has to choose an optimal search effort s_i , which determines the probability of receiving a job offer, expressed by $\pi(s_i)$. In the case of a job offer, she can choose between staying at home and accepting the offer. Notice that the new job is characterized by a completely different set of work conditions than the guaranteed job. The maximum expected discounted lifetime utility derived from staying on leave in month 36, represented by $V_{i,36}^{\text{Leave}}$, is thus, an analogue to all prior months, independent from the wage and the amenities of the guaranteed job.

Given the optimization problem outlined in equation (A.3), the probability of a mother i to return to her guaranteed job in month 36, looks as follows:

$$(A.6) \quad \lambda_i(36) = \Pr(E[V_{i,36}^{\text{Work}}] - E[V_{i,36}^{\text{Leave}}] \geq 0) = \Pr \left(\begin{aligned} & \frac{U_{i,36}^{\text{Work}}}{1-\beta} - U_{i,36}^{\text{Leave}} + c(s_i^*) - \beta[\pi(s_i^*) \max\{V_{i,37}^L; V_{i,37}^{\text{New Job}}\}] \\ & + (1-\pi(s_i^*))V_{i,37}^{\text{Leave}} \geq 0 \end{aligned} \right)$$

where s_i^* denotes optimally chosen search effort, i.e., solves equation (A.5).

Utility Derived from an Alternative Job Offer

Analogous to the utility derived from the guaranteed job, indicated by equation (4), the utility derived from a new job is determined by available income and the set of job attributes, but now those implied by the new job. Note that a mother has to declare the month of her return to work only at childbirth if she intends to return during the maternity leave period. If, however, she finds it optimal to exhaust maternity leave completely and consequently declares not to return to her guaranteed job until month 36, she is free to decide between working and not working at any single month $s \in \{37, 38, \dots, T\}$. Given the uncertainty of a mother about future conditions, her utility derived from a new job is determined by her expectations about available income, which depends on her expected other income sources $E[I_{i,s}]$, on her expected wage $E[W_{i,s}]$, and on expected working hours $E[H_{i,s}]$, as well as on her expectations about the attributes of the new job $E[A_{i,s}^1; \dots; A_{i,s}^J]$, at any single month. The expected utility derived from a new job is thus determined as follows:

$$(A.7) \quad E[U_{i,s}^{\text{New Job}}] = E[U(E[I_{i,s}]; E[W_{i,s}]; E[H_{i,s}]; E[A_{i,s}^1; \dots; A_{i,s}^J]; X_i; \alpha_i^{\text{New Job}}; \varepsilon_{i,s}^{\text{New Job}})] \quad \forall s = 37, 38, \dots, T$$

where, as before, individual heterogeneity is expressed by observable personal variables X_i , by an unobservable time constant and time varying term ($\alpha_i^{\text{New Job}}$ and $\varepsilon_{i,s}^{\text{New Job}}$).

Given the hazard rate in month 36, expressed by equation (A.6) and the fact that the value of continuing to stay on leave after month 36 depends not on the characteristics of the guaranteed job but on the expected characteristics of jobs available on the market, it is straightforward to see that the marginal effect of the hourly wage rate as well as the effect of any amenity on the hazard rate in month 36 is a function of the utility derived from returning to the guaranteed job only. The MWP in month 36 is thus determined as follows:

$$(A.8) \quad E[MWP_i] = E \left[\frac{\frac{\partial \lambda_i(36)}{\partial A_{i,0}^j}}{\frac{\partial \lambda_i(36)}{\partial W_{i,0}}} \right] = E \left[\frac{\frac{\partial E[U_i^{\text{Work}}]}{\partial A_{i,0}^j}}{\frac{\partial E[U_i^{\text{Work}}]}{\partial W_{i,0}}} \right] = E \left[\frac{\frac{\partial E[U_i^{\text{Work}}]}{\partial A_{i,0}^j}}{\frac{\partial E[U_i^{\text{Work}}]}{\partial W_{i,0}}} \right]$$

This expression is equal to the one indicated by equation (5); hence the MWP derived for phase 2 is equal to the one derived for phase 1.

Additional Specifications and Robustness Checks

Any modeling of mothers' leave decisions is complicated by the fact that mothers might differ systematically in their behavior, even though they are observationally identical. In the baseline estimation, I approach this problem by modeling the time invariant heterogeneity among mothers as a log-normally distributed random effect. The key assumption of this correction method is that there is no correlation between the unobserved characteristics and the control variables. Mothers, however, might differ in their career aspirations and in their preferences for job conditions. These differences might cause mothers to sort into occupations that differ in the amenities offered. In other words, job-related amenities and mothers' unobserved characteristics might actually be correlated, and thus, our estimated coefficients might be biased. Nevertheless, the direction of this bias is not obvious. It is possible that women who are career-oriented return to work earlier and have a high preference for wages but not a strong preference for amenities. In this case, our estimated amenity coefficients

would be biased toward zero, the estimated wage coefficient would be upward biased, and the derived MWP for amenities would consequently provide a lower bound. But it may also hold true that women who try to combine career and family, i.e., want to have a child but also intend to work as soon as possible, sort into jobs that offer them a high level of amenities and thus allow for the compatibility of work and family. Should this actually be the case, the amenity coefficients and the derived MWP would be overestimated.

One exercise to investigate if this presorting may bias the coefficients is to estimate the model using a subsample of women who cannot choose their job according to their personal preferences. In the former GDR occupational choice was severely restricted and highly controlled by a so-called “process of the supply of the young workforce” (Zimmermann 2002). Both the educational system and the Office of Labor were coordinating this process; while the school system accommodated the needs of the economy with the available students, the Office of Labor decided about each work contract carried out between a worker and a firm. In other words, the right of free occupational choice was severely restricted, if not even non-existent in the former GDR. Consequently, East German women who had a baby shortly after the reunification had the same right to maternity leave as West German women, but they did not have the opportunity to choose a job according to their family plans. Thus, restricting the sample to the first three years after reunification, 1992–94, and estimating the baseline model with interaction terms for the wage and amenities and a dummy for East German women should help us to investigate if presorting causes a bias.¹⁰ With respect to the MWP for better working conditions, no significant differences can be revealed for East German women soon after the German reunification. With respect to the work schedule, preferences of East German women right after the unification seem to resemble the preferences of all East German women. Hence, these results promote the possibility that presorting into family-friendly jobs might not affect mothers’ MWP. Because of the small sample size, however, we might not conclude statistically significant results.

Besides differences in career aspirations, there also might be diversity among women with respect to their family plans. First, the decision to become a mother might be triggered by the individual job situation. Women in an unsatisfying job situation might, for instance, want to take a break from work and anticipate their family plans. In this case our sample would overrepresent women in worse job conditions who stay longer on leave. Consequently, the estimated amenity coefficients would be upward biased. Previous studies (Lauer and Mühlenweg 2003; Bratti et al. 2004), however, do not find any selection into motherhood due to job attributes when estimating the decision about fertility and LFP simultaneously. Second, so far we neglected a further option women have besides staying at home or returning to work, namely having another child. Yet, the main sample includes all leave spells following first, second, and further births. In case the birth of a further baby lies within the maternity leave period allowed for the birth of a previous baby, this spell is treated as a censored spell. In order to take into account the possibility of consecutive childbirths, I use a restricted sample including only spells after first childbirth and analyze mothers’ decision between staying on leave, working, or having another baby. For this purpose, I estimate a competing risk model that allows me to incorporate the choices of first-time mothers deciding between these three alternatives during the 36 months after the first childbirth (results are available upon request). First-time mothers demonstrate a similar MWP to reduce hazards (30% for a decrease of 1 standard deviation) and to be able to work in the evening (50%) or in rotating shifts (45%).

One further unobserved dimension in which mothers might vary is ability. First, one might think that employers are willing to offer more productive women both a higher wage and more amenities. Second, more capable women might also be more likely to return to work early. If ability is correlated with both better working conditions and a tendency to

¹⁰A further reduction of the sample is not possible due to a small sample size. Due to high unemployment in East Germany, women, however, did not frequently change their job in the years following reunification. The results of the estimation are available upon request.

work, the coefficients estimated in the main specification may be overestimated. But because of the nature of disamenities such as dust, dirt, extreme temperatures, noise, and certain health risks, it would be difficult for an employer to treat more productive women differently with respect to the levels of these disamenities. Moreover, the wage, measured on the individual level, should be a function of such attributes as education, experience, and ability, and thus wage should incorporate individual ability; that is, the potential problem of endogeneity should be ruled out.

One last source of bias is the issue of attrition. So far I implicitly assume that missing women, those who disappear from the data (3% per month on average) behave as the women continuously observed in the data set. This is a strong assumption because we cannot be sure that attrition is a random event. One way to check the robustness of the main specification is to estimate the model using samples extended under extreme assumptions: the missing women might start working as soon as they drop out of the sample, or they might never return to their job during the maternity leave period of 36 months. Under both extreme assumptions the results are robust. They are available upon request.

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