

THE TIME OF FAMILY FORMATION

-

AN EXAMINATION OF SELECTED MECHANISMS INFLUENCING
CHILDBIRTH AND BREASTFEEDING

Inauguraldissertation

zur

Erlangung des Doktorgrades

der

Wirtschafts- und Sozialwissenschaftlichen Fakultät

der

Universität zu Köln

2014

vorgelegt

von

Dipl.Soz. Anja Beate Oppermann

aus

Sindelfingen

Referent: Prof. Dr. Karsten Hank

Korreferent: Prof. Dr. Marita Jacob

Tag der Promotion: 21. Oktober 2014

MEINER FAMILIE

DANKSAGUNG

Diese Dissertation entstand im Rahmen des Graduiertenkollegs SOCLIFE an der Universität zu Köln. Ich danke allen meinen SOCLIFE-Kollegen und beteiligten Professoren, allen voran Prof. Dr. Hans-Jürgen Andreß, für die vielfältige Unterstützung und Inspiration sowie der Deutschen Forschungsgemeinschaft für die Förderung.

Mein besonderer Dank gilt Prof. Dr. Karsten Hank und Prof. Dr. Marita Jacob. Beide haben mich schon während meines Studiums in Mannheim sehr inspiriert, so hat es mich besonders gefreut, dass wir uns in Köln wieder getroffen und sie meine Arbeit betreut haben. Ohne ihre Erfahrung, Beratung und Unterstützung wäre diese Dissertation nicht möglich gewesen, sie wird mir auch über diese Zeit hinaus zugutekommen.

Die letzten anderthalb Jahre meiner Dissertation durfte ich als Gast am DIW Berlin in den Abteilungen „Sozio- oekonomisches Panel“ und „Bildung und Familie“ verbringen. Dadurch wurden meiner Arbeit noch einmal neue Impulse gegeben. Ich möchte mich bei Prof. Dr. Jürgen Schupp und Prof. Dr. C. Katharina Spieß dafür sehr herzlich bedanken.

Während dieser Zeit entstand auch ein Artikel in Zusammenarbeit mit Anita Kottwitz und Katharina Spieß. Die gemeinsame Arbeit, die Diskussionen und die gemeinsame Freude über das Ergebnis sind eine Erfahrung, für die ich meinen beiden Ko-Autorinnen sehr dankbar bin.

Ich möchte mich bei allen bedanken, deren Unterstützung und Anregungen zu dieser Arbeit beigetragen haben.

Table of Contents

Introduction: The Time of Family Formation – An Examination of selected Mechanisms influencing Childbirth and Breastfeeding	8
1. Introducing the Research Project.....	8
2. Theoretical Framework: The Economic Theory of the Family	12
3. Educational Fields and Fertility.....	15
3.1 Education and Fertility	15
3.2 The Field of Education: Theoretical Model and Data.....	17
3.3 Summarizing Paper 1: Exploring the Relationship between Educational Field and Transition to Parenthood – An Analysis of Women and Men in Western Germany.....	21
3.4 Summarizing Paper 2: Educational Fields and Fertility in Western Germany – An Analysis of Women born 1955-59 with the Mikrozensus 2008.....	25
3.5 Integrating the Findings into Discourses.....	29
4. Parental Leave and Breastfeeding.....	31
4.1 Breastfeeding: Benefits, Definitions and Data	31
4.2 Parental Leave and the Conflict of Family and Labor Market Demands.....	33
4.3 Summarizing Paper 3: Parental Leave Benefits and Breastfeeding in Germany – Effects of the 2007 Reform (with Anita Kottwitz and C. Katharina Spiess).....	34
4.4 Integrating the Findings into Discourses.....	37
5. Discussion and Conclusion	38
References	42
Paper 1: Exploring the Relationship between Educational Field and Transition to Parenthood – An Analysis of Women and Men in Western Germany.....	49
1. Introduction	50
2. Theoretical Background	51
3. Previous Findings	53
4. Hypotheses for Western German Women and Men	56
5. Data and Method.....	58
5.1 Educational Fields.....	58
5.2 Event History Models.....	59

5.3	Simultaneous Estimations	61
6.	Analysis	63
7.	Discussion	71
	References	74
	Appendix	78
	Supporting Material (online-only content)	89
Paper 2: Educational Fields and Fertility in Western Germany – An Analysis of Women born 1955-59 with the Mikrozensus 2008		106
1.	Introduction	107
2.	A brief Argument: Why the Field matters	109
3.	The German Setting	110
4.	Hypotheses	113
5.	Data and Data Management	114
6.	Childlessness in Western Germany	118
6.1	Childlessness and Mean Age at Completion of Education	121
6.2	Groups with high Levels of Childlessness	123
6.3	Groups that never marry	123
6.4	Is there Change over Time?	125
7.	Childlessness in Eastern Germany	126
8.	The Findings in an International Context	129
9.	Ultimate Fertility in Western Germany	132
10.	Discussion and Conclusion	137
	References	139
	Appendix	142
Paper 3: Parental Leave Benefits and Breastfeeding in Germany – Effects of the 2007 Reform (with: Anita Kottwitz and C. Katharina Spiess)		153
1.	Introduction	154
2.	Background	157
2.1	Previous Findings	157
2.2	The German Parental Leave Reform and Breastfeeding	160
3.	Hypotheses	165
4.	Empirical Strategy and Data	166

4.1	Data	166
4.2	Estimation Strategy	169
5.	Results	175
6.	Sensitivity Analyses	180
7.	Discussion and Conclusion	185
	References	188
	Appendix	194

Introduction

The Time of Family Formation

–

An Examination of selected Mechanisms influencing Childbirth and Breastfeeding

1. Introducing the Research Project

Time is a scarce good. Throughout life, people constantly face decisions on the use of their time. Be it long-term or short-term decisions – the choice of one option is equivalent to deciding against at least one other option. A period in life where the pressure of scarce time and important decisions is especially high are the years of family formation and starting a career. The pressure of finding a balance between different life domains in a limited time span has been labeled as the “*rush hour of life*” (Bertram, Bujard, & Rösler 2011; Bittman & Wajcman 2000; BMFSFJ 2006).

The term rush hour of life is used to describe the period of time within a person’s life course, after graduating from education until the late thirties where multiple and conflicting demands from work and family life need to be balanced (Buber, Panova, & Dorbritz 2012, p. 2 et seq.). It is the period of labor market entry and obtaining economic independence from the parents as well as of career establishment and consolidation. At the same time it is the period for family formation, to form a partnership and childbirth as well as taking care of young children (Bertram et al. 2011; Buber et al. 2012; Bujard 2012). In this period people need to make important decisions, decisions with lasting implications for their life. They need to decide what they want to spend their time on – the just mentioned central biographic decisions – and they have to decide how much time they want to spend on it (e.g., Bertram et al. 2011).

The term rush hour of life expresses that the period of time within a person’s life course is rather short. The educational expansion is named among the main reasons for shortening the time available (Bertram et al. 2011). Age at graduation and as a consequence the age of economic independence from the parents has risen. The pressure on households of balancing work and family life has been increased further by the increased female labor force participation (Bertram et al. 2011). With an analogy between

the life course and the four seasons, Bovenberg states: “*The summer season in the modern life course is quite hot. The costs of living are high while time is scarce, as parents invest not only in their children but also in their careers. During this so-called ‘rush-hour of life’, people may experience ‘combination stress’.*” (Bovenberg 2008, p. 608 et seqq.)

This dissertation is about decisions people make about how they spent their time while they are in this period of their life. The focus is on their behavior and the mechanisms that are at work. It follows an empirical-analytical approach, applying quantitative methods of the social sciences.

Papers one and two focus on the decision to spend time on having children. Paper three focusses on the decision of spending time breastfeeding newborn children. These decisions are allocated in the described rush-hour within a persons’ life course. Both decisions involve time consuming family activities that compete against spending time with gainful employment.

Average age at the birth of the first child is rising as well as the level of childlessness throughout Europe (Frejka 2008). The impact of increased educational attainment in this development is the focus of many public and scholarly discussions (Blossfeld & Huinink 1991; Brewster & Rindfuss 2000; Brüderl & Klein 1993; Klein 1993; Kopp 2002, p. 87). While similar developments are observed among European countries, it is speculated that peculiarities of the institutional setting lead to a particularly short time span for the rush-hour in Germany (Bertram et al. 2011; BMFSFJ 2006; Mills, Rindfuss, McDonald, & Velde 2011).

The strong relationship between educational attainment and fertility is shown in many empirical studies (e.g., Blossfeld & Huinink 1991; Brewster & Rindfuss 2000; Brüderl & Klein 1993; Kravdal & Rindfuss 2008; Kreyenfeld & Konietzka 2008). Research on this relationship has been enriched by studies that take the educational field into account in addition to the educational level (Begall & Mills 2013; Hoem, Neyer, & Andersson 2006a, 2006b; Lappegård & Rønsen 2005; Martín-García & Baizán 2006; Martín-García 2009; Michelmore & Musick 2013; Neyer & Hoem 2008; Rønsen & Skrede 2010; Van Bavel 2010). The educational level and field indicate a person’s opportunities in the labor

market, their personality traits and preferences as well as their socialization. While this approach has been applied in other countries, to the best of my knowledge, my analyses are the first to apply it in Germany. The first paper addresses the question: How does the educational field influence the transition to parenthood of women and men in Western Germany? To answer this question methods of longitudinal analysis are applied to detailed micro-data of the German Socio-Economic Panel Study (SOEP). The analysis focusses on identifying a relationship between education field and transition to parenthood and mechanisms behind this relationship.

The aim of the second paper is to apply an internationally comparable approach of examining the relationship between educational fields and fertility (childlessness and ultimate fertility) to German data. Cross sectional data of the German Mikrozensus 2008 are used, mainly applying descriptive analysis that has been used on data from other countries by other authors. Conclusions on mechanisms behind the relationship between educational field and fertility are mainly drawn by comparison between the findings within different institutional settings. While the first paper digs into the mechanisms behind the relationship between educational fields and fertility, the second provides comparable data for international comparison as well as a detailed overview for Germany.

For those who opted to have children, breastfeeding is considered important for the children and the mother for various health reasons (e.g., Rubin 2013). Breastfeeding needs and maternal employment conflict with each other especially within the first year of a child's life (e.g., Berger, Hill, & Waldfogel 2005; Ogbuanu, Glover, Probst, Liu, & Hussey 2011; Roe, Whittington, Fein, & Teisl 1999).

The third paper addresses a possible conflict between breastfeeding and employment and how this conflict is influenced by measures of family policy. This paper was written in cooperation with Anita Kottwitz and C. Katharina Spiess. The question the third paper aims to answer is: Does the new parental leave reform impact breastfeeding initiation and duration in Germany?

In the broader context of decisions about time use and subsequent behavior, the questions addressed in the three papers can be summarized as follows:

1. Why do people behave the way they do in a given institutional setting?
2. How does peoples' behavior differ in different institutional settings?
3. How is peoples' behavior affected by a particular change in the institutional setting?

The introduction to this dissertation proceeds as follows: Section 2 presents the theoretical framework of the dissertation. Section 3 summarizes theoretical arguments and empirical findings on the relationship between education and fertility. Papers one and two are presented and their findings are discussed. Before Paper three is summarized, important aspects for the relationship between parental leave and breastfeeding are discussed in section 4. The section ends with a discussion of the findings of the third paper. Concluding remarks and discussions on the whole dissertation are presented in section 5.

2. Theoretical Framework: The Economic Theory of the Family

Theoretical considerations on the micro-level are made within the framework of the rational-choice theory, especially the economic theory of the family (Becker 1994), embedded in the “Coleman-bathtub” (Brüderl 2006; Coleman 1994; Esser 1999a, p. 91 et seqq., 1999b). These are influential and well-known theories that shall only be presented shortly.

The “Coleman-bathtub” is a general model for explaining the relationship between social situations and social behavior. The basic goal is to explain the mechanisms between two observed phenomena on the aggregated macro-level. The assumption is that the social situation (macro-level) impacts on individuals (micro-level) and their behavior. Aggregated individual behavior in turn influences the society. In order to explain how the social situation impact on the individual, the relevant characteristics of the situation need to be identified and reconstructed (“logic of the situation”). “Bridge hypotheses” that determine the impact of this specific social situation on the individual need to be formulated. On the micro-level a general theory of human behavior is needed in order to explain how individuals choose one behavior instead of another in a given social situation (“logic of selection”). The “logic of aggregation” describes rules determining how individual behavior is aggregated into a new social situation (Esser 1999a, p. 91 et seqq.).

Rational choice theory is a theory of human behavior. It assumes a subjective rational individual who maximizes utility, given their preferences and social situation. Human behavior satisfies needs, while two basic needs are assumed: physical well-being and social approval/esteem (Esser 1999b, p. 92 et seqq.; Lindenberg & Frey 1993; Lindenberg 1989; Nauck 2007). Subjectivity of rationality derives from the interpretation of the individual guided by the actual situation and his or her previous experiences. An individual chooses behavior, given preferences, from a set of behavior options according to its subjective expected utility (SEU) (Edwards 1954; Esser 1999b, p. 344 et seq.; Savage 1972). Each option promises a certain utility and its realization is tied to certain costs. Each costs und utility term is weighted with the subjective probability of coming true as a consequence of the behavior. The option with the highest net-utility is chosen (Esser 1999b, p. 249 et seqq.; 340 et seqq.).

The economic theory of the family is an influential approach carrying basic assumptions and mechanisms from economic theory to research on family behavior. It makes assumptions on the costs and utilities involved in familial behavior. It can therefore be applied within this rational-choice framework and enables formulating hypotheses to be tested empirically (e.g., Brüderl 2006). From an economic perspective, individuals, or rather couples, form a household unit to produce commodities (Becker 1982, p. 228 et seq.) “*which directly provide utility*” (Becker 1994, p. 23). Examples for commodities are: “*children, prestige and esteem, health, altruism, envy, and pleasures of the senses*” (Becker 1994, p. 24).

An essential part of this theory is the consideration of time as a scarce resource. Time is not available without limitations and a person needs to decide how they want to spend their time in order to maximize utility (Becker 1965, p. 493 et seqq.; Mincer 1963, p. 67 et seqq.).

The economic theory of the family has been applied to examine various familial behavior like partner choice, choice of cohabitation or marriage, division of labor within a partnership, or divorce (e.g., Blossfeld & Timm 1997; Brüderl, Diekmann, & Engelhardt 1997; Brüderl & Kalter 2001; Hill & Kopp 1999). It has also often been used to examine fertility (e.g., Blossfeld & Huinink 1991; Brüderl & Klein 1993). Children are a commodity (Becker 1960, p. 210) and couples decide on having a(nother) child if the expected utility (“satisfactions”) from the child is higher than the expected costs (Leibenstein 1957, p. 159). Nowadays, in Western societies, the main utility of children for their parents is their consumption utility or affect and stimulation utility (Becker 1960; Leibenstein 1957, p. 161, 1974; Nauck & Klaus 2007; Nauck 2007). Children are seen as “durable consumption (..) good” , as “a source of personal pleasure to the parents” (Leibenstein 1957, p. 161). Parents need to invest in their children and spend time with them in order to reach the children’s utility. This utility is seen as independent from changes in institutional settings and it cannot be substituted (Becker 1960; Nauck & Klaus 2007; Nauck 2007).

A person's educational attainment is of high importance within the economic theory of the family. The basic idea behind this is that the educational level determines a person's earning potential (Becker 1994, p. 350 et seqq.; Blossfeld & Huinink 1991; Brüderl & Klein 1993). In other words, it determines how much money a person could earn by gainful employment. How this can be done is dependent on the circumstances (Becker 1994, p. 356 et seqq., 2003, p. 91 et seqq.).

3. Educational Fields and Fertility

Papers one and two examine the relationship between educational fields and fertility. Before presenting the summarized content of the papers, the background of this research is described. I will briefly present theoretical assumptions and findings on the relationship between education and fertility. I proceed with describing the assumed relationship between educational fields and fertility including the theoretical model I developed. Following the presentation of the papers, the findings are related to each other and integrated into scholarly discourses.

3.1 Education and Fertility

The findings considering the impact of educational level on fertility behavior can mainly be subsumed to three basic effects: the enrollment effect, the opportunity cost effect and the income effect.

The so called enrollment effect states that a longer educational enrollment, which is usually necessary to gain a high educational degree, leads to postponement of family formation. Empirically this effect was evidenced many times (Blossfeld & Huinink 1991; Brüderl & Klein 1993; Hank 2003; Klein 2003; Lappegård & Rønsen 2005; Liefbroer & Corijn 1999; Martín-García & Baizán 2006; Schmitt 2012). Highly educated women and men tend to postpone marriage and the first birth of a child, therefore their rush-hour time is especially squeezed. Opportunity costs of children are the missed labor income due to having children and spending time with them (Mincer 1963, p. 75 et seqq.). A dispute developed concerning the empirical existence of this effect. While for example Blossfeld and Huinink (1991) argue there is in fact only an enrollment effect, Brüderl and Klein (1993) are, with the same data, able to show a significantly negative effect of high education on marriage and first birth and are also able to show that educational expansion leads to a decrease in cohort fertility. The effect is more pronounced regarding the decision about having children or not, than the decision on the number of children (Klein 1993). A positive income effect of education on fertility has been observed for men in Germany (Klein 2003; Schmitt 2005) and in other European countries e.g., Norway (Kravdal & Rindfuss 2008; Kravdal 2007).

Fertility rates are low in Germany (Dorbritz 2008). In Western Germany this is caused by high rates of childlessness. A polarization between childlessness and families with two or more children is observed (Dorbritz 2008). In Eastern Germany, on the contrary childlessness is very low (Kreyenfeld 2004). The enrollment effect is very pronounced in Western Germany and it is a common finding in Western Germany that highly educated women more often remain childless than women with a low educational level (Dorbritz 2008; Kreyenfeld 2004). It is noteworthy that highly educated women who opt for children, have a higher tendency to expand their family (Kreyenfeld 2002). It is assumed and supported by empirical evidence that highly educated women who opt for children despite the high opportunity costs are a group of very family prone women. This family proneness positively impacts on the decision to have a first child and also on their decision to have further children (Kreyenfeld 2002).

3.2 The Field of Education: Theoretical Model and Data

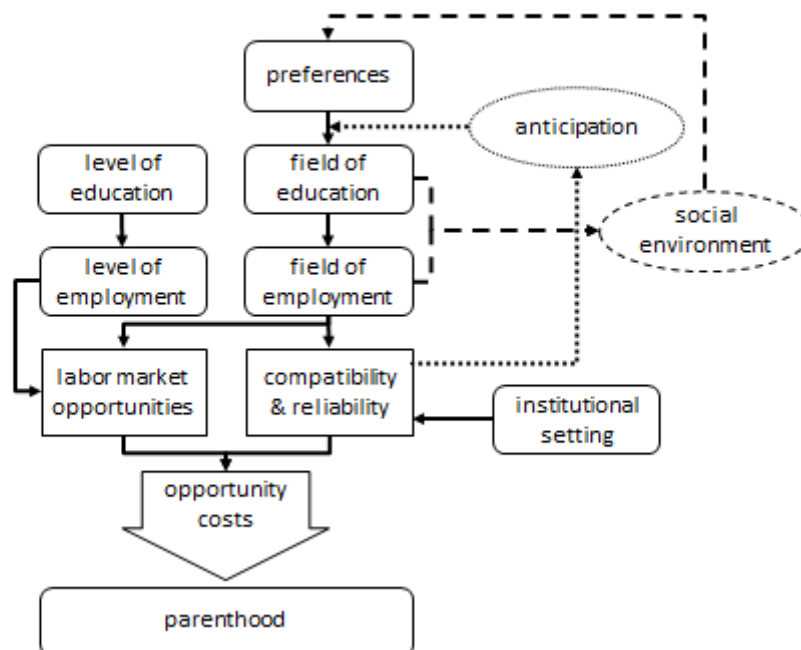
While education is usually understood as the level of educational attainment there is also another dimension of education which is the field. A lot of research has addressed the question what people of the same educational level have in common – like their income potential or opportunity costs that influences their fertility decision (Blossfeld & Huinink 1991; Brüderl & Klein 1993; Klein 2003; Kravdal & Rindfuss 2008; Kreyenfeld & Konietzka 2008; Kreyenfeld 2002; Liefbroer & Corijn 1999). The idea of looking at the impact of educational fields on fertility is that people in the same field also have things in common that are important with regard to fertility behavior. This might be opportunities in the labor market, compatibility of family and employment or expected workplace security, and it is assumed that the field is an indicator for preferences and a place of socialization (e.g., Hoem et al. 2006a).

Based on the theoretical background described above and the theoretical considerations made by authors examining the relationship between educational field and fertility (mainly: Begall & Mills 2013; Hoem et al. 2006a; Lappegård & Rønsen 2005; Neyer & Hoem 2008; Rønsen & Skrede 2010; Van Bavel 2010), I developed a theoretical model of the relationship between education and transition to parenthood. Figure 1 summarizes the main idea of this model.

Given a tight connection between education and labor market opportunities, it is assumed that the field indicates more about future working conditions than the sheer level. For example, some fields are more likely to lead to (secure) employment in the public sector. Therefore, both, level and field, determine labor market opportunities. The field determines the compatibility of family and employment. For example, a high share of women in a field is assumed to indicate compatibility of motherhood and employment in this field. Whether the higher share directly increases compatibility or more women choose the field because of the compatibility remains an open question. Labor market opportunities and compatibility influence the amount of opportunity costs of children – and the decision in favor or against transition to parenthood. Opportunity costs are not only understood as foregone earnings, but also other things like missed leisure time or job opportunities due to children.

This short description of the relationship between educational attainment and fertility implies a mono-causal relationship. Of course, there are more influencing factors and underlying mechanisms to this relationship. Most important are the individual's preferences that impact on educational choices. These are preferences towards a future life-style and work-content but also towards childbearing. According to these preferences individuals select themselves into certain fields of education. This selection in turn influences the social environment during the formative years and later in adult life, which also shapes and impacts on the preferences of the individual. Preferences and anticipation about working conditions in a field impact on educational choices. The institutional setting, like the educational system and measures of family policy further influence how compatibility is and how it is anticipated.

Figure 1: Theoretical model of the relationship between educational attainment (level and field of education) and parenthood



Several characteristics of educational fields are assumed to be of importance in the relationship between educational fields and fertility. The first is the compatibility of employment and parenthood. The share of women in an educational field is indicated by a high share of women or a high probability to work part-time, two indicators that are often correlated. The second is expected reliability of the employment career. Reliability

is indicated by the probability to lead to (secure) employment in the public sector or by the occupational specificity of an educational field (i.e. how directly a particular education leads to a particular employment). Additionally, different risks of “skill depreciation” are discussed by some authors. They assume that fields of education differ with regard to the knowledge loss that is caused by a break.

For the examination of the relationship between educational fields and fertility in Germany, the choice of available data is limited. Several datasets do not contain information on the field of education (for example SHARE or pairfam) or lack other important information. This applies especially for cross-sectional data sets like the Mikrozensus or the European Social Survey. The limitations of these datasets are mainly the information on birth biographies of the respondent. Nevertheless, two German datasets provide sufficient information for answering the research question. The first is the Socio-Economic Panel Study (SOEP) and the second is the Mikrozensus 2008.

The SOEP is an annual long-running household panel which started in 1984. It has about 20,000 participants and covers a broad range of socio-economic factors, demographic conditions, psychosocial factors and health indicators (Wagner, Frick, & Schupp 2007). Birth biographies of the respondents are surveyed in detail and are very well documented. Even though the field of education is available for educational degrees obtained while the respondent took part in the annual questionnaire of the SOEP, retrospective information is only available from 2001 onwards¹. Additionally, information on educational degrees was coded according to different classifications. In order to use these information, an important task was to re-classify them into a common classification. Most importantly the classification had to be suitable to capture what is understood as field of education. With the Klassifikation der Berufe 2010 (KldB2010) (Bundesagentur für Arbeit (BA) 2011a, 2011b) such a classification was found. For detailed information on the data situation and handling please see the supporting material of Paper 1.

¹ At the time the work on this dissertation started the latter data were not published.

The German Mikrozensus is collected annually (repeated cross-sectional), covering a representative sample of 1% of households in Germany. The Mikrozensus does not contain information on birth biographies of the respondents. The existence of children can only be inferred from the household composition which is imprecise for various reasons. The Mikrozensus 2008 is an exception as female respondents between age 15 and 75 were asked about their own children. Information on level and field of the highest degree obtained are available. Unfortunately it is not possible to code the information on the field of education in accordance to the KldB 2010, as the information in the Mikrozensus 2008 is not detailed enough to make a precise assignment. Therefore the aim was to reach comparability of the findings from the Mikrozensus with findings from other countries. For that, I developed a classification applied in the second paper. The aim of the classification is to account for the structure of the German educational system and to provide figures that are comparable to previous findings.

3.3 Summarizing Paper 1:

Exploring the Relationship between Educational Field and Transition to Parenthood – An Analysis of Women and Men in Western Germany

The first paper examines the question whether the field of education matters for the transition to parenthood in Western Germany and how. While the vast majority of previous studies examining this relationship focus on women only, little is known about the impact of educational fields on men's fertility decisions other than that it most likely differs from the impact on women (Martín-García 2009). Yet, it has been shown that the impact of educational level or employment insecurities on fertility behavior are not equal for women and men (Kravdal & Rindfuss 2008; Kreyenfeld 2010; Schmitt 2012; Tölke & Diewald 2003). The first paper looks at the transition to parenthood of both, men and women.

The data for this analysis come from the German Socio Economic Panel (1984-2010) (SOEP) (Wagner et al. 2007). The data were partly extracted using the Add-On package PanelWhiz for Stata®². Discrete time logit models are applied (Yamaguchi 1991). The dependent variable is transition to parenthood and years since graduation are used as a time axis. Several multivariate analyses are estimated for women and men separately.

The first paper examines four hypotheses that are presented here along with how they were tested empirically and whether the findings confirm them or not. This section ends with a short summary of the contribution of this paper.

Hypothesis 1: The field matters. I expect models examining the transition to parenthood that include the field of education to have a higher explanatory power than models that only include the level of education.

² PanelWhiz (<http://www.PanelWhiz.eu>) was written by Dr. John P. Haisken-DeNew (john@PanelWhiz.eu). See Haisken-DeNew and Hahn (2006) for details. The PanelWhiz-generated DO file to retrieve the data used here is available from me upon request. Any data or computational errors in this paper are my own. The following authors supplied PanelWhiz Plugins used to ensure longitudinal consistency, John P. Haisken-DeNew, Markus Hahn.

Two strategies were applied to test this hypothesis. First, discrete time event history models improve significantly due to including dummy variables for the different fields for women, but not men. Second, a multi-level approach, modeling individuals nested in fields (Hox 2010), showed a significant variance between the transition rates, again for women only. For men, the positive effect of a university degree on their transition rates implies a positive income effect. The first hypothesis is therefore confirmed for women, but not for men.

Hypotheses 2 and 3: **High compatibility positively impacts on women's but does not affect men's transition to parenthood. Compatibility is indicated by a high share of women in an educational field or a high probability to work part-time for those educated in a specific field.**

Reliability positively impacts on the transition to parenthood of women and men – indicated by a field's probability to lead to employment in the public sector and by its occupational specificity (i.e. how directly a particular education leads to a particular employment).

These hypotheses need further explanation: Compatibility of employment and childcare should lower the opportunity costs and increase a woman's probability to become a mother. Given the German context, compatibility should not matter as much for men as it does for women, therefore no effect of compatibility is expected. In fields with a high share of women, more female role models are available for young women (Hoem et al. 2006a; Tesching 2012). Awareness for compatibility needs is higher in such an environment, leading to structures that enable a better compatibility due to more flexible working conditions with regard to working hours or exit and re-entry options (Hoem et al. 2006a; Rønsen & Skrede 2010; Tesching 2012). Part-time employment enables mothers to combine employment and childcare.

A high job security and a foreseeable career improve the reliability of the employment career and impact positively on the transition to parenthood. For women, reliability reduces opportunity costs and should facilitate transition to parenthood. For men, the argument is not based on opportunity costs but rather on their ability to fulfill the role of

a reliable financial provider for their family. Public sector employment does provide higher security than private sector employment. Nevertheless, it has to be kept in mind that income potential might be higher for some men in the private sector. High occupational specificity of a field should lead to a faster transition into a stable employment situation after graduation and therefore also positively impact on the transition to parenthood.

The impact of the field characteristics is first explored separately. The relationship between the share of women in a field and transition to parenthood appears to be u-shaped and the probability of working in the public sector negatively impacts on the transition to parenthood. Neither the share of women working part-time nor the occupational specificity significantly influence the transition to parenthood. Based on these findings the initially large set of 37 fields was grouped according to one indicator for compatibility – the share of women – and one for reliability – the probability of public sector employment. The groups are defined by their stand-out characteristics, resulting in four groups and one residual group. The findings confirm the second hypothesis on the positive impact of compatibility, as women educated in fields with an outstandingly high share of women have high transition rates to parenthood. The third hypothesis on the positive impact of reliability is not confirmed, as women educated in fields with a high share of public sector employment have low transition rates to parenthood.

Hypothesis 4: The choice of an educational field and the relationship between educational fields and transition to parenthood is partly caused by a person-specific underlying pattern of preferences.

To test this hypothesis the probability of being educated in a group of educational fields is estimated jointly with an event history model of the transition to parenthood (Kravdal 2001; Kreyenfeld 2002; Tesching 2012). Only the female sample is analyzed. This specific part of the analysis is carried out with aML 2.09 (Lillard & Panis 2003). A common factor for unobserved heterogeneity is significant. The coefficients for the field groups in the event history models of transition to parenthood are less significant when estimated simultaneously with the probability of initially being educated in a specific field. In light of the theoretical background and the findings of Begall and Mills (2013),

the preferences towards childbearing at the time of graduation reflect the preferences that lead to the selection of an educational field and the influence of the socialization during educational enrollment. The results support the fourth hypotheses.

Contribution

This analysis is a contribution to the increasing knowledge about the connection between educational fields and the transition to parenthood. It adds Western Germany, a country with low fertility rates and traditional family attitudes, to the growing list of countries for which this has been examined, and looks at both men and women. It also adds to existing knowledge further insight into the mechanisms that cause the relationship between educational fields and fertility. The results indicate that an unobserved factor, like preferences towards childbearing, simultaneously impact on the probability to be educated in a specific field and the probability to have children.

3.4 Summarizing Paper 2:

Educational Fields and Fertility in Western Germany – An Analysis of Women born 1955-59 with the Mikrozensus 2008

The analysis with the SOEP-data conducted in the first paper showed that the educational field matters for the transition to parenthood for women in Western Germany. How does the pattern of the relationship between educational attainment and fertility in Western Germany match the previous findings from other countries? The operationalization of educational attainment varies considerably between these studies, especially with regard to the number of educational categories used in the analysis. Nevertheless three studies analyzing childlessness in three different countries, namely Sweden, Austria and Greece, apply a comparable set-up (Bagavos 2010; Hoem et al. 2006a; Neyer & Hoem 2008). Each study uses national register or census data to examine childlessness of women born between 1955 and 1959. The operationalization is very similar, each uses about sixty categories of educational attainment (about fifty in the case of Greece). These categories are built of combinations of educational levels and fields. For Sweden, a companion paper also looks at ultimate fertility (Hoem et al. 2006b).

The aim of the second paper is to add Western Germany to the list of countries this approach is applied to. Data of the German Mikrozensus 2008³ on educational attainment and childlessness are treated in a comparable manner to previous studies. Additionally, ultimate fertility is examined in accordance with the study of Hoem et al (2006b). A further aim of this paper is to provide reference data for researchers examining the relationship between education and fertility in the German context.

The analysis consists mainly of descriptive analyses like those that have been applied in the previous studies. The paper presents findings on childlessness for Western German women born between 1955 and 1959. These findings are compared to findings on the neighboring cohorts 1950-54 and 1960-64. They are further compared to the same cohort (1955-59) of Eastern German women and discussed in light of the findings from Sweden,

³ For the analysis, the full sample of the Mikrozensus 2008 was used. This was possible via on-site access for guest researchers. The author is very grateful for the kind support of the team at the Forschungsdatenzentrum in Berlin-Mitte.

Austria and Greece. Ultimate fertility is also examined and compared to the findings from Sweden.

In the following the hypotheses examined in the paper are presented along with the main findings.

Hypothesis 1: I expect the level of education to be strongly associated with childlessness and I expect the field of education to matter for childlessness.

Despite the strong relationship between educational level and childlessness in Western Germany, the educational field matters as well. A two way analysis of variance shows that the level of education accounts for more variation in childlessness than the field of education. For ultimate fertility level and field of education account equally for variation. The strong impact of the educational level on childlessness was expected, but the strength of the field is more pronounced than expected.

Hypothesis 2: I expect care-related fields (teaching and health care) and women-dominated fields to have low levels of childlessness.

The findings show, at each educational level, outstandingly low rates of childlessness among women educated in teaching and child care in Western Germany. Low childlessness among these women has also been found in Sweden, Austria and Greece. This implies that (in this group) the choice of an educational field is an expression of preferences or even personality traits that are independent from the institutional context. This is further supported by the similar findings on Eastern Germany.

Hypothesis 3: Fields with high skill depreciation (technology) or with uncertain occupational perspectives (humanities, social sciences) as well as fields with long educational enrollment should have high proportions of childlessness.

This cannot be confirmed as childlessness among graduates in industry crafts, engineering and natural sciences is rather at a medium level and it was also not observed in Sweden or Austria, but only in Greece. While women educated in humanities do not

show a clear pattern, those educated in social science indeed have a high share of childlessness. This finding on women educated in social sciences is consistent with Sweden, Austria, and Greece.

Hypothesis 4: A high mean age at completion of education should be associated with high rates of childlessness.

The findings are as expected. Very interestingly, a field effect is also observed: A higher age at completion does not necessarily lead to higher levels of childlessness in Western Germany. The possible causes for this finding can only be discussed as the data do not allow examining this any closer: It might be that childbearing and childcare is more compatible during educational enrollment in some educational fields than in others. It might also be that women educated in fields like teaching and health care (the field with the weakest association between mean age at completion and childlessness) catch-up with childbirth soon after graduation. If this is the case, differences in the school-to-work transition and aspects of employment security may play an important role.

Hypothesis 5: A high share of people never having married in a field should result in high childlessness.

The share of women never being married is strongly associated with the level of childlessness among the graduates of an educational line. No effect of the field on this association can be observed.

Hypothesis 6: I expect that mothers in fields with high childlessness have similar high or even higher numbers of children compared to mothers in fields with less childlessness (bifurcation).

The association between educational level, educational field, and ultimate fertility resembles those with childlessness. The number of children declines with an increasing level, but differences between fields are also observed. The number of children among women educated in teaching or health care is highest. This group does not however stick out as strongly as one would have expected due to their low levels of childlessness.

The only educational line a bifurcation between childlessness and number of children born to mothers can be observed are among women educated in theology (university degree). It was expected that women who are educated in educational lines with high rates of childlessness who opt for motherhood are a group of very family prone women. This family proneness should positively impact on the probability to have further children. However, this is not found in the present analysis. For Western Germany it has repeatedly been shown that women with a high educational level have lower probability of motherhood than less well educated women. Highly educated women who opt for motherhood on the other hand have a higher tendency to expand their family (Blossfeld & Huinink 1991; Kreyenfeld 2002). This is partly caused by the discussed family proneness of these women (Kreyenfeld 2002). The findings of the present analysis imply that the educational field also plays an important role in the relationship between educational attainment and fertility behavior. The choice of an educational field, like teaching and health care, might be an expression of family proneness. Therefore including the educational field into the analysis of the relationship between education and fertility should add to further understanding.

Contribution

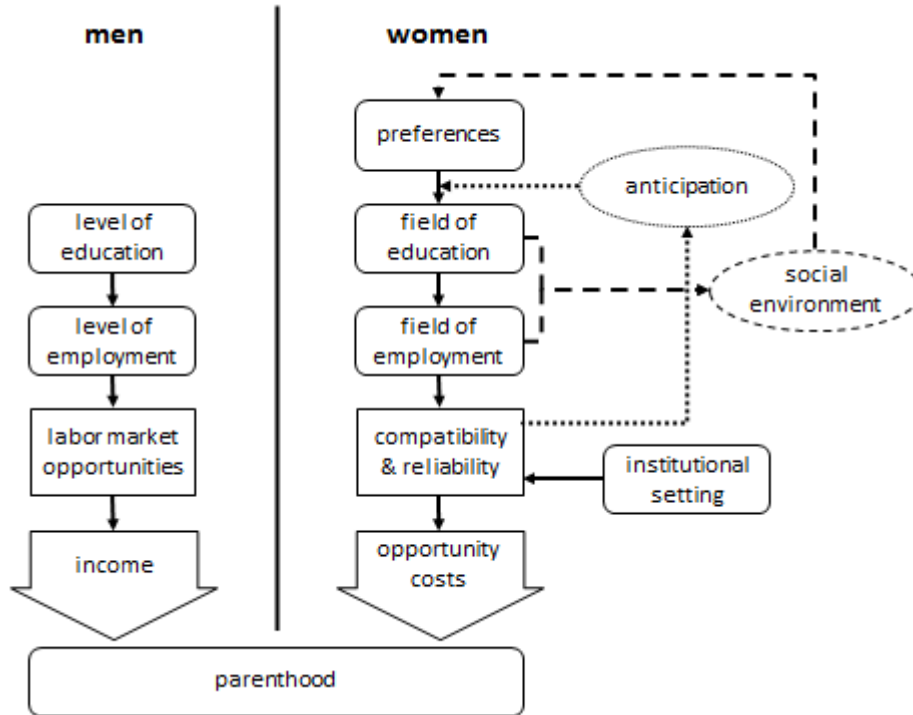
The overall finding of this paper is that there is a relationship between the field of educational attainment and fertility in Western Germany. Common patterns are observed across countries as well as differences. Differences are attributed to differences in institutional settings offering plausible explanations. Especially remarkable are the many similarities that are observed despite the differences in institutional settings.

3.5 Integrating the Findings into Discourses

The robust findings across both papers, across the datasets used, and the different methods applied is: The educational field matters in a woman's decision to have a child or to remain childless in Western Germany. The first paper shows this with the application of discrete time event history analysis using SOEP data. This analysis not only shows that models on the transition to parenthood improve significantly due to adding dummy-variables for the field a women is educated in. Applying a multi-level approach, modeling individuals nested in fields, it also shows significant variance in transition rates. The second paper comes to similar conclusions. Here cross sectional data of the German Mikrozensus 2008 are used. The analysis confirms the relationship between educational field and fertility by examining childlessness of women beyond childbearing age. It is confirmed with descriptive methods visualizing the relationship and a two way analysis of variance that the level of education accounts for more variation in childlessness than the field of education.

Findings of both papers are indicative of unobserved factors, like preferences towards childbearing that jointly influence the probability of being educated in a specific field of education and the decision to have a child or to remain childless. In the first paper this conclusion is drawn on the basis of a significant factor for unobserved heterogeneity when estimating the probability of being educated in a specific field and the transition to parenthood jointly. In the second paper this conclusion is drawn from the fact that low childlessness is found among women educated in some fields (teaching and child-care) across different institutional settings (Sweden, Austria, Greece, Western Germany, Eastern Germany). This implies that among these women the choice of an educational field is an expression of preferences that are independent from the institutional context.

Figure 2: Adapted Theoretical Model of the Relationship between Men's and Women's Educational Attainment (Level and Field of Education) and Parenthood in Western Germany



A finding of the first paper is that the educational field does not matter in men's transition to parenthood in Western Germany. The positive impact of a university degree on the probability of men to become fathers implies that a positive income effect can be observed. For Western Germany, the theoretical model described in section 3.2 has been adapted in light of these findings (see Figure 2). Unfortunately this finding of the first paper on men cannot be verified with the data of the Mikrozensus 2008 as informations on children are only available for female respondents. To the best of my knowledge only one other paper examines the relationship between educational field and transition to parenthood for men (Martín-García 2009). Findings on Spain show that this relationship differs between men and women. Comparability of these findings to those of other studies is limited due to the fact that educational fields are grouped very broadly in this study. Further research on other countries, especially those with less emphasis on the male-breadwinner model, should address the question of a role of educational fields in men's fertility.

4. Parental Leave and Breastfeeding

The following section is about the impact of political measures on breastfeeding behavior. Therefore, it is also about people's behavior in the family context. The background of this research is presented, starting with theoretical assumptions on breastfeeding as well as empirical research. The summary of the third paper follows the structure of the summaries of papers one and two. The section ends with a discussion of the findings with regard to scholarly discourses.

4.1 Breastfeeding: Benefits, Definitions and Data

Examining breastfeeding decisions means focusing on women who decided to have a child. A child is, in the sense of the economic theory of the family, a long-lasting consumption good. The child's utility for their parents is mainly the affect and stimulation utility and they need to invest in their child and spend time together (see above). Breastfeeding can be considered to be such an investment. Breastfeeding is associated with positive health effects for children, mothers and the mother-child relationship. For children, breastfeeding is associated with a reduced risk of infections or obesity and is positively associated with their cognitive and emotional development (Anderson, Johnstone, & Remley 1999; Belfield & Kelly 2012; Borra, Iacovou, & Sevilla 2012; Del Bono & Rabe 2012; McCrory & Layte 2012). For mothers, breastfeeding is positively associated with mental health and a reduced risk of breast cancer (Del Bono & Rabe 2012). On average breastfeeding is also connected to higher emotional care for the child by the mother than other forms of feeding (Smith & Ellwood 2011).

Breastfeeding as such is often differentiated further and important differences exist between the definitions and measurement of breastfeeding are discussed in the literature. Some differentiate between exclusive breastfeeding (only breast-milk) or predominant breastfeeding (breast-milk and water or water-based drinks like tea), while full breastfeeding refers to both. Supplementary feeding is used to describe the combination of breast-milk and formula, to just name a few (for an overview, see Kersting & Dulong 2002, p. 549). Those differentiations are especially important when examining child outcomes. Most recent datasets addressing breastfeeding in Germany are available only up to 2005 (Lange, Schenk, & Bergmann 2007). Nation-wide data are provided by the study "Stillen und Säuglingsernährung" (SuSe; see Dulong, Kersting, & Schach 2001) and the study

“German Health Interview and Examination Survey for Children and Adolescents” (KiGGS; see Lange et al. 2007). Data for 2005 are also available from Bavaria (Kohlhuber, Rebhan, Schwegler, Koletzko, & Fromme 2008). These data are not suitable for examining the impact of a reform that took place in 2007.

The data for our analysis come from the SOEP 2002 through 2012. Breastfeeding initiation and duration is assessed in an age specific questionnaire for mothers of newborn children in the SOEP and a follow up questionnaire for mothers of children aged two to three years (for the age specific questionnaire see Spiess 2011). The mothers were asked whether the child was breastfed and for how long the child was breastfed (measured in months). The questionnaire does not assess if the child was given nutritious supplementary or complementary foods. Thus, our classification of breastfeeding comprises exclusive, predominant, and partial breastfeeding.

Among the reasons of importance in the decision against breastfeeding initiation are the attitudes of the partner and of the maternal grandmother (Kohlhuber et al. 2008). Reasons for giving up breastfeeding before the child has reached the age of four months, are “breast milk was drying up”, mother’s exhaustion, family demands or health problems of the mother (related or not related to breastfeeding) and mothers returning to work (Dulon et al. 2001).

4.2 Parental Leave and the Conflict of Family and Labor Market Demands

Despite the benefits for mothers and children, breastfeeding needs may conflict with mothers' early labor market return (Berger et al. 2005; Ogbuanu et al. 2011; Roe et al. 1999). There is strong empirical evidence that the duration of work leave and duration of breastfeeding are closely related (Berger et al. 2005; Bick, MacArthur, & Lancashire 1998; Chatterji & Frick 2005; Kimbro 2006; Lindberg 1996; Ogbuanu et al. 2011; Visness & Kennedy 1997). Roe et al. (1999) show for an US-sample that the duration of work leaves impacts on the duration of breastfeeding, but not vice versa.

Maternity and parental leave regulations have been designed to reduce the conflict between family and labor market in the time after childbirth and reduce some pressure within the rush hour. Some empirical studies have shown a positive association between parental leave and children's health and development (Carneiro, Loken, & Salvanes 2011; Ruhm 2000; Tanaka 2005; Waldfogel, Han, & Brooks-Gunn 2002). Others find no significant relationship with child development if the duration of parental leave is extended over the first year of a child's life (Dustmann & Schönberg 2012; Liu & Skans Oskar 2010; Rasmussen 2010). Nevertheless, mothers using the time of leave for breastfeeding is among the reasons assumed to cause the positive effects for children. This is also plausible in light of these findings as breastfeeding is most extensive within the first months of a child's life.

In the recent time several studies examined the effects of changes in parental leave regulations. Like for example on child outcomes (Baker & Milligan 2010; Carneiro et al. 2011; Dustmann & Schönberg 2012) maternal employment (Baker & Milligan 2008a; Kluge & Tamm 2013; Lalive & Zweimüller 2009) or fathers earnings (Rege & Solli 2013). Two studies examine the impact of parental leave benefits on breastfeeding using data from Canada and California (USA) (Baker & Milligan 2008b; Huang & Yang 2014). We address a similar question for Germany.

4.3 Summarizing Paper 3:

Parental Leave Benefits and Breastfeeding in Germany – Effects of the 2007 Reform

(with Anita Kottwitz and C. Katharina Spiess)

Increasing the numbers of mothers who breastfeed their children and increasing the duration of breastfeeding has been identified as an important public health goal for a number of reasons (e.g., Rubin 2013). However, breastfeeding may conflict with mothers' early labor market return (e.g., Berger et al. 2005; Ogbuanu et al. 2011; Roe et al. 1999). Maternity and parental leave regulations are designed to reduce this conflict and a positive impact of parental leave benefits has been shown in Canada and California (USA) (Baker & Milligan 2008b; Huang & Yang 2014).

While rates of breastfeeding at birth are often found to be rather high in Germany (about 80 to 90%) in comparison to other countries, it is also reported that in Germany breastfeeding rates are declining sharply in the first months after childbirth (Dulon et al. 2001; Kersting & Dulon 2002; Lange et al. 2007).

In 2007, Germany put into effect a new parental leave benefit (*Elterngeld*). The reform related to this new benefit changed the benefit amount, the share of parents being eligible and the maximum benefit duration. Since 2007, all new parents are eligible for a parental leave benefit, while the previous parental leave system only provided financial support for a selected number of parents. The basic approach of the 2007 reform was to replace the previously existing means-tested child-rearing benefit (*Erziehungsgeld*) with a parental leave benefit (*Elterngeld*) that replaces 67% of individual net earnings for a stay-at-home parent in the first year after birth. Most importantly, the new benefit offers a much greater financial support to a much larger share of parents whereas only parents with a low income were eligible for financial support prior to 2007. Thus, the reform did not bring about much change for these parents within the first year (for details, see Kluge & Tamm 2013; Spiess & Wrohlich 2008; Wrohlich et al. 2012). One of the goals of the new reform was to financially support parents taking care of their young child during the first year of life (Bujard 2013; Deutscher Bundestag 2006). The financial support aims at lowering the pressure to return quickly to the labor market, especially for those parents who would not have benefited under the old system, i.e. mothers and fathers with incomes

above a low level. Empirical research indicates that this goal of the reform was achieved: More parents (mostly mothers) now stay at home longer during the first year of their child's life (Kluve & Tamm 2013; Spiess & Wrohlich 2008; Wrohlich et al. 2012).

The data are from the Socio-Economic Panel Study (SOEP) from 2002 through 2012. Breastfeeding initiation and duration is assessed in an age specific questionnaire for mothers of newborn children in the SOEP and a follow up questionnaire for mothers of children aged two to three years. The focus of the analysis is changes in breastfeeding during the first year of a child's life, where the conflict between breastfeeding and labor market participation is most prevalent.

In the following section the hypotheses this paper examines are presented along with the main findings.

Hypothesis 1: We do not expect to find an increase in breastfeeding initiation rates due to the reform.

We expect no effect, mainly as the duration and the benefit in the maternity protection period of two months after birth did not change at all. Applying a logistic regression on breastfeeding at birth with a dummy variable that equals one if the child was born after the reform, our results show no change in breastfeeding initiation.

Hypothesis 2: We expect a positive effect of the reform on breastfeeding duration (breastfeeding at four months and breastfeeding at six months).

Logistic regressions on breastfeeding for at least four month and for at least six months show a significant increase after the reform.

Hypotheses 3: We expect to find increased breastfeeding durations among mothers who most likely benefit from the reform and we expect no changes in breastfeeding behavior among those who did not.

Two groups of mothers are of special interest: The first are mothers that most likely benefit from the reform and are now less inclined to quickly return to the labor market (treatment group). The second are mothers who were most likely not affected by the new parental leave reform (control group) – namely those mothers with equal benefits under the old system. Our analysis shows that mothers who were most likely affected by the new reform (treatment group) show higher breastfeeding rates for at least four months after childbirth whereas mothers in the control group did not change their breastfeeding behavior after the reform. As expected, we do not find any effects of the new parental leave regulation on breastfeeding initiation for the treated but an increase in breastfeeding for at least four month. However, we do not find an increase in mothers who breastfeed their children for at least six months due to the reform. We observe no significant changes in breastfeeding behavior (initiation or duration) among the mothers in the control group. In addition, a fictitious reform in 2006 had no effects on breastfeeding in the placebo regression confirming that breastfeeding behavior does not differ in the absence of a policy intervention. Various model specifications show that the results are very robust when we control for other potential mechanisms which might explain an increase in the rates of mothers who breastfeed for at least four months.

Contribution

Given the goals of the German parental leave benefit reform, our results show that the reform was successful in the sense that parents with very young children were given the financial resources to interrupt work and take care for their very young child in the first year when the bonding between parents and their children is of particular importance. It is important to point out that these benefits of the reform have their costs. There are direct costs for the tax payers as the increase in the parental leave benefit have to be financed. Furthermore, there might be additional opportunity costs, for mothers who enter the labor market later.

4.4 Integrating the Findings into Discourses

One of the goals of the new reform was to financially support parents taking care of their particular young child during the first year of life in order to lower the pressure to return quickly to the labor market (Bujard 2013; Deutscher Bundestag 2006). Previous research has shown that more parents (mostly mothers) stay at home longer during the first year of their child's life (Kluve & Tamm 2013; Spiess & Wrohlich 2008; Wrohlich et al. 2012). Our findings show that those women who benefit from the reform use this time for breastfeeding their children longer. We are able to show that the most recent parental leave reform not only impacted maternal employment during the first year of their child's life but also impacted on breastfeeding duration.

To the best of my knowledge, this paper is the first to address the conflict between maternal employment and breastfeeding in the context of Germany. Despite the positive impact of the parental leave reform on breastfeeding duration among mothers who benefited from it, those who did not are also of importance. Mothers with a low socio-economic status are often found to have lower breastfeeding initiation rates as well as shorter breastfeeding durations. These mothers have a higher probability to be in our control group. They and their children, who are already more vulnerable to social and health inequalities, are put at a disadvantage, for example, with respect to potential positive health effects of breastfeeding. It is still an open question how those women can be targeted effectively to promote breastfeeding duration (Kohlhuber et al. 2008).

5. Discussion and Conclusion

We all face decisions every day. The choice of one option is also the decision against another option. The period of time within a person's life course where decisions may cause especially high "combination stress" is the so called rush hour of life. In this short period family formation and career establishment need to be balanced at the same time. Both domains demand high attention and are highly time consuming.

Time is a scarce good. And it is especially scarce in the rush hour. My dissertation examines decisions people make while they are in this rush hour. It addresses three general questions.

1. Why do people behave the way they do in a given institutional setting?

The first paper is about this issue and focuses on the question how the field of education impacts on the transition to parenthood within the context of Western Germany. While the level of education is usually used to operationalize income potential and opportunity costs, I analyze the impact of another dimension of education: the field. Educational fields differ with regard to expected compatibility of family and employment as well as expected reliability of the employment career. Both factors impact on the opportunity costs of children.

The findings provide interesting insights: the field of education matters for the transition to parenthood, but only for women not men in Western Germany. My findings indicate that the relationship between educational fields and transition to parenthood is influenced by an unobserved factor, such as preferences or personality traits. This factor is often assumed in the literature, my findings provide empirical support for this.

2. How does peoples' behavior differ in different institutional settings?

Social situations (Esser 1999a, p. 91 et seqq.) impact on individuals and the opportunity costs of children. The social situation of fertility decisions is determined among other things by the institutional settings and family policies in a country. The second paper presents results for Western Germany and provides a comparative

perspective on them: with regard to trends over time, with regard to Eastern Germany as well as international findings. In comparison with Sweden, Austria and Greece some differences are observed, but the similarities are more remarkable: The patterns are quite similar across the countries, despite the strong institutional differences. Especially the finding of care-related fields to be associated with low childlessness is observed in all countries. This supports the finding from the first paper of the role of preferences that are independent from the institutional setting further.

3. How is peoples' behavior affected by a particular change in the institutional setting?

The similarities observed in the second paper, raise the question of the impact of family policy on familial behavior. In the third paper I examine this question further – together with my co-authors. We examine if the most recent parental leave benefit reform impacted on breastfeeding behavior and how. In contrast to fertility behavior this question can be examined so soon after the reform took place in 2007. The reform aimed at lowering the pressure to return to the labor market early on after childbirth. It therefore reduces the opportunity costs of staying at home and taking care of the newborn child instead of spending time with gainful employment. A possible time conflict between breastfeeding and employment should therefore also be reduced. The findings do indeed show an effect of the reform: the share of mothers who breastfeed for at least four month is increased due to the reform. It shows that measures of family policy influencing the opportunity costs of children are able to impact on the behavior of people who are in the rush hour of life.

My dissertation contributes to research on the relationship between education and fertility. It adds to the knowledge on the relationship between field of education and fertility and disentangles influencing factors. It shows that it is worthwhile to analyze women and men separately and indicates the strong influence of preferences in the relationship between education and fertility. Western Germany is added to the list of countries comparable data are available showing remarkable similarities across different family policy regimes.

My dissertation contributes to research on the impact of family policy, especially the effects of parental leave benefits. This is done by showing an impact of the most recent parental leave reform in Germany on breastfeeding behavior. We are able to show that women who benefit from this reform use the time gained for longer breastfeeding duration.

My dissertation provides some answers. At the same time further questions are raised that are worthy of future research. These questions are discussed at the end of each paper; only two more general questions shall be highlighted here:

In order to reduce complexity, papers one and two treat fertility decisions as decisions made by an individual. It has been repeatedly pointed out by researchers that a partnership is the prerequisite for fertility decisions. Research on partnerships has often shown how important education is in the formation as well as maintaining of a partnership. Against this background the question arises how the choice of an educational field structurally impacts on a person's partner market.

Paper one examines men's transition to parenthood. The findings imply that the field does not matter for men's fertility in Western Germany. The question arises whether this finding is specific for this particular context or is also found in societies with more emphasis on gender equality like Scandinavian countries. To the best of my knowledge, studies from these countries have only considered women so far.

All three papers of my dissertation follow the approach of the economic theory of the family, which has been a fruitful framework for examining the specific research questions of each paper. My dissertation follows an empirical-analytical approach and applies quantitative methods of social sciences. This enabled me to disentangle effects and identify mechanisms. This in turn enabled me to formulate justified statements on the relationship between family policy, education, fertility and breastfeeding. The contribution of my dissertation will not only be judged by its contribution to existing knowledge. It will be judged by the extent to which it inspires further research on the issues addressed and the methods applied.

Table 1: Overview of the Papers

	Paper 1	Paper 2	Paper 3
Title	Exploring the Relationship between Educational Field and Transition to Parenthood – An Analysis of Women and Men in Western Germany ⁴	Educational Fields and Fertility in Western Germany – An Analysis of Women born 1955-59 with the Mikrozensus 2008	Parental Leave Benefits and Breastfeeding in Germany – Effects of the 2007 Reform
Author(s)	Anja Oppermann	Anja Oppermann	Anita Kottwitz, Anja Oppermann and C. Katharina Spiess ⁵
Status of publication	Conditionally accepted by "European Sociological Review" in May 2014 (submitted: October 2012, resubmitted: September 2013, May 2014) ⁶	submitted to "European Journal of Population" in May 2014	submitted to "Demography" in May 2014
Research Question	How does the educational field influence the transition to parenthood of women and men in Western Germany?	How is the relationship between educational field, educational level, childlessness, and ultimate fertility among Western German women, born between 1955 and 1959? What similarities and differences are found comparing the connection of education and fertility in different institutional settings?	Does the new parental leave reform impact breastfeeding initiation and duration in Germany?
Data	SOEP 1984-2010	Mikrozensus 2008	SOEP 2002-2012
Methods	discrete time event history analysis, multi-level analysis, simultaneous equations	descriptive graphical analysis (scatterplots); two way analysis of variance	logistic regressions, Difference-in-Difference; placebo-regressions, GIS-analysis

⁴ A previous version of this paper received the "Joachim R. Frick Memorial Prize 2012 for the best paper presented at the 10th International German Socio - Economic Panel User Conference".

⁵ The authors agreed on the following: The idea of the article was developed collaboratively. The majority of work was conducted by Anita Kottwitz and Anja Oppermann (jointly 80%). Both contributed equally to the article and took part in each single task (such as literature research and review, data analysis, writing, revision). Katharina Spiess contributed with her extensive knowledge on research on the issues addressed in the paper, and wrote some paragraphs of the paper. Each author discussed and revised the article several times (declaration according to Prüfungsordnung 2008, §8).

⁶ A previous and shortended version of this paper was published in Schmollers Jahrbuch, Zeitschrift für Wirtschafts- und Sozialwissenschaften (2013) 133 (2), 287-297

References

- Anderson, J. W., Johnstone, B. M., & Remley, D. T. (1999). Breast-feeding and cognitive development: a meta-analysis. *The American Journal of Clinical Nutrition*, 70(4), 525–535.
- Bagavos, C. (2010). Education and childlessness: the relationship between educational field, educational level, employment and childlessness among Greek women born in 1955-1959. *Vienna Yearbook of Population Research*, 8, 51–75. doi:10.1553/populationyearbook2010s51
- Baker, M., & Milligan, K. (2008a). How Does Job-Protected Maternity Leave Affect Mothers' Employment? *Journal of Labor Economics*, 26(4), 655–691.
- Baker, M., & Milligan, K. (2008b). Maternal employment, breastfeeding, and health: evidence from maternity leave mandates. *Journal of Health Economics*, 27(4), 871–87.
- Baker, M., & Milligan, K. (2010). Evidence from Maternity Leave Expansions of the Impact of Maternal Care on Early Child Development. *Journal of Human Resources*, 45(1), 1–32.
- Becker, G. S. (1960). An Economic Analysis of Fertility. In National Bureau of Economic Research (Ed.), *Demographic and Economic Change in Developed Countries* (pp. 209–231). Princeton: Princeton University Press.
- Becker, G. S. (1965). A Theory of the Allocation of Time. *The Economic Journal*, 75(299), 493–517.
- Becker, G. S. (1982). *Der ökonomische Ansatz zur Erklärung menschlichen Verhaltens, Übersetzung*. (M. Vanberg, V. J. Vanberg, & V. von J. M. P. Siebeck, Trans.). Tübingen: J.C.B. Mohr.
- Becker, G. S. (1994). *A treatise on the family. Enlarged Edition* (3rd ed.). Cambridge, Massachusetts, London, England: Harvard University Press.
- Becker, G. S. (2003). Die Bedeutung der Humanvermögensbildung in der Familie für die Zukunft von Wirtschaft und Gesellschaft. In C. Leipert (Ed.), *Demographie und Wohlstand* (pp. 89–102). Opladen: VS Verlag für Sozialwissenschaften.
- Begall, K., & Mills, M. C. (2013). The Influence of Educational Field, Occupation, and Occupational Sex Segregation on Fertility in the Netherlands. *European Sociological Review*, 29(4), 720–742.
- Belfield, C. R., & Kelly, I. R. (2012). The Benefits of Breast Feeding across the Early Years of Childhood. *Journal of Human Capital*, 6(3), 251–277.
- Berger, L. M., Hill, J., & Waldfogel, J. (2005). Maternity leave, early maternal employment and child health and development in the US. *Economic Journal*, 115(501), F29–F47.
- Bertram, H., Bujard, M., & Rösler, W. (2011). Rush-hour des Lebens: Geburtenaufschub, Einkommensverläufe und familienpolitische Perspektiven. *Journal für Reproduktionsmedizin und Endokrinologie-Journal of Reproductive Medicine and Endocrinology*, 8(2), 91–99.
- Bick, D. E., MacArthur, C., & Lancashire, R. J. (1998). What influences the uptake and early cessation of breast feeding? *Midwifery*, 14(4), 242–247.

- Bittman, M., & Wajcman, J. (2000). The Rush Hour: The Character of Leisure Time and Gender Equity. *Social Forces*, 79(1), 165–195.
- Blossfeld, H.-P., & Huinink, J. (1991). Human Capital Investments or Norms of Role Transition? How Women's Schooling and Career Affect the Process of Family Formation. *American Journal of Sociology*, 97(1), 143–168.
- Blossfeld, H.-P., & Timm, A. (1997). Der Einfluß des Bildungssystems auf den Heiratsmarkt. Eine Längsschnittanalyse der Wahl von Heiratspartnern im Lebenslauf. *Kölner Zeitschrift für Soziologie und Sozialpsychologie*. 49(3), 440–476.
- BMFSFJ. (2006). *Siebter Familienbericht. Familie zwischen Flexibilität und Verlässlichkeit. Perspektiven für eine lebenslaufbezogene Familienpolitik*. Berlin. Retrieved January 20, 2014, from http://www.bmfsfj.de/doku/Publikationen/familienbericht/download/familienbericht_gesamt.pdf
- Borra, C., Iacovou, M., & Sevilla, A. (2012). The effect of breastfeeding on children's cognitive and noncognitive development. *Labour Economics*, 19(4), 496–515.
- Bovenberg, A. L. (2008). The Life-course Perspective and Social Policies: An Overview of the Issues. *CESifo Economic Studies*, 54(4), 593–641.
- Brewster, K. L., & Rindfuss, R. R. (2000). Fertility and women's employment in industrialized nations. *Annual Review of Sociology*, 26, 271–296.
- Brüderl, J. (2006). Was kann familiensoziologische Theorie? Korreferat zum Beitrag von Günter Burkart. *Zeitschrift für Familienforschung - Journal of Family Research*, 18(2).
- Brüderl, J., Diekmann, A., & Engelhardt, H. (1997). Erhöht eine Probeehe das Scheidungsrisiko? Eine empirische Untersuchung mit dem Familiensurvey. *Kölner Zeitschrift für Soziologie und Sozialpsychologie*, 49, 205–222.
- Brüderl, J., & Kalter, F. (2001). The dissolution of marriages: The role of information and marital-specific capital. *The Journal of Mathematical Sociology*, 25(4), 403–421.
- Brüderl, J., & Klein, T. (1993). Bildung und Familiengründungsprozeß deutscher Frauen: Humankapital- und Institutioneneffekt. In A. Diekmann & S. Weick (Eds.), *Der Familienzyklus als sozialer Prozeß: bevölkerungssoziologische Untersuchungen mit den Methoden der Ereignisanalyse* (pp. 194–215). Berlin: Duncker & Humblot.
- Buber, I., Panova, R., & Dorbritz, J. (2012). Fertility intentions of highly educated men and women and the rush hour of life. *VID Working Papers, Vienna Institute of Demography*. Retrieved January 20, 2014, from http://www.iussp.org/sites/default/files/event_call_for_papers/Extended%20abstract%20IUSSP%20Buber.pdf
- Bujard, M. (2012). Zeit für Familie. Die Rush-Hour des Lebens entzerren. *Stimme der Familie*, 59(2), 9–13.
- Bujard, M. (2013). Elterngeld und Elternzeit in Deutschland: Ziele, Diskurse und Wirkungen. *Zeitschrift für Familienforschung*, 25(3), 123–131.
- Bundesagentur für Arbeit (BA). (2011a). Klassifikation der Berufe 2010 - Band 1: Systematischer und alphabetischer Teil mit Erläuterungen. Retrieved June 3, 2012, from <http://statistik.arbeitsagentur.de/Statischer-Content/Grundlagen/Klassifikation-der-Berufe/KldB2010/Printausgabe-KldB-2010/Generische-Publikationen/KldB2010-Printversion-Band1.pdf>

- Bundesagentur für Arbeit (BA). (2011b). Klassifikation der Berufe 2010 - Band 2: Definitiver und beschreibender Teil. Retrieved June 3, 2012, from <http://statistik.arbeitsagentur.de/Statischer-Content/Grundlagen/Klassifikation-der-Berufe/KldB2010/Printausgabe-KldB-2010/Generische-Publikationen/KldB2010-Printversion-Band2.pdf>
- Carneiro, P., Loken, K. V., & Salvanes, K. G. (2011). *A Flying Start? Maternity Leave Benefits and Long Run Outcomes of Children*. Institute for the Study of Labor (IZA).
- Chatterji, P., & Frick, K. (2005). Does Returning to Work After Childbirth Affect Breastfeeding Practices? *Review of Economics of the Household*, 3(3), 315–335.
- Coleman, J. S. (1994). *Foundations of Social Theory*. Harvard University Press.
- Del Bono, E., & Rabe, B. (2012). *Breastfeeding and child cognitive outcomes: evidence from a hospital-based breastfeeding support policy*. Institute for Social and Economic Research. Retrieved January 27, 2014, from <http://ideas.repec.org/p/ese/iserwp/2012-29.html>
- Deutscher Bundestag. (2006). Entwurf eines Gesetzes zur Einführung des Elterngeldes. *Bundestags-Drucksache*, 16/1889, 20 June 2006.
- Dorbritz, J. (2008). Germany: Family diversity with low actual and desired fertility. *Demographic Research*, 19, 557–597.
- Dulon, M., Kersting, M., & Schach, S. (2001). Duration of breastfeeding and associated factors in Western and Eastern Germany. *Acta Paediatrica*, 90(8), 931–935.
- Dustmann, C., & Schönberg, U. (2012). Expansions in Maternity Leave Coverage and Children's Long-Term Outcomes. *American Economic Journal: Applied Economics*, 4(3), 190–224.
- Edwards, W. (1954). The theory of decision making. *Psychological Bulletin*, 51(4), 380–417.
- Esser, H. (1999a). *Soziologie: Allgemeine Grundlagen* (3rd ed.). Frankfurt a. M. / New York: Campus.
- Esser, H. (1999b). *Soziologie. Spezielle Grundlagen: Bd. 1. Situationslogik und Handeln*. Frankfurt a. M.: Campus.
- Frejka, T. (2008). Parity distribution and completed family size in Europe: Incipient decline of the two-child family model? *Demographic Research*, 19(14), 47–72.
- Haisken-DeNew, John P., & Hahn, M. H. (2006). PanelWhiz: a flexible modularized stata interface for accessing large scale panel data sets. Retrieved June 3, 2012, from <http://www.panelwhiz.eu/>
- Hank, K. (2003). Eine Mehrebenenanalyse regionaler Einflüsse auf die Familiengründung westdeutscher Frauen in den Jahren 1984 bis 1999. *Kölner Zeitschrift für Soziologie & Sozialpsychologie*, 55(1), 79–98.
- Hill, P. B., & Kopp, J. (1999). Nichteheliche Lebensgemeinschaften - theoretische Aspekte zur Wahl von Lebensformen. In T. Klein & W. Lauterbach (Eds.), *Nichteheliche Lebensgemeinschaften Analysen zum Wandel partnerschaftlicher Lebensformen*. Opladen: Leske + Budrich.

- Hoem, J. M., Neyer, G., & Andersson, G. (2006a). Education and childlessness - The relationship between educational field, educational level, and childlessness among Swedish women born in 1955-59. *Demographic Research*, *14*, 331–380.
- Hoem, J. M., Neyer, G., & Andersson, G. (2006b). Educational attainment and ultimate fertility among Swedish women born in 1955-59. *Demographic Research*, *14*, 381–403.
- Hox, J. J. (2010). *Multilevel Analysis: Techniques and Applications* (New.). New York, Hove: Taylor & Francis.
- Huang, R., & Yang, M. (2014). Paid Maternity Leave and Breastfeeding Practice Before and After California's Implementation of the Nation's First Paid Family Leave Program. *Economics & Human Biology*. doi:10.1016/j.ehb.2013.12.009
- Kersting, M., & Dulon, M. (2002). Fakten zum Stillen in Deutschland. *Monatsschrift Kinderheilkunde*, *150*(10), 1196–1201.
- Kimbro, R. (2006). On-the-Job Moms: Work and Breastfeeding Initiation and Duration for a Sample of Low-Income Women. *Maternal and Child Health Journal*, *10*(1), 19–26.
- Klein, T. (1993). Bildungsexpansion und Geburtenrückgang: Eine kohortenbezogene Analyse zum Einfluß veränderter Bildungsbeteiligung auf die Geburt von Kindern im Lebensverlauf. In A. Diekmann & S. Weick (Eds.), *Der Familienzyklus als sozialer Prozeß: bevölkerungssoziologische Untersuchungen mit den Methoden der Ereignisanalyse* (1st ed., pp. 285–307). Berlin: Duncker & Humblot.
- Klein, T. (2003). Die Geburt von Kindern in paarbezogener Perspektive. (German). *Zeitschrift für Soziologie*, *32*(6), 506–527.
- Kluge, J., & Tamm, M. (2013). Parental leave regulations, mothers' labor force attachment and fathers' childcare involvement: evidence from a natural experiment. *Journal of Population Economics*, *26*(3), 983–1005.
- Kohlhuber, M., Rebhan, B., Schwegler, U., Koletzko, B., & Fromme, H. (2008). Breastfeeding rates and duration in Germany: a Bavarian cohort study. *British Journal of Nutrition*, *99*(05), 1127–1132.
- Kopp, J. (2002). *Geburtenentwicklung und Fertilitätsverhalten: theoretische Modellierungen und empirische Erklärungsansätze*. UVK-Verlag-Ges.
- Kravdal, Ø. (2001). The High Fertility of College Educated Women in Norway. *Demographic Research*, *5*, 187–216.
- Kravdal, Ø. (2007). Effects of current education on second-and third-birth rates among Norwegian women and men born in 1964: Substantive interpretations and methodological issues. *Demographic Research*, *Volume 17*, *17*(9), 211.
- Kravdal, Ø., & Rindfuss, R. R. (2008). Changing Relationships between Education and Fertility: A Study of Women and Men Born 1940 to 1964. *American Sociological Review*, *73*(5), 854–873.
- Kreyenfeld, M. (2002). Time Squeeze, Partner Effect or Self-Selection? *Demographic Research*, *7*, 15–48.

- Kreyenfeld, M. (2004). Fertility Decisions in the FRG and GDR: An Analysis with Data from the German Fertility and Family Survey. *Demographic Research, Special 3*, 275–318.
- Kreyenfeld, M. (2010). Uncertainties in Female Employment Careers and the Postponement of Parenthood in Germany. *European Sociological Review*, 26(3), 351–366.
- Kreyenfeld, M., & Konietzka, D. (2008). Education and Fertility in Germany. In I. Hamm, H. Seitz, & M. Werding (Eds.), *Demographic change in Germany: the economic and fiscal consequences* (pp. 165–187). Berlin: Springer.
- Lalive, R., & Zweimüller, J. (2009). How Does Parental Leave Affect Fertility and Return to Work? Evidence from Two Natural Experiments. *The Quarterly Journal of Economics*, 124(3), 1363–1402.
- Lange, C., Schenk, L., & Bergmann, R. (2007). Verbreitung, Dauer und zeitlicher Trend des Stillens in Deutschland. *Bundesgesundheitsblatt - Gesundheitsforschung - Gesundheitsschutz*, 50(5-6), 624–633.
- Lappegård, T., & Rønsen, M. (2005). The multifaceted impact of education on entry into motherhood. *European Journal of Population / Revue Europeenne De Demographie*, 21(1), 31–49.
- Leibenstein, H. (1957). *Economic backwardness and economic growth*. New York: Wiley.
- Leibenstein, H. (1974). An Interpretation of the Economic Theory of Fertility: Promising Path or Blind Alley? *Journal of Economic Literature*, 12(2), 457–479.
- Liefbroer, A. C., & Corijn, M. (1999). Who, what, where, and when? Specifying the impact of educational attainment and labour force participation on family formation. *European Journal of Population / Revue Europeenne De Demographie*, 15(1), 45–75.
- Lillard, L. A., & Panis, C. W. (2003). *aML Multilevel Multiprocess Statistical*. Los Angeles, California.
- Lindberg, L. D. (1996). Women's Decisions about Breastfeeding and Maternal Employment. *Journal of Marriage and Family*, 58(1), 239–251.
- Lindenberg, S. (1989). Social Production Functions, Deficits, and Social Revolutions Prerevolutionary France and Russia. *Rationality and Society*, 1(1), 51–77.
- Lindenberg, S., & Frey, B. S. (1993). Alternatives, Frames, and Relative Prices: A Broader View of Rational Choice Theory. *Acta Sociologica*, 36(3), 191–205.
- Liu, Q., & Skans Oskar, N. (2010). The Duration of Paid Parental Leave and Children's Scholastic Performance. *The B.E. Journal of Economic Analysis & Policy*, 10(1), 1–35.
- Martín-García, T. (2009). Bring Men Back In: A Re-examination of the Impact of Type of Education and Educational Enrolment on First Births in Spain. *European Sociological Review*, 25(2), 199–213.
- Martín-García, T., & Baizán, P. (2006). The impact of the type of education and of educational enrolment on first births. *European Sociological Review*, 22(3), 259–275.

- McCrary, C., & Layte, R. (2012). Breastfeeding and risk of overweight and obesity at nine-years of age. *Social Science & Medicine*, 75(2), 323–330.
- Michelmores, K., & Musick, K. (2013). Fertility patterns of college graduates by field of study, US women born 1960–79. *Population Studies: A Journal of Demography* doi:10.1080/00324728.2013.847971.
- Mills, M., Rindfuss, R. R., McDonald, P., & Velde, E. te. (2011). Why do people postpone parenthood? Reasons and social policy incentives. *Human Reproduction Update*, 17(6), 848–860.
- Mincer, J. (1963). Market Prices, Opportunity Costs, and Income Effects. In C. F. Christ (Ed.), *Measurement in Economics. Studies in Mathematical Economics in Memory of Yehuda Grunfeld*. (pp. 67–82). Stanford: Stanford University Press.
- Nauck, B. (2007). Value of Children and the Framing of Fertility: Results from a Cross-cultural Comparative Survey in 10 Societies. *European Sociological Review*, 23(5), 615–629.
- Nauck, B., & Klaus, D. (2007). The Varying Value of Children Empirical Results from Eleven Societies in Asia, Africa and Europe. *Current Sociology*, 55(4), 487–503.
- Neyer, G., & Hoem, J. M. (2008). Education and permanent childlessness: Austria vs. Sweden; a research note. In Surkyn, J., Deboosere, P., & Van Bavel, J (Eds.), *Demographic Challenges for the 21st Century: a State of the Art in Demography; Conference Organized as a Tribute to the Continuing Endeavours of Prof. Dr. Em. Ron Lesthaeghe in the Field of Demography*. Brussels: VUBPRESS.
- Ogbuanu, C., Glover, S., Probst, J., Liu, J. H., & Hussey, J. (2011). The Effect of Maternity Leave Length and Time of Return to Work on Breastfeeding. *Pediatrics*, 127(6), E1414–E1427.
- Rasmussen, A. W. (2010). Increasing the length of parents' birth-related leave: The effect on children's long-term educational outcomes. *Labour Economics*, 17(1), 91–100.
- Rege, M., & Solli, I. F. (2013). The Impact of Paternity Leave on Fathers' Future Earnings. *Demography*, 50(6), 2255–2277.
- Roe, B., Whittington, L. A., Fein, S. B., & Teisl, M. F. (1999). Is there competition between breast-feeding and maternal employment? *Demography*, 36(2), 157–171.
- Rønsen, M., & Skrede, K. (2010). Can public policies sustain fertility in the Nordic countries? Lessons from the past and questions for the future. *Demographic Research*, 22, 321–346.
- Rubin, D. (2013). Stillen in Deutschland. *Ernährung im Fokus*, 2013(7-8), 200–205.
- Ruhm, C. J. (2000). Parental leave and child health. *Journal of Health Economics*, 19(6), 931–960.
- Savage, L. J. (1972). *The foundations of statistics* (iBook, published 29.08.2012.). New York: Dover Publications.
- Schmitt, C. (2005). Kinderlosigkeit bei Männern - Geschlechtsspezifische Determinanten ausbleibender Elternschaft. In A. Tölke & K. Hank (Eds.), *Männer - Das „vernachlässigte“ Geschlecht in der Familienforschung* (pp. 18–43). Wiesbaden: VS Verlag für Sozialwissenschaften.

- Schmitt, C. (2012). Labour market integration, occupational uncertainties, and fertility choices in Germany and the UK. *Demographic Research*, 26, 253–292.
- Smith, J., & Ellwood, M. (2011). Feeding Patterns and Emotional Care in Breastfed Infants. *Social Indicators Research*, 101(2), 227–231.
- Spiess, C. K. (2011). Ever-Increasing Opportunities for Child-Related Research with the German Socio-Economic Panel (SOEP) Study. *LIFE Research School Newsletter. Max Planck Institute for Human Development*, 5(1), 2–5.
- Spiess, C. K., & Wrohlich, K. (2008). The Parental Leave Benefit Reform in Germany: Costs and Labour Market Outcomes of Moving towards the Nordic Model. *Population Research and Policy Review*, 27(5), 575–591.
- Tanaka, S. (2005). Parental leave and child health across OECD countries*. *The Economic Journal*, 115(501), F7–F28.
- Tesching, K. (2012). *Education and fertility: dynamic interrelations between women's educational level, educational field and fertility in Sweden*. Stockholm: Acta Universitatis Stockholmiensis. Retrieved February 15, 2012, from <http://urn.kb.se/resolve?urn=urn:nbn:se:su:diva-63761>
- Tölke, A., & Diewald, M. (2003). Insecurities in employment and occupational careers and their impact on the transition to fatherhood in Western Germany. *Demographic Research*, 9, 41–68.
- Van Bavel, J. (2010). Choice of Study Discipline and the Postponement of Motherhood in Europe: The Impact of Expected Earnings, Gender Composition, and Family Attitudes. *Demography*, 47(2), 439–458.
- Visness, C. M., & Kennedy, K. I. (1997). Maternal employment and breast-feeding: findings from the 1988 National Maternal and Infant Health Survey. *American Journal of Public Health*, 87(6), 945–950.
- Wagner, G. G., Frick, J. R., & Schupp, J. (2007). The German Socio-Economic Panel Study (SOEP) – Scope, Evolution and Enhancements. *Schmollers Jahrbuch – Zeitschrift für Wirtschafts- und Sozialwissenschaften*, 127(1), 139–169.
- Waldfogel, J., Han, W.-J., & Brooks-Gunn, J. (2002). The Effects of Early Maternal Employment on Child Cognitive Development. *Demography*, 39(2), 369–392.
- Wrohlich, K., Berger, E. M., Geyer, J., Haan, P., Sengül, D., Spiess, C. K., & Thiemann, A. (2012). *Elterngeld Monitor: Endbericht; Forschungsprojekt im Auftrag des Bundesministeriums für Familie, Senioren, Frauen und Jugend*. Berlin: DIW Berlin. Retrieved January 27, 2014, from http://nbn-resolving.de/urn:nbn:de:0084-diwkompakt_2012-0611
- Yamaguchi, K. (1991). *Event History Analysis*. Newbury Park, London, New Delhi: Sage Publications (CA).

Paper 1

Exploring the Relationship between Educational Field and Transition to Parenthood

—

An Analysis of Women and Men in Western Germany

Abstract

The already extensive existing research on the relationship between educational attainment and fertility behavior has been expanded by a new dimension: the field of education. The question this paper aims to answer is: How does the educational field influence the transition to parenthood of women and men in Western Germany? Using data from the German Socio-Economic Panel (1984-2010), discrete time event history models are applied looking at the time after graduation up until a first child is born. The results show that educational fields matter for the transition to parenthood only for women and not for men. However, they do point at the importance of the educational level for the probability of men to become fathers. High transition rates are found among women educated in both female-dominated and male-dominated fields while low rates are found among women educated in public-sector fields. Further analysis implies that the relationship between women's educational field and their transition to parenthood is partly caused by an underlying set of person-specific preferences.

Acknowledgements

The author is very grateful for helpful comments from Johannes Huinink, Karsten Hank, Marita Jacob, Katharina Maul, Gerrit Bauer, Pia Schober, the editor of European Sociological Review Melinda Mills, and three anonymous reviewers. A special thanks goes to DIW Berlin, Henning Lohmann, and Peter Krause for their expertise and support in allowing access to the SOEP data on the field of education.

1. Introduction

The connection between education and fertility is a prevailing theme in public discussion and scholarly research (e.g., Blossfeld & Huinink 1991; Brewster & Rindfuss 2000; Kravdal & Rindfuss 2008). Most studies focus on the level of education. A new approach to examining this connection is the distinction between an individual's educational level and their educational field (e.g., Begall & Mills 2013; Hoem, Neyer, & Andersson 2006a; Lappegård & Rønsen 2005; Martín-García & Baizán 2006; Van Bavel 2010). The field of education not only determines many opportunities in the labor market, but also is indicative of personality traits, preferences, and socialization. It is therefore of importance when analyzing fertility behavior, such as the transition to parenthood or the number of children.

Germany is a low-fertility country with one of the highest rates of childlessness worldwide (Dorbritz 2008). The strong relationship between educational attainment and fertility is shown in many empirical analyses conducted in Germany (e.g., Blossfeld & Huinink 1991; Brüderl & Klein 1993; Kreyenfeld & Konietzka 2008). Yet, it has so far escaped scholarly attention using the analytical framework supplied by the field of education approach¹. This paper contributes to the research on education and fertility by taking the field of education into account when examining the transition to parenthood.

Family behaviors like fertility are constantly found to differ between Eastern and Western Germany (Goldstein & Kreyenfeld 2011; Henz 2008; Kreyenfeld 2004). To ensure results of this analysis are not confounded by these differences, this paper focuses on Western Germany. The impact of education or employment insecurities on fertility behavior are not equal for women and men (Kravdal & Rindfuss 2008; Kreyenfeld 2010; Schmitt 2012; Tölke & Diewald 2003) and little is known about the impact of educational fields on men's fertility decisions other than that it most likely differs from the impact on women (Martín-García 2009). The question this paper aims to answer is: How does the educational field influence the transition to parenthood of women and men in Western Germany?

¹ Maul (2012) examines the relationship between actual occupational field and family formation, but not educational field.

2. Theoretical Background

Much research has addressed the relationship between educational level and fertility (e.g., Becker 1994; Blossfeld & Huinink 1991; Brüderl & Klein 1993; Kravdal & Rindfuss 2008; Liefbroer & Corijn 1999). An important extension to theoretical and empirical knowledge has been made by research that also considers the educational field and its relationship with fertility (Bagavos 2010; Begall & Mills 2013; Hoem et al. 2006a; Hoem, Neyer, & Andersson 2006b; Lappegård & Rønsen 2005; Martín-García & Baizán 2006; Martín-García 2009; Michelmore & Musick 2013; Rønsen & Skrede 2010; Tesching 2012; Van Bavel 2010). All studies have in common the assumption of a tight connection between educational attainment and labor market opportunities. For the educational level, three effects on fertility have been discussed repeatedly: a positive income effect (being able to bear the financial costs of children), a negative opportunity cost effect (missed income potential due to having a child), and an enrollment effect (the postponement of childbirth until after graduation). The field of education is assumed to be related to fertility as the working conditions a field leads to differ, for example with regard to job content, prospects of finding a job, job security, the probability of (reliable) public-sector employment, gender dominance, and “skill depreciation” (Hoem et al. 2006a). Additionally the field is an indicator for individual preferences and socialization (Begall & Mills 2013; Hoem et al. 2006a; Tesching 2012; Van Bavel 2010).

Four characteristics of educational fields and their relationship with fertility shall be presented in more detail here. The gender proportion in a field of education, the probability of part-time employment, the probability of public-sector employment for graduates of a certain field, and the occupational specificity of a field (i.e. how directly a particular education leads to a particular employment). In fields with a high share of women, more female role models are available for young women. Awareness for compatibility needs is higher in such an environment, leading to structures that enable a better compatibility due to more flexible working conditions with regard to working hours or exit and re-entry options, which should positively impact on fertility (Hoem et al. 2006a; Rønsen & Skrede 2010; Tesching 2012). Part-time employment enables parents to combine employment and childcare and therefore should positively impact on fertility (Hoem et al. 2006a; Martín-García & Baizán 2006; Rønsen & Skrede 2010). Public-sector employment provides higher job security than private-sector employment and should

facilitate the decision to have children (Hoem et al. 2006a; Rønsen & Skrede 2010). Finally, high occupational specificity should lead to a faster transition into a stable employment situation after graduation and also facilitate transition to parenthood (Hoem et al. 2006a). These four characteristics of educational fields and their relationship with fertility can be integrated into two factors: The factor compatibility is indicated by the share of women in a field and the probability to work part-time. The probability to work in the public sector and occupational specificity indicate the factor reliability.

In all studies analyzing the relationship between educational fields and fertility, ideas of self-selection and socialization processes are expressed: The selection of an educational field is an expression of preferences regarding the future lifestyle, such as the content of work or childbearing. Therefore, it might be that both the field of education and fertility depend on one underlying pattern of preferences or personality traits. Furthermore, the selection of a field of education might be an expression of anticipated working conditions and/or aspects of the compatibility of employment with parenthood. The selection of an educational field impacts on the social environment during education and adult life and this socialization also shapes a person's preferences (e.g., Begall & Mills 2013; Hoem et al. 2006a; Martín-García & Baizán 2006; Tesching 2012; Van Bavel 2010). The relationship between education and fertility therefore is assumed to be constitutive of “dynamically interactive processes that mutually determine each other” (Hoem et al. 2006b, p. 382).

In summary, it can be argued that three effects account for the relationship between educational fields and fertility. First: characteristics of educational fields that determine the compatibility of employment and parenthood. Second: characteristics of educational fields that determine the reliability of an employment career. And third: the moderating role of personal preferences, self-selection and socialization on the relationship between educational fields and fertility.

3. Previous Findings

All studies that take the educational field into account when analyzing fertility behavior find an effect of the educational field. The following remarks draw on findings for women². The strength of the association between field of education and fertility varies between countries. While in Sweden and Norway the field of education actually accounts for more differences in childlessness than the level (Hoem et al. 2006a; Rønsen & Skrede 2010), the impact is less pronounced in the Netherlands (Begall & Mills 2013). Findings are mixed with regard to common trends and patterns. Most studies find especially high fertility among women educated in teaching or health care (Bagavos 2010; Begall & Mills 2013; Hoem et al. 2006a; Lappegård & Rønsen 2005; Neyer & Hoem 2008; Tesching 2012).

Low childlessness is found among women educated in a field with an outstandingly high share of women in Sweden, Norway, Austria and Spain (Hoem et al. 2006a; Martín-García & Baizán 2006; Neyer & Hoem 2008; Rønsen & Skrede 2010). The share of women in a field is found to be negatively associated with postponement of motherhood across 21 European countries (Van Bavel 2010). Empirical evidence does not necessarily point to a linear relationship between the share of women in a field and childlessness (Michelmore & Musick 2013). Women educated in male-dominated fields have low childlessness in Sweden and Austria (Neyer & Hoem 2008). In Norway childlessness of women educated in male-dominated fields seems to be at a medium level (Rønsen & Skrede 2010), but university graduates in a male-dominated field initially have lowest first birth rates (Lappegård & Rønsen 2005).

The probability to work part-time for those educated in a specific field indicates compatibility of employment and parenthood, especially for women. This feature is usually discussed rather than measured (Hoem et al. 2006a; Martín-García & Baizán 2006; Rønsen & Skrede 2010; Tesching 2012). A high probability of public-sector employment is found to be associated with low childlessness in Norway (Rønsen &

² To the best of my knowledge, only Martín-García (2009) looks at the relationship between educational field and transition to parenthood for men. The results show an impact of the educational field that is just the opposite of earlier findings for women in Spain. Educational fields are grouped very broadly limiting comparability of these findings to other studies.

Skrede 2010). In Sweden childlessness is low among women educated in some public-sector field but not all of them (Hoem et al. 2006a). In Austria a negative relationship is found (Neyer & Hoem 2008).

High occupational specificity in a field lowers the risk of job-mismatch and leads to a shorter duration of job-search than fields with low occupational specificity (Klein 2011; Wolbers 2003). The evidence is ambiguous as to whether or not occupational specificity impacts on fertility. It has only been used to further distinguish fields with an equal share of men and women (gender-mixed fields). In Austria childlessness of women educated in fields with low occupational specificity is at an average level while it is high among those with high occupational specificity. In Sweden no such difference is found (Neyer & Hoem 2008) whilst in Norway, women educated in fields with high occupational specificity are the group with the highest share of childlessness (Rønsen & Skrede 2010).

The selection of an educational field and the transition to parenthood are both thought to be, at least partly, caused by an underlying person-specific pattern of preferences. Socialization during educational enrollment further impacts on these preferences. It has been shown that women educated in fields in which traditional family attitudes prevail are less likely to postpone the birth of a first child (Van Bavel 2010). Controlling for important occupational characteristics and the employment situation, Begall and Mills (2013) find an influence of the educational field on the transition to parenthood but not on higher order parity. Assuming the influence of socialization to be stable over the life course, Begall and Mills conclude from their findings that selection and socialization are jointly at work. Another approach to identify a person-specific set of preferences is applied by Tesching (2012). The transitions to first, second and third child are simultaneously estimated with the risk of attaining a degree in educational fields that have shown high levels of fertility and a common factor for unobserved preferences is identified.

The previous findings for women support the theoretical assumptions presented above. Fertility differences across educational fields are related to differences across fields with regard to compatibility of family and employment and to reliability of the employment career. Yet, the findings on the latter are less conclusive. Furthermore, the assumption that preferences, self-selection and socialization impact on the relationship between educational fields and fertility is also supported.

4. Hypotheses for Western German Women and Men

The theoretical considerations above are rather general and predominantly gender neutral. In order to formulate hypotheses for women and men, important aspects of the Western German context have to be considered.

Attitudes towards gender-roles, like labor force participation of mothers and preferences towards childcare for young children, are rather conservative in Western Germany (Pfau-Effinger & Smidt 2011; Pfau-Effinger 2012). German family policy traditionally emphasizes monetary support and provides structures that support the male-breadwinner model, such as taxation law or the lack of (full-time) day care (Dorbritz 2008; Gauthier 1996; Henz 2008). Childbirth is often followed by longer periods of maternal absence from the labor market (Dorbritz 2008, p. 590). While childlessness is high, especially among highly educated women, those women who do opt for children often have more than one child (Dorbritz 2008; Kreyenfeld & Konietzka 2008; Kreyenfeld 2002).

The German labor market is highly structured by educational attainment and occupation. The educational system in Germany is highly standardized, with an early tracking of students. Labor market qualifications are widely achieved by vocational education. A majority of school graduates enter vocational education, and only a small amount of students enter university (Hillmert & Jacob 2010; Hippach-Schneider, Krause, & Woll 2007; Shavit & Müller 2000). Compatibility of educational enrollment and childcare are limited as well as the possibility to reenter education – it is a common finding that childbirth is postponed until after graduation (e.g., Blossfeld & Huinink 1991; Kreyenfeld & Konietzka 2008; Kreyenfeld 2010).

Based on the theoretical considerations, the previous findings and the Western German context of my analysis, I expect to find that:

1. The field matters. I expect models examining the transition to parenthood that include the field of education to have a higher explanatory power than models that only include the level of education;
2. High compatibility positively impacts on women's but does not affect men's transition to parenthood. Compatibility of employment and childcare should increase a woman's probability to become a mother. Given the German context, compatibility should not matter as much for men as it does for women, therefore no effect of compatibility is expected. Compatibility is assumed to be indicated by a high share of women in an educational field or a high probability of working part-time for those educated in a specific field.
3. Reliability positively impacts on the transition to parenthood of women and men. For women, reliability should facilitate transition to parenthood due to an earlier career establishment, foreseeability and re-entry options. For men, the argument is based on their ability to fulfill the role of a reliable financial provider for their family. Nevertheless, it has to be kept in mind that income potential might be higher for some men in the private sector³. Reliability is assumed to be indicated by a field's probability to lead to employment in the public sector and by its occupational specificity.
4. The selection of an educational field and the relationship between educational fields and transition to parenthood is partly caused by a person-specific underlying pattern of preferences.

³ Employment in the public sector is a strong indicator for reliability (Bonin, Dohmen, Falk, Huffman, & Sunde 2007; Pfeifer 2011). It also influences possible income levels. In Germany men achieve a higher security of income when employed in the public than in the private sector, but at the same time this income is lower on average. The income of women benefits from public sector employment (Dustmann & Van Soest 1997; Jürges 2002; Melly 2005). Including the share of public sector employment among those educated in a specific educational field as an indicator for reliability comes at the cost of including parts of these income differences as well.

5. Data and Method

The data for this analysis come from the German Socio Economic Panel (1984-2010) (SOEP), which provides a database of very high quality that allows looking at the transition to a first birth across time (Wagner, Frick, & Schupp 2007). The data were partly extracted using the Add-On package PanelWhiz for Stata®⁴.

5.1 Educational Fields

The data on the field of education derive from annual person questionnaires, retrospective biography and gap questionnaires. They were classified using the Klassifikation der Berufe 2010 (KLdB2010) (Bundesagentur für Arbeit (BA) 2011a, 2011b), and coded on a two-digit level that contains thirty-seven categories. For a detailed description of the data situation and management, please see the online-appendix.

For each educational field in every year of the SOEP, the share of women, the share of public-sector employment, the occupational specificity, and the share of part-time employment was calculated. A minimum of ten observations per year and field are the prerequisite for calculation of a characteristic-value in this field/year. The cross-sectional weight provided by the SOEP is applied. The average values per field over the whole time of the SOEP are displayed in the appendix (Table 1a).

The sample for calculating the share of women within each field contains all respondents holding a degree in the field of education in the respective year. The share of public-sector employment compared to private-sector employment is restricted to employed respondents between 18 and 65. Occupational specificity is measured as share of people (employed, age 18 to 65) who report working in the occupation they are educated for. Women work part-time far more often than men and the share of people working part-time among graduates in a field is highly correlated to the share of women.

⁴ PanelWhiz (<http://www.PanelWhiz.eu>) was written by Dr. John P. Haisken-DeNew (john@PanelWhiz.eu). See Haisken-DeNew and Hahn (2006) for details. The PanelWhiz-generated DO file to retrieve the data used here is available from me upon request. Any data or computational errors in this paper are my own. The following authors supplied PanelWhiz Plugins used to ensure longitudinal consistency, John P. Haisken-DeNew, Markus Hahn.

Therefore the share of part-time employment was calculated separately for women and men.

5.2 Event History Models

The analysis sample consists of respondents who have completed vocational education in a known field. For the analysis, discrete time logit models are applied (Yamaguchi 1991). The dependent variable is transition to parenthood. Individuals leave the sample as soon as they become parents, females leave at age forty-five, and males at sixty, or when they are no longer observed by the SOEP⁵. 163 out of 2,544 women (6.4%) and 252 out of 3,018 men (8.3%) are excluded due to having had a child prior to graduation⁶. The female-sample contains 2,381 persons, 18.897 person-years, and 1,103 events (birth of a first child); the male-sample contains 2,766 persons, 24.579 person-years, and 995 events. Discrete time event history models require a time spell over which the transition rate to an event can be observed. Postponing childbirth until after educational enrollment is the common pattern in Western Germany, therefore the years since graduation are used as a time axis⁷. To model an increased probability of childbirth in the first years after graduation, the logarithm of the years since graduation is included.

The focus of this paper is on identifying an effect of the field of education that is separate from the influence of the level on the transition to parenthood. Using the years since graduation as time axis captures part of an effect of educational level on the timing of a first birth. Two variables control for educational level: Abitur vs. no Abitur and tertiary degree vs. vocational education. All models control for age at graduation, marital status, episodes of further educational enrollment, movement to Eastern Germany, migration background, the sample a respondent belongs to, and birth cohort. For further

⁵ The average duration of observation after graduation is 8.72 years for women and 8.82 years for men. Discrete time logit models with a dependent variable of leaving the sample without an event but before reaching the age of 45 for women and 65 for men give no indication that the findings are biased due to selective sample attrition.

⁶ Some educational fields might be more compatible with childbearing during educational enrollment or enable returning after interruptions better than others. Several discrete time logistic and multi-level logistic regressions are estimated to test for such a systematic exclusion. The results give no indication of differences in the probability of having a child by the time of graduation between the fields whatsoever.

⁷ All models were also calculated using age as a time axis, the results are available in the online appendix.

details, see Table 1. The models are un-weighted, in order to seek representativeness of the results, samples of the SOEP that are not representative are excluded, namely samples G and I.

Table 1: Variables and descriptive sample statistics for the discrete time Event History Analysis

variables	women M (SD)	men M (SD)
<u>dependent variable</u>		
birth of a first child 0 for all years no child is born 1 in the year a child is born <i>respondents leave the sample in the year after</i>	0.06	0.04
<u>(potentially) time varying variables</u>		
years since graduation year of graduation: 0	5.27 (4.48)	5.97 (5.3)
logarithm of years since graduation <i>as logarithm of 0 is not defined, 0 was recoded to 0, 1</i>	0.996 (1.48)	1.14 (1.47)
abitur 0 for respondents without abitur 1 for respondents with abitur	0.28	0.25
educational Level 0 for respondents with a vocational education 1 for respondents with a tertiary degree	0.17	0.19
married 0 for unmarried respondents 1 for married respondents	0.22	0.19
in education 0 for not in educational enrollment 1 for in education enrollment	0.09	0.11
move 0 for respondents living in Western Germany 1 for respondents living in Eastern Germany	0.007	0.006

Table 1 continued

<u>time constant variables</u>		
age at graduation	21.81 (3.62)	22.56 (4.39)
migration background	0.14	0.17
0 for respondents without migration background		
1 for those with a direct or indirect migration background		
cohort (%)		
1950-1959	2.27	4.77
1960-1969	33.39	38.21
1970-1979	39.77	37.53
1980-1989	24.57	19.49
sample (%)		
a	34.10	38.58
b	7.73	10.20
c	3.15	2.60
d	2.44	3.04
e	3.49	3.00
f	40.57	34.85
h	8.53	7.74
N (person-years)	18,897	24,579
N (persons)	2,381	2,766
N (events)	1,103	995

Data on 1170 women and 1191 men derive (at least partly) from retrospective information collected via biography questionnaires.

Source: SOEP 1984-2010, own calculations.

5.3 Simultaneous Estimations

The fourth hypothesis states that a person-specific underlying pattern of preferences jointly influences the selection of an education field and the transition to parenthood and therefore partly causes the relationship between educational fields and the transition to parenthood. The data prevent me from adequately controlling for employment status and occupation and to make inferences about underlying mechanisms. To avoid endogeneity effects, monthly information would be required and the event would be the conception of a child rather than childbirth (see Begall & Mills 2013). The information in the SOEP that were collected retrospectively only contain yearly information on employment status and multiple answers per year are possible; for example a person was employed and unemployed within one year.

To test the hypothesis, I apply a method proposed by Kravdal (2001), adapted by Kreyenfeld (2002) and similar to that used by Tesching (2012). Kreyenfeld simultaneously estimates the probability of having a first child in a probit model and an event history analysis of the transition to a second child. A common factor for unobserved

heterogeneity, that is the same for both models, is significant and interpreted as family proneness that influences both processes.

I adapt this approach to my hypothesis by jointly estimating a multinomial logit model of the probability of being educated in one group of fields rather than another with the event history model of transition to parenthood. I also add a common factor for unobserved heterogeneity to control for unobserved preferences that influence both results. This specific part of the analysis is carried out with aML 2.09 (Lillard & Panis 2003), while the other analysis and data preparation is performed in Stata 12.1.

6. Analysis

The first hypothesis predicts that the educational field matters for the transition to parenthood. In the second and third hypotheses expectations about how different characteristics of the educational fields should explain differences in transition rates are formulated. Additionally, it is assumed that a person-specific pattern of preferences is at least partly causing these differences. To test these hypotheses, several multivariate analyses are estimated for women and men separately.

Two strategies were applied to test for an impact of the educational field on the transition to parenthood. The first tests whether a model that includes the above-described control variables and dummy variables for educational fields (33 for women and 35 for men; Table 2a -5a in the Appendix) significantly improves due to these field dummies. Fields with fewer than five persons per field were excluded. A Wald-test and a likelihood-ratio test show significant improvement for the models for women (5% level), but not men. The second is a multi-level approach using the educational fields as level two units, modeling individuals nested in fields (Hox 2010). Confirming the previous findings, the multi-level models show a small but significant (0.1% level) variance in the transition rates to parenthood between women nested in different educational fields (Table 6a). No significant variance between men's transition rates to parenthood is observed (Table 7a).

The relationship between the share of women in an educational field, the probability of employment in the public sector and of part-time employment for those educated in a specific field, and the occupational specificity of a field and the transition to parenthood is analyzed. Table 1a shows that some distributions of the field characteristics are askew, and that the ranges differ considerably. Therefore, the field characteristics are included in the models as deviations from the median values calculated over all fields. The impact of the field characteristics is first explored separately. To avoid the limitations of multi-level models with regard to the number of level two indicators to be included in a model (Maas & Hox 2005), logistic regressions with clustered standard errors are estimated for this analysis (Moulton 1990) (Table 8a). The effect of the share of women appears to be u-shaped with high transition rates for women educated in male-dominated fields as well as fields with an outstandingly high share of women. The relationship between share of public-sector employment in a field and transition to parenthood is negative. Neither

occupational specificity nor share of women working part-time significantly influences the transition to parenthood. Besides the quadratic term for the share of women, no variable transformation or interactions provide further insight into the relationship between the characteristics of the educational field and the transition to parenthood for women. None of the field characteristics significantly impacts on men's transition to parenthood (Table 9a).

Based on these findings the educational fields are grouped by the share of women in a field and the probability to work in the public sector. The groups are defined by their stand-out characteristics, resulting in four groups and one residual group. Table 2 shows how the fields are assigned - the grouping criteria were determined by looking for gaps also with regard to the deviation from the median at the top and bottom of the respective distributions. Nine fields have outstanding values on both characteristics (eight have a high share of private-sector employment and a low share of women, one has a high share of public-sector employment and a low share of women), they are assigned according to the characteristic that differs most from the median. The groups were checked for internal homogeneity with regard to the dependent variable. This led to the reassignment of "protection, security and observation" from public-sector to male-dominated fields, "food production and processing" from private-sector to male-dominated fields and vice versa for "economics".

Table 2: The assignment of educational fields to five field groups and the number of observations for Event History Analysis

group characteristic (N women / N men)	fields of education (KldB 2010)
female-dominated fields share of women \geq 85% (568/96)	<ul style="list-style-type: none"> • textile and leather • non-medical health care, hygiene, wellness, medical technology • medical health care
male-dominated fields share of women \leq 40% (159/1722)	<ul style="list-style-type: none"> • agriculture, forestry • primary production, glass and ceramic • plastic production, woodworking • metal production and processing • machine and automotive engineering • mechatronics, energy, electronics • food production and processing • architecture and construction planning • construction above and below ground • interior fitting • building maintenance • geology, geography, environment protection • computer science, information and communication technology • transport and vehicle driving • protection, security, observation
public-sector fields public sector employment \geq 45% (458/177)	<ul style="list-style-type: none"> • law and administration • pedagogy and child care, social and home economics, theology • teaching and training • performing and entertainment
private-sector fields public sector employment \leq 15 % (573/379)	<ul style="list-style-type: none"> • paper and printing • technical research, development and construction • purchase, distribution, and trade • sales • tourism, hotel and restaurant • advertising, marketing, media • product design, arts and crafts • economics
non-distinctive attributes fields (623/392)	<ul style="list-style-type: none"> • gardening and floristry • mathematics, biology, chemistry, physics • transport and logistics (without driving) • cleaning • company management and organization • financial service, accountancy and tax advice • language, literature, humanities, social sciences

Source: SOEP 1984-2010, own calculations.

The results using the field-groups in the event history models confirm the previous findings (Table 3). Women educated in female-dominated fields have significantly higher transition rates to parenthood than women educated in the reference group “non-distinctive” fields. On average, the difference between them is 1.9%, all else being equal⁸. High transition rates are also found among women educated in private-sector fields or male-dominated fields. The difference between them and women educated in non-distinctive fields is, on average, 1.5% and 2.7%, respectively. The transition rate of women educated in public-sector fields does not significantly differ from those educated in non-distinctive fields. For men, no significant differences in transition rates to parenthood between men educated in fields belonging to different field groups are observed (Table 10a in the Appendix). Contrary to the findings for women, the level of education, university degree or vocational education, has a highly significant impact on men’s transition rates to parenthood. This finding is in line with the expectation that men’s capabilities as breadwinners impact upon their probability of becoming fathers. Tables 12o and 13o in the online appendix show the proportion of women and men with children by the five field groups that were observed until they reached the age of 40.

⁸ Average marginal effects (AME) are estimated using the STATA-ado `margeff` (Bartus 2005; see also Mood 2010).

Table 3: The association between educational fields and the transition to parenthood for Western German women (discrete time logit model, average marginal effects)

	(1)	(2)
	transition to parenthood	
years since graduation	-0.00475*** (-7.23)	-0.00461*** (-7.03)
In years since graduation	0.0185*** (6.80)	0.0183*** (6.77)
age at graduation	-0.00119+ (-1.90)	-0.00110+ (-1.77)
married	0.175*** (26.17)	0.175*** (26.25)
abitur	-0.0105* (-2.30)	-0.00857+ (-1.84)
university degree	0.00145 (0.25)	0.000205 (0.03)
female-dominated fields		0.0188*** (3.62)
male-dominated fields		0.0268** (2.94)
public-sector fields		0.00486 (0.91)
private-sector fields		0.0149** (2.84)
non-distinctive fields		Ref.
<i>N(person years)</i>	18,897	18,897
<i>N(persons)</i>	2,381	2,381
<i>N(events)</i>	1,003	1,003
pseudo R^2	0.196	0.199
chi ²	1,649.4	1,672.5

Notes: t statistics in parentheses

+p<0.10, * p < 0.05, ** p < 0.01, *** p < 0.001

The models also control for migration background, episodes of educational enrollment, movement to Eastern Germany, cohort, and sample membership.

Source: SOEP 1984-2010, unweighted data, own calculations.

The last step of the analysis deals with the question of unobserved factors that influence the selection of an educational field and the transition to parenthood (Table 4). Only the female-sample is analyzed. As described in the method section, I jointly estimate a multinomial logit model of the probability to be educated in one of the field groups (estimated in the year of graduation) with the discrete time logit model of transition to parenthood.

The data do not contain many variables that could indicate differences in preferences with regard to children. The models control for marital status, as being married at the time of graduation might express family orientation and they control for migration background as well as sample membership and cohort. The results of estimating the multinomial logit and the discrete time model separately in aML are in accordance with those in Stata (not reported here). Calculating them jointly does not lead to any meaningful changes in the coefficients with regard to values, direction or significance.

Adding a common factor of unobserved heterogeneity does however change the picture. The factor for unobserved heterogeneity is significant at the 5%-level. The coefficients for the educational fields in the event history model become less significant. The difference in transition rates between female-dominated fields and non-distinctive fields drops from being significant at 0.1%- to 10%-level. The coefficient for private-sector fields is no longer significant and for male-dominated fields drops to the 5%-level. As a robustness check, I estimated the event history model of the transition to parenthood with a factor for unobserved heterogeneity without jointly estimating the probability of being educated in a specific field group (not reported here). In this model the factor for unobserved heterogeneity is only significant at the 10%-level and most importantly, it does not affect the coefficients of the field groups. I interpret my findings as indicative of unobserved factors, like preferences toward childbearing that jointly influenced the probability of being educated in a specific field and the transition to parenthood. Other unobserved factors might be aspects of the partner market during educational enrollment, or intentions to withdraw from the labor market permanently or for a longer period of time after family formation.

Table 4: Simultaneous estimation of probability of being educated in a specific group of educational fields and the transition to parenthood (log odds)

	separate	simultaneous estimation	
	(1)	(2)	(3)
<u>multinomial logit (group of educational fields)</u>			
female dominated fields			
married	-0.0448 (0.2197)	-0.0448 (0.2207)	-0.0404 (0.2233)
constant	-0.8548 + (0.4438)	-0.8548 + (0.4455)	-0.8331 + (0.4512)
male dominated fields			
married	0.4189 (0.3137)	0.4189 (0.3163)	0.4209 (0.3182)
constant	-1.0883 * (0.5534)	-1.0883 + (0.5559)	-1.0655 + (0.5606)
public-sector fields			
married	0.4685 * (0.2124)	0.4685 * (0.2145)	0.4742 * (0.2172)
constant	-0.3008 (0.3633)	-0.3008 (0.3645)	-0.2784 (0.3714)
private-sector fields			
married	0.0198 (0.2236)	0.0198 (0.2250)	0.0239 (0.2278)
constant	-0.6707 (0.4222)	-0.6707 (0.4281)	-0.6559 (0.4340)
non-distinctive fields	Ref.	Ref.	Ref.
<u>discrete time logit (parenthood)</u>			
years since graduation	-0.0949 *** (0.0133)	-0.0948 *** (0.0134)	-0.0875 *** (0.0144)
ln years since graduation	0.3778 *** (0.0519)	0.3777 *** (0.0525)	0.3791 *** (0.0535)
age at graduation	-0.0228 + (0.0121)	-0.0227 + (0.0123)	-0.0211 (0.0131)
married	2.5729 *** (0.0737)	2.5731 *** (0.0743)	2.6304 *** (0.0903)
university degree	0.0042 (0.1284)	0.0010 (0.1299)	0.0032 (0.1374)
abitur	-0.1812 + (0.1066)	-0.1785 + (0.1075)	-0.1951 + (0.1145)
female dominated fields	0.3635 *** (0.0965)	0.3631 *** (0.0967)	0.2686 + (0.1419)
male dominated fields	0.4772 ** (0.1472)	0.4761 ** (0.1511)	0.3878 * (0.1828)
public-sector fields	0.0979 (0.1027)	0.0985 (0.1031)	0.0071 (0.1446)
private-sector fields	0.2901 ** (0.0989)	0.2901 ** (0.0994)	0.1954 (0.1425)
non-distinctive fields	Ref.	Ref.	Ref.
constant	-4.1793 *** (0.3911)	-4.1832 *** (0.3969)	-4.2466 *** (0.4214)
σ			0.3412 * (0.1650)

Notes to Table 4: t statistics in parentheses

+p<0.10, * p < 0.05, ** p < 0.01, *** p < 0.001

The multinomial logit models also control for migration background, cohort, and sample membership. The discrete time logit models control for migration background, episodes of educational enrollment, movement to Eastern Germany, cohort, and sample membership.

Source: SOEP 1984-2010, unweighted data, own calculations.

7. Discussion

The present analysis is a contribution to the increasing knowledge about the relationship between educational fields and transition to parenthood. It adds Western Germany, a country with low fertility rates and traditional family attitudes, to the growing list of countries for which this has been examined, and looks at both men and women. It also adds to existing knowledge further insight into the mechanisms that cause the relationship between educational fields and fertility.

The overall finding is that educational field matters for women's transition to parenthood but not men's, in Western Germany. Discrete time event history models improve significantly due to including dummy variables for the different fields and a multi-level approach, modeling individuals nested in fields, showed a significant variance between the transition rates for women but not men. Therefore the first hypothesis is confirmed only for women. For men, the positive effect of a university degree on their transition rates implies a positive income effect. The following remarks relate to the findings on women.

Characteristics of educational fields that indicate compatibility of family and employment or reliability and their association to women's transition to parenthood are analyzed in several discrete time logistic regressions. The relationship between the share of women in a field and transition to parenthood appears to be u-shaped while it is negative for the probability of working in the public sector. Neither the share of women working part-time nor the occupational specificity significantly influence the transition to parenthood. Based on these findings the initially large set of 37 fields was grouped according to one indicator for compatibility – the share of women – and one for reliability – the probability of public-sector employment. The findings confirm the second hypotheses on the positive impact of compatibility, as women educated in fields with an outstandingly high share of women have high transition rates to parenthood. The third hypothesis on the positive impact of reliability is not confirmed, as women educated in fields with a high share of public-sector employment have low transition rates to parenthood.

An underlying set of preferences is assumed to jointly influence the selection of an educational field and the transition to parenthood. The results confirm the fourth hypotheses. To test this hypothesis the probability of being educated in a group of educational fields is estimated jointly with an event history model of the transition to parenthood. A common factor for unobserved heterogeneity is significant and the coefficients for the field groups in the event history models of transition to parenthood are less significant. In light of the theoretical background and the findings of Begall and Mills (2013), the preferences towards childbearing at the time of graduation reflect the preferences that lead to the selection of an educational field and the influence of the socialization during educational enrollment.

The findings of this paper give new insights into the relationship between educational fields and fertility, but at the same time they raise further questions. The present analysis could not confirm any relationship between men's field of education and their transition to parenthood in Western Germany. The question arises whether this finding is specific for this particular context or is also found in societies with less emphasis on the male-breadwinner model. To the best of my knowledge, studies from these countries have only considered women so far.

The finding of low transition rates to parenthood of women educated in public-sector fields contradicts expectations. This finding comes as a surprise not only because a higher reliability for graduates in this field should have a positive impact on the transition to parenthood, but also because women educated in teaching or pedagogy belong to this group that are usually among those with highest transition rates (Begall & Mills 2013; Hoem et al. 2006a). Other public-sector fields (e.g., law and administration or art) are also found to have high childlessness in other countries. For teachers, the teaching-field and the level of teaching matters for the level of childlessness (Neyer & Hoem 2008).

For the present analysis retrospective data are combined with annually collected information of the SOEP. This led to a sample size that enabled the testing of the hypotheses and differentiating between a large number of educational fields. A shortcoming of this is that data are only available on a yearly basis. More detailed information on a monthly basis would enable examining the impact of educational field,

employment status and occupation on the transition to parenthood. Considering the partnership situation and partner characteristics would also help understanding the mechanisms that lead to a relationship between educational fields and parenthood. Socialization is assumed to impact on preferences, but the selection of an educational field also structurally influences one's partner market. This could be a cause of the high transition rates to parenthood among women educated in male-dominated fields.

The probability of being educated in a specific field is the outcome of a process. The process itself has not been modeled in this analysis. Even with the limited explanatory variables measuring the probability of being educated in a group of fields used here, the results imply an underlying set of preferences that influences the relationship between educational fields and fertility. This shows that unobserved factors like preferences, selection and socialization impact on the relationship between educational field and transition to parenthood but do not fully explain it. Exploring these factors in more detail is a task for further research.

References

- Bagavos, C. (2010). Education and childlessness: the relationship between educational field, educational level, employment and childlessness among Greek women born in 1955-1959. *Vienna Yearbook of Population Research*, 8, 51–75.
- Bartus, T. (2005). Estimation of marginal effects using `margins`. *The Stata Journal*, 5(3), 309–329.
- Becker, G. S. (1994). *A treatise on the family*. Enlarged Edition (3rd ed.). Cambridge, Massachusetts, London, England: Harvard University Press.
- Begall, K., & Mills, M. C. (2013). The Influence of Educational Field, Occupation, and Occupational Sex Segregation on Fertility in the Netherlands. *European Sociological Review*, 29(4), 720–742.
- Blossfeld, H.-P., & Huinink, J. (1991). Human Capital Investments or Norms of Role Transition? How Women's Schooling and Career Affect the Process of Family Formation. *American Journal of Sociology*, 97(1), 143–168.
- Bonin, H., Dohmen, T., Falk, A., Huffman, D., & Sunde, U. (2007). Cross-sectional earnings risk and occupational sorting: The role of risk attitudes. *Labour Economics*, 14(6), 926–937.
- Brewster, K. L., & Rindfuss, R. R. (2000). Fertility and women's employment in industrialized nations. *Annual Review of Sociology*, 26, 271–296.
- Brüderl, J., & Klein, T. (1993). Bildung und Familiengründungsprozeß deutscher Frauen: Humankapital- und Institutioneneffekt. In A. Diekmann & S. Weick (Eds.), *Der Familienzyklus als sozialer Prozeß: bevölkerungssoziologische Untersuchungen mit den Methoden der Ereignisanalyse* (pp. 194–215). Berlin: Duncker & Humblot.
- Bundesagentur für Arbeit (BA). (2011a). *Klassifikation der Berufe 2010 - Band 1: Systematischer und alphabetischer Teil mit Erläuterungen*. Retrieved June 3, 2012, from <http://statistik.arbeitsagentur.de/Statischer-Content/Grundlagen/Klassifikation-der-Berufe/KldB2010/Printausgabe-KldB-2010/Generische-Publikationen/KldB2010-Printversion-Band1.pdf>
- Bundesagentur für Arbeit (BA). (2011b). *Klassifikation der Berufe 2010 - Band 2: Definitiver und beschreibender Teil*. Retrieved June 3, 2012, from <http://statistik.arbeitsagentur.de/Statischer-Content/Grundlagen/Klassifikation-der-Berufe/KldB2010/Printausgabe-KldB-2010/Generische-Publikationen/KldB2010-Printversion-Band2.pdf>
- Dorbritz, J. (2008). Germany: Family diversity with low actual and desired fertility. *Demographic Research*, 19, 557–597.
- Dustmann, C., & Van Soest, A. (1997). Wage Structures in the Private and Public Sectors in West Germany. *Fiscal Studies*, 18(3), 225–247.
- Gauthier, A. H. (1996). *The State and the Family: A Comparative Analysis of Family Policies in Industrialized Countries*. Clarendon Press.
- Goldstein, J. R., & Kreyenfeld, M. (2011). Has East Germany Overtaken West Germany? Recent Trends in Order-Specific Fertility. *Population and Development Review*, 37(3), 453–472.

- Haisken-DeNew, John P., & Hahn, M. H. (2006). PanelWhiz: a flexible modularized stata interface for accessing large scale panel data sets. Retrieved June 3, 2012, from <http://www.panelwhiz.eu/>
- Henz, U. (2008). Gender roles and values of children: Childless Couples in East and West Germany. *Demographic Research*, 19, 1451–1500.
- Hillmert, S., & Jacob, M. (2010). Selections and social selectivity on the academic track: A life-course analysis of educational attainment in Germany. *Research in Social Stratification and Mobility*, 28(1), 59–76.
- Hippach-Schneider, U., Krause, M., & Woll, C. (2007). Vocational Education and Training in Germany: Short Description. Luxembourg: Office for Official Publications of the European Communities. Retrieved June 15, 2013, from http://www.cedefop.europa.eu/en/Files/5173_EN.PDF
- Hoem, J. M., Neyer, G., & Andersson, G. (2006a). Education and childlessness - The relationship between educational field, educational level, and childlessness among Swedish women born in 1955-59. *Demographic Research*, 14, 331–380.
- Hoem, J. M., Neyer, G., & Andersson, G. (2006b). Educational attainment and ultimate fertility among Swedish women born in 1955-59. *Demographic Research*, 14, 381–403.
- Hox, J. J. (2010). *Multilevel Analysis: Techniques and Applications (New.)*. New York, Hove: Taylor & Francis.
- Jürges, H. (2002). The Distribution of the German Public–Private Wage Gap. *LABOUR*, 16(2), 347–381.
- Klein, M. (2011). Higher education and non-pecuniary returns in Germany: tracing the mechanisms behind field of study effects at the start of the career. *Irish Educational Studies*, 30(2), 253–270.
- Kravdal, Ø. (2001). The High Fertility of College Educated Women in Norway. *Demographic Research*, 5, 187–216.
- Kravdal, Ø., & Rindfuss, R. R. (2008). Changing Relationships between Education and Fertility: A Study of Women and Men Born 1940 to 1964. *American Sociological Review*, 73(5), 854–873.
- Kreyenfeld, M. (2002). Time Squeeze, Partner Effect or Self-Selection? *Demographic Research*, 7, 15–48.
- Kreyenfeld, M. (2004). Fertility Decisions in the FRG and GDR: An Analysis with Data from the German Fertility and Family Survey. *Demographic Research*, Special 3, 275–318.
- Kreyenfeld, M. (2010). Uncertainties in Female Employment Careers and the Postponement of Parenthood in Germany. *European Sociological Review*, 26(3), 351–366.
- Kreyenfeld, M., & Konietzka, D. (2008). Education and Fertility in Germany. In I. Hamm, H. Seitz, & M. Werding (Eds.), *Demographic change in Germany: the economic and fiscal consequences* (pp. 165–187). Berlin: Springer.

- Lappegård, T., & Rønsen, M. (2005). The multifaceted impact of education on entry into motherhood. *European Journal of Population / Revue Européenne De Demographie*, 21(1), 31–49.
- Liefbroer, A. C., & Corijn, M. (1999). Who, What, Where, and When? Specifying the Impact of Educational Attainment and Labour Force Participation on Family Formation. *European Journal of Population / Revue européenne de Démographie*, 15(1), 45–75.
- Lillard, L. A., & Panis, C. W. . (2003). *aML Multilevel Multiprocess Statistical*. Los Angeles, California.
- Maas, C. C., & Hox, J. J. (2005). Sufficient sample sizes for multilevel modelling. *Methodology*, 1(3), 85–91.
- Martín-García, T. (2009). Bring Men Back In-1: A Re-examination of the Impact of Type of Education and Educational Enrolment on First Births in Spain. *European Sociological Review*, 25(2), 199–213.
- Martín-García, T., & Baizán, P. (2006). The impact of the type of education and of educational enrolment on first births. *European Sociological Review*, 22(3), 259–275.
- Maul, K. (2012). *Der Einfluss der beruflichen Tätigkeit auf die Familiengründung* (1st ed.). Würzburg: Ergon.
- Melly, B. (2005). Public-private sector wage differentials in Germany: Evidence from quantile regression. *Empirical Economics*, 30(2), 505–520.
- Michelmores, K., & Musick, K. (2013). Fertility patterns of college graduates by field of study, US women born 1960–79. *Population Studies: A Journal of Demography* doi:10.1080/00324728.2013.847971.
- Mood, C. (2010). Logistic Regression: Why We Cannot Do What We Think We Can Do, and What We Can Do About It. *European Sociological Review*, 26(1), 67–82.
- Moulton, B. R. (1990). An Illustration of a Pitfall in Estimating the Effects of Aggregate Variables on Micro Units. *The Review of Economics and Statistics*, 72(2), 334–338.
- Neyer, G., & Hoem, J. M. (2008). Education and permanent childlessness: Austria vs. Sweden; a research note. In Surkyn, J., Deboosere, P., & Van Bavel, J (Eds.), *Demographic Challenges for the 21st Century: a State of the Art in Demography; Conference Organized as a Tribute to the Continuing Endeavours of Prof. Dr. Em. Ron Lesthaeghe in the Field of Demography*. Brussels: VUBPRESS.
- Pfau-Effinger, B. (2012). Women's employment in the institutional and cultural context. *The International Journal of Sociology and Social Policy*, 32(9/10), 530–543.
- Pfau-Effinger, B., & Smidt, M. (2011). Differences in women's employment patterns and family policies: eastern and western Germany. *Community, Work & Family*, 14(2), 217–232.
- Pfeifer, C. (2011). Risk Aversion and Sorting into Public Sector Employment. *German Economic Review*, 12(1), 85–99.
- Rønsen, M., & Skrede, K. (2010). Can public policies sustain fertility in the Nordic countries? Lessons from the past and questions for the future. *Demographic Research*, 22, 321–346.

- Schmitt, C. (2012). Labour market integration, occupational uncertainties, and fertility choices in Germany and the UK. *Demographic Research*, 26, 253–292.
- Shavit, Y., & Müller, W. (2000). Vocational Secondary Education. *European Societies*, 2(1), 29–50.
- Tesching, K. (2012). Education and fertility: dynamic interrelations between women's educational level, educational field and fertility in Sweden. Stockholm: Acta Universitatis Stockholmiensis. Retrieved February 15, 2012, from <http://urn.kb.se/resolve?urn=urn:nbn:se:su:diva-63761>
- Tölke, A., & Diewald, M. (2003). Insecurities in employment and occupational careers and their impact on the transition to fatherhood in Western Germany. *Demographic Research*, 9, 41–68.
- Van Bavel, J. (2010). Choice of Study Discipline and the Postponement of Motherhood in Europe: The Impact of Expected Earnings, Gender Composition, and Family Attitudes. *Demography*, 47(2), 439–458.
- Wagner, G. G., Frick, J. R., & Schupp, J. (2007). The German Socio-Economic Panel Study (SOEP) - Scope, Evolution and Enhancements. *Schmollers Jahrbuch*, 127, 139–169.
- Wolbers, M. H. J. (2003). Job mismatches and their labour-market effects among school-leavers in Europe. *European Sociological Review*, 19(3), 249–266.
- Yamaguchi, K. (1991). *Event History Analysis*. Newbury Park, London, New Delhi: Sage Publications (CA).

Appendix

Table 1a: The average share of women, share of public sector employment, occupational specificity, share of women part-time employment and share of men part-time employment for each field of education

		share of women	share of public sector employ- ment	occu- pational specifi- city	share of women in part- time employ- ment	share of men in part- time employ- ment
11	agriculture, forestry	.23	.19	.61	.12	.02
12	gardening and floristry	.63	.24	.69	.36	.05
21	primary production, glass and ceramic	.22	.34	.62	.03	.07
22	plastic production and wood working	.05	.11	.71	.48	.01
23	paper and printing	.45	.06	.66	.28	.03
24	metal production and processing	.03	.20	.60	.05	.02
25	machine and automotive engineering	.04	.13	.62	.13	.01
26	mechatronics, energy and electronics	.04	.16	.73	.07	.01
27	technical research, development and construction	.52	.12	.60	.12	.04
28	textile and leather	.86	.17	.55	.30	.00
29	food production and processing	.31	.12	.69	.33	.05
31	architecture and construction planning	.29	.25	.89	.24	.03
32	construction above and below ground	.00	.13	.72	.11	.02
33	interior fitting	.03	.12	.72	.08	.04
34	building maintenance	.01	.14	.64	.25	.01
41	mathematics, biology, chemistry, physics	.45	.20	.76	.12	.07
42	geology, geography, environment protection	.36	.19	.62	.33	.07
43	computer science, information and communication technology	.15	.10	.85	.24	.02
51	transport and logistics (without driving)	.41	.27	.63	.22	.05
52	transport and vehicle driving	.11	.28	.56	.06	.00
53	protection, security and observation	.07	.91	.80	.08	.00
54	cleaning	.43	.20	.36	.43	.12

Table 1a continued

61	purchase, distribution and trade	.45	.09	.66	.25	.02
62	sales	.79	.08	.67	.25	.02
63	tourism, hotel and restaurant	.74	.14	.64	.19	.10
71	company management and organization	.80	.21	.67	.19	.02
72	financial service, accountancy and tax advice	.51	.33	.89	.21	.02
73	law and administration	.54	.47	.76	.23	.04
81	medical healthcare	.85	.33	.83	.23	.06
82	non medical healthcare, hygiene, wellness, medical technology	.89	.19	.67	.26	.04
83	pedagogy and child care, social and home economics, theology	.79	.63	.72	.26	.07
84	teaching and training	.47	.57	.74	.24	.05
91	language, literature, humanities and social sciences	.65	.25	.56	.19	.05
92	advertising, marketing, media	.67	.13	.74	.19	.10
93	product design, arts and crafts	.52	.06	.75	.17	.01
94	performing and entertainment	.63	.48	.89	.33	.02
95	economics	.34	.12	.78	.12	.02
	median	.45	.19	.69	.22	.03
	mean	.41	.24	.69	.21	.04

Source: SOEP 1984-2010, own calculations.

Table 2a: The improvement of explaining the transition to parenthood by adding the educational field, Western German women (discrete time logit model, average marginal effects)

	(1)	(2)
	transition to parenthood	
years since graduation	-0.00475*** (-7.21)	-0.00457*** (-6.95)
ln years since graduation	0.0185*** (6.80)	0.0185*** (6.82)
age at graduation	-0.00117+ (-1.86)	-0.00102 (-1.60)
married	0.174*** (26.08)	0.175*** (25.93)
abitur	-0.0107* (-2.34)	-0.00832+ (-1.70)
university degree	0.00155 (0.26)	-0.00231 (-0.33)
<i>N(person years)</i>	18,827	18,827
<i>N(persons)</i>	2,375	2,375
<i>N(events)</i>	1,101	1,101
pseudo R^2	0.195	0.201
chi ²	1,639.7	1,689.8

Notes:

t statistics in parentheses

+p<0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

Model 2 adds 32 dummy variables for educational fields (Ref. field 81), three fields (34, 52, 54) were not used due to an insufficient number of observations, the models also control for migration background, episodes of educational enrollment, movement to Eastern Germany, cohort and sample-membership.

Source: SOEP 1984-2010, unweighted data, own calculations.

Table 3a: Likelihood Ratio Test and Wald-test, models on Western German women

test	chi ²	p-value
Wald-test	49.52	0.0187
Likelihood-Ratio test	50.12	0.0217

Table 4a: The improvement of explaining the transition to parenthood by adding the educational field, Western German men (discrete time logit model, average marginal effects)

	(1)	(2)
	transition to parenthood	
years since graduation	-0.00195*** (-4.60)	-0.00185*** (-4.36)
ln years since graduation	0.00814*** (4.39)	0.00821*** (4.43)
age at graduation	-0.00162*** (-4.11)	-0.00140*** (-3.47)
married	0.176*** (24.72)	0.177*** (24.68)
abitur	-0.00422 (-1.26)	-0.00327 (-0.89)
university degree	0.0136** (3.07)	0.0217*** (3.68)
<i>N(person years)</i>	24,548	24,548
<i>N(persons)</i>	2,759	2,759
<i>N(events)</i>	993	993
pseudo R^2	0.230	0.236
chi ²	1,915.6	1,958.5

Notes:

t statistics in parentheses

+p<0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

Model 2 adds 34 dummy variables for educational fields (Ref. field 81), two fields (54, 94) were not used due to an insufficient number of observations, the models also control for migration background, episodes of educational enrollment, movement to Eastern Germany, cohort and sample-membership.

Source: SOEP 1984-2010, unweighted data, own calculations.

Table 5a: Likelihood Ratio Test and Wald-test, models on Western German men

test	chi ²	p-value
Wald-test	39.60	0.1993
Likelihood-Ratio test	42.86	0.1168

Table 6a: The variance in transition to parenthood by educational field, Western German women (multi-level discrete time logit model, log odds)

	(1)	(2)
	transition to parenthood	
years since graduation		-0.0958*** (-7.11)
ln years since graduation		0.380*** (6.83)
age at graduation		-0.0220+ (-1.70)
married		2.565*** (33.50)
abitur		-0.199+ (-1.92)
university degree		-0.0108 (-0.08)
cons	-2.781*** (-64.47)	-3.944*** (-8.96)
σ_u^2	0.013***	0.021***
<i>N(person years)</i>	18,827	18,827
<i>N(persons)</i>	2,375	2,375
<i>N(events)</i>	1,101	1,101
<i>N(fields)</i>	33	33

Notes:

t statistics in parentheses

+p<0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

The models also control for migration background, episodes of educational enrollment, movement to Eastern Germany, cohort and sample-membership. (three fields (34, 52, 54) were not used due to an insufficient number of observations)

Source: SOEP 1984-2010, unweighted data, own calculations.

Table 7a: The variance in transition to parenthood by educational field, Western German men (multi-level discrete time logit model, log odds)

	(1)	(2)
	transition to parenthood	
years since graduation		-0.0568*** (-4.61)
ln years since graduation		0.237*** (4.40)
age at graduation		-0.0471*** (-4.11)
married		3.087*** (36.12)
abitur		-0.125 (-1.24)
university degree		0.366*** (3.31)
cons	-3.167*** (-93.40)	-4.358*** (-11.66)
σ_u^2	0.0012	0
<i>N(person years)</i>	24,548	24,548
<i>N(persons)</i>	2,759	2,759
<i>N(events)</i>	993	993
<i>N(fields)</i>	35	35

Notes:

t statistics in parentheses

+p<0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

The models also control for migration background, episodes of educational enrollment, movement to Eastern Germany, cohort and sample-membership. (two fields (54, 94) were not used due to an insufficient number of observations)

Source: SOEP 1984-2010, unweighted data, own calculations.

Table 8a: Characteristics of educational fields and transition to parenthood for Western German women (discrete time logit model, average marginal effects)

	(1)	(2)	(3)	(4)	(5)
			transition to parenthood		
years since graduation	-0.00467*** (-8.90)	-0.00474*** (-9.11)	-0.00476*** (-8.78)	-0.00473*** (-8.83)	-0.00467*** (-9.13)
ln years since graduation	0.0183*** (5.92)	0.0185*** (5.75)	0.0185*** (5.68)	0.0185*** (5.75)	0.0183*** (5.88)
age at graduation	-0.00115 (-1.38)	-0.00107 (-1.36)	-0.00114 (-1.43)	-0.00113 (-1.36)	-0.00107 (-1.34)
married	0.174*** (29.32)	0.175*** (25.52)	0.174*** (24.73)	0.174*** (26.18)	0.174*** (28.71)
abitur	-0.00915* (-2.48)	-0.0104** (-2.85)	-0.00997** (-2.84)	-0.0104** (-2.96)	-0.00884* (-2.20)
university degree	0.00130 (0.16)	0.00219 (0.28)	0.00121 (0.16)	0.00177 (0.23)	0.00186 (0.24)
share of women	-0.0104* (-2.50)				-0.00935* (-2.13)
(share of women) ²	0.0204*** (3.66)				0.0193*** (3.52)
share of public sector employment		-0.00360* (-2.09)			-0.00296* (-2.09)
occupational specificity			-0.0169 (-1.02)		
share of part-time employment				0.00676 (0.59)	
<i>N</i> (person years)	18,827	18,827	18,827	18,827	18,827
<i>N</i> (persons)	2,375	2,375	2,375	2,375	2,375
<i>N</i> (events)	1,101	1,101	1,101	1,101	1,101
pseudo <i>R</i> ²	0.197	0.196	0.196	0.196	0.197
chi ²	6,477.5	6,530.3	7,647.3	6,937.8	10,216.3

Notes: t statistics in parentheses

+p<0.10, * p < 0.05, ** p < 0.01, *** p < 0.001

The models also control for migration background, episodes of educational enrollment, movement to Eastern Germany, cohort, and sample membership.

Source: SOEP 1984-2010, unweighted data, own calculations.

Table 9a: Characteristics of educational fields and transition to parenthood for Western German men (discrete time logit model, average marginal effects)

	(1)	(2)	(3)	(4)	(5)
	transition to parenthood				
years since graduation	-0.00195*** (-6.02)	-0.00194*** (-6.10)	-0.00195*** (-6.14)	-0.00194*** (-6.09)	-0.00194*** (-5.98)
ln years since graduation	0.00821*** (5.74)	0.00812*** (5.74)	0.00813*** (5.73)	0.00810*** (5.67)	0.00819*** (5.73)
age at graduation	-0.00159*** (-5.32)	-0.00160*** (-5.38)	-0.00162*** (-5.38)	-0.00160*** (-5.39)	-0.00158*** (-5.38)
married	0.176*** (21.89)	0.176*** (21.78)	0.176*** (21.97)	0.176*** (21.26)	0.176*** (21.80)
abitur	-0.00323 (-0.81)	-0.00375 (-0.98)	-0.00391 (-0.97)	-0.00374 (-0.98)	-0.00298 (-0.73)
university degree	0.0146*** (3.44)	0.0134** (2.81)	0.0136** (2.98)	0.0140** (3.07)	0.0145*** (3.34)
share of women	0.00103 (0.66)				0.00138 (0.88)
(share of women) ²	0.00652+ (1.80)				0.00643+ (1.76)
public-sector employment		-0.00145 (-1.25)			-0.00124 (-1.03)
occupational specificity			-0.00382 (-0.37)		
share of part-time employment				-0.00227 (-1.05)	
<i>N(person years)</i>	24,548	24,548	24,548	24,548	24,548
<i>N(persons)</i>	2,759	2,759	2,759	2,759	2,759
<i>N(events)</i>	993	993	993	993	993
pseudo <i>R</i> ²	0.231	0.230	0.230	0.231	0.231
chi ²	7,424.3	5,366.8	4,987.1	6,519.0	8,138.1

Notes: t statistics in parentheses

+p<0.10, * p < 0.05, ** p < 0.01, *** p < 0.001

The models also control for migration background, episodes of educational enrollment, movement to Eastern Germany, cohort, and sample membership.

Source: SOEP 1984-2010, unweighted data, own calculations.

Table 10a: The association between educational fields and the transition to parenthood for Western German men (discrete time logit model, average marginal effects)

	(1)	(2)
	transition to parenthood	
years since graduation	-0.00196*** (-4.64)	-0.00197*** (-4.65)
In years since graduation	0.00820*** (4.43)	0.00823*** (4.44)
age at graduation	-0.00163*** (-4.13)	-0.00164*** (-4.11)
married	0.176*** (24.75)	0.176*** (24.72)
abitur	-0.00427 (-1.28)	-0.00455 (-1.32)
university degree	0.0136** (3.07)	0.0144** (3.19)
female-dominated fields		-0.0000701 (-0.01)
public-sector fields		-0.00559 (-1.10)
non-distinctive fields		Ref.
private-sector fields		-0.00393 (-0.91)
male-dominated fields		-0.00275 (-0.76)
<i>N(person years)</i>	24,579	24,579
<i>N(persons)</i>	2,766	2,766
<i>N(events)</i>	995	995
pseudo R^2	0.230	0.230
chi ²	1,918.3	1,919.8

Notes: t statistics in parentheses

+p<0.10, * p < 0.05, ** p < 0.01, *** p < 0.001

The models also control for migration background, episodes of educational enrollment, movement to Eastern Germany, cohort, and sample membership.

Source: SOEP 1984-2010, unweighted data, own calculations.

Table 11a: Number of observations per educational field in the year of graduation (women, N= 2,381; men, N= 2,766)

		women (N)	women %	men (N)	men %
11	agriculture, forestry	9	0.38	34	1.23
12	gardening and floristry	26	1.09	27	0.98
21	primary production, glas and ceramic	5	0.21	15	0.54
22	plastic production and wood working	12	0.50	109	3.94
23	paper and printing	24	1.01	24	0.87
24	metal production and processing	6	0.25	213	7.70
25	machine and automotive engineering	15	0.63	459	16.59
26	mechatronics, energy and electronics	9	0.38	303	10.95
27	technical research, development and construction	42	1.76	43	1.55
28	textile and leather	43	1.81	7	0.25
29	food production and processing	46	1.93	114	4.12
31	architecture and construction planning	12	0.50	41	1.48
32	construction above and below ground	-	-	98	3.54
33	interior fitting	7	0.29	109	3.94
34	building maintenance	2	0.08	100	3.62
41	mathematics, biology, chemistry, physics	55	2.31	78	2.82
42	geology, geography, environment protection	7	0.29	16	0.58
43	computer science, information and communication technology	19	0.80	81	2.93
51	transport and logistics (without driving)	28	1.18	33	1.19
52	transport and vehicle driving	1	0.04	7	0.25
53	protection, security and observation	9	0.38	23	0.83
54	cleaning	2	0.08	4	0.14

Table 11a continued

		women (N)	women %	men (N)	men %
61	purchase, distribution and trade	62	2.60	82	2.96
62	sales	270	11.34	75	2.71
63	tourism, hotel and restaurant	75	3.15	19	0.69
71	company management and organization	322	13.52	115	4.16
72	financial service, accountancy and tax advice	144	6.05	112	4.05
73	law and administration	224	9.41	128	4.63
81	medical healthcare	363	15.25	62	2.24
82	non medical healthcare, hygiene, wellness, medical technology	162	6.80	27	0.98
83	pedagogy and child care, social and home economics, theology	197	8.27	31	1.12
84	teaching and training	24	1.01	15	0.54
91	language, literature, humanities and social sciences	46	1.93	23	0.83
92	advertising, marketing, media	21	0.88	11	0.40
93	product design, arts and crafts	18	0.76	15	0.54
94	performing and entertainment	13	0.55	3	0.11
95	economics	61	2.56	110	3.98

Source: SOEP 1984-2010, own calculations.

Supporting Material (online-only content)

Data Management

The SOEP provides five generated variables with information on educational fields of respondents, since the 2011 release. These variables (FIELD and TRAINA-TRAIND) combine information that was collected from three different sources:

1. the annual person questionnaire asking about educational attainment within the last year;
2. questionnaires on respondents' biography that are offered only when respondents enter the SOEP and that have been collected since 2001; and
3. gap questionnaires given to respondents who temporarily left the SOEP but rejoined.

The variable FIELD contains information on the field of a given tertiary degree, differentiating between fifty-eight fields and a residual one ("other"). For respondents with vocational educations, four different variables are available, all coded by the Klassifikation der Berufe 1992 (KldB1992) on a two-digit level (TRAINA-TRAIND). TRAINA contains fields of apprenticeships, differentiating eighty-six categories. TRAINB contains fields of full-time school based vocational training, differentiating seventy categories. TRAINC contains fields of higher level vocational training, differentiating seventy-two categories. TRAIND contains fields of civil servant training, differentiating seventeen categories (for further information on these variables, see the documentation of the PGEN-dataset, (Anger et al., 2011). The fields of university degrees (FIELD) were coded according to a classification of its own, instead of the KldB1992.

The two-digit level of the KldB1992 turned out not to be ideal for examining the question addressed in this paper. It also was difficult to assign the university degrees in a satisfying way. It appeared that, even though assigned to the correct KldB1992 code, this new category often did not seem to really represent the field of the university degree.

The Klassifikation der Berufe 2010 (KldB2010) appears to offer a better solution, grouping jobs in function of their content. Therefore, this classification represents what is understood by “field of education” in this paper. The KldB2010 is ordered hierarchically with different levels of abstraction (Bundesagentur für Arbeit (BA), 2011a). The two-digit level was the aim of the data recoding. The two-digit level seems to most adequately represent what is understood as field of education in this study. A nurse and a physician are in the same group at this level: They would be in different groups at the three-digit level, but at the one-digit level, they would be grouped with teachers and social workers (Bundesagentur für Arbeit (BA), 2011b)⁹. The only distinction between the original KldB2010 two-digit level and the one used here is that here respondents with degrees in economics are a group of their own instead of being part of a group with respondents with degrees in language, literature, the humanities, or social science. Both groups are still large and assumed to differ with regard to important working conditions. The field characteristics show differences that support this assumption. In the KldB2010, on a two-digit level, they are in the same category as respondents with degrees in language, literature, the humanities, or social science.

Even though transformation keys are available for transferring the KldB1992 to the KldB2010, this is not possible from the two-digit level provided in the TRAIN variables. Fortunately the SOEP provides the more detailed data basis of the TRAIN variables upon request. As described, these variables combine information from various sources. The more detailed information on vocational education that was collected via the annual person questionnaire are, up to 2009, coded by the classification of occupations provided by the Bundesanstalt für Arbeit from 1988. In the wave 2010, this information is coded according to the classification provided by the Statistisches Bundesamt from 1992, as is the information from biography and gap questionnaires.

⁹ Very few people (mostly men) in the SOEP have a military degree. Because this group has very special living conditions that can hardly be compared to others, those cases are not used.

Therefore, different transformation keys were applied. For vocational degrees from the person questionnaire up to 2009, the key that transforms the four-digit Kldb1988 to a five-digit Kldb2010 is used. For those collected in 2010 as well as the degrees from biography and gap questionnaires, the key transforming Kldb1992 (four-digits) to Kldb2010 (five-digits) is used. Afterward, all new codes were reduced to three digits. The code 914 for economics was recoded to 950, and afterward, all new codes were reduced to two digits.

The generated variable FIELD in the pgen-dataset also combines the information on university degrees collected via all sources, as described above. A flag variable enables researchers to identify the respective source of the information. It was possible to assign most, but not all, categories of university degrees to the Kldb2010 on a three-digit level. Table 10a shows how university degrees were assigned to the Kldb2010. University education may be specifically designed to lead to a teaching job. The information of the variable DEGREE “Type of tertiary degree” (pgen) is used to determine these cases. For example, a person who studied mathematics to become a math-teacher was assigned to teaching (84) instead of math (41). The label of some categories of university degrees is too broad to make a substantiated assignment. These categories are marked with a star in Table 10a. For these categories, I applied a stepwise procedure to identify the accurate Kldb2010-code. First, I looked at the plain text, the exact answer given by the respondents. These data were also given to me by the SOEP. Unfortunately, they are not always available. If this was the case, I checked old codes of the university degree that was provided in earlier versions of the SOEP. Some mistakes occurred in the current release, but I was provided with corrections, and in the cases that I checked, they were coherent with the new codes. The third step was to look at the employment biography of the respondents and assign a Kldb2010 code if they reported working in the occupation they were trained for (and if this was plausible, given the code for the university degree). Via this procedure, it was possible to assign a majority of respondents to a Kldb2010 code.

This information was then combined as a new field variable that contains the field of a completed vocational or university education. To calculate the field characteristics, information are taken from the person questionnaires once the field becomes available in the SOEP. For the event history analysis, the timing of graduation and birth of the first child is of great importance. For this analysis, the different data sources matter. For information received via person questionnaires, the year of graduation was the year before, while for information from the biography questionnaires, the time between graduation and reporting the field to the SOEP is in most cases much longer. For the latter, the year in which the degree was received was extracted from the bio-dataset in SOEP-long.

References

- Anger, S. et al. (2011). Documentation PGEN. Retrieved January 31, 2012, from http://www.diw.de/documents/dokumentenarchiv/17/diw_01.c.60055.de/pgen.pdf
- Bundesagentur für Arbeit (BA). (2011a). Klassifikation der Berufe 2010 - Band 1: Systematischer und alphabetischer Teil mit Erläuterungen. Retrieved June 3, 2012, from <http://statistik.arbeitsagentur.de/Statischer-Content/Grundlagen/Klassifikation-der-Berufe/KldB2010/Printausgabe-KldB-2010/Generische-Publikationen/KldB2010-Printversion-Band1.pdf>
- Bundesagentur für Arbeit (BA). (2011b). Klassifikation der Berufe 2010 - Band 2: Definitiver und beschreibender Teil. Retrieved June 3, 2012, from <http://statistik.arbeitsagentur.de/Statischer-Content/Grundlagen/Klassifikation-der-Berufe/KldB2010/Printausgabe-KldB-2010/Generische-Publikationen/KldB2010-Printversion-Band2.pdf>
- Bundesagentur für Arbeit (BA). (2011c). Umsteigeschlüssel - statistik.arbeitsagentur.de. Retrieved June 19, 2012, from <http://statistik.arbeitsagentur.de/Navigation/Statistik/Grundlagen/Klassifikation-der-Berufe/KldB2010/Arbeitshilfen/Umsteigeschlüssel/Umsteigeschlüssel-Nav.html>

Table 1o: The assignment of field of tertiary education to the KldB2010

	FIELD: "field of tertiary education"		KldB 2010
1	language, humanities	91	language, literature, humanities and social sciences
2	protestant theology	83	pedagogy and child care, social and home economics, theology
3	catholic theology	83	pedagogy and child care, social and home economics, theology
4	philosophy	91	language, literature, humanities and social sciences
5	history	91	language, literature, humanities and social sciences
6	librarianship/documentation/publication	*	
7	literature/language	91	language, literature, humanities and social sciences
8	philology	91	language, literature, humanities and social sciences
9	german philology	91	language, literature, humanities and social sciences
10	anglistics	91	language, literature, humanities and social sciences
11	roman studies	91	language, literature, humanities and social sciences
12	slavic studies	91	language, literature, humanities and social sciences
13	non-european studies	91	language, literature, humanities and social sciences
14	cultural studies	91	language, literature, humanities and social sciences
15	psychology	81	medical healthcare
16	pedagogy	83	pedagogy and child care, social and home economics, theology
17	orthopedagogy	83	pedagogy and child care, social and home economics, theology
22	sports	63	tourism, hotel and restaurant**
23	law/economics/social science	*	
24	regional science	91	language, literature, humanities and social sciences

Table 1o continued			
25	political science	91	language, literature, humanities and social sciences
26	social science	91	language, literature, humanities and social sciences
27	welfare	73	law and administration
28	law	73	law and administration
29	administration	73	law and administration
30	economics	95	economics
31	industrial engineer	27	technical research, development and construction
36	math/natural science general	*	
37	math	41	mathematics, biology, chemistry, physics
38	computer science	43	computer science, information and communication technology
39	physics	41	mathematics, biology, chemistry, physics
40	chemistry	41	mathematics, biology, chemistry, physics
41	pharmaceutics	81	medical healthcare
42	biology	41	mathematics, biology, chemistry, physics
43	geology	42	geology, geography, environment protection
44	geography	42	geology, geography, environment protection
48	healthcare	81	medical healthcare
49	medicine	81	medical healthcare
50	dentistry	81	medical healthcare
51	veterinary medicine	81	medical healthcare
57	horticulture	12	gardening and floristry
58	agriculture	11	agriculture, forestry
59	forestry	11	agriculture, forestry
60	home economics	82	non medical healthcare, hygiene, wellness, medical technology
61	engineering general	*	
62	mining	21	primary production, glas and ceramic

Table 1o continued			
63	engine building	25	machine and automotive engineering
64	electrical engineering	26	mechatronics, energy and electronics
65	traffic engineering	51	transport and logistics (without driving)
66	architecture	31	architecture and construction planning
67	urbanism	31	architecture and construction planning
68	civil engineering	31	architecture and construction planning
69	mapping	31	architecture and construction planning
74	arts, science of art general	*	
75	fine arts	93	product design, arts and crafts
76	design	*	
77	performing arst/movie and television/theatrical studies	*	
78	music	94	performing and entertainment

*assigned according to procedure described in the text

**KldB2010 code 631 is tourism and sports

Table 2o: The improvement of explaining the transition to parenthood by adding the educational field, Western German women (discrete time logit model, time axis: age, average marginal effects)

	(1)	(2)
	transition to parenthood	
age	-0.0108*** (-7.83)	-0.0111*** (-7.97)
ln age	0.126*** (7.31)	0.131*** (7.58)
married	0.171*** (25.78)	0.171*** (25.63)
abitur	-0.0136** (-3.21)	-0.0109* (-2.39)
university degree	0.000992 (0.18)	-0.00206 (-0.30)
<i>N</i> (person years)	18,827	18,827
<i>N</i> (persons)	2,375	2,375
<i>N</i> (events)	1,101	1,101
pseudo R^2	0.196	0.203
chi ²	1,646.6	1,701.5

Notes:

t statistics in parentheses

+p<0.10, * p < 0.05, ** p < 0.01, *** p < 0.001

Model 2 adds 32 dummy variables for educational fields (Ref. field 81), three fields (34, 52, 54) were not used due to an insufficient number of observations, the models also control for migration background, episodes of educational enrollment, movement to Eastern Germany, cohort and sample-membership.

Source: SOEP 1984-2010, unweighted data, own calculations.

Table 3o: Likelihood Ratio Test and Wald-test, models on Western German women

Test	chi ²	p-value
Wald-test	53.98	0.0065
Likelihood-Ratio test	54.88	0.0072

Table 4o: The improvement of explaining the transition to parenthood by adding the educational field, Western German men (discrete time logit model, time axis: age, average marginal effects)

	(1)	(2)
	transition to parenthood	
age	-0.00771*** (-8.11)	-0.00776*** (-8.15)
ln age	0.105*** (7.60)	0.108*** (7.80)
married	0.159*** (24.00)	0.160*** (24.09)
abitur	-0.00718* (-2.30)	-0.00527 (-1.52)
university degree	0.00680+ (1.78)	0.0144** (2.77)
<i>N(person years)</i>	2,4548	24548
<i>N(persons)</i>	2,759	2,759
<i>N(events)</i>	993	993
pseudo R^2	0.235	0.241
chi ²	1,957.4	2,006.6

Notes:

t statistics in parentheses

+p<0.10, * p < 0.05, ** p < 0.01, *** p < 0.001

Model 2 adds 32 dummy variables for educational fields (Ref. field 81), three fields (34, 52, 54) were not used due to an insufficient number of observations, the models also control for migration background, episodes of educational enrollment, movement to Eastern Germany, cohort and sample-membership.

Source: SOEP 1984-2010, unweighted data, own calculations.

Table 5o: Likelihood Ratio Test and Wald-test, models on Western German men

test	chi ²	p-value
Wald-test	47.14	0.0527
Likelihood-Ratio test	49.22	0.0344

Table 6o: The variance in transition to parenthood by educational field, Western German women (multi-level discrete time logit model, time axis: age, log odds)

	transition to parenthood
age	-0.227*** (-7.99)
ln age	2.661*** (7.54)
married	2.534*** (33.16)
abitur	-0.255** (-2.61)
university degree	-0.0196 (-0.16)
cons	-7.895*** (-13.75)
σ_u^2	0.028***
<i>N(person years)</i>	18,827
<i>N(persons)</i>	2,375
<i>N(events)</i>	1,101
<i>N(fields)</i>	33

Notes:

t statistics in parentheses

+p<0.10, * p < 0.05, ** p < 0.01, *** p < 0.001

The models also control for migration background, episodes of educational enrollment, movement to Eastern Germany, cohort and sample-membership. (three fields (34, 52, 54) were not used due to an insufficient number of observations)

Source: SOEP 1984-2010, unweighted data, own calculations.

Table 7o: The variance in transition to parenthood by educational field, Western German men (multi-level discrete time logit model, time axis: age, log odds)

	transition to parenthood
age	-0.226*** (-8.19)
ln age	3.073*** (7.66)
married	2.958*** (34.77)
abitur	-0.214* (-2.15)
university degree	0.204+ (1.85)
cons	-9.989*** (-14.76)
σ_u^2	0.006*
<i>N(person years)</i>	24,548
<i>N(persons)</i>	2,759
<i>N(events)</i>	993
<i>N(fields)</i>	35

Notes:

t statistics in parentheses

+p<0.10, * p < 0.05, ** p < 0.01, *** p < 0.001

The models also control for migration background, episodes of educational enrollment, movement to Eastern Germany, cohort and sample-membership. (two fields (54, 94) were not used due to an insufficient number of observations)

Source: SOEP 1984-2010, unweighted data, own calculations.

Table 8o: Characteristics of educational fields and transition to parenthood, Western German women (discrete time logit model, time axis: age, average marginal effects)

	(1)	(2)	(3)	(4)	(5)
	transition to parenthood				
age	-0.0108*** (-6.66)	-0.0110*** (-6.61)	-0.0109*** (-6.29)	-0.0109*** (-6.41)	-0.0109*** (-6.81)
ln age	0.125*** (5.16)	0.127*** (5.15)	0.127*** (4.96)	0.126*** (4.99)	0.127*** (5.27)
married	0.171*** (26.93)	0.171*** (25.82)	0.171*** (24.18)	0.170*** (24.87)	0.171*** (28.37)
abitur	-0.0119*** (-3.77)	-0.0130*** (-4.07)	-0.0127*** (-4.51)	-0.0132*** (-4.20)	-0.0113** (-3.28)
university degree	0.000886 (0.11)	0.00217 (0.29)	0.000723 (0.10)	0.00128 (0.17)	0.00202 (0.26)
share of women	-0.00981* (-2.11)				-0.00834+ (-1.68)
(share of women) ²	0.0212*** (3.74)				0.0197*** (3.52)
public-sector employment		-0.00455* (-2.33)			-0.00393* (-2.34)
occupational specificity			-0.0205 (-1.15)		
share of part-time employment				0.00830 (0.71)	
<i>N</i> (person years)	18,827	18,827	18,827	18,827	18,827
<i>N</i> (persons)	2,375	2,375	2,375	2,375	2,375
<i>N</i> (events)	1,101	1,101	1,101	1,101	1,101
pseudo <i>R</i> ²	0.197	0.197	0.197	0.196	0.198
chi ²	6,704.8	5,973.8	6,535.2	6,683.5	8,202.9

Notes: t statistics in parentheses

+p<0.10, * p < 0.05, ** p < 0.01, *** p < 0.001

The models also control for migration background, episodes of educational enrollment, movement to Eastern Germany, cohort, and sample membership.

Source: SOEP 1984-2010, unweighted data, own calculations.

Table 9o: Characteristics of educational fields and transition to parenthood, Western German men (discrete time logit model, time axis: age, average marginal effects)

	(1)	(2)	(3)	(4)	(5)
			transition to parenthood		
age	-0.00771*** (-5.64)	-0.00774*** (-5.55)	-0.00773*** (-5.60)	-0.00768*** (-5.55)	-0.00773*** (-5.65)
ln age	0.105*** (4.98)	0.105*** (4.88)	0.105*** (4.89)	0.104*** (4.86)	0.105*** (4.99)
married	0.159*** (16.56)	0.159*** (16.87)	0.159*** (16.73)	0.159*** (16.38)	0.159*** (16.57)
abitur	-0.00579 (-1.48)	-0.00650+ (-1.73)	-0.00657+ (-1.71)	-0.00670+ (-1.80)	-0.00546 (-1.38)
university degree	0.00761* (2.16)	0.00658 (1.56)	0.00698+ (1.81)	0.00718+ (1.77)	0.00746* (2.02)
share of women	-0.000434 (-0.22)				0.0000475 (0.02)
(share of women) ²	0.00588 (1.55)				0.00577 (1.51)
public-sector employment		-0.00210+ (-1.86)			-0.00167 (-1.24)
occupational specificity			-0.00785 (-0.72)		
share of part-time employment				-0.00207 (-0.98)	
<i>N(person years)</i>	24,548	24,548	24,548	24,548	24,548
<i>N(persons)</i>	2,759	2,759	2,759	2,759	2,759
<i>N(events)</i>	993	993	993	993	993
pseudo <i>R</i> ²	0.236	0.236	0.235	0.236	0.236
chi ²	6,403.1	4,839.4	4,510.5	6,193.9	8,033.9

Notes: t statistics in parentheses

+p<0.10, * p < 0.05, ** p < 0.01, *** p < 0.001

The models also control for migration background, episodes of educational enrollment, movement to Eastern Germany, cohort, and sample membership.

Source: SOEP 1984-2010, unweighted data, own calculations.

Table 10o: The association between educational fields and the transition to parenthood for Western German women (discrete time logit model, time axis: age, average marginal effects)

	(1)	(2)
	transition to parenthood	
age	-0.0108*** (-7.84)	-0.0109*** (-7.90)
ln age	0.125*** (7.31)	0.128*** (7.45)
married	0.171*** (25.86)	0.171*** (25.98)
abitur	-0.0134** (-3.18)	-0.0115** (-2.68)
university degree	0.000851 (0.15)	-0.000800 (-0.01)
female-dominated fields		0.0197*** (3.79)
male-dominated fields		0.0267** (2.94)
public-sector fields		0.00386 (0.73)
private-sector fields		0.0167** (3.16)
non-distinctive fields		Ref.
<i>N(person years)</i>	18,897	18,897
<i>N(persons)</i>	2,381	2,381
<i>N(events)</i>	1,003	1,003
pseudo R^2	0.197	0.200
chi ²	1,656.2	1,682.6

Notes: t statistics in parentheses

+p<0.10, * p < 0.05, ** p < 0.01, *** p < 0.001

The models also control for migration background, episodes of educational enrollment, movement to Eastern Germany, cohort, and sample membership.

Source: SOEP 1984-2010, unweighted data, own calculations.

Table 11o: The association between educational fields and the transition to parenthood for Western German men (discrete time logit model, time axis: age, average marginal effects)

	(1)	(2)
	transition to parenthood	
age	-0.00766*** (-8.09)	-0.00765*** (-8.07)
ln age	0.104*** (7.56)	0.103*** (7.55)
married	0.159*** (24.01)	0.159*** (23.96)
abitur	-0.00726* (-2.33)	-0.00698* (-2.14)
university degree	0.00680+ (1.78)	0.00740+ (1.89)
female-dominated fields		-0.00212 (-0.29)
male-dominated fields		-0.000878 (-0.25)
public-sector fields		-0.00460 (-0.89)
private-sector fields		-0.00316 (-0.73)
non-distinctive fields		Ref.
<i>N(person years)</i>	24,579	24,579
<i>N(persons)</i>	2,766	2,766
<i>N(events)</i>	995	995
pseudo R^2	0.235	0.235
chi ²	1,958.8	1,959.9

Notes: t statistics in parentheses

+p<0.10, * p < 0.05, ** p < 0.01, *** p < 0.001

The models also control for migration background, episodes of educational enrollment, movement to Eastern Germany, cohort, and sample membership.

Source: SOEP 1984-2010, unweighted data, own calculations.

Table 12o: The share of women (age 40) with children by educational fields

	% children (N)	% children (N), childless at graduation
female-dominated fields	79 (184)	77 (165)
male-dominated fields	76 (45)	74 (42)
public-sector fields	68 (149)	64 (131)
private-sector fields	70 (154)	68 (140)
non-distinctive attributes fields	74 (179)	69 (148)
total	73.70 (711)	70.13 (626)

Source: SOEP 1984-2010, own calculations, unweighted data.

Table 13o: The share of men (Age 40) with children by educational fields

	% children (N)	% children (N), childless at graduation
female-dominated fields	59 (41)	39 (28)
male-dominated fields	70 (580)	64 (478)
public-sector fields	59 (94)	49 (76)
private-sector fields	59 (128)	54 (115)
non-distinctive attributes fields	72 (130)	66 (109)
total	76.32 (973)	60.55 (806)

Source: SOEP 1984-2010, own calculations, unweighted data

Paper 2

Educational Fields and Fertility in Western Germany

—

An Analysis of Women born 1955-59 with the Mikrozensus 2008

Abstract

In recent years, research on education and fertility has been enriched by studies that take the educational field into account in addition the educational level. The aim of the present paper is to add Western Germany, a country with outstandingly high levels of childlessness, to the list of countries on which comparable research has been carried out. Using data from the German Mikrozensus 2008 the association between educational attainment, childlessness, and ultimate fertility among Western German women born between 1955 and 1959 is examined.

The overall finding of the present analysis is that, despite the strong impact of the level of education, there is also a relationship between the educational field and childlessness in Western Germany. Consistent with previous findings from other countries, women educated in teaching and health-care are the group with the lowest rates of childlessness at each educational level, while those educated in administration, economics or social science are the groups with the highest levels of childlessness. Educational field and level account equally for variation in ultimate fertility. In further analysis the differences between Eastern and Western Germany with regard to childlessness is confirmed. At the same time similarities are observed in comparison with other European countries.

Acknowledgements

The author is grateful for helpful comments from Karsten Hank.

1. Introduction

In recent years, research on education and fertility has been enriched by studies that take the educational field into account in addition to the educational level (Begall & Mills 2013; Hoem, Neyer, & Andersson 2006a, 2006b; Lappegård & Rønsen 2005; Martín-García & Baizán 2006; Michelmore & Musick 2013; Neyer & Hoem 2008; Rønsen & Skrede 2010; Van Bavel 2010). All of these studies find an effect of the field that is independent of the level. The findings differ with regard to the question of whether or not the level or the field of education is a better indicator for fertility. Institutional aspects of the educational system, like flexibility or its gendered structure, as well as measures of family policy are assumed to be of importance for these differences.

The operationalization of educational attainment varies considerably between these studies, especially with regard to the number of educational categories used in the analysis. Nevertheless three studies analyzing childlessness in three different countries, namely Sweden, Austria and Greece, apply a comparable set-up (Bagavos 2010; Hoem et al. 2006a; Neyer & Hoem 2008). Each study uses national register or census data to examine childlessness of women born between 1955 and 1959. The operationalization is very similar; each uses about sixty categories of educational attainment (about fifty in the case of Greece). These categories are built out of combinations of educational levels and fields. For Sweden, a companion paper also looks at ultimate fertility (i.e., the average number of children) (Hoem et al. 2006b).

The aim of the present paper is to add Western Germany to the list of countries this approach is applied to. Data from the German Mikrozensus 2008¹ on educational attainment and childlessness are treated in a comparable manner to previous studies. Additionally, ultimate fertility is examined in accordance with the study of Hoem et al (2006b). A further aim of this paper is to provide reference data for researchers examining the relationship between education and fertility in the German context.

¹ For the analysis, the full sample of the Mikrozensus 2008 was used. This was possible via an On-Site access for guest researchers. The author is very grateful for the kind support of the team at the Forschungsdatenzentrum in Berlin-Mitte.

Germany is a low-fertility country with one of the highest rates of childlessness worldwide (Dorbritz 2008). Due to the emphasis of German family policy on monetary support and structures that support the male-breadwinner model, like the taxation law or the lack of (full-time) daycare coverage, compatibility is considered to be rather low in Western Germany. Women of childbearing age seem to face the choice between career and children. A bifurcation between childless women and mothers with two or more children is often observed (e.g., Dorbritz 2008). Despite the fact that a lot of research has examined the relationship between the educational level and fertility in Western Germany, a possible impact of the field has so far been given little attention. Using data from the German Socio-Economic Panel study, it has been shown that educational field matters for the transition to parenthood for women in Western Germany, but not men (Oppermann 2013). The present analysis contributes to existing knowledge by applying a comparable approach to the data of the German Mikrozensus 2008. This overview is enabled by the large number of cases in the Mikrozensus. In addition, the relationship between educational fields and ultimate fertility is explored for the first time in Western Germany.

In the next section the main arguments why the educational field should matter for fertility behavior are summarized. In the subsequent section important features of the Western German educational system and family policy are discussed along with selected research findings. The data for the analysis come from the German Mikrozensus 2008. The data and how they are treated is described in the data section. Analysis is focused on Western German women born between 1955 and 1959. The main findings are presented. The findings on Western Germany are discussed with regard to results from Eastern Germany and previous findings from other countries. The paper concludes with a reflection of the findings also with regard to implications for research on Germany.

2. A brief Argument: Why the Field matters

The idea behind including the educational field into the analysis of the relationship between education and fertility is discussed in most detail by Hoem et al. (2006a). At this point only the main arguments are highlighted: A tight bond between education and labor market opportunities is assumed. Educational fields differ with regard to labor market opportunities that make compatibility of family and an employment career easier or more difficult. Flexible working hours and part-time work and a high workplace security (maybe due to employment in the public sector) are assumed to positively impact on compatibility. It is further assumed that educational fields differ with regard to skill depreciation: this term refers to the loss of knowledge due to a temporary break, for example for parental leave (Martín-García & Baizán 2006). This risk might be high especially in technical fields when important developments are missed during a break (Hoem et al. 2006a). Occupational specificity differs between educational fields; some fields lead more clearly to a certain occupations than others. For example, education in arts, humanities or social sciences usually does not prepare one for specific occupations (ibid.). Preferences regarding the future lifestyle, especially towards work content and family, as well as the anticipation of working conditions and compatibility of employment and parenthood, impact on the selection of a field of education. Especially for women educated in care-related fields like teaching and health care, it is assumed that preferences and personality traits simultaneously impact on the choice of an educational field and fertility behavior (ibid.). The selection of an educational field also influences the social environment during the years in education and later in adult life, which also shape a person's preferences with regard to childbearing (Martín-García & Baizán 2006; Van Bavel 2010).

The association between educational attainment, level and field of education, and fertility has been shown in many European countries. It is assumed that the association is shaped by country specific institutional settings.

3. The German Setting

Structure and organization of an educational system influence fertility outcomes (Hoem et al. 2006a). Three aspects of the German educational system are highlighted and a detailed overview is provided in the Appendix.

A main characteristic of the German educational system is early tracking (Jacob & Tieben 2009; Shavit & Müller 2000) after four years of elementary school. In general, the flexibility of the educational system is rather low (Kerckhoff 2001).

While the share of women participating in secondary and tertiary education increases, choices of educational fields are still strongly gender segregated (BMBF 1997, 2007; Charles & Bradley 2009; Wirth & Dümmler 2004). For example, women are overrepresented in health care and men in engineering (Charles & Bradley 2009).

The bond between educational system and labor market opportunities is tight (Schneider 2008; Shavit & Müller 2000). It is very common in Germany to earn a qualification, often closely related to an occupation, and to stick to this occupation throughout working life (Kerckhoff 2001). Numerous occupations are tied to formal educational qualification (Buchmann & Charles 1995, p. 85).

Next to the educational system, measures of family policy as well as dominant value orientations within a country impact on fertility behavior (Blossfeld & Huinink 1991; Brewster & Rindfuss 2000; Dorbritz 2008; Gauthier 2007; Henz 2008; Hoem et al. 2006a, 2006b; Kravdal & Rindfuss 2008; Kreyenfeld 2002). Very recent developments are not discussed here as they, like for example the introduction of the Elterngeld in 2007, occurred after women born between 1955 and 1959 reached the end of their fertile years.

Western Germany is a country with prevailing traditional family attitudes and gender roles (Pfau-Effinger & Smidt 2011; Pfau-Effinger 2012). Marriage and childbearing are strongly tied. In 1990 only 10.05% of children were born to mothers who were not married in Western Germany (Dorbritz 2008, p. 573). A pregnancy is an occasion for marriage (Blossfeld & Rohwer 1995; Dorbritz 2008, p. 573 and 579; Federkeil 1997; Sobotka 2008). Women's participation in education has increased, leading to more

opportunities in the labor market. At the same time, being a housewife and mother, is a widely accepted lifestyle choice.

A traditional division of labor is supported by many features of German family policy. The tax system supports marriages, with or without children. Due to the so-called “Ehegattensplitting” (Daly 2000, p. 91; Federkeil 1997, p. 87; Steiner & Wrohlich 2006), marriages with one main earner (usually the male-breadwinner) benefiting the most. The lack of full time day-care hinders compatibility of family and employment, which only recently became a political goal. A long parental leave on the other hand is supported financially and with a guaranteed return to the previous job after up to three years² of a child's life. Traditionally daycare is mainly provided by the Kindergarten, which is for children between age 3 and 6, usually for 4 hours per day (Daly 2000, p. 81; Dustmann & Schönberg 2012; Federkeil 1997, p. 90; Henz 2008, p. 1456). Daycare for children under the age of 3 or schoolchildren is scarce³ (Federkeil 1997, p. 90), the cohort under examination did not benefit from developments within the last years.

Fertility rates in Germany are beneath replacement rate since the end of the “Golden Age of Marriage” in the 1960s (Dorbritz 2008, p. 562; Federkeil 1997, p. 82). A polarization between childless women and women who opt to have more than one child can be observed. Women seem to choose between these two lifestyles as compatibility is low (Dorbritz 2008, p. 560).

The strong impact of education on fertility, especially the timing of childbirth but also on childlessness or ultimate fertility has drawn much attention in the context of low fertility in Germany. Among the common findings is that childbirth is postponed until after graduation (e.g., Blossfeld & Huinink 1991; Kreyenfeld & Konietzka 2008; Kreyenfeld 2010). While highly educated women (for whom the opportunity costs of children are especially high) more often remain childless than less well educated women; highly educated women who do become mothers, despite the opportunity costs, tend to

² Parental Leave with job protection was expanded from 2 month to 6 month in 1979. This protected period was increased to 10 month in 1986, to 18 month in 1990 and, to 36 month in 1992 (Dustmann & Schönberg 2012).

³ School in Germany usually is in the morning and only occasionally in the afternoon. Additionally, school start and ending times are not the same at every day of the week.

also have a second child. This is partly caused by self-selection of especially family prone women into motherhood (Kreyenfeld 2002).

4. Hypotheses

Based on the description of the Western German context and previous findings from Sweden, Austria and Greece I expect to find the following with regard to the relationship between educational level, educational field and childlessness:

I expect the level of education to be strongly associated with childlessness. Additionally I expect the field of education to matter for childlessness. Very much in line with other countries, I furthermore expect care-related fields (teaching and health care) and women-dominated fields to have low levels of childlessness. Fields with high skill depreciation (technology) or with uncertain occupational perspectives (humanities, social sciences) as well as fields with long educational enrollment should have high proportions of childlessness. Finally a high share of people never having married in a field should result in high childlessness.

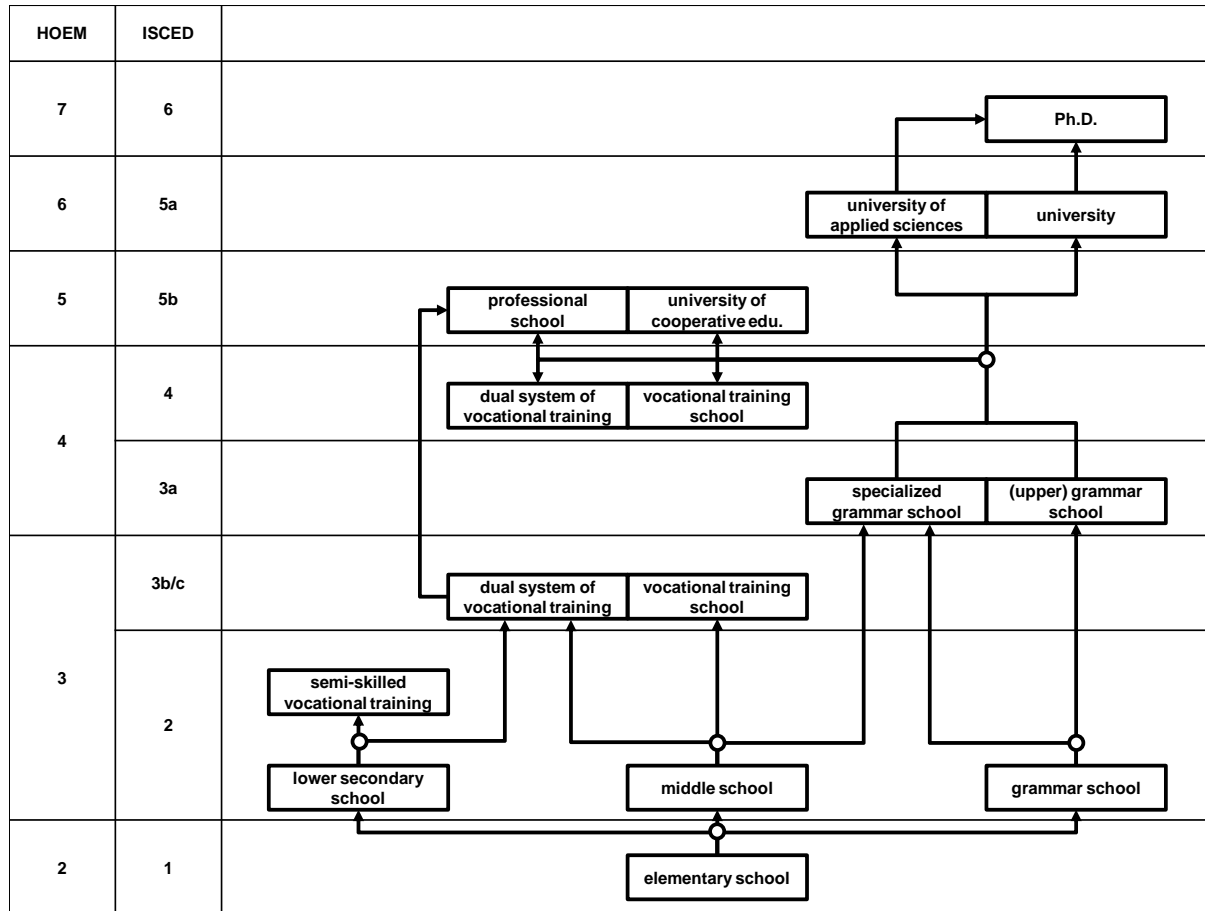
With regard to the relationship between educational level, educational field and ultimate fertility, I expect that mothers in fields with high childlessness have similar high or even higher numbers of children compared to mothers in fields with less childlessness (bifurcation).

5. Data and Data Management

The data for this analysis come from the German Mikrozensus 2008. The Mikrozensus consists of 1% of households in Germany⁴. Usually respondents are not asked about children and one can only infer from the household composition the existence of children. In the wave of 2008, female respondents between age 15 and 75 were asked (voluntarily) about having given birth to a child and the number of children. The Mikrozensus includes information on the highest level of education of a respondent as well as about 90 categories of educational fields. The aim of this analysis is to provide figures that are comparable to previous findings. The studies of Hoem et al. (2006a and 2006b) were the first to use such a detailed differentiation of educational categories. The data management of the Swedish data by Hoem et al. is used as guide for the data management of the Mikrozensus data. The information on the ISCED level of the highest educational degree and the information on the field of education are used to build categories as similar as possible to the categories used by Hoem et al. (2006a and 2006b).

⁴ While the previous studies on Sweden, Austria and Greece use register or census-data, and therefore information on the whole cohort of women born between 1955 and 1959, such data are not available for Germany. The census carried out in 2011 does not include the information needed for this analysis.

Figure 1: German educational system



Source: own representation

Figure 1 shows how the German educational system fits into ISCED and how the ISCED levels were combined to match the levels used in the analysis of Hoem et al. 2006a and 2006b. These are used for the analysis. Due to the structures of the German educational system, some groups are not completely identical. For example teachers in Germany have a university degree (level 6) while some teachers (like pre-school teachers) in Sweden have level 5. Also the information on the field of education does not allow some of the differentiations made by Hoem et al.. For example a midwife and a nurse cannot be differentiated and are labeled health-care specialists. How the educational categories used in the present analysis correspond to those used in Hoem et al. (2006a) is displayed in Table 1. For the present analysis 50 categories of educational attainment are used.

Table 1: Educational Fields in Sweden and Germany

SWEDEN (HOEM et al. 2006a)		GERMANY		
FIELD	LEVEL	LEVEL	FIELD	CODE
general education, non specific				
primary school	2	2	primary school	101
brief secondary school, general	3	3	brief secondary school, general	102
long secondary school, general	4	4	long secondary school or higher, general	103
arts, humanist, religious				
religious education, brief	5	6	theology, university degree	201
theology, university degree	6			
arts, brief	5	3	arts, brief	202
arts, university-level degree	6	6	arts, university-level degree	203
humanities, university degree (not teacher)	6	3	humanities, brief	204
		4	humanities, long	205
		5	humanities, specialist	206
librarian	6	6	humanities, university degree (not teacher)	207
personal service etc				
hotel & restaurant worker	3	3	hotel & restaurant worker	301
home maker	3	3	service worker, unspecified	302
cleaner	3			
food processing	3			
policewoman	5			
service worker, unspecified	3			
grand-household administrator	5	5	service specialist	303
beautician, hairdresser	3	3	beautician, hairdresser	304
mail carrier	3	3	mail office worker	305
mail office worker	3			
		4	mail and transports	306
admin. econom. social science				
administration, brief secondary	3	3	administration, brief secondary	401
		3	trade and storage	406
business administration, brief secondary	4	4	business administration, long secondary	402
business administration, long secondary	5	5	business administration specialist	403
business administration, university degree	6	6	business administration, university degree	404
journalist	6			
medical secretary	4	3	medical secretary	405
social worker	6	5	social worker	407
psychologist	6	6	psychologist	408
lawyer	6	6	lawyer	409
social science, university degree	6	6	social science, university degree	410
industry, crafts, engineering, natural science				
mechanic etc, brief secondary	3	3	mechanic etc, brief secondary	501
pharmacy technician	3			
engineer advanced vocational training	5	4	engineer, long	502
pharmacy receptionist	5	5	engineer specialist	503
laboratory assistant	5			
textile worker	3	3	textile worker	504
natural science & engineering, university degree	6	6	natural science & engineering, university degree	505
pharmacist	6			
mapmaker	3	3	architecture, brief	506
architect	6	6	architect	507

Table 1: Continued

SWEDEN (HOEM et al. 2006a)		GERMANY		
FIELD	LEVEL	LEVEL	FIELD	CODE
agriculture				
farm worker, brief secondary	3	3	farm worker, brief secondary	601
agronomist, veterinarian	6	6	agronomist, veterinarian	602
health professions				
health-care worker	3	3	health-care worker, brief secondary	701
dental nurse etc	4	4	health-care worker, long secondary	702
nurse	5	5	health-care specialist	703
midwife	5			
physician	6	6	health care, university degree	704
child-care worker	4	3	child-care worker, brief secondary	705
		4	child-care worker, long secondary	706
		5	child-care specialist	707
Ph.D. (Med)	7	7	Ph.D. (Med)	708
dentist	6			
teaching				
youth worker	5	3	youth worker	801
primary-school teacher	6	6	primary-school teacher	802
teacher of children with special needs	6	6	teacher of children with special needs	803
high-school teacher	6	6	high-school teacher	804
pre-school teacher	5	6	other teacher	805
physical education, teacher	5			
music or arts teacher	5			
home-economics teacher	6			
non-medical research				
Ph.D. (Social Science or Humanities)	7	7	Ph.D. (Social Science or Humanities)	901
Ph.D. (Natural or Technical Science)	7	7	Ph.D. (Natural or Technical Science)	902

The analysis is conducted for women born between 1955 and 1959, the same cohort used in the studies on Sweden, Austria and Greece. The sample is restricted to women who live in Western Germany in the year 2008 – the year of the survey. Women in Eastern and Western Germany differ with regard to their fertility behavior (Dorbritz 2008; Henz 2008; Kreyenfeld 2004). Ideally the sample would have been restricted by residence prior to the German reunification in 1990. Unfortunately no information is available in the Mikrozensus that allows identifying residence prior to 1990. Using the current residence is the next best thing and has been used in studies of Germany before (Huinink, Kreyenfeld, & Trappe 2012; e.g., Wirth 2007). The analysis sample consists of 19,879 women. Table 1a in the appendix displays the main findings.

6. Childlessness in Western Germany

The presentation of the main findings is structured as follows: First the relationship between childlessness and educational attainment of Western German women born between 1955 and 1959 is explored. In a second step, childlessness of this cohort is compared to childlessness of the neighboring cohorts of 1950-1954 and 1960-1964. It is further compared to childlessness of women in Eastern Germany. The findings from Germany are discussed in comparison to the previous findings from Sweden, Austria and Greece. Finally, ultimate fertility and its relationship with educational attainment is explored.

The following figures and discussions are mainly based on Table 1a in the appendix. As described before, the level of childlessness is high in Western Germany - it varies between 9% (child-care worker) and 45% (Ph.D. in Social Science or Humanities). The overall childlessness in the sample is 17.8%.

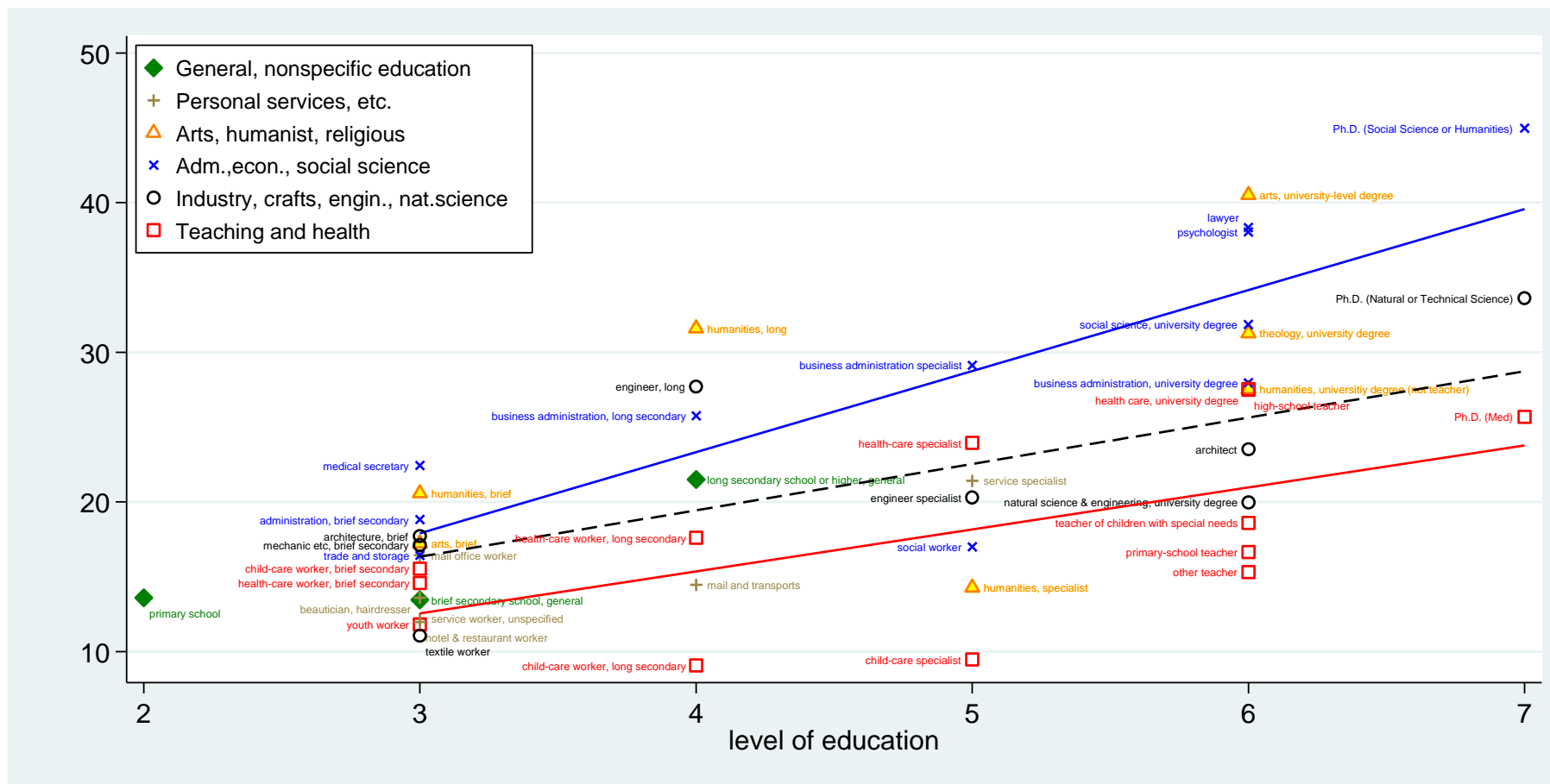
Figure 2 contains the main findings on the relationship between educational level, educational field and childlessness for Western German women born 1955-59⁵. Figure 2 clearly shows a relationship between the field of education and childlessness. It also shows a clear effect of the level; the trend lines are rather steep. The margin between the group with the highest and those with the lowest childlessness at each educational level increases with an increasing level of education. Women educated in teaching and health care are the group with the lowest rates of childlessness at each educational level, while those educated in administration, economics or social science are the groups with the highest levels of childlessness. Social workers seem to be an exception within this group. Their low level of childlessness fits more into the group of women educated in teaching and health care. The results for women educated in the arts or humanities do not show a clear pattern. Childlessness of women with a Ph.D. in medicine is about 26%, while those of women with a Ph.D. in natural or technical science is about 34%. Women with a Ph.D. in social science or humanities are the group with the highest level of childlessness within

⁵ In order to make comparison easier, the layout of Figure 2 resembles those of Hoem et al. (2006a and 2006b) using similar markers and colors. In Figure 2, all markers are labeled while in some of the following graphs only selected markers are labeled.

the analysis sample. As can be seen in Figure 3, those women also have the highest mean age at completion of education.

A two way analysis of variance shows that the level of education accounts for more variation in childlessness than the field of education. Table 2a in the appendix shows the association between educational level and childlessness in the analysis sample.

Figure 2: Per cent permanently childless, by education group; Western German women born in 1955-1959

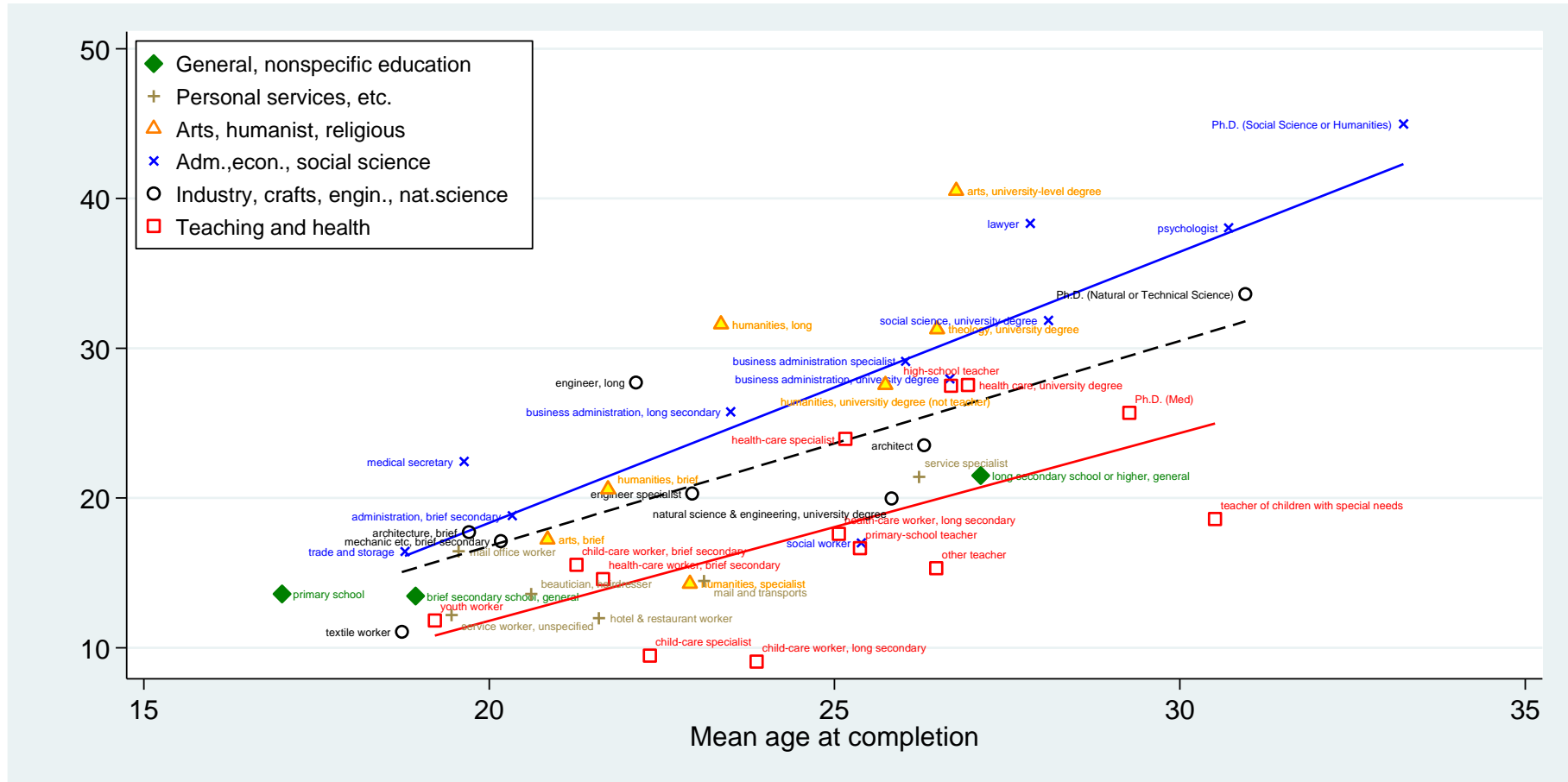


Source: FDZ der Statistischen Ämter des Bundes und der Länder, Mikrozensus 2008, own calculations

6.1 Childlessness and Mean Age at Completion of Education

Figure 3 shows a strong relationship between the duration of education and permanent childlessness. As described above, it is very common in Germany to postpone the birth of a first child until after graduation. Nevertheless, Figure 3 also shows an effect of the field of education. Again, women educated in teaching and health-care are among those with the lowest levels of childlessness. While the mean age of completion for women educated as teachers for children with special needs and psychologists is about the same (30.5 and 30.7) their rates of childlessness differ considerably. While the former group has about 19% childlessness, childlessness among psychologists is 38%. A higher age at completion does therefore not necessarily lead to higher levels of childlessness in Western Germany. Some educational fields might be more compatible with childbearing during educational enrollment than others. Some of the women educated as teachers for children with special needs might have had their first child prior to graduation while this is not feasible with training as a psychologist. While the Mikrozensus does contain the information in which year the highest educational degree was received, it does not include the age or year of the birth of the first child. Given the German educational system described above and the high tendency of women to postpone childbirth until after graduation, I would not expect to find many women having their first child prior to graduation in Western Germany, but this cannot be examined using these data. It cannot be ruled out that educational lines differ with regard to compatibility with having children while in educational enrollment, as findings from Norway and Sweden imply (Hoem et al. 2006a; Lappegård & Rønsen 2005).

Figure 3: Per cent permanently childless, by mean age at completion of education; Western German women born 1955-1959



Source: FDZ der Statistischen Ämter des Bundes und der Länder, Mikrozensus 2008, own calculations

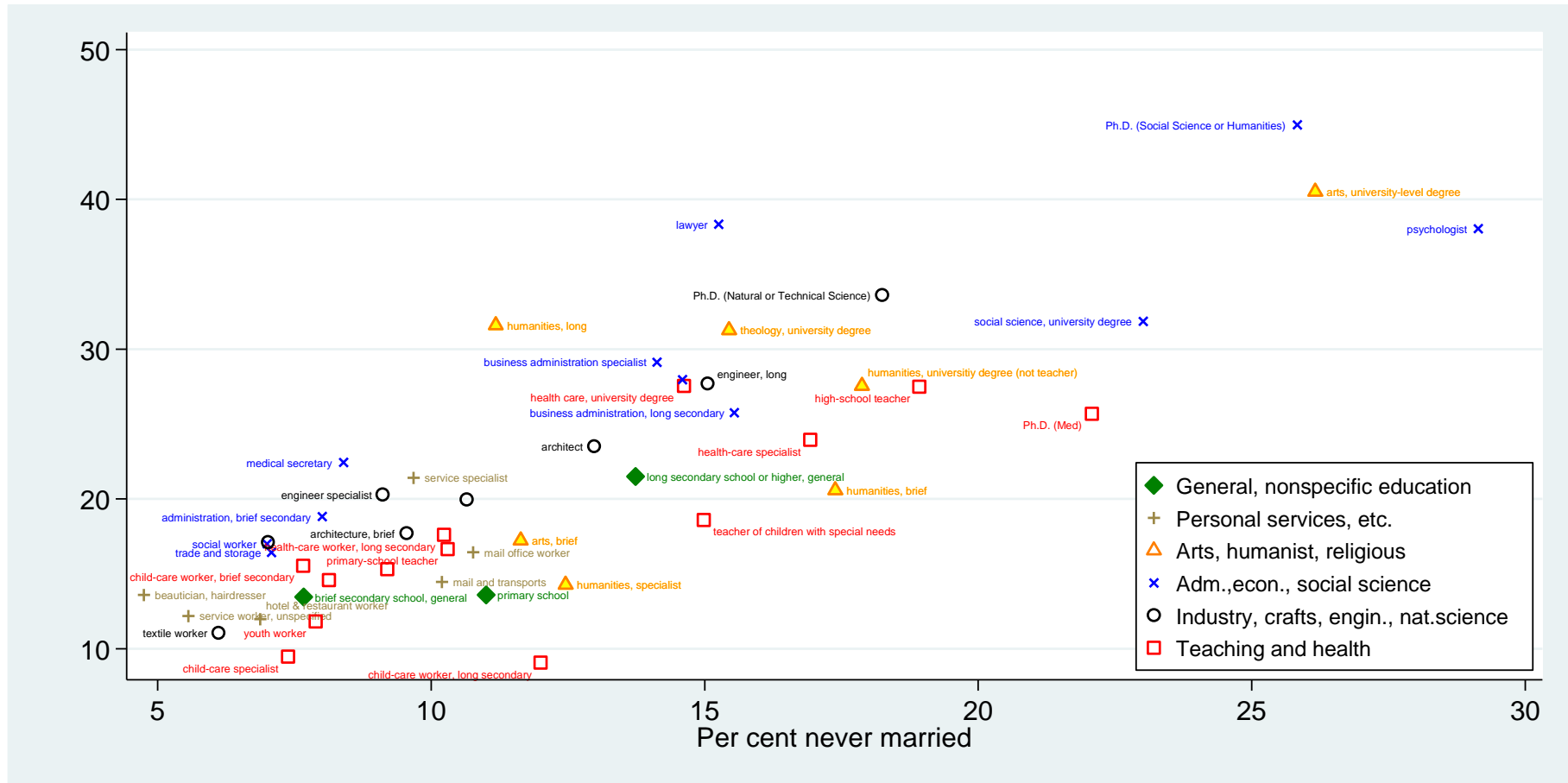
6.2 Groups with high Levels of Childlessness

In Western Germany, no effect of the field of education can be observed among the groups with more than a quarter childless. Given the overall high levels of childlessness in Western Germany, quite many educational lines have childlessness above 25%. Even within the group of teaching and health care, there are three sub-groups that have childlessness above 25% (Ph.D. (Med): 26%; high-school teacher: 27%; health care, university degree: 28%). Each of them has an educational level of 6 or above. It has to be noted that no group with a general or unspecified educational field or field in personal services has childlessness above 25%. Administration, economics and social science are fields with high fractions of childlessness. Childlessness of women educated in business administration varies between 26% and 29%, childlessness of psychologists and lawyers is about 38% and 45% of women with a Ph.D. in social science or humanities remain childless. High childlessness is also observed among women educated in arts, humanist or religious fields, varying from 28% of women educated in the humanities at university-level, to 41% of those educated in the arts at university-degree level. Among the natural sciences, engineers have 28% childlessness and women with a research degree 34%. The majority of the groups with more than 25% childlessness have an educational level of 6 (university degree) or above.

6.3 Groups that never marry

Childbearing within marriage is the common pattern in Western Germany. Therefore it is not surprising that Figure 4 shows very low percentages of never married among groups with low levels of childlessness. No field effect can be observed in this figure. The upper right half of Figure 4 shows a few educational lines with high childlessness, all of those educational lines have a high educational level (level 6 or 7).

Figure 4: Per cent permanently childless vs. never married; Western German women born 1955-59



Source: FDZ der Statistischen Ämter des Bundes und der Länder, Mikrozensus 2008, own calculations

6.4 Is there Change over Time?

In order to examine whether the described relationship between educational level, educational field and childlessness is persistent over time, the two neighboring cohorts (1950-1954 and 1960-1964) are examined⁶. The overall level of childlessness has risen from cohort to cohort. 16.3% of the women born between 1950 and 1954 remained childless, 17.8% of those born between 1955-1959, and about 20% of those born between 1960-1964. Educational level and childlessness are strongly related in each cohort. With regard to childlessness within educational lines, changes between cohorts are mainly observed among fields that do not contain many observations. The only eye-catching change is the rise in childlessness among women educated in industry, crafts, engineering and natural sciences. In the cohort 1950-1954, childlessness within this field is close to childlessness among women educated in teaching and health care. Childlessness within this field is higher in the cohort 1955-59 as described above. The pattern of the relationship between educational attainment (level and field) is remarkably similar between the two cohorts 1955-1959 and 1960-1964. Only the level of childlessness is higher in the latter cohort.

The association between childlessness and average age at education is less pronounced in the cohort 1950-54 than in the following two cohorts. The pattern does not change over time. The association between the share of women in an educational line who were never married and childlessness does not show any clear change.

⁶ Figures on childlessness of the cohorts 1950-1954 and 1960-1964 are enclosed at the end of the appendix.

7. Childlessness in Eastern Germany

During the years of separation the observed fertility behavior developed quite differently in Eastern and Western Germany. On average, women in the German Democratic Republic (GDR) had their children at an earlier age, were more often unmarried at the time of the first birth and the overall childlessness was lower than in Western Germany (Dorbritz 2008; Kreyenfeld 2004).

The development in the GDR is often explained with the pronatalist family policy since the 1970s that provided child allowances and maternal leave. Having a child improved the chances of getting a home while daycare was available and affordable (Dorbritz 2008, p. 563). According to the political goals of the GDR, women should participate in the labor market as well as become mothers (Henz 2008; Kreyenfeld 2004). Institutional settings were very different during the fertile years of the cohort under examination. As Dorbritz puts it, the choice for children was easier in the GDR due to the combination between limited life-choices and a higher amount of social security (Dorbritz 2008, p. 563).

The number of cases in the Mikrozensus 2008 for Eastern German women born between 1955 and 1959 are too small for a comparison of the full range of educational lines. Table 2 therefore consists of a comparison of childlessness in Eastern and Western Germany between those educational lines for which data on at least 50 women in Eastern Germany are available.

Table 2: Educational attainment and childlessness in Western and Eastern Germany, women born in 1955-59

field of education	level	Western Germany (FRG)		Eastern Germany (GDR)	
		N	% childless	N	% childless
<u>general education, non specific</u>					
brief secondary school, general	3	3,105	13.4%	176	9.0%
<u>art, humanist, religious</u>					
arts, brief	3	276	17.2%	66	10.3%
humanities, brief	3	56	20.6%	50	14.3%
<u>personal service etc.</u>					
hotel & restaurant worker	3	232	12.0%	157	5.8%
service worker, unspecified	3	426	12.2%	87	4.7%
beautician, hairdresser	3	588	13.6%	58	3.6%
mail office worker	3	112	16.4%	93	5.0%
<u>administration, economy, social sciences</u>					
administration, brief secondary	3	2,583	18.8%	402	6.5%
business administration specialist	5	179	29.1%	123	6.0%
business administration, university	6	273	28.0%	124	8.1%
medical secretary	3	730	22.4%	143	5.8%
trade and storage	3	2,523	16.4%	377	7.6%
social science, university degree	6	457	31.9%	70	8.8%
<u>industry, crafts, engineering, natural sciences</u>					
mechanic etc, brief secondary	3	406	17.1%	434	8.3%
engineer specialist	5	85	20.3%	74	7.2%
textile worker	3	496	11.1%	325	6.5%
natural science & engineering, university	6	312	20.0%	149	9.4%
<u>agriculture</u>					
farm worker, brief secondary	3	98	23.0%	174	6.1%
<u>health professions</u>					
health-care worker, brief secondary	3	1,889	14.6%	187	8.1%
health-care specialist	5	410	23.9%	266	6.7%
health care, university degree	6	192	27.5%	56	3.0%
child-care specialist	5	141	9.5%	179	6.3%
<u>teaching</u>					
other teacher	6	301	15.3%	78	1.3%
Total		19,879	17.8%	4,276	7.4%

Source: FDZ der Statistischen Ämter des Bundes und der Länder, Mikrozensus 2008, own calculations
Selected educational lines with at least 50 observations in Eastern Germany

The overall childlessness is 7.4% in Eastern Germany; there is no real relationship between the level of education and childlessness. Childlessness is on an average level at each educational level. Higher childlessness is only observed among women who only completed primary school or those who hold a Ph.D., but both groups only consist of very few women (37 and 29).

Both within Eastern and Western Germany, lower than average childlessness is observed among women educated in teaching and child-care. Childlessness is low among women educated in health care only among those with a low educational level in Western Germany, while there is no clear pattern in Eastern Germany. Women educated in personal services (e.g., hotel or restaurant worker or beautician, hairdresser - all educational level 3) have lower than average childlessness in both parts of Germany. Contrary to Western Germany, childlessness among women educated in administration or social sciences is not clearly above average in Eastern Germany. The high childlessness among Western German women is assumed to be caused by the low occupational specificity of these educational lines and the insecurities that derive from this. Seemingly, these insecurities were minimized in Eastern Germany.

8. The Findings in an International Context

The findings of this analysis add to a set of comparable studies on Sweden, Austria and Greece (Hoem, et al. 2006; Neyer and Hoem 2008; Bagavos 2010). All of them are industrialized countries but differ with regard to welfare state and family policy regime. Sweden is known for its social-democratic welfare state, generous family policy and strong emphasis on gender equality (Gauthier 2002). Greece belongs to the group with a southern European family policy, with low benefits and numerous private and public incentive schemes (ibid.). The geographical neighbors, Western Germany and Austria, are both known for their conservative family policies oriented towards a traditional division of labor between men and women (ibid.). Both are also quite similar with regard to their educational systems, especially the early tracking of students and the “dual system of vocational training” (Schneider 2008; Neyer and Hoem 2008). The findings from Western Germany should therefore be more similar to Austria than to Sweden or Greece.

But there also relevant differences between Western Germany and Austria. While Western Germany is more urbanized, the agricultural sector is more important in Austria than in Western Germany (STATISTICS AUSTRIA 2013; United Nations 2013). Tourism and related occupations are also of higher importance in Austria (STATISTICS AUSTRIA 2013). The gender-segregation among educational fields is higher in Germany than in Austria (Charles & Bradley 2009).

Overall childlessness is about 15.7% among women born between 1955-1959 in both Sweden and Austria. 12.3% of the women of this cohort are childless in Greece. Western Germany's 17.8% is the highest overall childlessness among the four countries.

A strong relationship between educational level and childlessness is observed in Western Germany, Austria and Greece. In Austria and Western Germany, the level of education accounts for more variance in childlessness than the field of education. In Greece both are equally important and in Sweden the field is even more important than the level.

Comparing the patterns of childlessness, the most eye catching are – despite the different levels of childlessness – the similarities. A relationship between the field of education and childlessness is found in all countries. In all countries, childlessness is low in the fields of teaching and child care. High rates of childlessness are found among women educated in administration and social sciences. While women educated in health care have low rates of childlessness in Sweden and Western Germany, the opposite is observed in Austria and Greece. A clear pattern of high childlessness among women educated in engineering and natural science was only found in Greece but neither in Sweden, Austria, nor Western Germany.

Furthermore, high childlessness was expected in arts, humanist and religious fields of education. The results do not show a clear pattern. Childlessness among this group varies between 14% (humanities, specialists) and 41% (arts, university-level degree). The latter finding is in line with findings from Sweden, but the generally high childlessness among this group observed in Sweden as well as in Austria is not observed in Western Germany. Uncertain career perspectives are assumed to cause the high rates of childlessness in this group in Sweden. In Germany, dropping out of the labor market and becoming a mother and housewife might have been an attractive option for women in this field. They might have opted for the latter to avoid the difficulties of the former. Women educated in the field of administration, economy, or social science have medium to high rates of childlessness in all analyzed countries.

Childlessness among women educated for a service job in a hotel or restaurant is low in Austria and Western Germany but high in Sweden. While the Swedish finding is explained by working conditions, such as unusual working hours, that are difficult to combine with family life, those working conditions could have prompted German women to leave the labor market and become a mother and housewife. Another possibility is the explanation given for the Austrian finding: Women educated for jobs in hotels or restaurants might be working within family businesses offering enough flexibility to combine parenthood and employment. Childlessness among women educated in agriculture is also low in Austria, while Sweden and Western Germany are more alike. As described above both sectors are more important in Austria than in Western Germany and therefore contribute to the overall childlessness to a greater extent.

The pattern of the relationship between educational attainment and childlessness observed in Western Germany is most similar to the Swedish pattern, but with a stronger impact of the level of education and a higher overall level of childlessness in Western Germany. Differences in the patterns of childlessness between Austria and Western Germany are probably mainly based on the stronger impact of tourism and agriculture in Austria. Greece is unique in many ways, but the high childlessness among women holding a Ph.D is very similar to Western Germany.

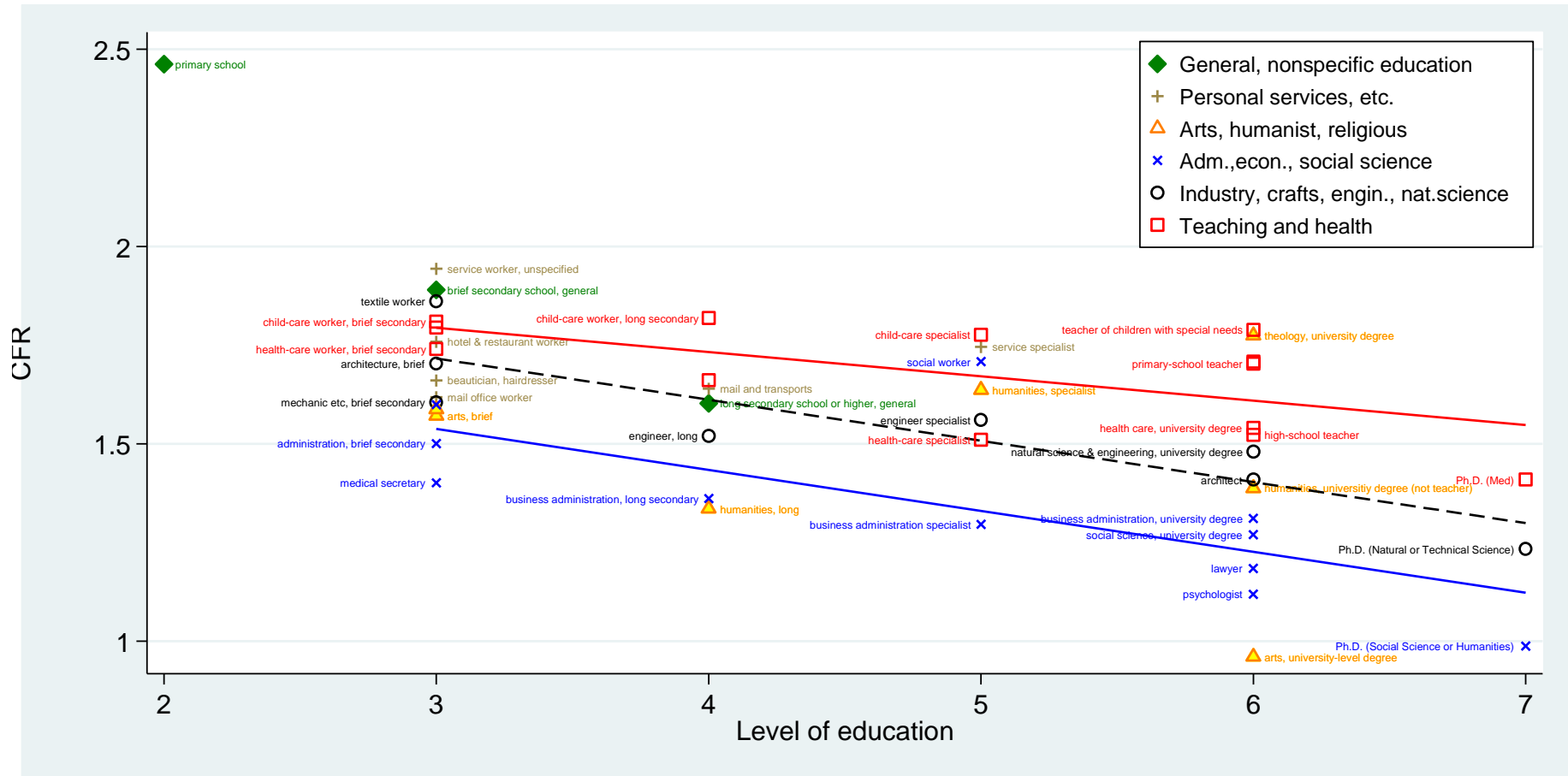
9. Ultimate Fertility in Western Germany

Figure 5 shows the relationship between educational level, educational field and ultimate fertility for Western German women born 1955-59⁷. The most eye catching is the high ultimate fertility of women with a low educational level (primary school, level 2). On average women educated only with a primary school have about 2.5 children, 71% have two or more children and among those who do become mothers, the average number of children is 2.9. Childlessness of this group is low (14%) but does not stick out; many groups at higher levels of education have lower fractions of childlessness. No other group has an ultimate fertility that is even close to this group. Education at this level contains little or no specific labor market qualifications. It might be that the low labor market potential of these women encouraged them to practice a traditional division of labor and specialize in housework and childcare while their partners contributed financially to the household as male breadwinner.

Figure 5 shows, as one would expect, that ultimate fertility declines with an increasing level of education. It also shows an effect of the field of education in the expected order, but the effect seems less pronounced than with regard to childlessness. Again, social workers stick out in their group and are more comparable to the group of teaching and healthcare. Even though the group of teaching and health care is the group with the highest ultimate fertility, with the exception of educational level 2, ultimate fertility of other educational lines are also at their level. Ultimate fertility of teaching and health care does not stick out as prominently as one might have expected given the low childlessness of this group in Western Germany. In Sweden this group sticks out with highest ultimate fertility at each level of education. Ultimate fertility in the group of arts and humanities does not display a clear pattern. They have rather high levels of childlessness but especially women educated in theology are among those with the highest ultimate fertility at educational level 6. A two-way analysis of variance shows that educational level and educational field account equally for variation in ultimate fertility.

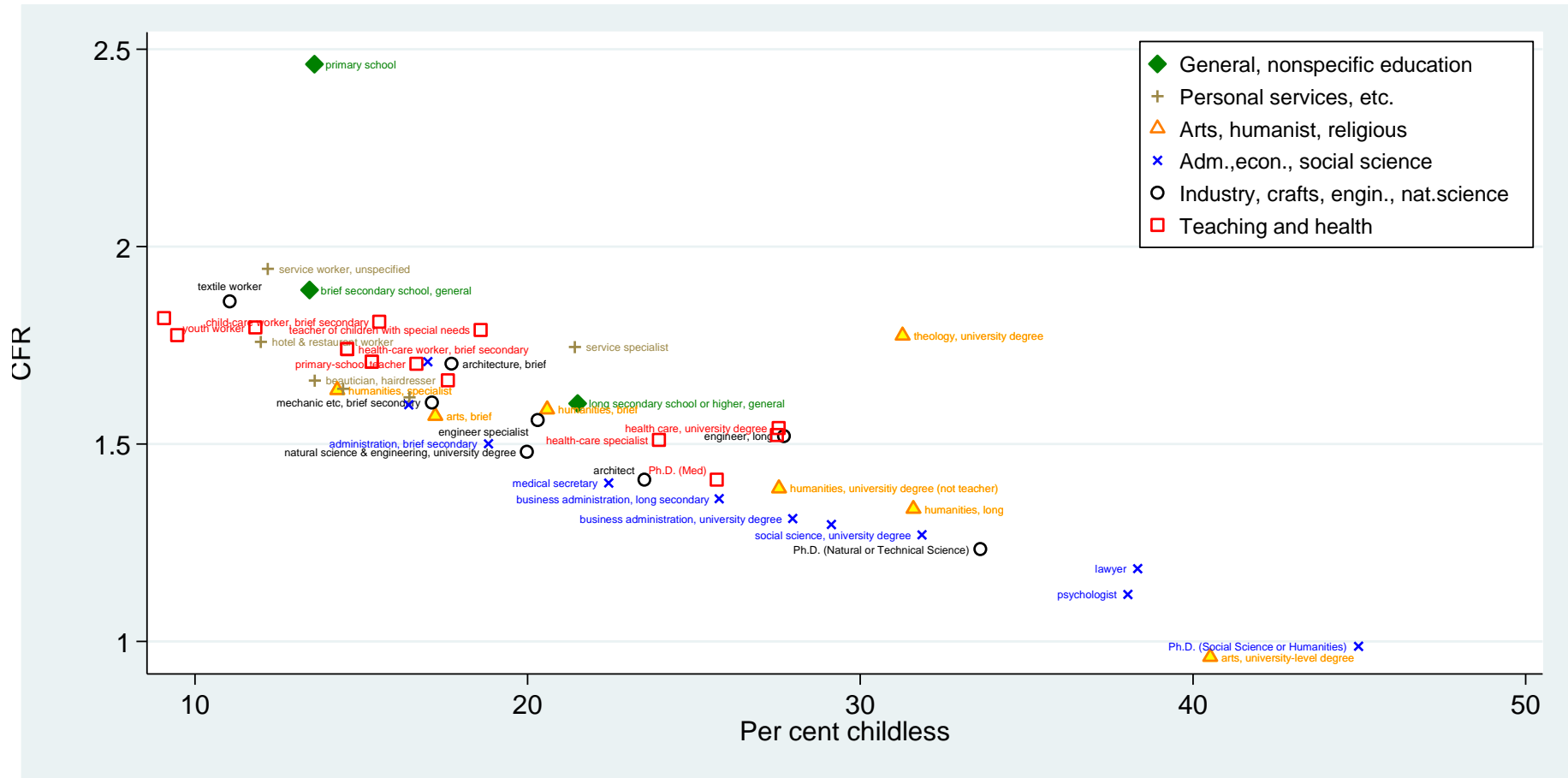
⁷ The association between educational attainment and ultimate fertility does not change between the three cohorts: 1950-54, 1955-59, and 1960-64.

Figure 5: Ultimate fertility (CFR) by educational group; Western German women born 1955-59



Source: FDZ der Statistischen Ämter des Bundes und der Länder, Mikrozensus 2008, own calculations

Figure 6: Ultimate fertility (CFR) vs. per cent childless; Western German women born 1955-59

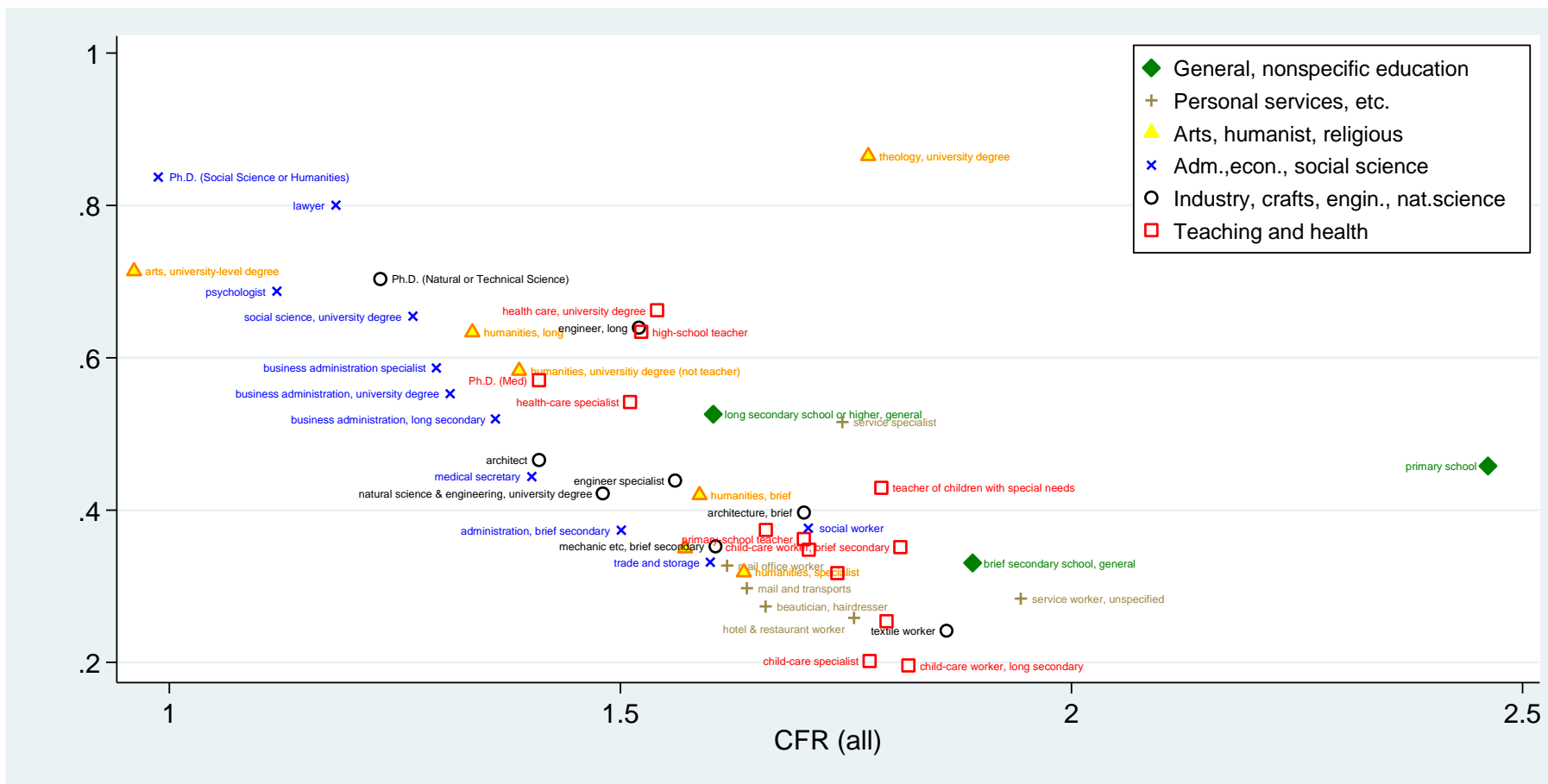


Source: FDZ der Statistischen Ämter des Bundes und der Länder, Mikrozensus 2008, own calculations

Comparing childlessness and ultimate fertility does show how strongly those two are related. Figure 6 confirms the two outliers described above. The first group is again those women with only primary school education. These women stick out for their low childlessness and especially an outstandingly high level of ultimate fertility. The second group are the women educated in theology. Given their rather high rates of childlessness, their rather high level of ultimate fertility comes as a surprise. This becomes even more obvious when comparing ultimate fertility and the number of children born to those women who do become mothers.

The average number of children born to women educated in theology is 1.8, but the number of children born to mothers is 2.6 (while childlessness is about 31%). This findings resembles the finding of bifurcation between childlessness and rather high numbers of children for those women who do become mothers found in Sweden. Contrary to expectations this is the only group in which such a polarization was found. It was expected that a low compatibility of childbearing and rearing within an educational line would lead to high childlessness among women educated in these lines. It was also expected that women who do opt to become mothers despite low compatibility are especially family prone (as Kreyenfeld, 2002 puts it). This family proneness should also increase the probability for these women to have a second child. The findings of the present analysis imply that family proneness and choice of educational field are closely related.

Figure 7: [CFR (mothers) minus CFR (all)] vs. CFR (all); Western German women born 1955-59



Source: FDZ der Statistischen Ämter des Bundes und der Länder, Mikrozensus 2008, own calculations

10. Discussion and Conclusion

The overall finding of this analysis is that despite the strong relationship between educational level and childlessness in Western Germany, the educational field matters as well. Educational field and level account equally for variation in ultimate fertility. The strong impact of the educational level on childlessness was expected, but the strength of the field is more pronounced than expected.

The present analysis shows, at each educational level, outstandingly low rates of childlessness among women educated in teaching and child care in Western Germany. Low childlessness among these women has also been found in Sweden, Austria and Greece. This implies that (in this group) the choice of an educational field is an expression of preferences or even personality traits that are independent from the institutional context. This is further supported by similar findings from Eastern Germany.

High childlessness was expected among graduates in industry crafts, engineering and natural sciences according to the argument of Hoem et al. (2006a), due to high risks of skill depreciation resulting from breaks in employment. This cannot be confirmed as childlessness is rather at a medium level and it was also not observed in Sweden or Austria, and only in Greece. High childlessness was expected among women educated in humanities or social sciences. While the first group does not show a clear pattern, the latter indeed has a high share of childless women. This finding on women educated in social sciences is consistent with Sweden, Austria, and Greece.

As expected, a higher mean age at completion of education is associated with higher rates of childlessness. Very interestingly, a field effect is also observed: A higher age at completion does not necessarily lead to higher levels of childlessness in Western Germany. The possible causes for this finding can only be speculated about as the data do not allow close examination. It might be that childbearing and childcare are more compatible during educational enrollment in some educational fields than in other. It might also be that women educated in fields like teaching and health care (the field with the weakest association between mean age at completion and childlessness) catch-up with childbirth soon after graduation. If this is the case, differences in the school-to-work transition and aspects of employment security may play an important role.

The share of women never being married is strongly associated with the level of childlessness among the graduates of an educational line. No effect of the field on this association can be observed. The overall level of women who were never married is low in the analysis sample (9.6%).

The association between educational level, educational field, and ultimate fertility resembles those with childlessness. The number of children declines with an increasing level, but differences between fields are also observed. The number of children among women educated in teaching or health care is highest. This group does not however stick out as strongly as one would have expected due to their low levels of childlessness.

The only educational line in which bifurcation between childlessness and number of children born to mothers can be observed is theology (university degree). It was expected that women who are educated in educational lines with high rates of childlessness who opt for motherhood are a group of very family prone women. This family proneness should positively impact on the probability to have further children. However, this is not found in the present analysis. For Western Germany it has repeatedly been shown that women with a high educational level have lower probability of motherhood than less well-educated women. Highly educated women who opt for motherhood on the other hand have a higher tendency to expand their family (Blossfeld & Huinink 1991; Kreyenfeld 2002). This is partly caused by the previously-discussed family proneness of these women (Kreyenfeld 2002). The findings of the present analysis imply that the educational field also plays an important role in the relationship between educational attainment and fertility behavior. The choice of an educational field, like teaching and health care, might be an expression of family proneness. Therefore including the educational field into the analysis of the relationship between education and fertility should increase our understanding.

The overall finding of the present analysis is that there is a relationship between the field of educational attainment and fertility in Western Germany. Common patterns are observed across countries as well as differences. The differences are attributed to differences in institutional settings and match these settings. Given the differences in the institutional settings similarities between the countries are much more remarkable.

References

- Bagavos, C. (2010). Education and childlessness: the relationship between educational field, educational level, employment and childlessness among Greek women born in 1955-1959. *Vienna Yearbook of Population Research*, 8, 51–75.
- Begall, K., & Mills, M. C. (2013). The Influence of Educational Field, Occupation, and Occupational Sex Segregation on Fertility in the Netherlands. *European Sociological Review*, 29(4), 720–742.
- Blossfeld, H.-P., & Huinink, J. (1991). Human Capital Investments or Norms of Role Transition? How Women's Schooling and Career Affect the Process of Family Formation. *American Journal of Sociology*, 97(1), 143–168.
- Blossfeld, H.-P., & Rohwer, G. (1995). West Germany. In H.-P. Blossfeld (Ed.), *The new role of women. Family formation in modern societies* (pp. 56–76). Boulder: Westview Press.
- BMBF. (1997). *Berufsbildungsbericht 1997*. Berlin: Bundesministerium für Bildung und Forschung. Retrieved October 20, 2013, from http://www.bmbf.de/pub/bbb_97.pdf
- BMBF. (2007). *Berufsbildungsbericht 2007*. Berlin: Bundesministerium für Bildung und Forschung. Retrieved October 20, 2013, from http://www.bmbf.de/pub/bbb_07.pdf
- Brewster, K. L., & Rindfuss, R. R. (2000). Fertility and women's employment in industrialized nations. *Annual Review of Sociology*, 26, 271–296.
- Buchmann, M., & Charles, M. (1995). Organizational and Institutional Factors in the Process of Gender Stratification: Comparing Social Arrangements in Six European Countries. *International Journal of Sociology*, 25(2), 66.
- Charles, M., & Bradley, K. (2009). Indulging Our Gendered Selves? Sex Segregation by Field of Study in 44 Countries. *American Journal of Sociology*, 114(4), 924–976.
- Daly, M. (2000). *The Gender Division of Welfare: The Impact of the British and German Welfare States*. Cambridge: Cambridge University Press.
- Dorbritz, J. (2008). Germany: Family diversity with low actual and desired fertility. *Demographic Research*, 19, 557–597.
- Dustmann, C., & Schönberg, U. (2012). Expansions in Maternity Leave Coverage and Children's Long-Term Outcomes. *American Economic Journal: Applied Economics*, 4(3), 190–224.
- Federkeil, G. (1997). The Federal Republic of Germany: Polarization of Family Structure. In F.-X. Kaufmann, A. Kuijsten, H.-J. Schulze, & K. P. Strohmeier (Eds.), *Family life and family policies in Europe, Volume 1 Structures and Trends in the 1980s* (pp. 77–113). Oxford, England: Clarendon Press.
- Gauthier, A. H. (2002). Family Policies in Industrialized Countries: Is There Convergence? *Population (English Edition)*, Vol. 57(3), 447–474.
- Gauthier, A. H. (2007). The Impact of Family Policies on Fertility in Industrialized Countries: A Review of the Literature. *Population Research and Policy Review*, 26(3), 323–346.
- Henz, U. (2008). Gender roles and values of children: Childless Couples in East and West Germany. *Demographic Research*, 19, 1451–1500.
- Hillmert, S., & Jacob, M. (2010). Selections and social selectivity on the academic track: A life-course analysis of educational attainment in Germany. *Research in Social Stratification and Mobility*, 28(1), 59–76.

- Hippach-Schneider, U., Krause, M., & Woll, C. (2007). *Vocational Education and Training in Germany: Short Description*. Luxembourg: Office for Official Publications of the European Communities. Retrieved June 22, 2013, from http://www.cedefop.europa.eu/en/Files/5173_EN.PDF
- Hoem, J. M., Neyer, G., & Andersson, G. (2006a). Education and childlessness - The relationship between educational field, educational level, and childlessness among Swedish women born in 1955-59. *Demographic Research*, *14*, 331-380.
- Hoem, J. M., Neyer, G., & Andersson, G. (2006b). Educational attainment and ultimate fertility among Swedish women born in 1955-59. *Demographic Research*, *14*, 381-403.
- Huinink, J., Kreyenfeld, M., & Trappe, H. (2012). Familie und Partnerschaft in Ost- und Westdeutschland. Eine Bilanz. In J. Huinink, M. Kreyenfeld, & H. Trappe (Eds.), *Familie und Partnerschaft in Ost- und Westdeutschland. Ähnlich und doch immer noch anders* (9th ed., pp. 9-28). Opladen, Berlin, Toronto: Verlag Barbara Budrich.
- Jacob, M., & Tieben, N. (2009). Social Selectivity of Track Mobility in Secondary Schools. *European Societies*, *11*(5), 747-773.
- Kerckhoff, A. C. (2001). Education and Social Stratification Processes in Comparative Perspective. *Sociology of Education*, *74*, 3-18.
- Kravdal, Ø., & Rindfuss, R. R. (2008). Changing Relationships between Education and Fertility: A Study of Women and Men Born 1940 to 1964. *American Sociological Review*, *73*(5), 854-873.
- Kreyenfeld, M. (2002). Time Squeeze, Partner Effect or Self-Selection? *Demographic Research*, *7*, 15-48.
- Kreyenfeld, M. (2004). Fertility Decisions in the FRG and GDR: An Analysis with Data from the German Fertility and Family Survey. *Demographic Research*, *Special 3*, 275-318.
- Kreyenfeld, M. (2010). Uncertainties in Female Employment Careers and the Postponement of Parenthood in Germany. *European Sociological Review*, *26*(3), 351-366.
- Kreyenfeld, M., & Konietzka, D. (2008). Education and Fertility in Germany. In I. Hamm, H. Seitz, & M. Werding (Eds.), *Demographic change in Germany: the economic and fiscal consequences* (pp. 165-187). Berlin: Springer.
- Lappegård, T., & Rønsen, M. (2005). The multifaceted impact of education on entry into motherhood. *European Journal of Population / Revue Européenne De Démographie*, *21*(1), 31-49.
- Martín-García, T., & Baizán, P. (2006). The impact of the type of education and of educational enrolment on first births. *European Sociological Review*, *22*(3), 259-275.
- Michelmores, K., & Musick, K. (2013). Fertility patterns of college graduates by field of study, US women born 1960-79. *Population Studies: A Journal of Demography* doi:10.1080/00324728.2013.847971
- Neyer, G., & Hoem, J. M. (2008). Education and permanent childlessness: Austria vs. Sweden; a research note. In Surkyn, J., Deboosere, P., & Van Bavel, J (Eds.), *Demographic Challenges for the 21st Century: a State of the Art in Demography; Conference Organized as a Tribute to the Continuing Endeavours of Prof. Dr. Em. Ron Lesthaeghe in the Field of Demography*. Brussels: VUBPRESS.

- Oppermann, A. (2013). The Impact of Educational Fields on Fertility in Western Germany. *Schmollers Jahrbuch*, 133(2), 287–297.
- Pfau-Effinger, B. (2012). Women's employment in the institutional and cultural context. *The International Journal of Sociology and Social Policy*, 32(9/10), 530–543.
- Pfau-Effinger, B., & Smidt, M. (2011). Differences in women's employment patterns and family policies: eastern and western Germany. *Community, Work & Family*, 14(2), 217–232.
- Rønsen, M., & Skrede, K. (2010). Can public policies sustain fertility in the Nordic countries? Lessons from the past and questions for the future. *Demographic Research*, 22, 321–346.
- Schneider, S. L. (2008). Applying the ISCED-97 to the German educational qualifications. In S. L. Schneider (Ed.), *The International Standard Classification of Education: An Evaluation of Content and Criterion Validity for 15 European Countries* (pp. 76–102). Mannheim: Mannheimer Zentrum für Europäische Sozialforschung.
- Shavit, Y., & Müller, W. (2000). Vocational Secondary Education. *European Societies*, 2(1), 29–50.
- Sobotka, T. (2008). The rising importance of migrants for childbearing in Europe. *Demographic Research*, 19, 225–247.
- STATISTICS AUSTRIA. (2013). *Statistisches Jahrbuch Österreichs*. Retrieved December 20, 2013, from http://www.statistik.at/web_en/publications_services/statistisches_jahrbuch/index.html
- Steiner, V., & Wrohlich, K. (2006). Familienpolitische Reformen und ihre Wirkungen auf die Erwerbsbeteiligung von Eltern. *Zeitschrift für Sozialreform*, 52(4), 421–438.
- United Nations, D. of E. and S. A. (Ed.). (2013). World Urbanization Prospects, the 2011 Revision: Urban Population, 1950-2050. Retrieved December 20, 2013, from http://esa.un.org/unup/CD-ROM/WUP2011-F03-Urban_Population.xls
- Van Bavel, J. (2010). Choice of Study Discipline and the Postponement of Motherhood in Europe: The Impact of Expected Earnings, Gender Composition, and Family Attitudes. *Demography*, 47(2), 439–458.
- Wirth, H. (2007). Kinderlosigkeit von hoch qualifizierten Frauen und Männern im Paarkontext – Eine Folge von Bildungshomogamie? In D. Konietzka & M. Kreyenfeld (Eds.), *Ein Leben ohne Kinder: Kinderlosigkeit in Deutschland* (pp. 167–197). Wiesbaden: VS Verlag für Sozialwissenschaften.
- Wirth, H., & Dümmler, K. (2004). Zunehmende Tendenz zu späteren geburt und Kinderlosigkeit bei Akademikerinnen. Eine Kohortenanalyse auf der Basis von Mikrozensusdaten. *Informationsdienst Soziale Indikatoren (ISI)*, 32, 1–6.

Appendix

Table 1a: Basic childbearing statistic for Western German women born 1955-59

	edu level	all	% childless	% 2 or more children	mean number of children	% never married
<u>general education, non specific</u>						
primary school	2	770	13.6	70.8	2.46	11.0
brief secondary school, general	3	3,105	13.4	63.1	1.89	7.7
long secondary school or higher, general	4	336	21.5	52.3	1.60	13.7
<u>art, humanist, religious</u>						
theology, university degree	6	38	31.3	56.6	1.77	15.4
arts, brief	3	276	17.2	53.4	1.57	11.6
arts, university-level degree	6	138	40.5	30.7	0.96	26.2
humanities, brief	3	56	20.6	55.6	1.59	17.4
humanities, long	4	48	31.6	47.5	1.34	11.2
humanities, specialist	5	24	14.3	57.9	1.64	12.5
humanities, university degree (not teacher)	6	177	27.6	47.4	1.39	17.9
<u>personal service etc.</u>						
hotel & restaurant worker	3	232	12.0	61.9	1.76	6.9
service worker, unspecified	3	426	12.2	70.0	1.94	5.6
service specialist	5	109	21.4	60.0	1.75	9.7
beautician, hairdresser	3	588	13.6	60.0	1.66	4.7
mail office worker	3	112	16.4	55.7	1.62	10.8
mail and transports	4	19	14.5	49.4	1.64	10.2
<u>administration, economy, social sciences</u>						
administration, brief secondary	3	2,583	18.8	53.9	1.50	8.0
business administration, long secondary	3	431	25.8	46.5	1.36	15.5
business administration specialist	4	179	29.1	42.8	1.30	14.1
business administration, university degree	5	273	28.0	45.2	1.31	14.6
medical secretary	6	730	22.4	47.2	1.40	8.4
trade and storage	3	2,523	16.4	55.0	1.60	7.1
social worker	5	54	17.0	63.7	1.71	7.0
psychologist	6	44	28.0	40.4	1.12	29.1
lawyer	6	100	38.3	41.4	1.18	15.3
social science, university degree	6	457	31.9	44.3	1.27	23.0

Table 1a: Continued

	edu level	all	mean number children (never married)	mean number children (ever married)	mean number children (mothers)	mean age at completion of education
<u>general education, non specific</u>						
primary school	2	770	0.52	2.72	2.92	17.00
brief secondary school, general	3	3,105	0.51	2.01	2.22	18.94
long secondary school or higher, general	4	336	0.20	1.88	2.13	27.12
<u>art, humanist, religious</u>						
theology, university degree	6	38	0.00	2.12	2.64	26.48
arts, brief	3	276	0.59	1.71	1.92	20.84
arts, university-level degree	6	138	0.15	1.29	1.67	26.76
humanities, brief	3	56	0.52	1.77	2.01	21.72
humanities, long	4	48	0.17	1.49	1.97	23.36
humanities, specialist	5	24	0.52	1.83	1.96	22.91
humanities, university degree (not teacher)	6	177	0.36	1.65	1.97	25.74
<u>personal service etc.</u>						
hotel & restaurant worker	3	232	0.26	1.88	2.02	21.59
service worker, unspecified	3	426	0.39	2.04	2.23	19.46
service specialist	5	109	0.00	1.95	2.26	26.22
beautician, hairdresser	3	588	0.50	1.72	1.93	20.61
mail office worker	3	112			1.95	19.56
mail and transports	4	19	0.68*	1.73*	1.94	23.11
<u>administration, economy, social sciences</u>						
administration, brief secondary	3	2,583	0.26	1.62	1.87	20.33
business administration, long secondary	3	431	0.23	1.57	1.88	23.50
business administration specialist	4	179	0.23	1.50	1.88	26.03
business administration, university degree	5	273	0.13	1.54	1.86	26.67
medical secretary	6	730	0.18	1.52	1.85	19.64
trade and storage	3	2,523	0.32	1.70	1.93	18.78
social worker	5	54	0.00	1.85	2.08	25.39
psychologist	6	44	0.42	1.43	1.81	30.71
lawyer	6	100	0.13	1.39	1.98	27.83
social science, university degree	6	457	0.40	1.56	1.92	28.10

*due to a small number of cases the lines mail office worker and mail and transport had to be combined

Table 1a: Continued

	edu level	all	% childless	% 2 or more children	mean number of children	% never married
<u>industry, crafts, engineering, natural sciences</u>						
mechanic etc, brief secondary	3	406	17.1	55.0	1.61	7.0
engineer, long	4	68	27.7	58.8	1.52	15.1
engineer specialist	5	85	20.3	58.0	1.56	9.1
textile worker	3	496	11.1	64.6	1.86	6.1
natural science & engineering, university degree	6	312	20.0	54.8	1.48	10.6
architecture, brief	3	66	17.7	65.8	1.70	9.6
architect	6	65	23.5	50.8	1.41	13.0
<u>agriculture</u>						
farm worker, brief secondary	3	98	23.0	59.1	1.75	10.6
agronomist, veterinarian	6	40	30.0	51.8	1.40	23.0
<u>health professions</u>						
health-care worker, brief secondary	3	1,889	14.6	62.4	1.74	8.1
health-care worker, long secondary	4	278	17.6	61.4	1.66	10.2
health-care specialist	5	410	23.9	56.3	1.51	16.9
health care, university degree	6	192	27.5	52.5	1.54	14.6
child-care worker, brief secondary	3	313	15.5	66.0	1.81	7.7
child-care worker, long secondary	4	91	9.1	62.5	1.82	12.0
child-care specialist	5	141	9.5	64.2	1.78	7.4
Ph.D. (Med)	7	77	25.7	51.3	1.41	22.1
<u>teaching</u>						
youth worker	3	165	11.8	64.7	1.80	7.9
primary-school teacher	6	208	16.7	63.2	1.70	10.3
teacher of children with special needs	6	71	18.6	65.4	1.79	15.0
high-school teacher	6	197	27.5	55.3	1.52	18.9
other teacher	6	301	15.3	60.7	1.71	9.2
<u>non-medical research</u>						
Ph.D. (Social Science or Humanities)	7	45	45.0	38.3	0.99	25.8
Ph.D. (Natural or Technical Science)	7	37	33.6	46.7	1.23	18.2
Total		19,879	17.8	57.6	1.67	9.64

Table 1a: Continued

	edu level	all	mean number children (never married)	mean number children (ever married)	mean number children (mothers)	mean age at completion of education
<u>industry, crafts, engineering, natural sciences</u>						
mechanic etc, brief secondary	3	406	0.40	1.70	1.96	20.17
engineer, long	4	68	0.26	1.77	2.16	22.13
engineer specialist	5	85	0.09	1.75	2.00	22.94
textile worker	3	496	0.66	1.94	2.10	18.74
natural science & engineering, university degree	6	312	0.26	1.66	1.90	25.83
architecture, brief	3	66	0.55	1.82	2.10	19.71
architect	6	65	0.00	1.66	1.88	26.30
<u>agriculture</u>						
farm worker, brief secondary	3	98	0.37	1.92	2.29	21.55
agronomist, veterinarian	6	40	0.25	1.76	2.02	26.29
<u>health professions</u>						
health-care worker, brief secondary	3	1,889	0.40	1.87	2.06	21.65
health-care worker, long secondary	4	278	0.49	1.81	2.04	25.06
health-care specialist	5	410	0.14	1.86	2.05	25.16
health care, university degree	6	192	0.26	1.80	2.20	26.93
child-care worker, brief secondary	3	313	0.20	1.94	2.16	21.26
child-care worker, long secondary	4	91	0.46	2.01	2.02	23.87
child-care specialist	5	141	0.35	1.89	1.98	22.33
Ph.D. (Med)	7	77	0.20	1.84	1.98	29.27
<u>teaching</u>						
youth worker	3	165	0.85	1.88	2.05	19.21
primary-school teacher	6	208	0.34	1.88	2.07	25.37
teacher of children with special needs	6	71	0.46	2.05	2.22	30.51
high-school teacher	6	197	0.28	1.85	2.16	26.69
other teacher	6	301	0.24	1.89	2.06	26.47
<u>non-medical research</u>						
Ph.D. (Social Science or Humanities)	7	45	0.00	1.36	1.82	33.24
Ph.D. (Natural or Technical Science)	7	37	0.00	1.56	1.94	30.95
Total		19,879	0.34	1.82	2.06	21.90

Source: FDZ der Statistischen Ämter des Bundes und der Länder, Mikrozensus 2008, own calculations

Table 2a: childlessness by level of education, Western German women born 1955-59

educational level	% childless	N (childless)
2	13.6	770
3	15.8	14,064
4	21.8	1,271
5	21.7	1,002
6	26.1	2,613
7	32.9	159

Source: FDZ der Statistischen Ämter des Bundes und der Länder, Mikrozensus 2008, own calculations

Table 3a: Educational attainment and childlessness in Western Germany, Sweden, Austria and Greece, women born 1955-59

field of education	level	% childless			
		W-Germany	Sweden	Austria	Greece
<u>general education, non specific</u>					
primary school	2	13.6%	14.7%	13.0%	10.0%
<u>personal service etc.</u>					
hotel & restaurant worker	3	12.0%	22.4%	11.7%	20.0%
<u>administration, economy, social sciences</u>					
administration, brief secondary	3	18.8%	14.7%	18.0%	n.a.
business administration, long secondary	4	25.8%	16.5%	22.0%	14.4%
business administration specialist	5	29.1%	21.1%	24.0%	n.a.
social worker	5	17.0%	16.5%	24.0%	18.7%
social science, university degree	6	31.9%	22.1%	37.0%	15.1%
Ph.D. Social Sciences	7	45.0%	31.9%	n.a.	37.0%
<u>industry, crafts, engineering, natural sciences</u>					
textile worker	3	11.1%	13.9%	9.0%	n.a.
engineer, long	4	27.7%	18.4%	15.0%	15.3%
engineer specialist	5	20.3%	17.0%	27.0%	n.a.
natural science & engineering, university	6	20.0%	20.2%	27.0%	22.8%
Ph.D. Natural Sciences	7	33.6%	25.1%	n.a.	28.0%
<u>agriculture</u>					
farm worker	3	23.0%	15.5%	7.0%	11.3%
agronomist	6	30.0%	22.0%	14.0%	17.3%
<u>health professions</u>					
health-care worker, brief secondary	3	14.6%	10.2%	17.0%	n.a.
health-care worker, long secondary	4	17.6%	10.4%	n.a.	15.3%
health-care specialist	5	23.9%	13.0%	14.5%	n.a.
Ph.D. Medicine	7	25.7%	18.9%	n.a.	32.0%
<u>teaching</u>					
child-care worker, brief secondary	3	15.5%	8.6%	n.a.	n.a.
child-care worker, long secondary	4	9.1%	8.6%	n.a.	14.9%
child-care specialist	5	9.5%	8.6%	n.a.	n.a.
primary school teacher	6	16.7%	10.3%	16.5%	11.9%
high school teacher	6	27.5%	17.3%	28.0%	12.4%
Total		17.8%	15.7%	15.7%	12.3%

Source: FDZ der Statistischen Ämter des Bundes und der Länder, Mikrozensus 2008, own calculations; (Bagavos 2010; Hoem et al. 2006a; Neyer & Hoem 2008), values that are not available in Tables or mentioned in the paper were extracted from graphs.

The Educational System in Western Germany

Structure and organization of an educational system influence fertility outcomes (Hoem et al. 2006a). This overview of the educational system in Western Germany focuses on the system in place in the 1960s, 70s and 80s and therefore effective during educational attainment of the cohort under examination⁸.

The description of the educational system follows the one by Schneider (2008) dedicated to applying the International Standard Classification of Education (ISCED-97) to the German educational degrees. This description closely fits the data management applied in the following analysis.

One main characteristic of the German educational system is early tracking (Jacob & Tieben 2009; Shavit & Müller 2000). Nevertheless, it is generally possible to change tracks both downwards and upwards (Schneider 2008, p. 85), but in general the flexibility of the educational system is rather low (Kerckhoff 2001). Track change usually takes place during the first two years in secondary school or after graduation from a lower school by upgrading the level achieved (Schneider 2008, p. 81). After four years of elementary school, students are sent to a secondary school in accordance with their performance (ibid.).

Lower secondary school aims at preparing students for vocational training (Schneider 2008, p. 81 et seq.). Students who attended middle school typically continue with a vocational training in fields which require a higher level of general education such as trade, technical and administrative professions (Schneider 2008, p. 80 et seq.). Grammar school prepares children for higher education. The leaving certificate (Abitur) opens up access to all types of higher education (Allgemeine Hochschulreife) (Schneider 2008, p. 83 et seq.).

Vocational training can follow all types of secondary school, while it is most common for students from lower secondary school and middle school. It takes place in the so called

⁸ Despite variations among the federal states, the main elements of the educational systems are the same in all federal states (Schneider 2008, 77).

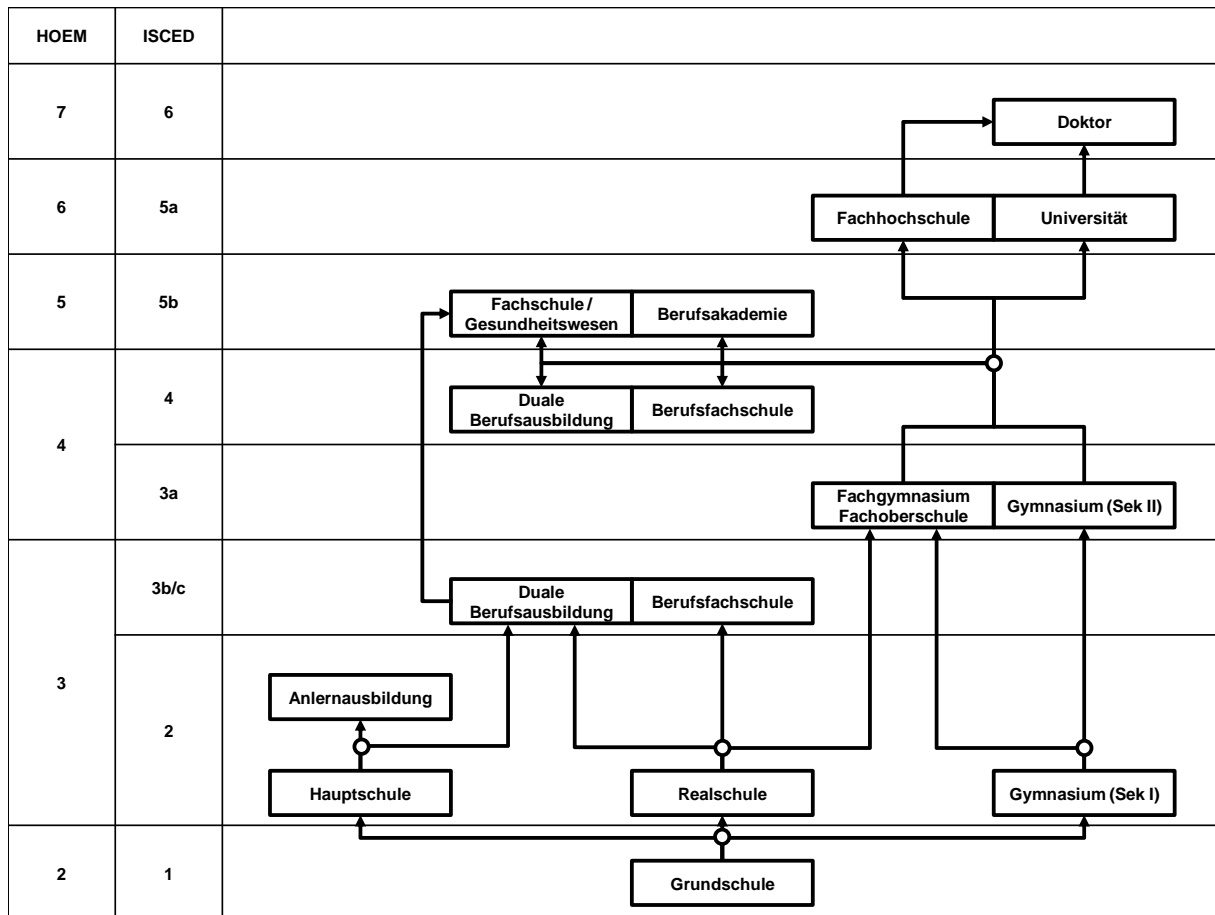
“dual system of vocational training” (Duales System der Berufsausbildung), which consists of vocational training on the job within a company and one or two days a week general schooling in vocational schools (Schneider 2008, p. 87 et seq.). This system is “relatively unique and largely restricted to German-speaking countries”, as Schneider (ibid.) puts it. Some vocational trainings such as in the fields of banking and insurance, require graduation of grammar school (Schneider 2008, p. 88).

It is very common in Germany to earn a qualification, often closely related to an occupation, and to stick to this occupation throughout working life (Kerckhoff 2001). Childbirth is postponed until after graduation (Blossfeld & Huinink 1991; Kreyenfeld & Konietzka 2008; Kreyenfeld 2010). Numerous occupations are tied to formal educational qualification (Buchmann & Charles 1995, p. 85). The bond between educational system and labor market opportunities is tight, flexibility is low (Shavit & Müller 2000).

The highest levels of education can be achieved at two types of universities: The research-orientated traditional universities (Universität) and the universities of applied science (Fachhochschule), which focus on application of knowledge in professional life rather than academic research (Schneider 2008, p. 90 et seqq.).

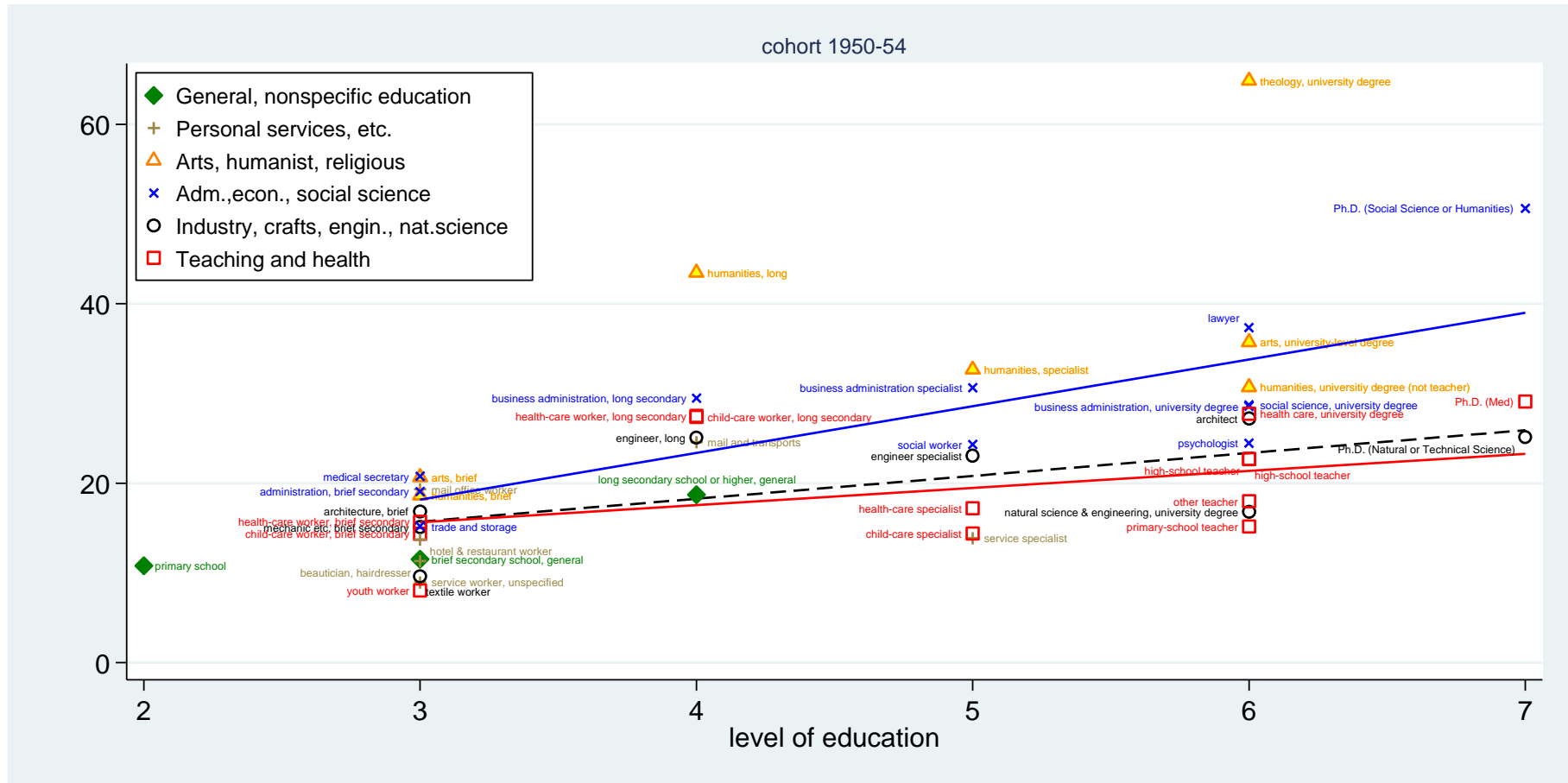
Education at upper secondary or post secondary level is most common in Germany, while only a small number of students enter tertiary education (Hillmert & Jacob 2010; Hippach-Schneider, Krause, & Woll 2007). While the share of women participating in secondary and tertiary education increases, choices of educational fields are still strongly gender segregated (BMBF 1997, 2007; Wirth & Dümmler 2004).

Figure 1a: German educational system (German terms)



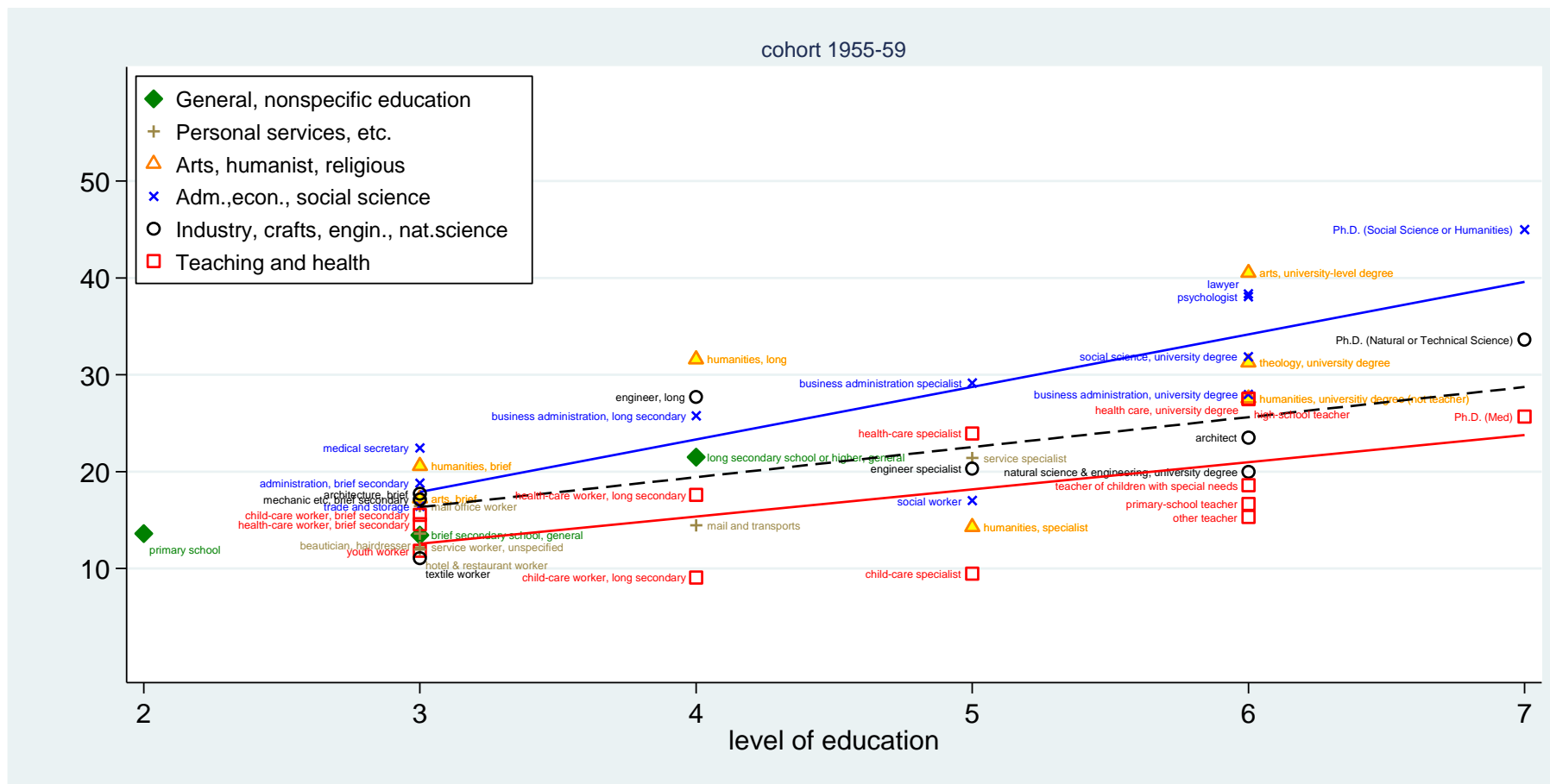
Source: own representation

Figure 2a: Per cent permanently childless, by education group; Western German women born in 1950-1954



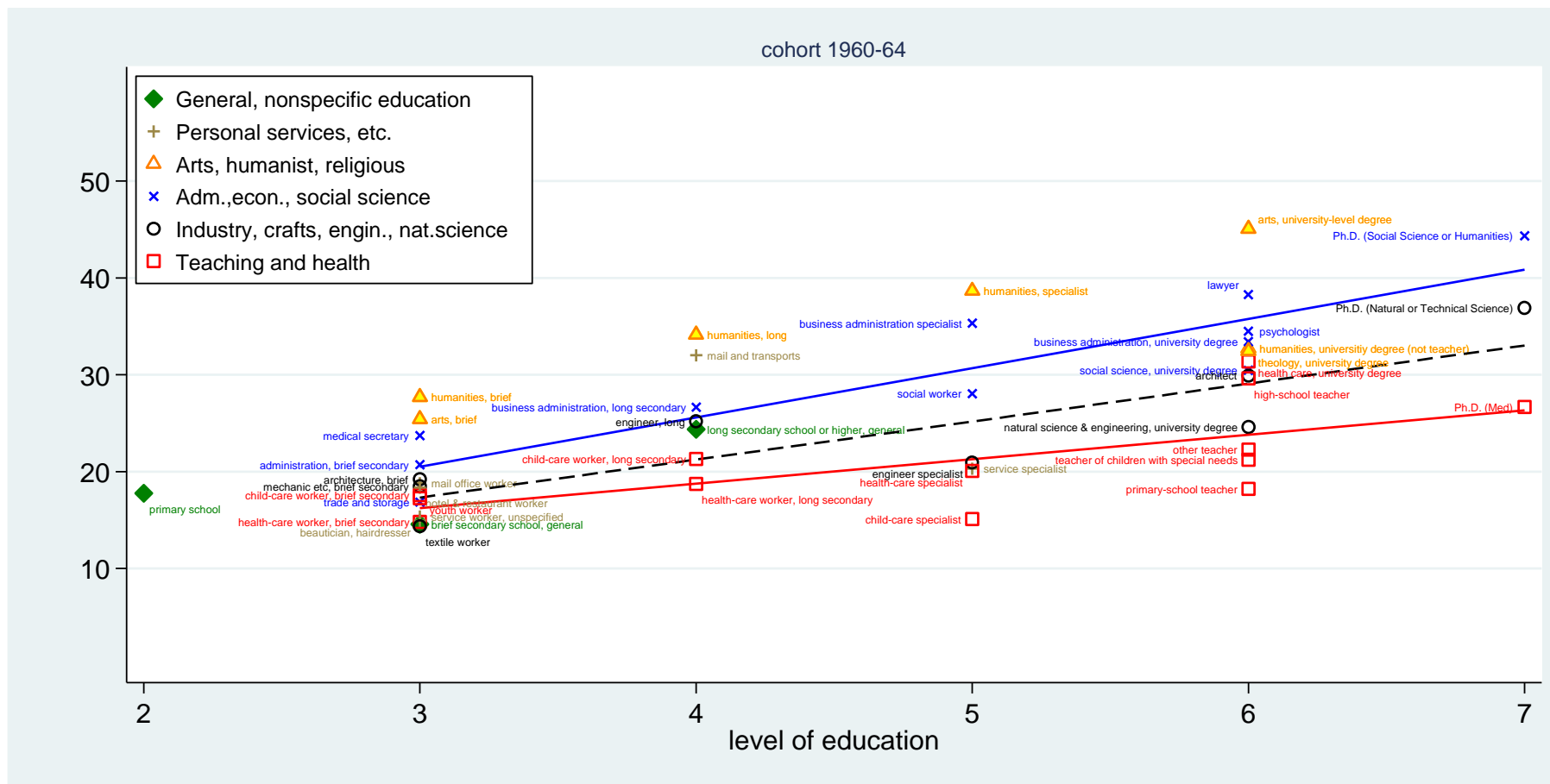
Source: FDZ der Statistischen Ämter des Bundes und der Länder, Mikrozensus 2008, own calculations

Figure 3a: Per cent permanently childless, by education group; Western German women born in 1955-1959



Source: FDZ der Statistischen Ämter des Bundes und der Länder, Mikrozensus 2008, own calculations

Figure 4a: Per cent permanently childless, by education group; Western German women born in 1960-1964



Source: FDZ der Statistischen Ämter des Bundes und der Länder, Mikrozensus 2008, own calculations

Paper 3

Parental Leave Benefits and Breastfeeding in Germany

—

Effects of the 2007 Reform

Co-Authors: Anita Kottwitz and C. Katharina Spiess

Abstract

While the health benefits of breastfeeding for both mothers and children are well known, breastfeeding may make it difficult for mothers to return early to the labor market. Maternity and parental leave regulations have been designed to reduce this conflict. In 2007, Germany put into effect a new parental leave benefit (*Elterngeld*). The related reform increased the number of parents eligible for benefits and changed the amount and duration of the benefits. The reform sought to decrease the pressure to return to the labor market soon after childbirth, especially for those parents who did not benefit under the old system. The current paper investigates whether this reform of parental leave impacted breastfeeding initiation and duration in Germany. We draw on representative survey data from the German Socio-Economic Panel Study (SOEP) from 2002 through 2012. Three breastfeeding measures are exploited 1) breastfeeding at birth or no breastfeeding initiation; 2) breastfeeding for at least four months; and 3) breastfeeding for at least six months.

We find no effect of the *Elterngeld* reform on breastfeeding initiation or breastfeeding for at least six months, but do find an effect on breastfeeding for at least four months. Applying a difference-in-difference approach, it is shown that mothers who were not affected by the reform did not change their breastfeeding behavior. Breastfeeding duration increased among mothers who benefited from the reform. The results were robust over various sensitivity tests including placebo regressions and controlling for regional indicators, among others. Thus, our empirical results provide evidence that the reform's goal of allowing parents to spend more time with their children during the first year of life also impacted breastfeeding behavior.

Acknowledgements

The authors are grateful to Silke Anger, Emilia del Bono, Christian Krekel, and Nicolas Ziebarth for their helpful comments. We also thank the "Babyfreundliches Krankenhaus" initiative for providing data on certified Baby-friendly hospitals in Germany. During the work on her dissertation Anita Kottwitz was a pre-doctoral fellow of the International Max Planck Research School on the Life Course (LIFE, www.imprs-life.mpg.de; participating institutions: MPI for Human Development, Freie Universität Berlin, Humboldt-Universität zu Berlin, University of Michigan, University of Virginia, University of Zurich).

1. Introduction

Increasing the prevalence and duration of breastfeeding has been identified as an important public health goal for a number of reasons (e.g., Rubin 2013): breastfeeding has been found to reduce the risk of infections and obesity in children and to improve their cognitive and emotional development (Anderson, Johnstone, & Remley 1999; Belfield & Kelly 2012; Borra, Iacovou, & Sevilla 2012; Del Bono & Rabe 2012; McCrory & Layte 2012)¹. On average, breastfeeding is related to more time spent in emotional care for the child than other forms of feeding (Smith & Ellwood 2011). Breastfeeding is also associated with positive mental health effects and a reduced risk of breast cancer in mothers (e.g., Beral et al. 2002; Del Bono & Rabe 2012). Breast milk is the recommended source of nutrition for newborn children for at least the first six months of life (World Health Organization & UNICEF 2003). However, breastfeeding may make it more difficult for mothers to return to the labor market soon after childbirth (e.g., Berger, Hill, & Waldfogel 2005; Kobayashi & Usui 2014; Ogbuanu, Glover, Probst, Liu, & Hussey 2011; Roe, Whittington, Fein, & Teisl 1999).

Maternity and parental leave provisions have been developed to mitigate this conflict. Some empirical studies show that the duration of maternity and parental leave is associated with improved child health and development (Carneiro, Loken, & Salvanes 2011; Ruhm 2000; Tanaka 2005; Waldfogel, Han, & Brooks-Gunn 2002), while others report no significant association (Dustmann & Schönberg 2012; Liu & Skans Oskar 2010; Rasmussen 2010) if parental leave extends beyond the first year of a child's life. It is assumed that the positive effects of parental leave provisions identified within the first year are partly a result of breastfeeding, yet only a few studies to date have focused directly on the relationship between breastfeeding and parental leave mandates. These include the studies by Baker and Milligan (2008) and Huang and Yang (2014), who estimate a positive impact of parental leave benefits on breastfeeding in Canada and California (USA).

¹ A recent sibling study finds no significant long-term breastfeeding benefits in sibling pairs in which one child was breastfed and the other was not (Colen and Ramey 2014); however, this study does not account for e.g. exclusive breastfeeding duration.

In this paper, we address the question of whether parental leave benefits have a direct effect on breastfeeding in Germany. In 2007, Germany passed a reform creating a new parental leave benefit (*Elterngeld*). The reform changed the amount of money provided to parents, the proportion of parents considered eligible, and the maximum benefit duration. As of 2007, all new parents became eligible to receive a parental leave benefit, in contrast to the previous parental leave system, which provided financial support only to selected parents. The 2007 reform replaced the previous means-tested child-rearing benefit (*Erziehungsgeld*) with a parental leave benefit (*Elterngeld*) of 67% of the pre-birth net income of the parent taking leave during the first year following childbirth (Spiess & Wrohlich 2008). Most importantly, the new benefit offers much greater financial support to a much larger share of parents than the previous child-rearing benefit, for which only parents with a low income were eligible. The reform therefore did not bring much change to these groups within the first year (for details see: Kluge & Tamm 2013; Spiess & Wrohlich 2008; Wrohlich et al. 2012a and chapter 2.2). It aimed at reducing possible income losses due to childbirth and at facilitating family formation. It also sought to increase both parents' economic independence by reducing the maximum duration of transfers and thereby reducing career interruptions for women after the first year of their child's life. Additionally, the reform aimed at encouraging in particular fathers to take part in child care by introducing two additional "partner months." With the expansion of the benefit, the reform aimed at creating a protected phase (*Schonraum*) during the first year of a child's life, which has been shown to be particularly important for the interaction between parents and children and thus for child development in general (Bujard 2013; Deutscher Bundestag 2006). By lowering the pressure to return quickly to the labor market, the financial support allows parents to maintain a relatively constant standard of living – especially those who would not have benefited under the old system, i.e., mothers and fathers with incomes above the established threshold. Empirical research indicates that this major goal of the reform has been achieved: More parents (mostly mothers) now stay at home longer during the first year of their child's life (Kluge & Tamm 2013; Spiess & Wrohlich 2008; Wrohlich et al. 2012a).

While rates of breastfeeding at birth have increased in the past decades and are relatively high overall in Germany (about 80 to 90%) compared to other countries, it is also reported that breastfeeding rates in Germany decline sharply in the first months after

childbirth (Dulon, Kersting, & Schach 2001; Kersting & Dulon 2002; Lange, Schenk, & Bergmann 2007).

With respect to maternal employment after birth, Germany shows relatively low employment rates for mothers with small children in comparison to other European countries (OECD 2014). In 2010, the employment rate of mothers with children less than a year old was almost 12%, while it increased to 40% once the child reached his or her first birthday.

Given these developments in maternal employment and a potential conflict between breastfeeding and employment, we address the following research question in more detail: Does the new parental leave reform impact breastfeeding initiation and duration in Germany? We use the reform as an exogenous policy variation to obtain causal evidence on breastfeeding behavior. We provide the first empirical evidence of this effect for Germany, a country with a much more generous family policy regime than the US or Canada, the countries that have been the focus of previous studies using comparable approaches (Baker & Milligan 2008; Huang & Yang 2014). As the German reform has not changed entitlement to parental leave with job protection for three years, we can isolate the effect of a change in size and duration of a benefit on breastfeeding from an effect of a longer leave period without benefits. This contributes to the existing knowledge, as this particular aspect has not been addressed in previous studies.

Our contribution is structured as follows: Section 2 gives an overview of previous findings on the conflict between maternal employment and breastfeeding as well as the impact of parental leave regulations. Next, the German context is presented, describing important details of the new parental leave reform and findings on the impact of the parental leave reform on maternal employment. Common findings on breastfeeding in Germany are discussed as well. Hypotheses are presented in Section 3. Data and estimation strategy are described in Section 4, followed by the main findings in Section 5. Additionally, several sensitivity checks for our findings are presented in Section 6. Finally, conclusions are presented in Section 7.

2. Background

2.1 Previous Findings

A key strand of the literature for our research questions consists of studies on employment interruptions after childbirth and breastfeeding in general. There is strong empirical evidence that the duration of work leave and the duration of breastfeeding are closely related (Berger et al. 2005; Bick, MacArthur, & Lancashire 1998; Chatterji & Frick 2005; Kimbro 2006; Lindberg 1996; Ogbuanu et al. 2011; Visness & Kennedy 1997). However, concerns have been raised about the causal direction of this relation; Roe et al. (1999) show, using a US sample, that the duration of maternity/parental leave affects the duration of breastfeeding, but not vice versa. Research also shows that working hours (part-time vs. full-time) and working conditions affect the duration of breastfeeding (Dennis 2002; Fein & Roe 1998; Kurinij, Shiono, Ezrine, & Rhoads 1989; Lindberg 1996), for example, shows that mothers who return to the workforce full-time are more likely to quit breastfeeding than mothers who return to part-time employment.

Maternal employment can also impact whether a mother initiates breastfeeding at all. Empirically, an impact on initiation is only found either if the mother returns to the workforce very early after childbirth or intends to do so. “Early” refers here to a return to employment within six weeks (Noble & The Alspac Study Team 2001) or three months postpartum (Berger et al. 2005; Chatterji & Frick 2005; Guendelman et al. 2009). No effect of maternal employment on breastfeeding initiation is found if mothers return to work after a longer period of leave. Neither the intention to return to work within six months after childbirth (Gielen, Faden, O’Campo, Brown, & Paige 1991; Noble & The Alspac Study Team 2001) nor the intention and actual return to work within 1 year postpartum (Kimbro 2006; Visness & Kennedy 1997) have been found to be correlated with breastfeeding initiation. However, most of the aforementioned studies do not explicitly focus on parental leave benefit regulations. Moreover, they are based mainly on US data and thus have to be interpreted in relation to their specific context: an institutional setting without generous leave regulations.

Another strand of literature important for our study consists of studies analyzing the effects of parental leave and benefits policies on maternal employment decisions. They show that parental leave reforms extending the duration of parental leave mandates have a causal effect on individual employment interruptions. Although these studies focus on very different reforms, use different data sets and methods, their results are very similar: The longer the period of leave entitlement and the higher the benefits received, the longer the period of leave taken and the longer mothers wait to return to work. For such studies on Germany, see, for example, Ondrich, Spiess, Yang, and Wagner (2003), Schönberg and Ludsteck (2007), Spiess and Wrohlich (2008), Wrohlich et al. (2012a) and Kluge and Schmitz (2014); for Austria see Lalive and Zweimüller (2009); and for Canada see Baker and Milligan (2010).

One of the few studies focusing directly on the effect of parental leave regulations and breastfeeding is Baker and Milligan (2008), who examined how a Canadian parental leave reform affected postpartum employment and breastfeeding. The authors analyzed a reform that increased the share of women eligible for parental leave benefits as well as the length of leave from 25 to 50 weeks. They find an increase in the duration of parental leave taken by mothers as well as an increase in the share of mothers who breastfeed for at least six months. They find little impact of parental leave mandates on breastfeeding initiation. However, returning to employment was cited as a reason for quitting breastfeeding less often after the reform than before. Thus the reform shows an effect on the duration of breastfeeding, at least for those women whose behavior is responsive to maternity leave mandates. The findings of Baker and Milligan (2008) imply an impact of parental leave entitlement and cash benefits on breastfeeding duration. As the reform under examination changed these two aspects, their specific impacts cannot be disentangled.

In a very recent study, Huang and Yang (2014) also report a positive impact of parental leave benefits on breastfeeding in California (USA). The policy under examination introduced six weeks of paid maternity leave but without job protection. Like Baker and Milligan, Huang and Yang (2014) find no increase in breastfeeding initiation due to the reform. Even though Huang and Yang find a positive impact on breastfeeding duration, it has to be noted that the time span of financial support (six weeks) does not

cover the duration of breastfeeding examined in this study (three, six, and nine months): The authors do not discuss the question of why 6 weeks of financial support should have an impact on the durations of breastfeeding they address. Additionally, they use a time span of 10 years between pre-reform measurement and the reform, which is a rather long period. The findings of Huang and Yang (2014) imply that it is the cash benefits rather than job protection that positively impact breastfeeding duration. Because the duration of cash benefits does not cover the duration of breastfeeding examined in this study, however, this interpretation requires further evidence. Examining how a change in cash benefits that affects a family's financial situation in the first year of their child's life without changes in parental leave entitlement impacts breastfeeding is thus one of the major contributions of the present analysis.

2.2 The German Parental Leave Reform and Breastfeeding

Parental Leave Reform of 2007

On January 1, 2007, a new parental leave benefit was introduced in Germany (*Elterngeld*). The crucial points of this reform are that it changed, respective to the previously existing benefit, the terms of eligibility for parental leave benefits, thereby increasing the number of parents eligible, and it decreased the maximum duration of the benefit. Prior to 2007, a means-tested child-rearing benefit (*Erziehungsgeld*) was granted to parents based on overall household income. Couples were only eligible for the allowance if their yearly net income was below €30,000 (€23,000 for single parents). About 76% of all parents were eligible for a child-rearing benefit (Kluve & Tamm 2013, p. 989). Eligible parents received either €300 per month per child for a maximum of 24 months or €450 per month per child for a maximum of 12 months². 87% of eligible parents received €300 and 13% received €450 for the first six months after childbirth (BMFSFJ 2008, p. 32). After six months, the number of eligible parents decreased further: Relatively few parents received the benefit, since the household income threshold for eligibility was lowered to €16,500 per month (€13,500 for single parents): at this stage, 66% of all previously eligible parents received €300 (or in a few cases €450), 16% received less than this amount, and for 18% stopped receiving the benefit (BMFSFJ 2008, p. 32).

The new benefit is available to all parents with a child born on or after January 1, 2007, and does not include income limits. The parent on leave receives 67% of her/his previous net income up to a maximum benefit of €1,800. The minimum of €300 per month is paid to parents without pre-birth income (Spiess & Wrohlich 2008).³ The new parental leave benefit is granted for 12 months, with an additional 2 months if both parents take at least 2 months of parental leave. The parental leave benefit is intended to (partly) replace pre-birth earnings. A parent who takes parental leave and does not start working after

² Some federal states like Baden-Wurttemberg and Bavaria provided a benefit for additional 12 months prior to 2007.

³ It has to be noted that the replacement rate under the new parental leave benefit is between 67% and 100% for parents with a net income below €1,000 per month, i.e., the lower the income, the higher the replacement rate (Spiess & Wrohlich 2008).

childbirth receives the full amount (67% of her/his previous net income). In case of part-time work (up to 30 hours per week) the parent who takes parental leave is entitled to a benefit of 67% of the difference between pre- and post-birth income. Even though parental leave and benefit entitlements are gender-neutral, it is mothers rather than fathers who take (at least the majority of) parental leave and apply for benefits. Mothers who were employed prior to childbirth received on average €863 per month (Destatis 2011, p. 34), while non-employed mothers received on average €330 in 2010. The vast majority of parents profit from the new parental leave benefit, meaning that they receive more financial support within the first year of their child's life now than they would have under the previous system (Wrohlich et al. 2012a).

While the amount of financial support provided to families changed dramatically with the reform, other important employment-related aspects did not change. Both before and after the reform, parents may work no more than 30 hours per week to receive financial support. The period of maternity protection is still eight weeks after the birth of a child, just as it was before the reform. During this time, mothers are not allowed to engage in paid employment. Employees receive a benefit based on their former average monthly income that has to be supplemented by the employer, which usually means that mothers do not see any decrease in their income⁴ (see Ondrich et al. 2003). After this 2-month period, parents are entitled to take parental leave with a guaranteed return to their previous job until the child turns three. During these 36 months, parents also have the right to reduce their working hours to part-time. Table 1 summarizes the key aspects of these policy measures. As shown in Table 1, mothers are entitled to breastfeeding breaks during their working hours. Nevertheless there are numerous practical issues that still might make it difficult to balance work and breastfeeding. For example, to enable breastfeeding on demand, childcare would have to be provided in the mother's workplace. To the best of our knowledge, there is no study on the use of this entitlement in Germany.

⁴ While employed mothers are entitled to *Elterngeld* after these eight weeks, others (e.g. mothers who are students or self-employed as well as fathers) are entitled from birth on.

Table 1: Overview of German parental leave schemes before and after 2007

		Old parental leave scheme prior to 2007	New parental leave scheme since 2007
Financial support	<i>Amount</i>	€300, means-tested benefits (household income)	67% of previous net labor market income of the parent on leave, minimum of €300, maximum of €1,800.
	<i>Duration</i>	24 months	12+2 months
	<i>Requirement</i>	working less than 30 hours per week	
Statutory rules	<i>Maternity protection period</i>	compulsory maternity protection period of 8 weeks postpartum and income as during the 3 months before birth	
	<i>Parental leave</i>	entitlement to parental leave with guaranteed return to previous job with the right to reduce hours to part-time: 36 months	
	<i>Breastfeeding legislation</i>	Maternity protection law regulates rights to breastfeeding breaks during working hours	

Sources: Drasch (2013), Kluge and Tamm (2013), Wrohlich et al. (2012a), Maternity Protection Act (“*Mutterschutzgesetz*” Article 3(2), Article 6(1), Article 7(1, 2, 3), Article 8(1))

An important goal of the 2007 reform was to lower the pressure on women to return to the workforce for financial reasons soon after childbirth. Empirically, this goal has been achieved. The parental leave reform decreased the differences in maternal employment during the first year of a child’s life in Germany across all socio-economic groups. Since the reform, mothers are staying at home for a longer period of time in the first year of their child’s life (Kluge & Tamm 2013; Wrohlich et al. 2012a). The percentage of married mothers who entered part-time employment within the first year of their child’s life decreased by more than 5% following the reform. The percentage of married mothers who entered full-time employment decreased by 14 percent (Wrohlich et al. 2012a, p. 42).

Breastfeeding in Germany

The official recommendation by the German National Breastfeeding Committee (Nationale Stillkommission) to new mothers in Germany is to exclusively breastfeed their child for at least four months (Bundesinstitut für Risikobewertung 2004). Introduction of solid food is recommended between four and six months of age. There is no recommended upper bound for the total duration of breastfeeding (Bundesinstitut für Risikobewertung

2004; Koletzko et al. 2013). In contrast, the World Health Organization recommends breastfeeding for at least six months (World Health Organization & UNICEF 2003).

In general, German breastfeeding behavior has not been studied in much detail, with the most recent results being from 2005 (Lange et al. 2007).⁵ Nationwide data on breastfeeding in Germany are provided by the study “Stillen und Säuglingsernährung” (SuSe; see Dulong et al. 2001) and the study “German Health Interview and Examination Survey for Children and Adolescents” (KiGGS; see Lange et al. 2007). The few existing studies on breastfeeding in Germany indicate a high rate of breastfeeding initiation, but a sharp decline in the rate of breastfeeding in the first few months after the child is born. The data from the SuSe Study include prospective feeding information on 1,717 mother-infant pairs with children born between March and May 1997. 86% of the children were initially breastfed, but at four months only 59% received breast milk, falling to 48% at six months⁶ (Kersting & Dulong 2002). The KiGGS Study provides the first representative data on breastfeeding for Germany. About 17,000 children born between 1986 and 2005 and their parents participated. The questionnaire given to parents contained retrospective questions on breastfeeding. The data show that breastfeeding initiation and duration has increased over the 20 years of the survey (Lange et al. 2007).

The empirical findings on breastfeeding in Germany are in line with those from other countries. A low socio-economic status of the mother (mostly operationalized by the educational level) is associated with lower probability of breastfeeding initiation as well as breastfeeding duration. A high socio-economic status, in contrast, is positively associated with breastfeeding initiation and duration (Dulong et al. 2001; Kohlhuber, Rebhan, Schwegler, Koletzko, & Fromme 2008; Lange et al. 2007). Similar correlations have also been found in other studies all over the world (e.g., Dennis 2002 for an overview; USA: Chatterji & Frick 2005; Fein & Roe 1998; Heck, Braveman, Cubbin,

⁵ The more recent study by Kottwitz, Spiess, and Wagner (2011) provides new data on breastfeeding as well, but does not cover breastfeeding as a main focus.

⁶ The figures refer to children who receive any breastfeeding, not necessarily exclusive breastfeeding. Exclusive breastfeeding refers to feeding with breast milk only, without “other liquids or solids (except vitamin/mineral drops, syrups)” (Kersting & Dulong 2002), while any breastfeeding refers to feeding with breast milk regardless of additional feeding or not.

Chávez, & Kiely 2006; UK: Noble & The Alspac Study Team 2001; Ogbuanu et al. 2011; Sweden: Flacking, Dykes, & Ewald 2010; Italy: Bertini et al. 2003; Russia: Grjibovski, Yngve, Olov Bygren, & Sjöström 2005; Iran: Hajian-Tilaki 2005). Maternal age is also often found to be associated with breastfeeding in Germany. Very young mothers are less likely to breastfeed and more likely to breastfeed for a shorter period of time (Lange et al. 2007). Again, this is a global trend (e.g., Dulon et al. 2001; Grjibovski et al. 2005; Noble & The Alspac Study Team 2001; Ogbuanu et al. 2011). Being a single parent negatively impacts breastfeeding initiation and duration (Dulon et al. 2001; Ogbuanu et al. 2011; Grjibovski et al. 2005). Giving birth by Cesarean section reduces the probability of breastfeeding initiation in Germany (Kottwitz, Spiess, & Wagner 2011). This is in line with international findings; however, once breastfeeding is initiated, no differences in breastfeeding duration between Cesarean and non-Cesarean mothers can be observed (Hyde, Mostyn, Modi, & Kemp 2012; Prior et al. 2012). Smoking is associated with a lower rate of breastfeeding initiation and shorter duration in Germany and other countries (Bertini et al. 2003; Chatterji & Frick 2005; Kohlhuber et al. 2008; Lange et al. 2007; Noble & The Alspac Study Team 2001; Ogbuanu et al. 2011).

Children that are born prematurely are less likely to be breastfed but, at the same time, are more likely to be breastfed at six months. Having an immigration background is associated with a higher rate of breastfeeding initiation, but this association is not affected by the amount of time the mother has lived in Germany. Furthermore, mothers from the eastern part of Germany are more likely to initiate breastfeeding but tend to breastfeed for a shorter period of time than mothers from western Germany (Lange et al. 2007). Additionally, it is interesting to note that more East than West German mothers cite returning to work as the reason why they stopped breastfeeding (Dulon et al. 2001).

3. Hypotheses

Time conflicts between breastfeeding and labor market participation are most likely to arise for mothers during the first year after childbirth. Therefore, our focus is on the changes in breastfeeding during the first year of a child's life since the 2007 parental leave reform. While we do not expect the 2007 reform to impact breastfeeding initiation, we expect a positive effect on breastfeeding duration (breastfeeding at four months and breastfeeding at six months). We have chosen four and six months because these are the recommended breastfeeding durations in Germany (see section 2.2.2).

As described above, the new parental leave reform seems to have reduced the differences of work leave across various socio-economic groups (Wrohlich et al. 2012a). In line with previous research (Baker & Milligan 2008; Gielen et al. 1991; Kimbro 2006; Visness & Kennedy 1997), we do not expect to find an increase in breastfeeding initiation rates due to the reform – mainly because the eight-week maternity protection period following childbirth did not change. During this period, mothers are not allowed to return to the labor market. Nevertheless, an increase in the rate of breastfeeding initiation in the first 2 months after childbirth might be related to other factors such as nationwide breastfeeding promotion campaigns or similar efforts. However, since 80% to 90% of all mothers in Germany already initiate breastfeeding (Dulon et al. 2001; Kersting & Dulon 2002; Koletzko et al. 2013; Lange et al. 2007), the effect of such campaigns may be expected to be rather small – apart from the important fact that no such broader campaign took place in our observation period.

Moreover, not all mothers were affected by the new reform (see 2.2.1). Thus we hypothesize that only mothers who are affected by the reform show a significant change in their breastfeeding behavior.

4. Empirical Strategy and Data

4.1 Data

Three binary outcome variables are of primary interest: 1) breastfeeding initiation at birth versus no breastfeeding initiation; 2) breastfeeding for at least four months versus less or none; and 3) breastfeeding for at least six months versus less or none. To investigate these outcomes, we made use of a representative German data set: the German Socio-Economic Panel Study (SOEP), waves 2002 through 2012. The SOEP, which started in 1984, is an annual, long-running household panel study with about 20,000 participants covering a broad range of socio-economic factors, demographic conditions, psychosocial factors, and health (Wagner, Frick, & Schupp 2007). Breastfeeding initiation and duration is assessed in the SOEP with an age-specific questionnaire for mothers of newborn children and a follow-up questionnaire for mothers of children aged 2 to 3 years (for the age-specific questionnaire, see Spiess 2011). The mothers were asked whether the child was breastfed and for how long (in months). The questionnaire does not ask whether the child was given any additional foods or nutritional supplements. Thus, our classification of breastfeeding comprises exclusive, predominant, and partial breastfeeding.

The SOEP started with these age-specific questionnaires in 2003, covering all birth cohorts starting with 2002; however, the breastfeeding questions were not part of these questionnaires from the very beginning. They were introduced in 2007 in the questionnaires for mothers of newborn children (birth cohorts 2006 and 2007) and children aged two to three years (birth cohorts 2004 and 2005). Thus, the SOEP provides breastfeeding information for children born from 2004 on. Breastfeeding status is derived from the questionnaires for mothers of children aged two to three years if breastfeeding information is either missing or censored in the newborn questionnaire; in all other cases, breastfeeding information is taken from the newborn questionnaire. Excluding observations with missing information on important control variables leaves us with a sample of 1,025 children at this stage.

However, for several children, information is only available from a newborn questionnaire but not from the follow-up questionnaire distributed at the age of two to three years. 47 of those children were assessed very early, i.e., between birth and the age of six months. We therefore lack observation of the full potential breastfeeding period for some of these children. In order to avoid biased estimates due to the incorporation of partly incomplete breastfeeding histories, all 47 of these children were excluded. This left us with 978 children born to 802 mothers between 2004 and 2009 for the final analysis.⁷

For our analysis of the reform effect on breastfeeding, we controlled for other relevant factors affecting breastfeeding (see 2.2.2). All models include the following control variables: maternal education measured by highest degree obtained (least educated, vocationally educated, and tertiary educated mothers), poor physical health of the mother during the third trimester of pregnancy, poor mental health of the mother during the third trimester of pregnancy, first child, multiple birth, preterm birth, birth weight above 4,000 grams, maternal age at birth, planned pregnancy, family status, mother's residence in municipality with a population of less than 20,000, residence in the western regions of Germany, and smoking status. Smoking information has been collected in the SOEP with every second wave since 2002. As smoking information is therefore missing in every other wave, smoking status was operationalized as "ever smoked," which identifies women who have stated at least once during survey participation that they are smokers. Maternal health factors and further individual characteristics were derived from the annual individual questionnaire from the survey year when the child was born. To account for the concern that breastfeeding would have increased even in the absence of a parental leave reform, a potential time trend was controlled for by including quarter-year dummy variable indicators.

When estimating reform effects, we must rule out the possibility that another reform or intervention that may have led to a change in breastfeeding behavior took place at the same time as the parental leave reform. We are not aware of any such reform. However, one might argue that the increasing number of baby-friendly hospitals, an initiative by the

⁷ Dropping these 47 cases should not lead to a systematic bias as births are nearly randomly distributed over a calendar year. However, we performed an analysis for breastfeeding at birth vs. no breastfeeding initiation for the full sample of 1,025 children, which yielded similar results.

World Health Organization and UNICEF (World Health Organization & UNICEF 2009), may have affected breastfeeding.⁸ Thus, data on certified baby-friendly hospitals were linked to the mother's residence by making use of geographic coordinates of the household and the relevant hospitals using "Geographic Information Systems" (GIS).⁹ By calculating simple Euclidean straight-line distance (McLafferty 2003) from the household to the nearest baby-friendly hospital, we identified whether the household is located within a distance of 20-km of a baby-friendly hospital or not.¹⁰ Additionally, we will also control for mode of delivery as previous research has found a great impact of Cesarean sections on breastfeeding initiation. However, information on mode of delivery is not available for the birth cohorts 2004 and 2005. Instead, we controlled for annual Cesarean section rates at the state level as an approximation (GBE 2012).

⁸ The number of certified baby-friendly hospitals in Germany rose from 19 to 51 out of more than 800 hospitals with a maternity unit in our observation period 2004 to 2009 (BFHI 2013).

⁹ Data on certified baby-friendly hospitals of the years 2006 to 2009 was provided to the authors by the "Babyfreundliches Krankenhaus" (Baby-Friendly Hospital), an initiative supported by UNICEF and the WHO (BFHI 2014). Hospital data from 2006 were also linked with data from the 2004 and 2005 birth cohorts. The sample size was reduced to N=963 due to missing information on geographic coordinates of some households.

¹⁰ The choice of a 20 km distance is justified by the fact that 98% of the German population can access a hospital within 20 minutes' travel time by car, i.e., a travel distance of 20 km at a speed of 60 km/h (Beivers & Spangenberg 2008). As geographic coordinates are not available for all households, a separate category for those missing cases was included in the estimation to avoid further dropping of observations.

4.2 Estimation Strategy

The parental leave reform of 2007 creates an exogenous policy variation that can be used to compare breastfeeding before and after the reform. We first estimated a simple difference-in-difference (DiD) logistic regression for breastfeeding initiation and breastfeeding duration of the following notation:

$$\text{Logit}(Y_{i/0}) = \ln \frac{P(Y_i = 1)}{1 - P(Y_i = 1)} = \beta_0 + \beta_1 \text{reform2007} + \dots + \beta_n x_n + \varepsilon \quad (\text{Eq. 1})$$

where the outcome variable Y_i stands for one of the three binary outcome variables on the child level: 1) breastfeeding at birth vs. no breastfeeding initiation; 2) breastfeeding for at least four months; and 3) breastfeeding for at least six months. The latter two outcome variables include women who did not start breastfeeding after childbirth to avoid selection bias due to a possibly nonrandom sample. *Reform2007* is a dummy variable indicator equal to 1 if the child was born after the reform came into effect (birth cohorts 2007 to 2009).

Second, we applied a more specified difference-in-difference (DiD) approach that estimates the causal effect of the 2007 parental leave scheme. For this effect, two groups of mothers are of special interest: The first are mothers who were least affected and/or not affected by the new parental leave scheme (control group). The second are mothers who benefited from the reform and are now less inclined to return to the labor market quickly (treatment group). Given German parental leave regulations, the treatment and control groups are defined by their pre-pregnancy employment status and their annual household income (Table 2). The employment status and annual household income enable us to identify those women who were most likely to have benefited from the reform (treatment group) and those who were most likely to have received the same transfer amount in the first year after childbirth before and after the reform, thus being less likely to be affected by the reform (control group). We assume that non-working mothers with an annual household income of less than €30,000 were not affected by the new parental leave reform, and thus received the same monetary transfer amount of about €300 per

month before and after the reform.¹¹ Non-working mothers with an annual household income of more than €30,000 as well as working mothers, who earn their own income, should benefit from the new parental leave reform. Mothers with a high household income would not have received any transfers before the reform. Empirical studies show that employed mothers benefit most from the new parental leave benefit (Wrohlich et al. 2012b). In our sample, we derived the employment status from the monthly biography calendar ten months before childbirth. We differentiated between working (full-time, part-time) and not working (housewife, unemployed, in education).¹² Pre-pregnancy employment status was chosen to avoid any misreporting due to pregnancy-related (sick) leave.

Table 2: Definition of treatment and control groups

Group	Old parental leave scheme 2004-2006	New parental leave scheme 2007-2009	Operationalization
Treatment Group	No benefit or benefit below €300 /month	Eligible for €300 to €1,800 /month	mothers with pre-birth employment or without pre-birth employment and annual household income greater than €30,000
Control Group	Eligible for €300 /month	Eligible for €300 /month	mothers without pre-birth employment and annual household income less than €30,000

Note: Treatment and control groups are defined by the expected monthly parental leave benefit in the first six months after childbirth.

In the absence of a reform effect, treatment and control groups would follow the same distribution patterns and a parallel breastfeeding trend over time (common linear trend

¹¹ As described above, after 6 months, only parents with a maximum household income of €16,500 (€13,500 for single parents) received a benefit of €300 or more per month prior to the reform. A separate robustness check was performed for breastfeeding at 6 months by allocating non-working mothers with an annual household income of more than €16,500 to the treatment group as they benefit from new parental leave reform after 6 months. This specification, however, does not change our main findings.

¹² In the case of parallel employment calendar spells (such as women who reported both working part-time and being a homemaker), employment is given priority when coding employment status before pregnancy. The category “in education” comprises all women who stated that they were in the vocational or tertiary educational system.

assumption). The DiD of the following notation estimates the causal reform effects on breastfeeding initiation and duration:

$$\text{Logit}(Y_{i/0}) = \ln \frac{P(Y_i = 1)}{1 - P(Y_i = 1)} = \beta_0 + \beta_1 \text{reform2007} + \beta_2 \text{treat} + \beta_3 \text{reform2007} * \text{treat} + \dots + \beta_n x_n + \varepsilon$$

(Eq. 2)

where *treat* measures treatment status and is equal to one for all mothers that were affected by the reform. *Reform2007*treat* is the interaction effect of *reform2007* and *treat* and identifies the causal effect of the reform on breastfeeding initiation respectively the other breastfeeding “outcomes”. The sign of the coefficient of the interaction term is the same as the sign of the treatment effect (Puhani 2012); hence, a positive coefficient would yield a positive reform effect on breastfeeding. Furthermore, the interaction effect was conceptualized in terms of predicted probabilities to ease interpretation.

$$P(Y_i = 1) = \frac{e^{\beta_0 + \beta_1 \text{reform2007} + \beta_2 \text{treat} + \beta_3 \text{reform2007} * \text{treat} + \dots + \beta_n x_n + \varepsilon}}{1 + e^{\beta_0 + \beta_1 \text{reform2007} + \beta_2 \text{treat} + \beta_3 \text{reform2007} * \text{treat} + \dots + \beta_n x_n + \varepsilon}}$$

(Eq. 3)

As predicted probabilities are sensitive to the choice of variable values, and as holding covariates fixed at their mean values may not represent a mother in reality, predicted probabilities were calculated for an average mother (mother’s age at birth: 30, good physical health during first 3 months after childbirth, birth at term, first child) living in the Eastern states of Germany. In alternative specifications, sensitivity analyses are performed by holding covariates constant at other plausible values.

Table 3: Descriptive statistics of variables before and after the parental leave reform

	Scale	Variable means		Group differences (t-Test)	
		2004-2006	2007-2009	Difference	t
<u>Outcome variables</u>					
Breastfeeding at birth	<i>Dummy</i>	0.865	0.894	-0.029	(-1.37)
Breastfeeding at four months	<i>Dummy</i>	0.603	0.695	-0.092**	(-3.01)
Breastfeeding at six months	<i>Dummy</i>	0.523	0.602	-0.079*	(-2.48)
<u>Treatment</u>					
Treatment group	<i>Dummy</i>	0.785	0.808	-0.022	(-0.86)
<u>Socio-demographic characteristics</u>					
Mother's age at birth	<i>Continuous</i>	30.506	31.173	-0.667+	(-1.93)
Least educated mothers (ref.)	<i>Categorical</i>	0.163	0.128	0.035	(1.55)
Vocationally educated mothers		0.591	0.584	0.007	(0.23)
Tertiary educated mothers		0.245	0.288	-0.042	(-1.50)
Married (ref.)	<i>Categorical</i>	0.709	0.748	-0.039	(-1.35)
Cohabiting		0.226	0.184	0.043	(1.64)
Single mother		0.065	0.069	-0.004	(-0.25)
Migration background	<i>Dummy</i>	0.205	0.226	-0.020	(-0.77)
Living in municipality with a population lower than 20,000	<i>Dummy</i>	0.401	0.372	0.029	(0.94)
Living in West Germany	<i>Dummy</i>	0.730	0.728	0.002	(0.08)
<u>Maternal health, pregnancy, and child characteristics</u>					
Poor physical health condition during third trimester of pregnancy	<i>Dummy</i>	0.198	0.177	0.021	(0.83)
Poor physical health during first three months after childbirth	<i>Dummy</i>	0.148	0.126	0.022	(1.00)
Poor mental health condition during third trimester of pregnancy	<i>Dummy</i>	0.133	0.113	0.020	(0.96)
Poor mental health during first three months after childbirth	<i>Dummy</i>	0.169	0.144	0.025	(1.09)
Smoker	<i>Dummy</i>	0.394	0.367	0.026	(0.84)
Pregnancy was planned	<i>Dummy</i>	0.721	0.772	-0.052+	(-1.85)
First child	<i>Dummy</i>	0.483	0.414	0.069*	(2.17)
Multiple birth	<i>Dummy</i>	0.034	0.027	0.008	(0.69)
Premature birth (less than 37 weeks gestational age)	<i>Dummy</i>	0.116	0.080	0.036+	(1.90)
Birth weight higher than 4,000g	<i>Dummy</i>	0.091	0.124	-0.033+	(-1.65)
<u>Regional characteristics</u>					
Cesarean section rate on federal states level	<i>Continuous</i>	27.060	29.694	-2.634***	(-11.83)
No baby-friendly hospital within 20-km radius (ref.)	<i>Categorical</i>	0.705	0.706	-0.000	(-0.01)
Baby-friendly hospital within 20-km radius	<i>Categorical</i>	0.222	0.248	-0.025	(-0.93)
No information on hospitals available	<i>Categorical</i>	0.072	0.046	0.026+	(1.69)
Observations (Total: N=978)		526	452		

t statistics in parantheses

+ p<0.10, * p<0.05, ** p<0.01, *** p<0.001

Source: SOEP waves 2002-2012 (SOEP 2013, doi:10.5684/soep.v29), own calculations

A major concern in DiD estimates is the potential endogeneity of a reform itself. The estimated reform effect is biased if, for example, the reform led to a change in individual fertility choices—for instance, if some women who would have otherwise remained childless based their decisions to have children on the new parental leave regulation. Recent evidence on the short-term consequences of the parental leave reform in 2007 shows that mothers aged 34 and younger have a lower probability of a higher-order birth (Bujard & Passet 2013). However, the authors do not identify a causal effect (*ibid.*). Thyrian et al. (2010) find increased higher-order fertility among certain subgroups, such as mothers with a higher socio-economic status, after the reform. However, the data from this study are not representative for Germany. Moreover, the question is whether we see such differences in our sample. Table 3 reports the summary statistics of individual characteristics of our sample before and after the reform. The results indicate that covariates between both sample groups remained similar and are not statistically different, except for first-time pregnancies, which are significantly less frequent after the reform and Cesarean section rates, which increased significantly over time. In addition, Table 4 shows that covariate distribution of treatment and control groups is very similar before and after the reform. Thus, we have no reason to assume that mothers in our sample who gave birth after the reform are different from mothers who gave birth prior to the reform.

Table 4: Sample characteristics of treatment and control group before and after the parental leave reform

	Treatment Group				Control Group			
	2004-2006	2007-2009	Difference	t	2004-2006	2007-2009	Difference	t
<u>Outcome variables</u>								
Breastfeeding at birth	0.889	0.912	-0.024	(-1.10)	0.779	0.816	-0.037	(-0.65)
Breastfeeding at four months	0.632	0.745	-0.113***	(-3.41)	0.496	0.483	0.013	(0.18)
Breastfeeding at six months	0.554	0.647	-0.092**	(-2.62)	0.407	0.414	-0.007	(-0.10)
<u>Socio-demographic characteristics</u>								
Mother's age at birth of child	31.402	32.101	-0.700+	(-1.92)	27.231	27.276	-0.045	(-0.06)
Least educated mothers	0.097	0.066	0.031	(1.58)	0.407	0.391	0.016	(0.23)
Vocationally educated mothers	0.627	0.605	0.022	(0.62)	0.460	0.494	-0.034	(-0.48)
Tertiary educated mothers	0.276	0.329	-0.053	(-1.60)	0.133	0.115	0.018	(0.38)
Married	0.755	0.773	-0.017	(-0.56)	0.540	0.644	-0.104	(-1.48)
Cohabiting	0.211	0.181	0.030	(1.04)	0.283	0.195	0.088	(1.43)
Single mother	0.034	0.047	-0.013	(-0.90)	0.177	0.161	0.016	(0.30)
Migration background	0.172	0.208	-0.036	(-1.29)	0.327	0.299	0.029	(0.43)
Living in municipality with a population of less than 20,000	0.409	0.367	0.042	(1.20)	0.372	0.391	-0.019	(-0.27)
Living in West Germany	0.751	0.762	-0.011	(-0.36)	0.655	0.586	0.069	(0.99)
<u>Pregnancy, birth outcomes, and maternal health</u>								
Poor physical health condition during third trimester of pregnancy	0.194	0.167	0.027	(0.96)	0.212	0.218	-0.006	(-0.10)
Poor physical health during first three months after childbirth	0.140	0.118	0.023	(0.94)	0.177	0.161	0.016	(0.30)
Poor mental health condition during third trimester of pregnancy	0.111	0.107	0.005	(0.20)	0.212	0.138	0.074	(1.36)
Poor mental health during first three months after childbirth	0.165	0.140	0.025	(0.96)	0.186	0.161	0.025	(0.46)
Smoker	0.351	0.342	0.009	(0.25)	0.549	0.471	0.077	(1.08)
Pregnancy was planned	0.785	0.792	-0.007	(-0.25)	0.487	0.690	-0.203**	(-2.92)
First child	0.516	0.444	0.072*	(2.01)	0.363	0.287	0.075	(1.12)
Multiple birth	0.039	0.022	0.017	(1.35)	0.018	0.046	-0.028	(-1.16)
Premature birth (less than 37 weeks gestational age)	0.102	0.085	0.017	(0.80)	0.168	0.057	0.111*	(2.41)
Birth weight higher than 4000g	0.097	0.134	-0.037	(-1.64)	0.071	0.080	-0.010	(-0.26)
<u>Regional characteristics</u>								
Cesarean section rate on federal states level	27.130	29.918	-2.788***	(-11.36)	26.804	28.756	-1.952***	(-3.77)
No baby-friendly hospital within 20-km radius (ref.)	0.705	0.696	0.009	(0.26)	0.708	0.747	-0.039	(-0.61)
Baby-friendly hospital within 20-km radius	0.223	0.249	-0.027	(-0.87)	0.221	0.241	-0.020	(-0.33)
No information on hospitals available	0.073	0.055	0.018	(1.01)	0.071	0.011	0.059*	(2.02)
Observations	778				200			

t statistics in parantheses

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

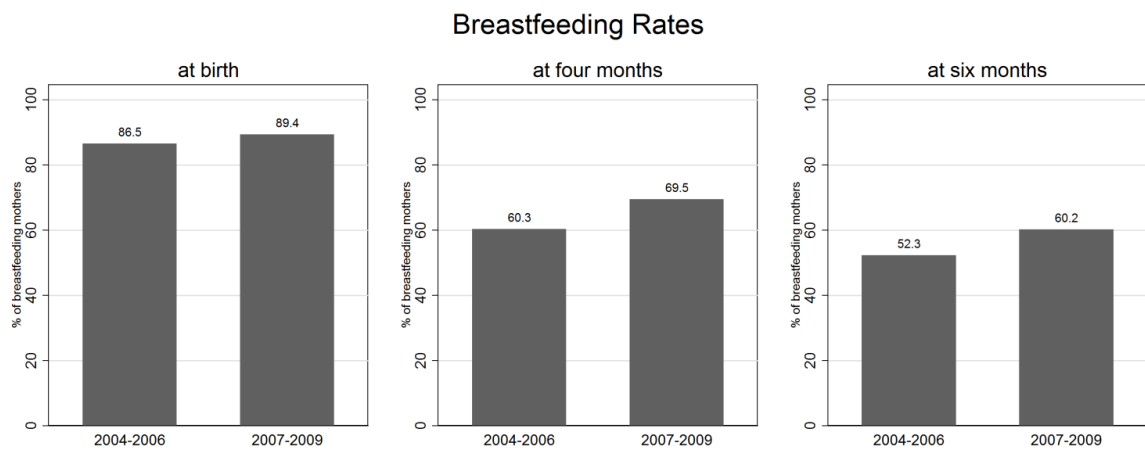
Source: SOEP waves 2002-2012 (SOEP 2013, doi:10.5684/soep.v29), own calculations

Multiple pregnancies by the same mother are adjusted by estimating the robust variance in the logistic regression that adjusts for within-cluster correlation (Rogers 1993).

5. Results

Figure 1 shows unadjusted breastfeeding rates of mothers before and after the reform. In line with our expectations, we find no statistically significant difference between breastfeeding initiation before and after the parental leave reform in 2007 (see also Table 3). However, we do find a significant increase in breastfeeding duration: breastfeeding at four months increased by 9.2 percentage points and breastfeeding at six months by 7.9 percentage points.

Figure 1: Breastfeeding rates in Germany before and after 2007



Source: SOEP waves 2002-2012 (SOEP 2013, doi:10.5684/soep.v29), own calculations

Adjusting for socio-demographic characteristics as well as further maternal and child-related characteristics in a logistic regression of the equation (1), a positive reform effect can still be observed for breastfeeding at four months (t-value=1.94) and for breastfeeding at six months (t-value=2.05, see Table 5).

Table 5: The effect of parental leave on breastfeeding initiation and duration (logistic regression)

	Breastfeeding at birth	Breastfeeding at four months	Breastfeeding at six months
	(1)	(2)	(3)
Reform	-0.101 (-0.28)	0.480+ (1.94)	0.476* (2.05)
N(children)	978	978	978
N(cluster mothers)	802	802	802
Pseudo-R2	0.188	0.140	0.130
Correctly classified	88.86%	71.17%	67.38%
	<i>Chi2</i> <i>[p]</i>	<i>Chi2</i> <i>[p]</i>	<i>Chi2</i> <i>[p]</i>
Wald test	128.913 [0.000]	146.732 [0.000]	130.222 [0.000]
Goodness-of-fit test (grouped into deciles of risk, Hosmer & Lemeshow)	5.988 [0.649]	3.621 [0.890]	5.456 [0.708]

t statistics in parantheses

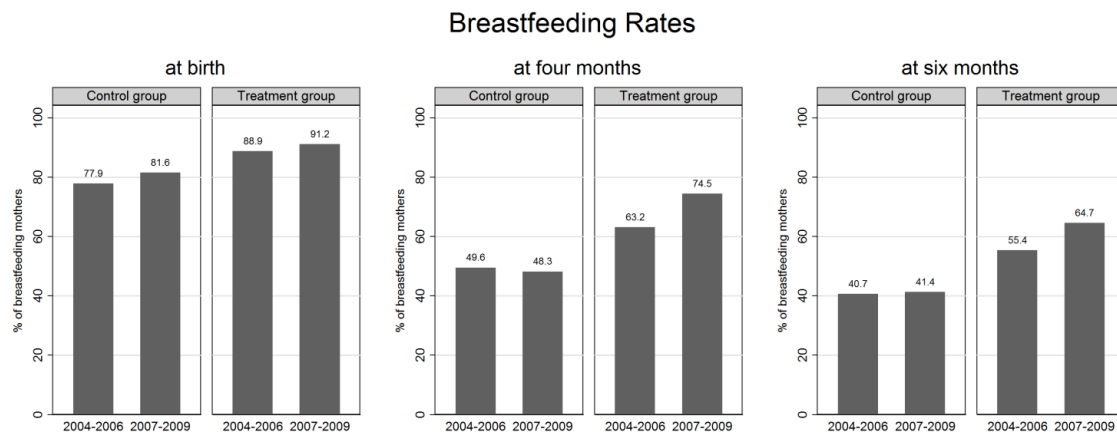
+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Note: All models control for covariates listed in Table 3 plus quarter-year dummy variables. The cutoff point is set at 0.5 for the calculation of the classification statistics.

Source: SOEP waves 2002-2012 (SOEP 2013, doi:10.5684/soep.v29), own calculations

However, a reform effect should only be observed among those women who actually benefited from the reform (treatment group). Figure 2 shows the unadjusted breastfeeding rates before and after the reform for the control and treatment group. Breastfeeding initiation did not change significantly in either the control or the treatment group. Breastfeeding duration did significantly increase among mothers in the treatment group but not in the control group. Breastfeeding at four months has increased by 11.3 percentage points and breastfeeding at six months by 9.2 percentage points among mothers in the treatment group (see also Table 4).

Figure 2: Breastfeeding rates in Germany by treatment and control groups



Source: SOEP waves 2002-2012 (SOEP 2013, doi:10.5684/soep.v29), own calculations

Results from the DiD logistic regression models of the equation (2) controlling for maternal and child-related characteristics are presented in Table 6.1. In line with the descriptive findings, we find no effect of the parental leave reform on breastfeeding initiation; but there is an effect on breastfeeding at four months. We find no statistically significant effect of the reform on breastfeeding of at least six months.

Table 6: DiD estimates on breastfeeding initiation and duration (logistic regression)

6.1 Log odds

	Breastfeeding at birth	Breastfeeding at four months	Breastfeeding at six months
	(1)	(2)	(3)
Reform	-0.204 (-0.37)	-0.114 (-0.29)	0.054 (0.14)
Treatment	0.527 (1.45)	0.042 (0.15)	0.076 (0.28)
Reform x Treatment	0.119 (0.23)	0.760* (2.02)	0.524 (1.41)
N(children)	978	978	978
N(cluster mothers)	802	802	802
Pseudo-R2	0.194	0.146	0.133
<i>Correctly classified</i>	<i>88.55%</i>	<i>72.09%</i>	<i>67.08%</i>
	<i>Chi2</i>	<i>Chi2</i>	<i>Chi2</i>
	<i>[p]</i>	<i>[p]</i>	<i>[p]</i>
Wald test	137.964 [0.000]	146.734 [0.000]	130.256 [0.000]
Goodness-of-fit test (grouped into deciles of risk, Hosmer & Lemeshow)	3.391 (0.908)	4.564 (0.803)	10.310 (0.244)

6.2 Predicted Probabilities of DiD estimates

<i>Interaction: Reform x Treatment</i>	Breastfeeding at birth	Breastfeeding at four months	Breastfeeding at six months
	(1)	(2)	(3)
Before#Control	0.926*** (19.51)	0.556*** (5.17)	0.419*** (4.19)
Before#Treatment	0.953*** (33.02)	0.564*** (5.99)	0.435*** (4.49)
After#Control	0.912*** (21.94)	0.532*** (6.75)	0.430*** (5.60)
After#Treatment	0.949*** (38.49)	0.693*** (11.21)	0.557*** (8.37)
Control: Diff. After-Before	-0.014 (-0.39)	-0.024 (-0.29)	0.011 (0.14)
Treatment: Diff. After-Before	-0.004 (-0.23)	0.129* (2.37)	0.122* (2.52)
DiD	0.010 (0.030)	0.153* (1.97)	0.111 (1.44)
N	978	978	978

t statistics in parentheses; + p<0.10, * p<0.05, ** p<0.01, *** p<0.001

Note: All models control for covariates listed in Table 3 plus quarter-year dummy variables. The cutoff point is set at 0.5 for the calculation of the classification statistics. Predicted probabilities base on the logistic regression model (Table 6.1) by holding covariates fixed at following values: East German mothers, mother's age at birth of child: 30, good physical health during first three months after childbirth, birth at term, first child (main specification).

Source: SOEP waves 2002-2012 (SOEP 2013, doi:10.5684/soep.v29), own calculations

Further results from our main DiD regression model are presented in Table 6.2. In a first step, predicted probabilities are calculated for different combinations of the interaction effect *reform2007*treat*: control group before the reform (Before#Control), treatment group before the reform (Before#Treat), control group after the reform (After#Control), and treatment group after the reform (After#Treat) as shown in the upper part of Table 6.2. In a second step, we tested whether there are differences in breastfeeding probabilities of our groups of interest, namely 1) the treatment group and 2) the control group, both before and after the 2007 reform. Differences are calculated by subtracting pre-reform estimates from post-reform estimates (as shown in the lower part of Table 6.2). There is a significant difference in the treatment group before and after the reform with regard to breastfeeding at four months. Mothers who were affected by the parental leave reform (treatment group) show a higher probability (0.693) of breastfeeding for at least four months after than before the reform (0.564), which is nearly 13 percentage points lower. No effect can be found for mothers in the control group when comparing estimates before and after the reform, for which we calculated a difference of -2 percentage points. The DiD shows a significant difference in probabilities of 15 percentage points indicating a causal reform effect on breastfeeding of at least four months. No significant DiD can be found for breastfeeding at six months. These results therefore partly confirm our hypothesis that the parental leave reform affected breastfeeding duration.

6. Sensitivity Analyses

In order to confirm our findings, we applied several sensitivity analyses. Furthermore, we tested whether our results are sensitive to the choice of covariates when estimating the predicted probabilities by holding covariates constant at other plausible values (Table A1 in the appendix). The 2007 parental leave reform shows an effect on the treatment group but not on the control group in all model specifications for East German mothers. Again, significant reform effects can be found for breastfeeding at four months but not for breastfeeding initiation and for breastfeeding at six months. Interestingly, the reform effect seems weaker for West German mothers and is found to be significant at the 10% level.

Next we address the issue of our relatively large observation window of three years before and after the reform. As treatment groups are mainly operationalized by pre-pregnancy employment status, treatment status is prone to endogeneity either if women adapt their employment behavior due to the reform or if childbearing is reduced or increased dependent on women's employment status. For example, if non-employed potential mothers have been "adjusting" their fertility since the 2007 reform by taking a job just before becoming pregnant to be eligible for parental benefits, the reform itself cannot be interpreted as having a causal effect on breastfeeding. To account for this concern, the analysis is restricted to birth cohorts 2006 and 2007 to compare breastfeeding in a smaller time frame around the point of time when the reform came into effect. This enables us to draw conclusions from a comparison sample which has been largely unanticipated by the reform: The public debate about the new German parental leave benefit scheme started in May 2006 (Kluve & Tamm 2013), passed the parliament on September 29, 2006, and was approved by the Federal Assembly on November 3, 2006. Theoretically, women could have started family planning in anticipation of the new reform in May 2006 at the earliest (see also Kluve & Schmitz 2014). However, as the parental leave benefit is calculated from the annual income before childbirth, only mothers who worked a longer period of time would have had a potential incentive to plan to have a child because of the benefit increase. However, conception may take some time. Furthermore, it is possible that potential mothers enter the labor market to increase their income before childbirth. We argue that it is unlikely that non-working women would be able to find a job at such short notice and immediately begin earning a high salary.

Therefore, it seems reasonable to assume that the pre-birth employment statuses of women with children born in 2007 were largely unaffected by the reform. DiD estimations in Table 7 show similar results with the shorter observation period as in the main specification with higher breastfeeding probabilities at four months after the reform.

Table 7: DiD estimates on breastfeeding initiation and duration, birth cohorts 2006 and 2007 (logistic regression)

	Breastfeeding at birth	Breastfeeding at four months	Breastfeeding at six months
	(1)	(2)	(3)
Reform	3.062 (1.03)	-0.414 (-0.50)	-0.241 (-0.31)
Treatment	0.965 (1.51)	0.057 (0.13)	0.175 (0.42)
Reform x Treatment	1.564 (1.37)	1.442* (2.19)	1.196+ (1.91)
N(children)	319	319	319
N(cluster mothers)	311.000	311.000	311.000
Pseudo-R2	0.401	0.176	0.143
<i>Correctly classified</i>	<i>90.91%</i>	<i>69.28%</i>	<i>68.65%</i>
	<i>Chi2</i> <i>[p]</i>	<i>Chi2</i> <i>[p]</i>	<i>Chi2</i> <i>[p]</i>
Wald test	135.353 [0.000]	145.786 [0.000]	132.598 [0.000]
Goodness-of-fit test (grouped into deciles of risk, Hosmer & Lemeshow)	5.637 [0.688]	7.975 [0.434]	8.420 [0.394]

t statistics in parentheses

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Note: All models control for covariates listed in Table 3 plus quarter-year dummy variables. The cutoff point is set at 0.5 for the calculation of the classification statistics

Source: SOEP waves 2002-2012 (SOEP 2013, doi:10.5684/soep.v29), own calculations

Furthermore, we examined the plausibility of the DiD estimator by applying so-called placebo regressions that shift the time cut to a year before the reform (i.e., placebo reform in 2006) to explore whether there are any preexisting breastfeeding trends. This fictitious reform should not show any statistical significant effect. If it does, this would be an indicator that treatment and control groups follow a parallel breastfeeding trend over the time and that they are both independent from the new parental leave reform. In

Table 8, we show regressions with a fictitious reform set at 2006 to check whether there are any existing breastfeeding trends before the reform in 2007 that might have an effect on our findings. No such effects were found in these specifications, indicating that our estimated effects of the reform in 2007 are plausible and that a causal reform effect is identified.

Table 8: DiD estimates on breastfeeding initiation and duration: Placebo estimates (logistic regression)

	Breastfeeding at birth	Breastfeeding at four months	Breastfeeding at six months
	(1)	(2)	(3)
Placebo reform 2006	0.311 (0.57)	-0.003 (-0.01)	0.181 (0.45)
Treatment	0.665 (1.42)	0.124 (0.35)	0.087 (0.26)
Placebo reform 2006 x Treatment	-0.140 (-0.25)	0.414 (1.05)	0.380 (0.98)
N(children)	978	978	978
N(cluster mothers)	802	802	802
Pseudo-R2	0.194	0.142	0.132

t statistics in parentheses

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Note: All models control for covariates listed in Table 3 plus quarter-year dummy variables.

Source: SOEP waves 2002-2012 (SOEP 2013, doi:10.5684/soep.v29), own calculations

We performed several further robustness checks (Table 9). Firstly, we controlled for the availability of publicly funded day care centers for children under the age of three.¹³ If a mother lives in a region with no access to publicly funded day care centers, she might not be able to return to work – even if she wants to – and consequently may continue breastfeeding. Hence, we link our data to information on the availability of day care slots for children under 3 in the county where the mother lives (data on day care slots for children under the age of 1 are not available on the county level). The information on the availability of day care centers is provided by the Federal Statistical Office (Statistisches Bundesamt 2013a). However, controlling for this availability does not change our

¹³ It has to be noted that almost all children who are in day care attend publicly funded day care centers.

results.¹⁴ This result may presumably be explained by the fact that only very few parents use public day care in the first years of their child's life. Only 2-3% of all children attend day care in their first year of life (Statistisches Bundesamt 2013b), and thus, the availability of day care slots for children younger than one year may be of minor importance for our research question.

Table 9: Robustness checks: DiD estimates on breastfeeding initiation and duration (logistic regression)

	Breastfeeding at birth			Breastfeeding at four months			Breastfeeding at six months		
	(1a)	(1b)	(1c)	(2a)	(2b)	(2c)	(3a)	(3b)	(3c)
Reform	-0.209 (-0.35)	-0.196 (-0.35)	-0.199 (-0.36)	-0.143 (-0.35)	-0.114 (-0.29)	-0.165 (-0.42)	0.092 (0.23)	0.050 (0.13)	0.012 (0.03)
Treatment	0.625+ (1.70)	0.504 (1.38)	0.528 (1.45)	0.074 (0.26)	0.022 (0.08)	0.067 (0.24)	0.105 (0.38)	0.047 (0.17)	0.137 (0.50)
Reform x Treatment	0.009 (0.02)	0.150 (0.29)	0.112 (0.21)	0.780* (2.04)	0.786* (2.09)	0.755* (1.98)	0.523 (1.40)	0.560 (1.51)	0.477 (1.26)
N(children)	953	966	947	953	966	947	953	966	947
N(cluster mothers)	787	795	780	787	795	780	787	795	780
Pseudo-R2	0.197	0.196	0.194	0.140	0.144	0.145	0.128	0.131	0.134
Availability of day care centers	✓			✓			✓		
Without civil servants		✓			✓			✓	
Without self- employed			✓			✓			✓

t statistics in parentheses

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Note: All models control for covariates listed in Table 3 plus quarter-year dummy variables.

Source: SOEP waves 2002-2012 (SOEP 2013, doi:10.5684/soep.v29), own calculations

Secondly, we excluded civil servants from our sample. In our main specification, civil servants are included in the treatment group. However, civil servants might differ in when they return to work as they can take a much longer period of parental leave than all other employees. This specification produces similar results, indicating that results were not driven by an imprecise definition of treatment and control groups. Thirdly, an additional robustness check was performed by excluding self-employed mothers from the

¹⁴ Missing data from the official statistics on publicly funded day care slots for children under three in 2004 and 2005 were imputed by using day care information from 2002 (data were provided by the Federal statistical office; Statistisches Bundesamt 2013a).

analysis. Despite being eligible for parental leave benefits, employment protection after childbirth does not apply to them. Again, the results remain unaffected.

Lastly, a multinomial logistic regression model was estimated to address the fact that our reference groups in the DiD estimations of breastfeeding at four and six months covers mothers who did not breast feed at all and thus who initiated breastfeeding with short breastfeeding durations (less than four months or six months, respectively). The outcome variables examined were (a) no breastfeeding at birth versus any breastfeeding up to three months, and breastfeeding at four months versus any breastfeeding up to three months (model specifications 1 and 2 in Table 10), and (b) no breastfeeding at birth versus any breastfeeding up to five months, and breastfeeding at six months versus any breastfeeding up to five months (model specifications 3 and 4 in Table 10). These model specifications also confirm our previous findings.

Table 10: Robustness checks: The effect of parental leave on breastfeeding initiation and duration (multinomial logistic regression)

	(1)	(2)	(3)	(4)
	No Breastfeeding at birth vs. reference group: any breastfeeding up to three months		No Breastfeeding at birth vs. reference group: any breastfeeding up to five months	
Reform	0.599 (1.43)	0.257 (0.41)	0.451 (1.13)	0.326 (0.55)
Treatment		-0.645 (-1.55)		-0.578 (-1.48)
Reform x Treatment		0.480 (0.79)		0.176 (0.31)
	Breastfeeding at four months vs. reference group: any breastfeeding up to three months		Breastfeeding at six months vs. reference group: any breastfeeding up to five months	
Reform	0.719* (2.56)	0.010 (0.02)	0.619* (2.46)	0.158 (0.39)
Treatment		-0.186 (-0.59)		-0.093 (-0.32)
Reform x Treatment		0.914* (2.09)		0.572 (1.41)
N(children)	978	978	978	978
N(cluster mothers)	802	802	802	802
Pseudo-R2	0.157	0.163	0.142	0.146

t statistics in parentheses

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Note: All models control for covariates listed in Table 3 plus quarter-year dummy variables.

Source: SOEP waves 2002-2012 (SOEP 2013, doi:10.5684/soep.v29), own calculations

7. Discussion and Conclusion

This study provides further insights into parental leave schemes and breastfeeding. It contributes to previous research in several ways. While the study by Baker and Milligan (2008) examined both parental leave entitlement and cash benefits, they were not able to disentangle these two policy effects on breastfeeding. Although Huang and Yang (2014) explored a parental leave scheme that introduced parental leave benefits but no job protection, it is not clear from the study how financial support for six weeks can affect breastfeeding duration up to nine months. In contrast to both of these studies, our study has been able to explore a single policy: namely, the introduction of a generous parental leave benefit in Germany.

We compared the breastfeeding behavior of German mothers before and after the 2007 parental leave benefit reform. We hypothesized that the parental leave reform should not affect breastfeeding initiation. Instead, we expected changes in breastfeeding duration. As expected, we did not find any effects of the new parental leave regulation on breastfeeding initiation. Breastfeeding for at least four months has increased significantly since the reform for mothers who were most likely to benefit from the new reform. However, we also did not find evidence of an increase in mothers who breastfeed their children for at least six months. The results are in line with the hypotheses and confirm two out of three hypotheses. In addition, a fictitious reform in 2006 had no effects on breastfeeding in the placebo regression, confirming that breastfeeding behavior does not differ in the absence of a policy intervention. Various model specifications show that our results were very robust when controlling for other potential mechanisms that might explain an increase in the proportion of mothers who breastfeed for at least four months.

The benefit reform did not impact all mothers in the same way. We find stronger effects on breastfeeding for East German mothers compared to West German mothers. This result might be due to different reasons for returning to the labor market earlier. Furthermore, East German mothers have generally higher employment rates than West German mothers (Pfau-Effinger & Smidt 2011). Due to a lower household income in East Germany the necessity to return to the labor market is in principle higher for mothers in East Germany (Dressel, Cornelißen, & Wolf 2005). It could be that the increase in the

benefit allowed East German mothers in particular to stay at home and breastfeed their child.

Nevertheless our study has some limitations. First, our data give us no information about whether or not the child was breastfed exclusively. But as long as there is no systematic variation due to our analyzed reform, this missing information should be of less concern. Second, employment is only one reason among others for the cessation of breastfeeding. Other reasons might be that mothers are exhausted due to breastfeeding or are experiencing health problems (Dulon et al. 2001). However, controlling for health problems in the first three months after childbirth should at least partly account for this concern. Third, we cannot disentangle possible heterogeneity in the effects, given the sample size of our dataset. It would be interesting to know if the reform has a particularly strong effect on mothers with a higher or lower socio-economic status, as some campaigns to encourage breastfeeding focus on mothers with a lower socio-economic status. However, they have a higher probability to be in our control group, as there is no change in the benefit for low-income mothers who were not working before childbirth. The latter point is of great importance, as women with previous employment and/or high household income benefited most from the new parental leave reform. This is an essential aspect for the research on social and health inequalities in our control group. The group of mothers without pre-pregnancy employment and a low household income are not addressed by the reform and thus are not at risk of potential breastfeeding benefits, which in principle might come with the reform. This is of particular relevance, as these mothers are on average more vulnerable to social and health inequalities. Thus, policy makers and health care professionals have to be aware that those women need to be targeted differently to promote breastfeeding duration (Kohlhuber et al. 2008).

Our findings should be of interest to policy makers for multiple reasons. Given the goals of the German parental benefit reform, our results indicate that the reform was successful in the sense that parents with very young children were given the financial resources to interrupt work and take care of their very young child in the first year when the bonding between parents and children is of particular importance. With the new benefit, mothers are more likely to breastfeed for a longer period after their maternity

leave ends. However, there is no change in the percentage of mothers who breastfeed for at least six months.

In respect to health policy, our results show how measures from other policy fields, such as family policy, can be effective in promoting the health of young children and their mothers at the same time. More concretely, parental leave benefits can be effective in improving the health both children and their mothers. However, more research is needed to determine whether these health effects actually occur and if they last over the medium and long term.

Moreover, it is important to point out that these benefits of the reform also have their costs. There are direct costs to taxpayers, who have to finance the increase in the parental leave benefit. Further, there might be additional opportunity costs to mothers who enter the labor market later. An evaluation of the efficiency of this change in the benefit would need to account fully for all benefits and costs.

Finally, from a family policy perspective, other policy measures might also be effective at alleviating the conflict mothers may experience between breastfeeding and working. Policy measures that allow mothers to manage both might also be useful. Employer-provided space and break time for the expression of breast milk or access to the child may also be helpful policy measures. Further research on this would help to better understand maternal coping strategies.

References

- Anderson, J. W., Johnstone, B. M., & Remley, D. T. (1999). Breast-feeding and cognitive development: a meta-analysis. *The American Journal of Clinical Nutrition*, 70(4), 525–535.
- Baker, M., & Milligan, K. (2008). Maternal employment, breastfeeding, and health: evidence from maternity leave mandates. *Journal of Health Economics*, 27(4), 871–87.
- Baker, M., & Milligan, K. (2010). Evidence from Maternity Leave Expansions of the Impact of Maternal Care on Early Child Development. *Journal of Human Resources*, 45(1), 1–32.
- Beivers, A., & Spangenberg, M. (2008). Ländliche Krankenhausversorgung im Fokus der Raumordnung. *Informationen zur Raumentwicklung*, 1/2.2008, 91–99.
- Belfield, C. R., & Kelly, I. R. (2012). The Benefits of Breast Feeding across the Early Years of Childhood. *Journal of Human Capital*, 6(3), 251–277.
- Beral, V., Bull, D., Doll, R., Peto, R., Reeves, G., & Collaborative Group on Hormonal Factors in Breast Cancer. (2002). Breast cancer and breastfeeding: collaborative reanalysis of individual data from 47 epidemiological studies in 30 countries, including 50 302 women with breast cancer and 96 973 women without the disease. *The Lancet*, 360(9328), 187–195.
- Berger, L. M., Hill, J., & Waldfogel, J. (2005). Maternity leave, early maternal employment and child health and development in the US. *Economic Journal*, 115(501), F29–F47.
- Bertini, G., Perugi, S., Dani, C., Pezzati, M., Tronchin, M., & Rubaltelli, F. F. (2003). Maternal Education and the Incidence and Duration of Breast Feeding: A Prospective Study. *Journal of Pediatric Gastroenterology and Nutrition*, 37(4), 447–452.
- BFHI. (2013). Jahresbericht 2013. Retrieved November 29, 2013, from http://www.babyfreundlich.org/fileadmin/user_upload/download/verein_und_vorstand/Baby_Jahresbericht_2013_Web2_300dpi.pdf
- BFHI. (2014). WHO/UNICEF-Initiative Babyfreundliches Krankenhaus (BFHI). Retrieved January 21, 2014, from <http://www.babyfreundlich.org>
- Bick, D. E., MacArthur, C., & Lancashire, R. J. (1998). What influences the uptake and early cessation of breast feeding? *Midwifery*, 14(4), 242–247.
- BMFSFJ. (2008). *Evaluation des Gesetzes zum Elterngeld und zur Elternzeit - Endbericht 2008*. Berlin: Bundesministerium für Familie, Senioren, Frauen und Jugend. Retrieved December 02, 2013, from <http://www.bmfsfj.de/RedaktionBMFSFJ/Abteilung2/Pdf-Anlagen/beeg-evaluation-endbericht.pdf>
- Borra, C., Iacovou, M., & Sevilla, A. (2012). The effect of breastfeeding on children's cognitive and noncognitive development. *Labour Economics*, 19(4), 496–515.
- Bujard, M. (2013). Elterngeld und Elternzeit in Deutschland: Ziele, Diskurse und Wirkungen. *Zeitschrift für Familienforschung*, 25(3), 123–131.
- Bujard, M., & Passet, J. (2013). Wirkungen des Elterngelds auf Einkommen und Fertilität. *Zeitschrift für Familienforschung*, 25(3), 212–237.

- Bundesinstitut für Risikobewertung. (2004). Empfehlungen zur Stilldauer. Empfehlungen der Nationalen Stillkommission vom 1. März 2004. *Bundesgesundheitsblatt - Gesundheitsforschung - Gesundheitsschutz*, 908.
- Carneiro, P., Loken, K. V., & Salvanes, K. G. (2011). *A Flying Start? Maternity Leave Benefits and Long Run Outcomes of Children*. Institute for the Study of Labor (IZA).
- Chatterji, P., & Frick, K. (2005). Does Returning to Work After Childbirth Affect Breastfeeding Practices? *Review of Economics of the Household*, 3(3), 315–335.
- Colen, C. G., & Ramey, D. M. (2014). Is breast truly best? Estimating the effects of breastfeeding on long-term child health and wellbeing in the United States using sibling comparisons. *Social Science & Medicine*, 109, 55–65.
- Del Bono, E., & Rabe, B. (2012). *Breastfeeding and child cognitive outcomes: evidence from a hospital-based breastfeeding support policy*. Institute for Social and Economic Research. Retrieved January 27, 2014, from <http://ideas.repec.org/p/ese/iserwp/2012-29.html>
- Dennis, C.-L. (2002). Breastfeeding Initiation and Duration: A 1990-2000 Literature Review. *Journal of Obstetric, Gynecologic, & Neonatal Nursing*, 31(1), 12–32.
- Destatis. (2011). *Öffentliche Sozialleistungen. Statistik zum Elterngeld. Gemeldete beendete Leistungsbezüge. Jahr 2010*. Wiesbaden: Statistisches Bundesamt. Retrieved December 3, 2013, from http://www.elterngeld.net/quellen/Elterngeldstatistik_2010.pdf
- Deutscher Bundestag. (2006). Entwurf eines Gesetzes zur Einführung des Elterngeldes. *Bundestags-Drucksache, 16/1889, 20 June 2006*.
- Drasch, K. (2013). Educational Attainment and Family-Related Employment Interruptions in Germany: Do Changing Institutional Settings Matter? *European Sociological Review*, 29(5), 981–995.
- Dressel, C., Cornelißen, W., & Wolf, K. (2005). Vereinbarkeit von Familie und Beruf. In W. Cornelißen (Ed.), *Gender-Datenreport. 1. Datenreport zur Gleichstellung von Frauen und Männern in der Bundesrepublik Deutschland* (pp. 278–356). Im Auftrag des Bundesministeriums für Familie, Senioren, Frauen und Jugend (BMFSFJ), Berlin.
- Dulon, M., Kersting, M., & Schach, S. (2001). Duration of breastfeeding and associated factors in Western and Eastern Germany. *Acta Paediatrica*, 90(8), 931–935.
- Dustmann, C., & Schönberg, U. (2012). Expansions in Maternity Leave Coverage and Children's Long-Term Outcomes. *American Economic Journal: Applied Economics*, 4(3), 190–224.
- Fein, S. B., & Roe, B. (1998). The effect of work status on initiation and duration of breast-feeding. *American Journal of Public Health*, 88(7), 1042–1046.
- Flacking, R., Dykes, F., & Ewald, U. (2010). The influence of fathers' socioeconomic status and paternity leave on breastfeeding duration: A population-based cohort study. *Scandinavian Journal of Public Health*, 38(4), 337–343.
- GBE. (2012). Entbindungen in Krankenhäusern. Gliederungsmerkmale: Jahre, Region, Art der Entbindung. Retrieved October 24, 2012, from www.gbe-bund.de

- Gielen, A. C., Faden, R. R., O'Campo, P., Brown, C. H., & Paige, D. M. (1991). Maternal Employment During the Early Postpartum Period: Effects on Initiation and Continuation of Breast-feeding. *Pediatrics*, *87*(3), 298–305.
- Grijbovski, A. M., Yngve, A., Olov Bygren, L., & Sjöström, M. (2005). Socio-demographic determinants of initiation and duration of breastfeeding in northwest Russia. *Acta Pædiatrica*, *94*(5), 588–594.
- Guendelman, S., Kosa, J. L., Pearl, M., Graham, S., Goodman, J., & Kharrazi, M. (2009). Juggling Work and Breastfeeding: Effects of Maternity Leave and Occupational Characteristics. *Pediatrics*, *123*(1), E38–E46.
- Hajian-Tilaki, K. O. (2005). Factors associated with the pattern of breastfeeding in the north of Iran. *Annals of Human Biology*, *32*(6), 702–713.
- Heck, K. E., Braveman, P., Cubbin, C., Chávez, G. F., & Kiely, J. L. (2006). Socioeconomic Status and Breastfeeding Initiation Among California Mothers. *Public Health Reports*, *121*(1), 51–59.
- Huang, R., & Yang, M. (2014). Paid Maternity Leave and Breastfeeding Practice Before and After California's Implementation of the Nation's First Paid Family Leave Program. *Economics & Human Biology*. doi:10.1016/j.ehb.2013.12.009
- Hyde, M. J., Mostyn, A., Modi, N., & Kemp, P. R. (2012). The health implications of birth by Caesarean section. *Biological Reviews*, *87*(1), 229–243.
- Kersting, M., & Dulon, M. (2002). Fakten zum Stillen in Deutschland. *Monatsschrift Kinderheilkunde*, *150*(10), 1196–1201.
- Kimbro, R. (2006). On-the-Job Moms: Work and Breastfeeding Initiation and Duration for a Sample of Low-Income Women. *Maternal and Child Health Journal*, *10*(1), 19–26.
- Kluge, J., & Schmitz, S. (2014). Social Norms and Mothers' Labor Market Attachment: The Medium-Run Effects of Parental Benefits. IZA Discussion Paper No. 8115. Retrieved May 21, 2014, from <http://ftp.iza.org/dp8115.pdf>
- Kluge, J., & Tamm, M. (2013). Parental leave regulations, mothers' labor force attachment and fathers' childcare involvement: evidence from a natural experiment. *Journal of Population Economics*, *26*(3), 983–1005.
- Kobayashi, M., & Usui, E. (2014). Breastfeeding practices and parental employment in Japan. *Review of Economics of the Household*. doi:10.1007/s11150-014-9246-9
- Kohlhuber, M., Rebhan, B., Schwegler, U., Koletzko, B., & Fromme, H. (2008). Breastfeeding rates and duration in Germany: a Bavarian cohort study. *British Journal of Nutrition*, *99*(05), 1127–1132.
- Koletzko, B., Bauer, C.-P., Brönstrup, A., Cremer, M., Flothkötter, M., Hellmers, C., Weissenborn, A. (2013). Säuglingsernährung und Ernährung der stillenden Mutter. *Monatsschrift Kinderheilkunde*, *161*, 237–246.
- Kottwitz, A., Spiess, K. C., & Wagner, G. G. (2011). Die Geburt im Kontext der Zeit kurz davor und danach -- Eine repräsentative empirische Beschreibung der Situation in Deutschland auf der Basis des Sozio-oekonomischen Panels (SOEP). In P.-I. Villa, S. Moebius, & B. Thiessen (Eds.), *Soziologie der Geburt: Diskurse, Praktiken und Perspektiven* (pp. 129–154). Campus Verlag.

- Kurini, N., Shiono, P. H., Ezrine, S. F., & Rhoads, G. G. (1989). Does maternal employment affect breast-feeding? *American Journal of Public Health, 79*(9), 1247–1250.
- Lalive, R., & Zweimüller, J. (2009). How Does Parental Leave Affect Fertility and Return to Work? Evidence from Two Natural Experiments. *The Quarterly Journal of Economics, 124*(3), 1363–1402.
- Lange, C., Schenk, L., & Bergmann, R. (2007). Verbreitung, Dauer und zeitlicher Trend des Stillens in Deutschland. *Bundesgesundheitsblatt - Gesundheitsforschung - Gesundheitsschutz, 50*(5-6), 624–633.
- Lindberg, L. D. (1996). Women's Decisions about Breastfeeding and Maternal Employment. *Journal of Marriage and Family, 58*(1), 239–251.
- Liu, Q., & Skans Oskar, N. (2010). The Duration of Paid Parental Leave and Children's Scholastic Performance. *The B.E. Journal of Economic Analysis & Policy, 10*(1), 1–35.
- McCrary, C., & Layte, R. (2012). Breastfeeding and risk of overweight and obesity at nine-years of age. *Social Science & Medicine, 75*(2), 323–330.
- McLafferty, S. L. (2003). GIS and health care. *Annual Review of Public Health, 24*(1), 25–42.
- Noble, S., & The Alspac Study Team. (2001). Maternal employment and the initiation of breastfeeding. *Acta Paediatrica, 90*(4), 423–428.
- OECD. (2014). OECD Family database. LMF1.2 Maternal employment. Retrieved April 14, 2014, from http://www.oecd.org/els/family/LMF1_2_Maternal_Employment_July2013.xls
- Ogbuanu, C., Glover, S., Probst, J., Liu, J. H., & Hussey, J. (2011). The Effect of Maternity Leave Length and Time of Return to Work on Breastfeeding. *Pediatrics, 127*(6), E1414–E1427.
- Ondrich, J., Spiess, C. K., Yang, Q., & Wagner, G. (2003). The Liberalization of Maternity Leave Policy and the Return to Work after Childbirth in Germany. *Review of Economics of the Household, 1*(1-2), 77–110.
- Pfau-Effinger, B., & Smidt, M. (2011). Differences in women's employment patterns and family policies: eastern and western Germany. *Community, Work & Family, 14*(2), 217–232.
- Prior, E., Santhakumaran, S., Gale, C., Philipps, L. H., Modi, N., & Hyde, M. J. (2012). Breastfeeding after cesarean delivery: a systematic review and meta-analysis of world literature. *The American Journal of Clinical Nutrition, 95*(5), 1113–1135.
- Puhani, P. A. (2012). The treatment effect, the cross difference, and the interaction term in nonlinear “difference-in-differences” models. *Economics Letters, 115*(1), 85–87.
- Rasmussen, A. W. (2010). Increasing the length of parents' birth-related leave: The effect on children's long-term educational outcomes. *Labour Economics, 17*(1), 91–100.
- Roe, B., Whittington, L. A., Fein, S. B., & Teisl, M. F. (1999). Is there competition between breast-feeding and maternal employment? *Demography, 36*(2), 157–171.
- Rogers, W. H. (1993). Regression standard errors in clustered samples. *Stata Technical Bulletin (Reprinted in Stata Technical Bulletin Reprints, Vol. 3, 88-94), 13*, 19–23.

- Rubin, D. (2013). Stillen in Deutschland. *Ernährung im Fokus*, 2013(7-8), 200–205.
- Ruhm, C. J. (2000). Parental leave and child health. *Journal of Health Economics*, 19(6), 931–960.
- Schönberg, U., & Ludsteck, J. (2007). *Maternity Leave Legislation, Female Labor Supply, and the Family Wage Gap*. Institute for the Study of Labor (IZA). Retrieved January 20, 2014, from <http://ideas.repec.org/p/iza/izadps/dp2699.html>
- Smith, J., & Ellwood, M. (2011). Feeding Patterns and Emotional Care in Breastfed Infants. *Social Indicators Research*, 101(2), 227–231.
- Spiess, C. K. (2011). Ever-Increasing Opportunities for Child-Related Research with the German Socio-Economic Panel (SOEP) Study. *LIFE Research School Newsletter. Max Planck Institute for Human Development*, 5(1), 2–5.
- Spiess, C. K., & Wrohlich, K. (2008). The Parental Leave Benefit Reform in Germany: Costs and Labour Market Outcomes of Moving towards the Nordic Model. *Population Research and Policy Review*, 27(5), 575–591.
- Statistisches Bundesamt. (2013a). *Regionaldatenbank*. Wiesbaden. Retrieved October 15, 2013, from <http://www.regionalstatistik.de/>
- Statistisches Bundesamt. (2013b). *Statistik der Kinder- und Jugendhilfe Teil III. Kinder in Tageseinrichtungen nach Ländern, Altersgruppen und Besuchsquoten am 1.3.2013*. Wiesbaden.
- Tanaka, S. (2005). Parental leave and child health across OECD countries. *The Economic Journal*, 115(501), F7–F28.
- Thyrian, J. R., Fendrich, K., Lange, A., Haas, J.-P., Zygmunt, M., & Hoffmann, W. (2010). Changing maternity leave policy: Short-term effects on fertility rates and demographic variables in Germany. *Social Science & Medicine*, 71(4), 672–676.
- Visness, C. M., & Kennedy, K. I. (1997). Maternal employment and breast-feeding: findings from the 1988 National Maternal and Infant Health Survey. *American Journal of Public Health*, 87(6), 945–950.
- Wagner, G. G., Frick, J. R., & Schupp, J. (2007). The German Socio-Economic Panel Study (SOEP) – Scope, Evolution and Enhancements. *Schmollers Jahrbuch – Zeitschrift für Wirtschafts- und Sozialwissenschaften*, 127(1), 139–169.
- Waldfoegel, J., Han, W.-J., & Brooks-Gunn, J. (2002). The Effects of Early Maternal Employment on Child Cognitive Development. *Demography*, 39(2), 369–392.
- World Health Organization, & UNICEF. (2003). *Global strategy for infant and young child feeding*. Geneva: World Health Organization. Retrieved January 15, 2014, from www.who.int/nutrition/topics/global_strategy/en/index.html
- World Health Organization, & UNICEF. (2009). *Baby-friendly hospital initiative: revised, updated and expanded for integrated care. Section 1, Background and implementation*. Retrieved January 20, 2014, from http://www.who.int/nutrition/publications/infantfeeding/bfhi_trainingcourse_s1/en/index.html

- Wrohlich, K., Berger, E. M., Geyer, J., Haan, P., Sengül, D., Spiess, C. K., & Thiemann, A. (2012a). *Elterngeld Monitor: Endbericht; Forschungsprojekt im Auftrag des Bundesministeriums für Familie, Senioren, Frauen und Jugend*. Berlin: DIW Berlin. Retrieved January 14, 2014, from http://nbn-resolving.de/urn:nbn:de:0084-diwkompakt_2012-0611
- Wrohlich, K., Berger, E. M., Geyer, J., Haan, P., Sengül, D., Spiess, C. K., & Thiemann, A. (2012b). *Studie: Elterngeld-Monitor. Kurzfassung*. Berlin: Bundesministerium für Familie, Senioren, Frauen und Jugend. Retrieved January 14, 2014, from <http://www.bmfsfj.de/RedaktionBMFSFJ/Broschuerenstelle/Pdf-Anlagen/Elterngeld-Monitor-Studie-Kurzfassung,property=pdf,bereich=bmfsfj,sprache=de,rwb=true.pdf>

Appendix

Table A1: Predicted Probabilities of DiD estimates on breastfeeding initiation and duration; Sensitivity analyses

	Breastfeeding at birth		Breastfeeding at four months		Breastfeeding at six months	
Model 1: East German mother, mother's age at birth of child: 25, first child						
Before#Control	0.931***	(21.00)	0.527***	(4.97)	0.397***	(4.10)
Before#Treatment	0.956***	(34.81)	0.536***	(5.64)	0.413***	(4.74)
After#Control	0.918***	(23.80)	0.503***	(6.52)	0.408***	(5.50)
After#Treatment	0.953***	(41.06)	0.667***	(10.44)	0.535***	(7.93)
Control: Diff. After - Before	-0.013	(-0.39)	-0.024	(-0.29)	0.011	(0.14)
Treatment: Diff. After - Before	-0.003	(-0.23)	0.132*	(2.43)	0.121*	(2.55)
DiD	0.009	(0.30)	0.156*	(1.99)	0.111	(1.45)
Model 2: West German mother, mother's age at birth of child: 30, first child						
Before#Control	0.866***	(22.26)	0.643***	(11.78)	0.572***	(10.25)
Before#Treatment	0.912***	(53.79)	0.651***	(21.73)	0.588***	(19.10)
After#Control	0.845***	(13.15)	0.620***	(8.53)	0.584***	(8.06)
After#Treatment	0.905***	(28.58)	0.767***	(19.82)	0.701***	(16.70)
Control: Diff. After - Before	-0.022	(-0.36)	-0.023	(-0.29)	0.011	(0.14)
Treat: Diff. After - Before	-0.006	(-0.22)	0.115**	(2.74)	0.113*	(2.57)
DiD	0.015	(0.28)	0.138+	(1.85)	0.102	(1.33)
Model 3: West German mother, mother's age at birth of child: 25, first child						
Before#Control	0.875***	(24.41)	0.616***	(11.25)	0.550***	(9.89)
Before#Treatment	0.918***	(50.55)	0.624***	(17.68)	0.566***	(15.74)
After#Control	0.854***	(14.17)	0.593***	(7.92)	0.562***	(7.66)
After#Treatment	0.912***	(30.23)	0.744***	(17.25)	0.682***	(14.79)
Control: Diff. After - Before	-0.021	(-0.36)	-0.023	(-0.29)	0.011	(0.14)
Treatment: Diff. After - Before	-0.006	(-0.22)	0.120**	(2.72)	0.115*	(2.56)
DiD	0.015	(0.28)	0.143+	(1.87)	0.104	(1.34)
Model 4: East German mother, mother's age at birth of child: 30, not the first child						
Before#Control	0.901***	(15.67)	0.548***	(5.42)	0.397***	(4.25)
Before#Treatment	0.936***	(24.80)	0.557***	(6.10)	0.412***	(4.90)
After#Control	0.884***	(19.26)	0.524***	(7.31)	0.408***	(5.97)
After#Treatment	0.932***	(30.03)	0.686***	(11.83)	0.534***	(8.58)
Control: Diff. After - Before	-0.017	(-0.39)	-0.024	(-0.29)	0.011	(0.14)
Treatment: Diff. After - Before	-0.005	(-0.23)	0.129*	(2.39)	0.121*	(2.56)
DiD	0.012	(0.30)	0.153*	(1.97)	0.111	(1.45)
N	978		978		978	

Table A1: continued

	Breastfeeding at birth		Breastfeeding at four months		Breastfeeding at six months	
Model 5: East-German mother, mother's age at birth of child: 25, not the first child						
Before#Control	0.908***	(16.45)	0.519***	(5.10)	0.376***	(4.06)
Before#Treatment	0.941***	(25.48)	0.528***	(5.58)	0.391***	(4.55)
After#Control	0.891***	(20.01)	0.495***	(6.73)	0.386***	(5.61)
After#Treatment	0.936***	(30.70)	0.660***	(10.39)	0.512***	(7.64)
Control: Diff. After - Before	-0.016	(-0.39)	-0.024	(-0.29)	0.011	(0.14)
Treatment: Diff. After - Before	-0.004	(-0.23)	0.132*	(2.44)	0.121**	(2.59)
DiD	0.012	(0.30)	0.156*	(1.99)	0.110	(1.46)
Model 6: West German mother, mother's age at birth of child: 30, not the first child						
Before#Control	0.828***	(19.98)	0.636***	(12.35)	0.550***	(10.08)
Before#Treatment	0.884***	(36.41)	0.644***	(18.35)	0.566***	(15.37)
After#Control	0.802***	(11.61)	0.613***	(8.43)	0.561***	(7.87)
After#Treatment	0.876***	(22.48)	0.761***	(18.38)	0.681***	(14.93)
Control: Diff. After - Before	-0.026	(-0.36)	-0.023	(-0.29)	0.011	(0.14)
Treatment: Diff. After - Before	-0.008	(-0.22)	0.117**	(2.72)	0.116*	(2.55)
DiD	0.018	(0.28)	0.139+	(1.84)	0.104	(1.34)
Model 7 West-German mother, mother's age at birth of child: 25, not the first child						
Before#Control	0.838***	(19.96)	0.609***	(10.84)	0.527***	(8.98)
Before#Treatment	0.891***	(31.12)	0.617***	(13.47)	0.543***	(11.53)
After#Control	0.813***	(11.98)	0.585***	(7.49)	0.539***	(7.14)
After#Treatment	0.883***	(22.20)	0.738***	(14.90)	0.661***	(12.28)
Control: Diff. After - Before	-0.025	(-0.36)	-0.023	(-0.29)	0.011	(0.14)
Treatment: Diff. After - Before	-0.007	(-0.22)	0.121**	(2.70)	0.118*	(2.54)
DiD	0.017	(0.28)	0.145+	(1.86)	0.106	(1.36)
N	978		978		978	

t statistics in parentheses; + p<0.10, * p<0.05, ** p<0.01, *** p<0.001

Note: Predicted probabilities base on a logistic regression model by holding covariates fixed at following values: All models are calculated for mothers with childbirth at term who were in good physical health during the first three months after birth.

Source: SOEP waves 2002-2012 (SOEP 2013, doi:10.5684/soep.v29), own calculations