Women's Noncognitive Skills and Return to Employment After Childbirth

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August 2010

Abstract

The aim of this paper is to investigate the effect of women's noncognitive traits on the duration until return to employment after childbirth. I thus links the existing literature on the determinants of mothers' return to employment with the very recent literature on the economic consequences of noncognitive skills. Using data from the German Socio-Economic Panel Study (SOEP) and referring to the concepts of Locus of Control and the Big Five personality traits, a discrete semi-parametric survival model with a discrete mixture distribution to account for unobserved heterogeneity is estimated. The results confirm predictions according to which women with an external Locus of Control return to employment later than women with a more internal Locus of Control. The dimension Agreeableness of the Big Five personality traits is found to be associated with later return to employment.

Keywords: Noncognitive skills, personality, maternal employment, female labor supply, survival analysis

JEL-codes: J22, J24

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1   Introduction

The aim of the study is to investigate the role of a mother's noncognitive skills for the duration until return to employment after childbirth. On the one hand, noncognitive skills might affect the overall labor market attachment of a women; on the other hand, noncognitive skills play a role for the attitude of a woman toward her child and her belief of how long a mother should be available full-time for her child. The research question makes me combine two strands of literature in economics: first, that of the determinants of mothers' return to employment after childbearing and second, that of the economic consequences of noncognitive skills.

There is a large literature on the determinants of mothers' return to employment after childbearing. Post-birth employment behavior matters because it affects future employment chances and wages since longer breaks reduce the amount of human capital (e.g., Beblo and Wolf 2002, Davies and Pierre 2005, Gutierrez-Domenech 2005, Lefebvre, Merrigan, and Verstraete 2009). Especially for highly educated women, long periods of non-participation and the resulting devaluation of skills are an enormous waste of human capital resources. Moreover, especially for low-income families, post-birth employment plays an important role for the stability of the family income. Maternal employment is an important aspect in the current debate about poverty among families and single parents.

Traditionally, studies in the field of mothers' return to employment after childbearing focus on incentive schemes, the role of labor market institutions, and educational attainment. Especially the role of parental leave schemes and tax regimes has been investigated by a number of studies (e.g., Bergemann and Riphahn 2009, Burgess, Gregg, Propper, and Washbrook 2008, Gutierrez-Domenech 2005, Ondrich, Spiess, Yang, and Wagner 2003). Kuhlenkasper and Kauermann (2010) focused on the role of individual and family-related factors like income, educational attainment, and labor market experience. As to my knowledge, no previous study investigated the role of noncognitive traits in the context of mothers' return to employment. This is done in the present paper. Since noncognitive traits are expected to be related to both, the labor market behavior and the behavior toward a child, the research question appears to be of high interest.

The relatively recent literature on the economics of noncognitive skills found that these skills play an important role in economic and social success such as employment outcomes, educational attainment, and a variety of risky behaviors (Borghans, Duckworth, Heckman, and ter Weel 2008, Heckman, Stixrud, and Urzua 2006, Heckman and Rubinstein 2001). The term noncognitive skills in the literature refers to traits other than cognitive ability (IQ), that is, to traits that are sometimes also referred to as personality traits. They include for example perseverance, conscientiousness, belief in control over own life, self-

esteem, extraversion etc.[1] Using data from the US, Heckman, Stixrud, and Urzua (2006) as well as Coleman and DeLeire (2003) found that teenagers with a high belief in internal control (internal LOC) accumulated higher schooling. Using German data, Coneus, Gernandt, and Saam (2009) found that young adults with an internal LOC are less likely to become an educational dropout. Blomeyer, Laucht, Coneus, and Pfeiffer (2009) came to the result that children with higher persistence scores in early childhood have better school grades at age eight and are more likely to enter the higher-track secondary school (Gymnasium). Concerning employment outcomes, a number of studies found that noncognitive traits are associated with earnings (Andrisani 1977, 1981, Cebi 2007, Flossmann, Piatek, and Wichert 2007, Heckman and Rubinstein 2001, Heckman, Stixrud, and Urzua 2006, Heineck and Anger 2010, Mueller and Plug 2006, Nyhus and Pons 2005, Osborne Groves 2005). Uhlendorff (2004) as well as Uysal and Pohlmeier (2009) analyzed the relationship between unemployment duration and noncognitive skills. They found that unemployed with an internal LOC find a new job within a shorter period of time than unemployed with a more external LOC. A number of studies in psychology investigated the relationship between personality traits and occupational attainment; for a review, see, e.g., Roberts, Kuncel, Shiner, Caspi, and Goldberg (2007). Although a number of studies investigated the impact of noncognitive traits on the mentioned employment outcomes, relatively little is known about the impact on labor supply, specifically the labor supply behavior of women or mothers. Two exceptions are the studies of Wichert and Pohlmeier (2010) as well as Heckman, Stixrud, and Urzua (2006). Wichert and Pohlmeier (2010) analyzed the impact of the Big Five personality traits on women's probability to participate in the labor market. They found a positive effect of the traits Conscientiousness and Extraversion and a negative effect of Neuroticism and Openness on the probability to participate. Heckman, Stixrud, and Urzua (2006) used the Rotter Locus of Control Scale and the Rosenberg Self-Esteem Scale to construct a single noncognitive skill factor. Their results suggest that the impact of the noncognitive skill factor on the employment probability is even larger than the effect of cognitive skills (in terms of one standard deviation change). The pattern was found to be more pronounced for women than for men. An explanation for the gender difference might be the conflicting roles of employment and family. Women face more frequently than men the trade-off between family and career decisions and the behavior toward the trade-off is likely to be influenced by noncognitive traits. To examine the issue in more detail, it appears useful to investigate the return-to-employment behavior of women after childbirth because they face the family-career conflict to a particularly high extent.

The noncognitive traits focused on are Locus of Control and the Big Five personality

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[1]For a detailed discussion of the research on noncognitive skills, see Borghans, Duckworth, Heckman, and ter Weel (2008).

traits. The measures have been found to be important for economic outcomes (e.g., Coleman and DeLeire 2003, Heckman, Stixrud, and Urzua 2006, Uhlendorff 2004, Wichert and Pohlmeier 2010). Using data from the German Socio-Economic Panel Study (SOEP), I estimate the duration until return to employment after first childbirth. I concentrate on the first birth because transitions into employment after higher order births are much more complex to model as they are related to previous career interruptions due to previous births. Focusing on the first birth allows me to control for employment characteristics of the job prior to first birth and to neglect the dynamic process of the timing of further births and career interruptions. I account for women having a second child shortly after the first as this might influence their return decision. The details will be describe in Section 3.2. The empirical strategy is to estimate a discrete semi-parametric survival model incorporating a discrete mixture distribution to summarize unobserved individual heterogeneity, as proposed by Heckman and Singer (1984). The results indicate that external LOC and Agreeableness are related to a late return to employment after childbirth.

The paper is organized as follows: Section 2 specifies the concepts of noncognitive skill measures used in the analysis; Section 3 describes the data base and variables; Section 4 exposes the estimation method; Section 5 presents and discusses the results; Section 6 presents several robustness checks; Section 7 concludes.

2 The concept of noncognitive traits and the role in maternal employment decisions

I refer to two concepts of noncognitive skill measures, namely the Locus of Control (LOC) and the Big Five personality traits. The measures are used because they have been found to be influential for a number of economic outcomes and they are available in the nationally representative data set of the SOEP. In the following two subsections, the two concepts are presented and the expected effects on a woman's decision to return to employment after childbearing are discussed. Since so far little is known about the relationship between noncognitive skills and labor supply behavior, some of the expectations rely on theoretical arguments rather than on previous empirical evidence.

2.1 Locus of Control

The Locus of Control (LOC) is a measure of the "individual differences in a generalized belief for internal versus external control of reinforcement" (Rotter 1966, p. 1). It is a measure of the degree to which an individual perceives that success or failure in life follows from his own behavior or attributes versus the degree to which he feels that it is controlled by forces outside of himself and may occur independently of his own actions.

If life events are perceived by a person as being contingent upon her own behavior or her own relatively permanent characteristics, this is labeled an *internal* LOC. If, on the other hand, life events are perceived by a person as the result of luck, chance, fate, as under the control of powerful others, or as unpredictable because of the great complexity of the forces surrounding her, this is labeled an *external* LOC.

There are several ways through which LOC could affects the time until return to employment after childbearing. First, I follow the line of argument by Coleman and DeLeire (2003), who assert that LOC affects the decision to invest in human capital through its impact on expected earnings. The authors develop a model of schooling decisions as a function of expected future earnings. They incorporate individual LOC in the model arguing that the expected increase in future earnings induced by an extra year of schooling will be higher for individuals with a more internal LOC than for individuals with a more external LOC. A similar argumentation can be adopted for the investment in work experience, which, in addition to schooling, influences future earnings according to the Mincer model of earnings (Mincer 1958, 1974). The earlier a woman returns to employment after childbearing the more work experience she will gain. Therefore, returning to employment shortly after childbirth can be interpreted as an investment in human capital. This interpretation is especially relevant as child-related career breaks usually occur at an early stage of a career when each year of work experience is still highly rewarded on the labor market. Hence, one would expect LOC to affect the return decision of a woman after childbirth as follows: persons with a more internal LOC should return earlier than persons with a more external LOC because they expect higher returns to work experience. If a woman believes that her future career depends to a large extent on luck or powerful others rather than on her work experience, she might return later than a woman who is convinced that her future career chances highly depend on her previous engagement in the labor market.

A second line of argument for the relationship between LOC and return to employment could be that women with a more internal LOC are more resolute in trying to find a solution to reconcile work and family life as soon as they wish to return to employment. For example, they might search more intensively for child care and negotiate harder with their employer on work conditions allowing a better compatibility with family life. Women with a more external LOC on the other hand, are more likely to accept a situation where they are not able to combine paid work and family because they feel unable to change the situation. Noor (2002) found that LOC is correlated with the perception of work-family conflict in the way that women with an internal LOC perceive a lower level of conflict. Perceiving less work-family conflict and being more effective in finding solutions to combine work and family, women with an internal LOC are expected to return to employment relatively early after childbirth.

A third argument for LOC being associated with the time until return to employment would be that LOC affects the job search intensity. Caliendo, Cobb-Clark, and Uhlendorff (2010) found that external LOC is associated with a lower job search intensity of unemployed persons. A woman who wants to return to the labor market might take some time until she finds a job. Expecting mothers with a more external LOC to search less intensively, they are likely to take more time until they find a job. However, women usually have the right to return to their previous position within three years after childbirth. Consequently, these women do not have to search for a new job when they want to return to the labor market. However, the right to return is relevant only in cases where the job did not expire in the meantime (temporary job). Furthermore, one could think of jobs being not compatible with family life; the right to return would not be relevant in these cases either. Due to the two cases, temporary jobs and incompatible jobs, the job search argument might be relevant. I will return to the argument in the robustness section further below in this paper.

A fourth argument, an argument to expect the opposite effect to the first three arguments, would be that women with a more internal LOC might be more considerate with their children. A woman with a more internal LOC might believe to a higher degree that her behavior and the maternal caring time influence the development of her child. She might prefer to care for her child herself full-time rather than placing the responsibility to someone else and giving the child in some non-maternal care. This mechanism leads to the expectation that a women with an internal LOC returns to employment later. However, one could also argue that these caring women with internal LOC prefer to place their children in thoroughly selected high quality care since care by professionals might stimulates the development of children more than full-time maternal care. In this case there would be no reason left for them to return to employment later.

2.2   The Big Five personality traits

The Big Five personality traits refer to a concept in personality psychology according to which a personality can be described by the five dimensions *Neuroticism* (the opposite of *emotional stability*), *Openness to Experience*, *Conscientiousness*, *Extraversion*, and *Agreeableness* (John and Srivastava 1999, McCrae and Costa Jr 1996, 1999). The Big Five concept is among the best-established models in personality psychology and widely used in empirical research (Caspi, Roberts, and Shiner 2005). In the following, I will describe the five personality dimensions and discuss how they might affect the decision of return to employment after childbirth. Mostly, there exist several arguments pointing to different (opposite) effects. Which of them dominate will finally be an empirical issue.

The trait *Neuroticism* characterizes how individuals experience strong positive and

negative emotions, i.e., their emotional stability. Individuals with a high score on Neuroticism cannot cope with stress, they worry a lot and get frustrated and nervous easily. Wayne, Musisca, and Fleeson (2004) found that individuals with higher scores in Neuroticism perceive higher work-family conflict. They explain the result by arguing that neurotic persons spend more time worrying or focusing on negative affect and thus use the time less efficiently than emotionally stable persons. This in turn leads to time pressure and conflict between tasks. One could also think of neurotic persons coping less well with occupational stress in general and therefore these people returning to employment later. Concerning a mother's behavior toward her child, one could thing of neurotic women worrying a lot about their children and preferring to care for the child full-time as long as possible rather than trusting in non-maternal care options. The hypothesize that the trait Neuroticism is associated with a later return to employment is consistent with the empirical result of Wichert and Pohlmeier (2010) who found that women (including mothers as well as childless women) with a higher Neuroticism score are less likely to participate in the labor force.

An argument for the opposite effect of Neuroticism could be that neurotic women worry also about their future job opportunities and are afraid that long career breaks lower the future wage profile and increase the unemployment risk. This might then lead them to return early in order to minimize future disadvantages. The argument is connected to the result of Vearing and Mak (2007) who found that a high score of Neuroticism leads to a high work commitment (even an over-commitment).

The personality trait *Openness to Experience* describes how needy an individual is for changes and novelty and whether she has an active imagination and frequently comes up with new ideas. One could expect that an open woman appreciates the new life style when having her first child and enjoys becoming acquainted with new aspects of life. In general, open individuals might prefer not being employed and having time for a variety of other activities. Accordingly, Wichert and Pohlmeier (2010) found that open women are less likely to participate in the labor force.

On the other hand, one could think of open individuals being bored by a life staying at home and exclusively caring for a child. Open persons might appreciate employment because it brings a certain amount of diversity in life. Also, one could expect open persons being successful in their careers and enjoying their success and therefore returning early after childbirth. The argument is driven by the result of Fietze, Holst, and Tobsch (2009), who found that the Big Five trait Openness to Experience is positively associated with occupying a management position.

Conscientiousness describes the way how people deal with problems. Conscientious people do things thoroughly, are organized, hard working, and ambitious. On the one hand, Conscientiousness is associate with a higher attachment to the labor market. Con-

scientious women might to a higher degree feel responsible of their job tasks and therefore return to employment relatively shortly after childbirth. Wichert and Pohlmeier (2010) found that conscientious women are more likely to participate in the labor force in general. Conscientiousness is also likely to advance career success and thus increase the attachment to the job. Ham, Junankar, and Wells (2009) found that conscientious women are more likely be in a white collar occupation compared to a blue collar. Fietze, Holst, and Tobsch (2009) and Trzcinski and Holst (2010) found that for women Conscientiousness is positively associated with occupying a management position. Being successful and occupying responsible positions, conscientious women are expected to tend to return to their job early after childbirth. Furthermore, Wayne, Musisca, and Fleeson (2004) found that conscientious women perceive lower levels of work-family conflict. This could be due to conscientious people using their time efficiently and thus reducing incompatible time pressure. The arguments lead to the hypothesis that Conscientiousness is associated with an early return to employment.

An argument for the opposite effect could be as follows: if conscientious women feel particularly responsible for the development of their children, they might decide to return to employment later in order to be available to care for the child as long as possible. However, as argued above, high-quality institutional care might be more beneficial for a child than full-time maternal care and therefore very conscientious mothers might opt for an early entry into such an institution. This would again allow them to return to employment early.

The Big Five trait *Extraversion* captures how an individual behaves among others. A person with a high level of Extraversion is outgoing, talkative, and sociable. One would expect extraverted women to enjoy the social contact brought by employment, that is, enjoy being with colleagues and business clients rather than staying at home. Wichert and Pohlmeier (2010) found that extraverted women are in general more likely to participate in the labor force. The psychological study of Caspi, Elder Jr., and Bem (1988) found that women with a childhood history of shyness (which could be interpreted as an opposite construct to Extraversion) are more likely to have either no work history at all or to terminate employment at marriage or childbirth with no later re-entry into the labor force. Furthermore, Wayne, Musisca, and Fleeson (2004) found that Extraversion is positively related to the perception of work-family facilitation. They claim that extraverted people have higher levels of energy and experience more positive affect to transfer across life domains. Therefore extraverted mothers can be expected to return to employment relatively shortly after childbirth.

Arguing for the opposite effect, one could think of extraverted women preferring not to be employed and to have time to spend with friends and other parents. Extraverted women with a young child might enjoy making acquaintance of other parents and having time to

share experiences. This would imply that extraverted women return to employment later than more introverted individuals.

A person with a high score on the trait *Agreeableness* is altruistic, has a forgiving nature, and is considerate and kind to others. Agreeable women tend to be altruistic towards their spouse or other persons and therefore are more likely to resign from their own career ambitions. Also, agreeable women might avoid the work-family conflict, which is likely to arise for employed women with young children. Also, agreeable women might be more likely to adopt to traditional (western German) social norms in that a mother with a young child should stay at home. Being more family-oriented, agreeable women are expected to return to employment later. Trzcinski and Holst (2010) found that Agreeableness is negatively associated with years in a management position. The result could be due to both, lower labor market orientation or lower career success (which might of course be related). Both leads me to expect that agreeable women stay a longer time at home when having a child. Wichert and Pohlmeier (2010) did not find a significant relationship between the trait Agreeableness and the probability to participate in the labor force for women. The pattern could be different, however, when focusing on mothers rather than on all women.

3   Data

The empirical analyses in this paper are based on data from the German Socio-Economic Panel Study (SOEP), an annual household panel study, which is representative of the population in Germany (Wagner, Frick, and Schupp 2007). In the sample used for the present analysis, I include women who had their first child between 1992 and 2007 and who were employed prior to first childbirth.

Since I focus on the return decision after childbirth, I do not account for selection into motherhood. The fertility decision itself is likely to depend on noncognitive personality traits and, thus, the population of mothers is not representative of all women. However, the research question I focus on is the return-to-employment decision of the selected population of mothers. The research question itself implies that I do not intend to generalize the results to the overall population of women.

A similar argument applies for the selection of women employed prior to childbirth: I focus on the *return* decision of mothers, that is, the decision to re-enter employment after childbirth and therefore I concentrate on women who were employed prior to childbirth.[2] Certainly, the population of mothers being employed prior to childbirth is a selective one. However, women who are not employed prior to childbirth are expected to be a special

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[2]Previous studies like Kuhlenkasper and Kauermann (2010) undertake a similar selection.

group as these women have a very low labor market attachment, were unemployed, were still in education, or have some other reasons (e.g. health reasons) not to participate in the labor force. For this special group of women the decision to enter employment after childbirth is assumed to be different than for other women and it might be difficult to find common factors which influence the decision. Therefore, I concentrate on the more homogeneous group of women who were employed prior to childbirth, even though I am aware to address a selective group. Women who were employed prior to childbirth are most likely to return to employment in a relatively short period of time and for them it appears interesting to find out who takes more or less time than others. In an extension in Section 6, the model is also estimated for the full sample, that is, including mothers who were not employed prior to childbirth. The results emerge to be only slightly different.

A mother's employment status is observed on a monthly basis from the fourth month after childbirth until she returns to employment or until the observation period is censored. The first three months after childbirth are left out because a mother is in maternity protection leave ("Mutterschutz") in the first eight weeks after a regular birth and in the first twelve weeks after a multiple birth or a preterm birth. Censoring occurs when the current end of the survey (end of year 2007) is reached before a transition into employment is observed. Censoring also occurs when a respondent leaves the survey or does not respond in one year following the birth and before a transition into employment is observed. Individuals for whom a transition into unemployment[3] or education is observed (before a transition into employment is observed) are discarded from the sample.[4] In total, the sample contains 14,981 person-month observations from 695 individuals observed between a minimum of one and a maximum of 162 monthly spells (corresponds to 13.5 years). For 532 individuals (77%) a transition into employment is observed, their mean number of spells is 20 (std. dev. 22.95). The remaining 163 individuals (23%) are censored, their mean number of spells is 28 (std. dev. 36.87).

3.1   Measures of noncognitive traits

As exposed above, I use two types of noncognitive skill measures, Locus of Control and the Big Five personality traits. The Locus of Control measure is based on five items surveyed in the 2005-wave of the SOEP. The items were answered on 7-point Likert type scales (1 "disagree completely" to 7 "agree completely"). A list of the items (English translation) with means and standard deviations of the non-standardized scores is given

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[3]A person is defined unemployed if she has been registered as unemployed at the Employment Office.

[4]This is done because the transitions into and out of unemployment and into and out of education have to be treated differently than a return to employment. Nevertheless, in an alternative specification in Section 6 I estimated a model including women who enter unemployment or education before entering employment or before being censored (86 individuals). The main results are largely unchanged.

in Table 1. The Locus of Control measure used for the estimations is the average of the standardized (to mean zero and standard deviation one) scores of the five items.[5] The variable is to be interpreted in the way that the higher the score, the more external the LOC.

For the Big Five personality traits, the 2005-wave of the SOEP survey provides a set of fifteen items — three for each of the five dimensions. They were, like the Locus of Control items, answered on a 7-point Likert type scale (1 "does not apply to me at all" to 7 "applies to me perfectly"). A list of the items (English translation) as well as the means and standard deviations of the (non-standardized) scores are also given in Table 1.[6] The variables for the five dimensions used in the estimations below are again the average of the standardized answer scores. The correlation between the different measure, i.e., between the five dimensions of the Big Five personality traits and the LOC measure, are given in Table A2 in the Appendix.

Since the non-cognitive traits have been surveyed only once in the SOEP, namely in the 2005 wave, I have to assume that the traits are stable over time for each individual. This is a sufficiently plausible assumption since psychologists widely agree upon the mean-level and rank-order stability of personality traits in adulthood (Caspi, Roberts, and Shiner 2005, Costa Jr and McCrae 1994, Fraley and Roberts 2005, McCrae and Costa 1994, McCrae and Costa Jr 1996, 2003, Roberts and DelVecchio 2000). Heckman, Stixrud, and Urzua (2006) as well as Coleman and DeLeire (2003) make a similar assumption as their measure of noncognitive traits is available only in one wave of their data set. Nevertheless, an alternative specification, which will be discussed below, showed that the results are robust in this respect.

3.2 Control variables

In addition to the above given noncognitive measures, a number of socio-economic and demographic control variables are introduced into the model. For the choice of these covariates I follow the previous literature on mothers' return to employment cited in Section 1. The covariates included are age at first birth, age squared, education, labor market experience (in years),[7] log of hourly wage prior to childbirth, log of the net inflation-adjusted other household income (in euros), partner status, whether other adults are living in the household, region (eastern versus western Germany), migration background,

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[5]A similar measure has been used by Coleman and DeLeire (2003) with the LOC-items from the National Educational Longitudinal Study (NELS) and by Cebi (2007) with the LOC-items from the National Longitudinal Survey of Youth (NLSY).

[6]For more information on the implementation of the Big Five traits in the SOEP survey as well as on the reliability and validity, see Dehne and Schupp (2007).

[7]I also tested to additionally control for the tenure with the same employer, but the results did not change and the model did not improve with the variable.

Table 1: Summary statistics of the items of the Big Five personality traits and of Locus of Control

Item	Mean	Std. dev.
Locus of control (LOC)		
How my life goes depends on me (reversed)	2.443	1.198
What a person achieves in life is above all a question of fate or luck	3.564	1.639
I frequently have the experience that other people have a controlling influence over my life	2.940	1.585
The opportunities that I have in life are determined by the social conditions	4.535	1.408
I have little control over the things that happen in my life	2.475	1.392
Big Five personality traits: *I see myself as someone who...*		
Neuroticism:		
worries a lot	4.911	1.621
gets nervous easily	3.826	1.621
is relaxed, handles stress well (reversed)	3.600	1.451
Openness:		
is original, comes up with new ideas	4.685	1.364
values artistic experiences	4.223	1.785
has an active imagination	4.960	1.521
Conscientiousness:		
does a thorough job	6.278	0.898
tends to be lazy (reversed)	5.832	1.430
does things effectively and efficiently	5.922	0.975
Extraversion:		
is communicative, talkative	5.794	1.139
is outgoing, sociable	5.348	1.391
is reserved (reversed)	4.135	1.701
Agreeableness:		
is sometimes somewhat rude to others (reversed)	5.170	1.626
has a forgiving nature	5.463	1.281
is considerate and kind to others	5.951	0.996

Note: The figures refer to the non-standardized answer scores ranging from one to seven (7-point Likert scale). N = 695 individuals. Author's calculations with data from the SOEP, 2005.

health, whether the women has a second child within three years after the first birth,[8] and year dummies for the year of the first birth.[9]

Table 2: Summary statistics of covariates

	Mean	Std. dev.
LOC	-0.055	0.592
Neuroticism	-0.041	0.738
Openness	0.016	0.785
Conscientiousness	0.045	0.733
Extraversion	0.064	0.785
Agreeableness	-0.008	0.705
Age first birth	29.033	4.263
$(Age)^2/1000$	0.861	0.255
Educational degree		
University	0.191	0.394
Vocational	0.714	0.452
No degree	0.095	0.293
Experience	7.492	4.331
Prior wage	11.866	5.935
Other income	2398.639	1132.456
Partner in HH	0.938	0.241
Other adults in HH	0.024	0.155
East Germany	0.210	0.408
Migration background	0.096	0.295
Health	3.807	0.759
2nd child w/in 3 years	0.282	0.450

Note: N = 695 individuals. Author's calculations with data from the SOEP 1994-2007.

Since all these covariates have not been surveyed on a monthly but only on a yearly basis, they are taken from the latest interview year (i.e., when the transition into employment or censoring is observed) and are included in the survival model as time-constant covariates. Exact definitions of the covariates are given in Table A1 in the Appendix. Summary statistics for the covariates are reported in Table 2.

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[8]I have tried a number of different ways to account for the fact of having another child within a short period of time; I controlled for different dummy variables for having a second or third child within different periods of time and for the spacing between children (in months) and the spacing squared. The main results were always largely the same.

[9]In an alternative specification I combined the year dummies into groups of dummies according to some institutional changes; these were 1992 as the reference group, 1993-2000 as a second group (child raising benefits ("Erziehungsgeld") for children born after 1992 are paid 24 instead of only 18 months), 2001-2006 (mother and father are both simultaneously eligible for the child raising leave ("Erziehungsurlaub"), possibility to work up to 30 hours during the child raising leave), 2007 (implementation of a wage-dependent parental benefit rule ("Eltergeld")). The estimation results of the alternative specification are very similar to the more flexible specification of controlling for each year.

4 Estimation method

I estimate a Prentice and Gloeckler (1978) model incorporating a discrete mixture distribution to summarize unobserved individual heterogeneity, as proposed by Heckman and Singer (1984). The model is suitable for analyzing interval-censored (monthly) data. The non-parametric modeling of the baseline hazard and the non-parametric approach of characterizing the unobserved heterogeneity allows a high degree of flexibility in the model.

While the available data are interval-censored, I suppose an underlying continuous survival time model which can be summarized by the hazard rate $\theta(t, X)$. Suppose that the hazard rate satisfies the proportional hazards assumption

$$\theta(t, X) = \theta_0\left(t\right)\exp(\beta'X)$$

where $\theta_0\left(t\right)$ is the baseline hazard depending on time t but not on the covariates X. β describes the parameter vector to be estimated. The proportional hazard property of the model implies that absolute differences in the covariates imply proportionate differences in the hazard at each time. The hazard ratio for two individuals who are identical on all covariates but x_k, is

$$\frac{\theta(t, X_1)}{\theta(t, X_2)} = \exp(\beta_k[x_{k1} - x_{k2}])$$

where X_1 and X_2 are the covariate vectors of individual 1 and 2, respectively, and x_{k1} and x_{k1} is the kth covariate for individual 1 and 2, respectively. Given that each time interval in the data is of unit length (one month), and using the complementary log-log transformation,[10] the discrete time hazard can be written as

$$h(j, X) = 1 - \exp[-\exp(\gamma_k D_k + \beta'X)]$$

where j is the spell (number of month after childbirth minus three). The baseline hazard of the model is not specified parametrically, that is, I estimate a semi-parametric hazard model. The duration dependency of the hazard rate is contained in $\gamma_k D_k$, where D_k is an indicator equal to one if month j lies within the kth group of months and zero otherwise. That is, the model contains one dummy variable for each group of months but not for each month; otherwise the model would be overloaded and could not be estimated with the available data. The groups of months are defined as follows: the first group includes months four to six (the first three months are left out because return is only considered from the fourth month onward as explained above), the second group months

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[10]For the transformation see, for example, Jenkins (2005, p.41-42).

seven to nine, the third group months ten to twelve; from the second to the fourth year each group embraces six months; from the fifth to the seventh year each group embraces twelve months; from the eighth to the ninth year each group embraces 24 months; the last group encompasses all remaining months. The classification of increasing intervals is chosen because the number of women returning to employment per month decreases with the order of spells. The parameters γ are estimated by the model along with the parameters β.

To allow for unobserved heterogeneity without assuming a specific distribution for the random effect, it is assumed that there are two types of individuals in the population. The idea is incorporated by allowing the intercept β_0 to vary between the two classes, i.e.,

$$h_1(j, X) = 1 - \exp\left[-\exp(\gamma_k D_k + \beta_{01} + \beta' X)\right]$$

$$h_2(j, X) = 1 - \exp\left[-\exp(\gamma_k D_k + \beta_{02} + \beta' X)\right]$$

where $\beta' X$ does no longer contain an intercept. The likelihood contribution of a person with spell length j months is

$$L = \pi L_1 + (1 - \pi) L_2$$

where

$$L_1 = \left(\frac{h_1(j, X)}{1 - h_1(j, X)}\right)^c \prod_{m=1}^{j} \left[1 - h_1(m, X)\right]$$

$$L_2 = \left(\frac{h_2(j, X)}{1 - h_2(j, X)}\right)^c \prod_{m=1}^{j} \left[1 - h_2(m, X)\right]$$

where π is the probability of belonging to type 1, and c is the censoring indicator. The parameters π, β_{01}, and β_{02} are estimated by the model together with β and γ.

5 Results

The estimation results of the above given model are reported in Table 3. Column 1 contains the results of an estimation without control variables, column 2 contains the results of an estimation with control variables. The estimated coefficients of the noncognitive skill variables are similar in both models and suggest that external LOC and Agreeableness have negative effects on the hazard rate of return to employment. Women with a high belief in external control and highly agreeable women return to employment later than individuals with a more internal LOC and less agreeable women. The coefficients of the control variables in model 2 show mostly the expected sign, pointing to the reliability

of the estimation; household income other than own labor income is associated with a lower risk to return to employment, while own wage is related to a higher risk to return; the variables having a partner, living in east Germany, and having a university degree are all related to a higher risk to return. To account for unobserved heterogeneity two mass points are included in the models in column 1 and 2. To test for this specification, the model is re-estimated twice allowing for three and four mass points (Table 3, column 3 and 4, respectively). The signs and significance levels of most coefficients are similar compared to those in the reference model in column 2. However, the standard errors of all coefficients are larger and not all mass points are significantly different from zero. The information criteria do not unambiguously point to an improvement of the model. Finally, I refer to model 2 of Table 3 as the main model containing the most reliable results.

The proportional hazard model implies that the effects of the covariates on the hazard rate are proportional and do not depend on the duration j. Hence, one-standard deviation decrease in the LOC score (decrease by 0.592 points, i.e. moving to a more internal LOC) leads, ceteris paribus, to an increase in the hazard rate to return by 16 percent according to the results in column 2 of Table 3. Moving from the 90th percentile of LOC to the 10th percentile increases the hazard rate by 47 percent.

To illustrate the result, Figure 1 plots the hazard functions for two persons who are equal in all characteristics but LOC. The non-binary covariates other than LOC are set to their mean and the (sets of) dummy variables are set to their modal value, that is, vocational degree, having a partner, no other adults in the household, living in western Germany, no migration background, no second child within three years. Changing these covariates would not change the pattern of the graph but only rescale it — due to the proportional hazard feature of the model. The solid line in the graph relates to a person with high external LOC (90th percentile), the dashed line to a person with low LOC (10th percentile). The solid line being always below the dashed line illustrates that a person with high external LOC is less likely to return to employment in each period, given that she has not returned until that period.

The step pattern of the graph is a result of modeling the duration dependency by groups of months, as has been exposed in Section 4. The first peak of the hazard function is at the time span of months 13 to 18 suggesting that there is a relatively high probability to return to employment in the first half of the second year after childbirth. The second peak can be observed in the graph at months 31 to 36, that is, in the second half of the third year after childbirth. This appears very plausible as the legal right to return to the previous job vanishes after three years and many women thus return before this date. The last peak of the hazard function is observed when the child is six years old, which is the usual school entry age in Germany. The irregular pattern of the hazard function confirms the importance to model duration dependency non-parametrically.

Table 3: Estimation of the duration until return to employment after first childbirth: discrete semi-parametric hazard estimation incorporating unobserved heterogeneity with a discrete mixture distribution

	(1)		(2)		(3)		(4)	
	coeff	se	coeff	se	coeff	se	coeff	se
External LOC	-0.244**	(0.087)	-0.251**	(0.092)	-0.410*	(0.195)	-0.843**	(0.148)
Neuroticism	0.075	(0.077)	0.065	(0.086)	0.075	(0.127)	-0.057	(0.180)
Openness	0.036	(0.073)	-0.004	(0.085)	0.051	(0.161)	0.028	(0.431)
Conscientiousness	0.116	(0.080)	0.121	(0.097)	0.121	(0.116)	-0.144	(0.173)
Extraversion	0.056	(0.068)	0.077	(0.069)	0.120	(0.154)	0.022	(0.100)
Agreeableness	-0.192*	(0.077)	-0.220**	(0.078)	-0.340*	(0.146)	-0.461*	(0.205)
Age at first birth			0.022	(0.136)	-0.016	(0.241)	0.010	(0.357)
$(Age)^2/1000$			-0.556	(2.270)	-0.022	(4.163)	-1.088	(6.007)
University degree			0.651**	(0.191)	1.132**	(0.370)	1.116+	(0.640)
No degree			0.173	(0.181)	0.286	(0.245)	0.529	(0.651)
Experience			-0.028	(0.022)	-0.030	(0.043)	-0.085	(0.066)
log(Prior wage)			0.563**	(0.158)	0.927**	(0.351)	1.991**	(0.479)
log(Other income)			-0.650**	(0.124)	-1.079**	(0.321)	-1.419**	(0.160)
Partner in HH			0.512*	(0.242)	1.125*	(0.527)	1.232**	(0.384)
Other adults in HH			0.519	(0.545)	1.312+	(0.687)	1.995**	(0.595)
2nd child w/in 3 yrs			-0.456**	(0.151)	-0.605**	(0.190)	-1.419**	(0.459)
East Germany			0.608**	(0.217)	0.633**	(0.234)	1.255**	(0.444)
Migration background			-0.160	(0.308)	-0.288	(0.355)	-0.351	(0.282)
Health			0.117	(0.079)	0.169	(0.153)	0.423	(0.335)

Table continues..

Continued Table 3

	(1)		(2)		(3)		(4)	
	coeff	se	coeff	se	coeff	se	coeff	se
Year dummies	Yes		Yes		Yes		Yes	
_cons	-4.130**	(0.354)	-1.418	(2.168)	1.581	(3.836)	2.843	(6.313)
z_1	4.390**	(0.260)	4.393**	(0.668)	0.020	(0.318)	8.618**	(0.702)
p_1	-1.829**	(0.169)	-1.977**	(0.380)	0.578	(0.721)	-0.785**	(0.218)
z_2					4.779**	(0.436)	2.416**	(0.502)
p_2					-0.949	(0.578)	0.116	(0.195)
z_3							-1.066**	(0.278)
p_3							0.826**	(0.201)
Log likelihood	-2198.61		-2128.44		-2124.10		-2112.18	
AIC	4441.22		4356.87		4352.19		4332.36	
BIC	4608.74		4737.60		4748.14		4743.54	

Note: standard errors are in parentheses. + $p<0.10$, * $p<0.05$, ** $p<0.01$. N = 14981 person-month observations from 695 individuals. Author's calculations with data from the SOEP 1994-2007.
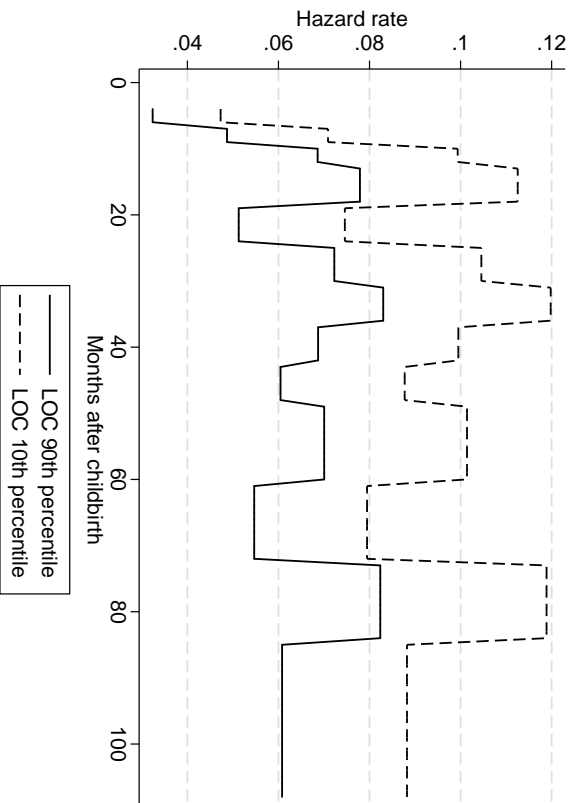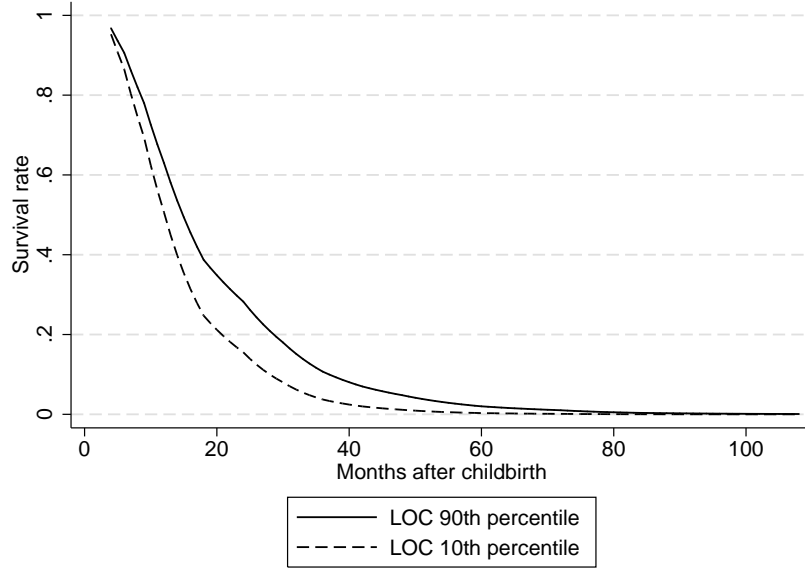
Figure 1: Hazard function by level of LOC

The result can likewise be illustrated by survival functions. Figure 2 plots the survival functions for two persons with 90th-percentile LOC (solid line) and 10th-percentile LOC (dashed line), respectively. The former being always above the latter indicates that a mother with a highly external LOC is more likely to "survive", i.e. to remain out of the labor force, until a given point in time than a person with a more internal LOC. The probability to return to employment within twelve months after childbirth, for instance, is 37 percent for a person with a LOC score at the 90th percentile, while it is 49 percent for a person with a LOC score at the 10th percentile.[11] The median return time for a person with a LOC score at the 90th percentile is estimated to be 15 months, while the median return time for a person with a LOC score at the 10th percentile is 13 months.

The finding confirms the expectation that women with a more internal LOC return to employment earlier. This might be due to their greater willingness to invest in human capital or to their lower perceived work-family conflict and greater resoluteness when looking for solutions to combine work and family.

Concerning the Big Five personality traits, the results in Table 3 suggest that highly agreeable women return to employment later than less agreeable women. One-standard

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[11]The numbers appear fairly high; however, recall that the sample is not representative for all mothers but it includes only women employed prior to childbirth and excludes women who enter unemployment or education after childbirth.
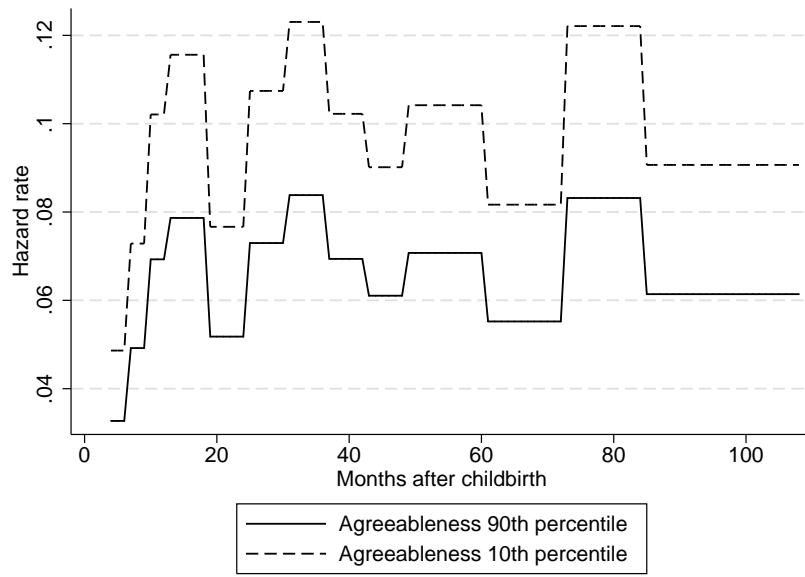
Note: the estimated parameters of model 2 of Table 3 are used. The covariates other than LOC are set analogously to Figure 1.
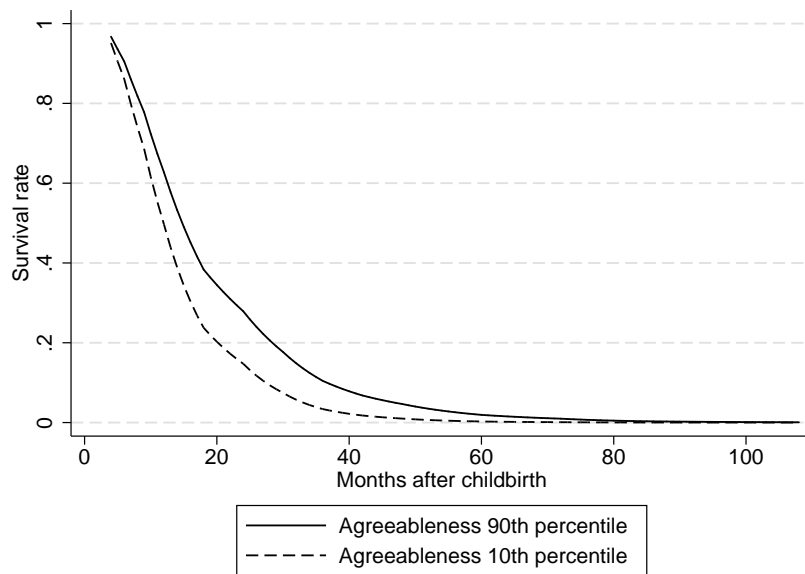
Figure 2: Survival function by level of LOC

deviation decrease in the Agreeableness score (decrease by 0.705 points) leads, ceteris paribus, to an increase in the hazard rate by 17 percent according to the estimates in column 2 of Table 3. Moving from the 90th percentile of Agreeableness to the 10th percentile increases the hazard rate by 50 percent. Analogously to the effect of LOC, the effects of Agreeableness on the hazard and survival functions are illustrated in Figures 3 and 4, respectively. A person with high Agreeableness (90th percentile) has always a lower hazard rate and a higher survival rate than an otherwise identical person with a low score on Agreeableness (10th percentile). The probability to return to employment within twelve months after childbirth is 37 percent for a person with an Agreeableness score at the 90th percentile, while it is 50 percent for a person with an Agreeableness score at the 10th percentile. The median return time for a person with an Agreeableness score at the 90th percentile is 15 months while for a person with an Agreeableness score at the 10th percentile it is 12 months.

Since I do not control for cognitive ability directly (since there is no such measure available in the data set), one could argue that the noncognitive measures pick up the effect of cognitive ability ((Coleman and DeLeire 2003)). Cognitive ability is rewarded on the labor market and the (expected) wage decreases the duration of the child-related leave. However, since I control for the wage earned prior to childbirth, this potential bias effect is minimized.

Note: the estimated parameters of model 2 of Table 3 are used. The covariates other than Agreeableness are set analogously to Figure 1.

Figure 3: Hazard function by level of Agreeableness

Note: the estimated parameters of model 2 of Table 3 are used. The covariates other than Agreeableness are set analogously to Figure 1.

Figure 4: Survival function by level of Agreeableness

6 Robustness tests

In a first series of robustness tests the model is estimated with a parametrically specified random effect. Given that the hazard function is

$$h(j, X) = 1 - \exp[-\exp(\gamma_k D_k + \beta' X + u)],$$

where u is an individual effect and $u = log(v)$, I estimate the model first with v Gamma-distributed, second with u Normal distributed with mean zero, and third with $u = 0$, that is, no random effect. The results of the three estimations are reported in Table 4. Note that there is no change in the signs and significances compared to the main model. However, the magnitudes differ; the coefficients are much larger when u is assumed to be Normally distributed and slightly smaller when no random effect is assumed to exist. Finally, assuming no specific parametric distribution for the random effect as is done in the main model is the most flexible and therefore the preferred specification.

Table 4: Estimation of the duration until return to employment: discrete semi-parametric hazard estimation with distributional assumption for the random effect

	(1) v Gamma distributed		(2) u Normal distributed with mean zero		(3) u = 0 (no random effect)	
	coeff	se	coeff	se	coeff	se
External LOC	-0.290*	(0.121)	-0.688**	(0.252)	-0.223**	(0.084)
Neuroticism	0.121	(0.097)	0.294	(0.199)	0.089	(0.074)
Openness	-0.035	(0.095)	-0.144	(0.193)	-0.032	(0.067)
Conscientiousness	0.095	(0.096)	0.243	(0.199)	0.093	(0.075)
Extraversion	0.093	(0.093)	0.250	(0.193)	0.070	(0.064)
Agreeableness	-0.215*	(0.102)	-0.454*	(0.209)	-0.170*	(0.076)
ln_varg	-0.395	(0.470)				
lnsig2u			2.438**	(0.193)		
Log likelihood	-2160.78		-2138.23		-2163.85	

Note: all models include the same control variables as model 3 of Table 3 though not all coefficients are reported here. Standard errors are in parentheses. + p<0.10, * p<0.05, ** p<0.01. N = 695 individuals. Author's calculations with data from the SOEP 1994-2007.

A number of further specifications are estimated in order to check the robustness of the results. First, a channel for the above findings could be that women with certain noncognitive traits select themselves into specific job types — e.g., civil service or self-employment — and these job types being at the same time more compatible with a longer or shorter leave. If this is the case, the noncognitive traits would not directly affect the decision to return to employment but rather indirectly through the choice of the job type. To check for this possibility, I introduce into the model a set of variables characterizing the job type occupied prior to childbirth; these are civil servant, self-employed, white

collar worker (reference category), and blue collar worker. Additionally, working hours categories are introduced; these are full-time (reference category), part-time, and marginal hours. The results with the additional covariates are reported in column 1 of Table 5. Although it emerges that some of the variables have additional predictive power — self-employed women appear to return to employment earlier — the main results remain the same.

The second robustness test refers to the explanation of the findings. Above, I argued that the finding that individuals with an internal LOC return to employment earlier might be due to their greater willingness to invest in human capital and their greater resoluteness when looking for solutions to combine work and family and lower perceived work-family conflict. However, another explanation for the finding could be that individuals with a more internal LOC search more intensively for a job and therefore return earlier to employment (Caliendo, Cobb-Clark, and Uhlendorff 2010). Also, certain noncognitive traits might be rewarded on the labor market such that women with these traits find more easily a new position after the period of child-related leave. However, since mothers in Germany are usually entitled to return to their previous job within three years after childbirth, the explanation would be only applicable for women who are not able to return to their previous job position. This is the case for women who had a temporary job and whose contract expired during the time of leave.[12] If the alternative explanation is the only reason for the finding, removing from the sample all individuals who had a temporary job prior to childbirth would vanish the effects of the noncognitive traits on the hazard. This is tested estimating a model including only individuals who were employed on a permanent basis prior to childbirth and also considering only the period within the first three years after childbirth. The results of the estimation are reported in column 2 of Table 5. Although the sample is reduced to 7325 person-month observations from 490 individuals, it emerges that the results remain largely robust and similar in magnitude compared to the main model.

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[12]However, in some jobs mainly in the public sector, one can add the time of leave at the end of a temporary contract.

Table 5: Estimation of the duration until return to employment after first childbirth: discrete semi-parametric hazard estimation — several robustness specifications

	(1)		(2)		(3)		(4)		(5)		(6)	
	coeff	se	coeff	se	coeff	se	coeff	se	coeff	se	coeff	se
External LOC	-0.400*	(0.156)	-0.263*	(0.119)			-0.228+	(0.118)	-0.298*	(0.117)	-0.168*	(0.074)
External LOC 99					-1.043**	(0.389)						
Neuroticism	0.196	(0.173)	0.133	(0.116)			0.025	(0.098)	0.166+	(0.093)	0.063	(0.065)
Openness	-0.147	(0.183)	0.019	(0.106)			0.071	(0.095)	-0.058	(0.124)	0.007	(0.062)
Conscientiousness	0.091	(0.099)	0.011	(0.132)			0.182*	(0.089)	0.116	(0.092)	0.130*	(0.066)
Extraversion	0.161	(0.117)	0.100	(0.083)			0.004	(0.079)	0.098	(0.094)	0.104+	(0.059)
Agreeableness	-0.238*	(0.100)	-0.310**	(0.110)			-0.300**	(0.092)	-0.206+	(0.108)	-0.169*	(0.070)
Part-time	-0.273	(0.247)										
Marginal hours	-0.773	(0.637)										
Civil servant	0.047	(0.268)										
Self-employed	1.603**	(0.615)										
Blue-collar	-0.328	(0.214)										
Partner's LOC							-0.010	(0.026)				
Partner's Neuro							0.038	(0.030)				
Partner's Open							-0.023	(0.034)				
Partner's Consc							-0.021	(0.031)				
Partner's Extra							0.005	(0.028)				
Partner's Agree							0.029	(0.033)				
Log likelihood	-2149.54		-1201.04		-782.48		-1724.01		-2467.30		-2840.03	
No. pers-mon obs	14981		7325		4662		12226		19312		23570	
No. individuals	695		490		288		539		781		952	

Note: in all models but (3) the unobserved effect is accounted for by a discrete mixture distribution; model (3) incorporates the unobserved effect by v Gamma-distributed. All estimations contain the same control variables as model 3 of Table 3. Standard errors are in parentheses. + p<0.10, * p<0.05, ** p<0.01. Author's calculations with data from the SOEP 1994-2007.

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A third robustness test refers to the concern of endogeneity of the noncognitive traits with childbirth. So far, I had to assume that the noncognitive traits are constant over time for each individual. So far, I had to assume that the noncognitive traits are constant over time for each individual. This is necessary because the Big Five personality traits and the here used version of the LOC have been surveyed only once in the 2005 wave of the SOEP. However, the concern could arise that mothers of child with special characteristics like poor health becoming more external in their LOC and at the same time extending their leave period. Dunkelberg and Spiess (2007), for example, found that women's labor supply is correlated with their child's health conditions. This would cause a bias in my results. The main reason why this is an issue here is that most births in the sample occur before 2005 and thus before the noncognitive traits are surveyed. Therefore, it cannot be excluded that the characteristics of the child affect both the noncognitive traits and the time until return to employment. To check for this possible bias, at least with respect to LOC, I use a LOC version of wave 1999 where the same items as in 2005 have been surveyed (but with answer scores on a 4-point scale instead of a 7-point scale). In the robustness test, I substitute the 2005 LOC by the 1999 version of the LOC and reduce the sample to those persons who have had their first child after 1999. This is to make sure that the characteristics of the child cannot influence the LOC score. The reduced sample contains only 4662 person-month observations from 288 individuals. Unfortunately, the small sample size does not allow to estimate the above mixed model. Instead I estimate a model with v is Gamma-distributed as it has been shown above that this produces similar results. The Big Five personality traits were not included in the estimation since this would have reduced the sample to an even smaller size. Also, it would again bias the results as the Big Five traits have been surveyed in 2005, which for most women is after their first childbirth. However, it has been tested and found that removing the Big Five personality variables from the main model (model 2 of Table 3) does not change substantially the estimated effect of LOC on the hazard rate. The results using the 1999 LOC are reported in column 3 of Table 5.[13] The coefficient related to LOC is negative and significant as in the main model, only the magnitude of the effect is much larger — with also a higher standard error due to the reduced sample size. The test shows that the previously estimated effects are unlikely to be due to an endogeneity effect.

Another robustness test was to address the concern of assortative mating of partners. One could think of partners matching systematically according to certain patterns of personality traits. Also, the traits of the partner might play a role for the labor supply of the woman. Rammstedt and Schupp (2008) as well as Botwin, Buss, and Shackelford (1997) found that there is assortative mating based on Agreeableness, Conscientiousness, and Openness to Experience, while less on Extraversion and Neuroticism. Little, Burt,

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[13]The results of a model with u Normal distributed and a model without random effect are not much different.

and Perrett (2006) found that the correlations between partners were significant for Conscientiousness, Openness to Experience and Neuroticism but not for Extraversion and Agreeableness. Even though assortative mating is found to be rather modest for most personality traits compared to other characteristics like educational level and religious affiliation (Hur 2003), I address the issue of potential bias due to assortative mating by including the partners' noncognitive traits as additional covariates into the estimation model. Since only women with a partner and whose partners' noncognitive traits are observed in the data can be included in the estimation, the sample size decreases to 525 individuals. The results are reported in column 4 of Table 5. No significant effect of the partners' noncognitive traits can be identified. The effects of the women's LOC and Agreeableness are largely the same as in the main estimation. In addition, the trait Conscientiousness appears to be significant in this estimation, pointing to conscientious mothers returning to employment earlier.

The last two estimations are to test the robustness with respect to the selection of the sample. In column 5 of Table 5 the sample is enlarged by including also women who enter unemployment or education at some stage after childbirth and before a transition to employment is observed or before censoring occurs. The effects of LOC and Agreeableness are again very similar as in the main model. In addition the effect of the trait Neuroticism appears to be significantly different from zero on the 10% level in this specification.

Column 6 of Table 5 gives the results of an estimation with an enlarged sample including women who were not employed prior to childbirth but who were in education (57), unemployed (36), not participating (32), or for whom the information on employment status prior to childbirth is missing (53). The control variable wage had to be dropped from the model since it is naturally not available for individuals who were not employed. The estimated effects of LOC and Agreeableness on the hazard rate are again largely similar, even though slightly smaller in absolute size. In addition, the coefficients of Conscientiousness and Extraversion turn into significant positive effects.

7   Conclusions

In this paper I analyzed the effect of noncognitive traits on the duration of mothers' leave after first childbirth. Using data from the German Socio-Economic Panel Study (SOEP), I estimated a discrete semi-parametric survival model incorporating a discrete mixture distribution to summarize unobserved individual heterogeneity.

The results indicated that women with high belief in external control and agreeable women return to employment later than women with lower scores in these traits. The finding for LOC confirms expectations according to which individuals with an internal LOC are more likely to invest in human capital (including labor market experience) as

they expect higher returns in terms of future earnings (Coleman and DeLeire 2003). Also, women with an internal LOC are more likely to make an effort to reconcile work and family life as they are more confident to find a solution and perceive lower work-family conflict (Noor 2002). The finding for the trait Agreeableness is consistent with the expectation that agreeable women tend to be altruistic towards their spouse or other persons and are more likely to resign from their own career ambitions. Another explanation for the relationship would be that agreeable women tend to avoid the work-family conflict and that they are more inclined to adapt to traditional social norms of family patterns.

The paper contributes to understanding the impact that individuals differences other than cognitive abilities have on economic outcomes. Although there are no direct policy implications from this research, it is important to understand the mechanisms that influence mothers' labor supply decisions before designing policy measures. Preferences among women differ and therefore political decision makers should allow for different options. Furthermore, noncognitive traits are not determined from birth but develop during adolescence and young adulthood much more than cognitive skills do (Cunha and Heckman 2007, 2008). A number of surrounding factors — like education (Heckman, Stixrud, and Urzua 2006) — influence the development of noncognitive traits. Especially for Locus of Control, it is easy to imagine that education contributes to a belief in internal control. Apart from the acquisition of qualifications and its signaling effect, education can form a number of noncognitive skills. Hence, it is interesting to understand the effect these skills have on later outcomes like labor supply decisions.

Appendix

Table A1: Variable definitions

Variable	Definition
Noncognitive traits	
LOC	*Locus of Control*: Average of the standardized answer scores of the five related items given in Table 1; a high value reflects strong belief in external control of reinforcement
Neuroticism	Big Five personality trait *Neuroticism*: Average of the standardized answer scores of the three related items given in Table 1
Openness	Big Five personality trait *Openness*: Average of the standardized answer scores of the three related items given in Table 1
Conscientiousness	Big Five personality trait *Conscientiousness*: Average of the standardized answer scores of the three related items given in Table 1
Extraversion	Big Five personality trait *Extraversion*: Average of the standardized answer scores of the three related items given in Table 1
Agreeableness	Big Five personality trait *Agreeableness*: Average of the standardized answer scores of the three related items given in Table 1
Socio-economic and demographic characteristics	
Age first birth	Age at first childbirth
Educational degree	
University	Indicator variable equal to one if the highest educational degree is a university degree (*Universität, Hochschule, Fachhochschule*)
Vocational	Indicator variable equal to one if the highest educational degree is a vocational degree (*Berufsausbildung, Lehre*) (Ommitted category)
No degree	Indicator variable equal to one if the person has no professional degree, i.e., neither a university degree nor a vocational degree
Experience	Number of years of labor market experience prior to childbirth
log(Prior wage)	Natural logarithm of the inflation-adjusted (to the base year 2001) gross hourly wage before childbirth, in euros
log(Other income)	Natural logarithm of the inflation-adjusted (to the base year 2001) net household income net of own labor earnings, in euros per month
Partner in HH	Indicator variable equal to one if the women is living with a partner in the same household
Other adults in HH	Indicator variable equal to one if one or more other adults (apart from a partner) are living in the same household
East Germany	Indicator variable equal to one if the woman lives in eastern Germany (former German Democratic Republic)
Migration background	Indicator variable equal to one if the women has a migration background
Health	Health status on a self-rated scale taking on values from 1 (bad) to 5 (very good)
2nd child w/in 3 yrs	Indicator variable equal to one if the woman has a second child within four years after the first childbirth
log(Prior wage)	Natural logarithm of the inflation-adjusted (to the base year 2001) gross hourly wage before childbirth, in euros (only for women who were employed prior to childbirth)

Table A2: Cross-correlations between measures of noncognitive skills

	External LOC	Neuroticism	Openness	Conscientiousness	Extraversion	Agreeableness
External LOC	1.000					
Neuroticism	0.294	1.000				
Openness	-0.130	-0.105	1.000			
Conscientiousness	-0.135	-0.113	0.198	1.000		
Extraversion	-0.206	-0.241	0.380	0.221	1.000	
Agreeableness	-0.132	-0.149	0.168	0.320	0.136	1.000

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