

The Impact of Educational Fields on Fertility in Western Germany*

By Anja Oppermann**

Abstract

Research on the impact of educational attainment on fertility behavior has been expanded by a new dimension – the field of education. This paper analyses how the educational field influences the transition to parenthood of women and men in Western Germany. The results show that educational fields matter for the transition to parenthood only for women. For men, the results do not show a significant impact of educational fields on the transition rates to parenthood. However, they point at the importance of the educational level for the probability of men to become fathers.

JEL Classifications: J12, J13, J16, I24

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; Liefbroer/Corijn, 1999). Most studies focus on the level of education. But a new approach distinguishes between an individual's educational level and their educational field (e.g., Begall/Mills, 2012; Hoem et al., 2006a; Lappegard/Ronsen, 2005; Martín-García/Baizán, 2006; Van Bavel, 2010). Generally speaking, the idea is that people educated in the same field have a lot in common that is important for fertility behavior. The field of education not only determines many opportunities in the labor market, but also indicates personality traits, preferences and socialization. This paper contributes to the research by taking the field of education into ac-

* A previous version including more detailed information especially on the theoretical background, data, and data management is available (SOEPpapers 496).

** The author is very grateful for comments from Johannes Huinink and the participants of the 8th Young Scholar SOEP-Symposium, the participants of the 10th SOEP User Conference as well as an anonymous reviewer. A special thanks goes to Henning Lohmann and Peter Krause for their expertise and support in allowing access to the SOEP data on the field of education.

count when examining the transition to parenthood. Germany is a low-fertility country with one of the highest rates of childlessness worldwide (Dorbritz, 2008) and yet it has so far escaped scholarly attention using this analytical framework¹. 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?

2. Previous Findings

All studies examining the relationship between educational field and fertility find differences in individuals' fertility behavior that are independent of their educational level (e.g., Hoem et al., 2006a; Rønsen/Skrede, 2010). Hoem et al. (2006a) find that in Sweden, the field of education is a better indicator of women's fertility behavior than educational level. Different educational levels do not create large differences in fertility behavior between women in Norway, but the differences between educational fields are large and persistent (Rønsen/Skrede, 2010). Most studies find especially high fertility among women educated in teaching or health care (Bagavos, 2010; Begall/Mills, 2012; Hoem et al., 2006a; Lappegard/Rønsen, 2005; Neyer/Hoem, 2008; Tesching, 2012). In an analysis across twenty-one European countries, Van Bavel (2010) shows that the share of women, family-attitudes, starting wage, and steepness of earning profile within a field influence timing of fertility.

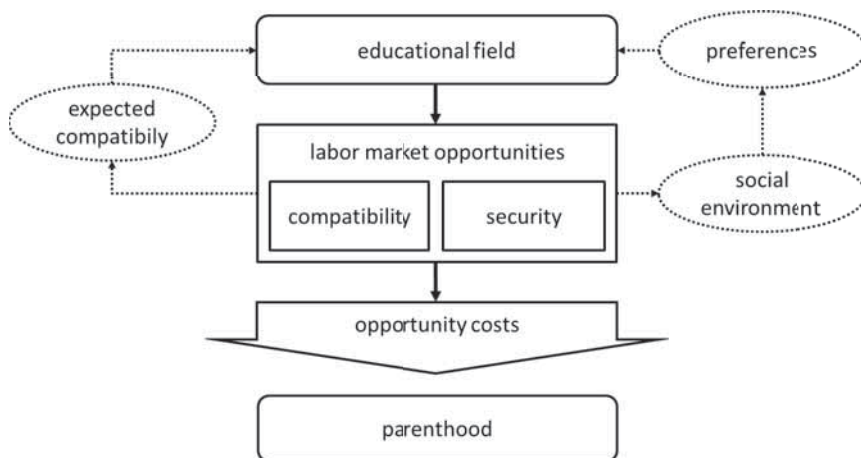
3. Theoretical Background and Hypotheses

The explicit and implicit ideas and assumptions in the literature are arranged in a theoretical model that provides the basis for examining the research question of this paper.

There are three possible effects of education on fertility, as identified by theory (Becker, 1991) and supported by empirical studies (Blossfeld/Huinink, 1991; Brüderl/Klein, 1993; Klein, 2003; Kravdal/Rindfuss, 2008; Lappegard/Rønsen, 2005; Liefbroer/Corijn, 1999; Martín-García/Baizán, 2006): the institutional effect (the postponement of the first birth until after graduation), a positive income effect, and a negative opportunity cost effect. Opportunity costs derive from labor market potential. They are constituted by income potential, job security, and the compatibility of parenthood and employment. A tight

¹ Maul (2012) examines the relationship between actual occupation and family formation. The study finds that occupation is of importance for men but not for women, with the chances for welfare ("*Wohlfahrtsmöglichkeiten*") being the most important distinctive characteristic.

bond between educational attainment and labor market potential is assumed. The level of education influences the level of employment and therefore labor market and income opportunities. The field of education determines in many cases the possible fields of employment and therefore impacts upon labor market and income opportunities as well. In addition, the field of employment is crucial for compatibility and job security². The selection of a field of education is an expression of preferences regarding future lifestyle, such as the content of work and childbearing. Therefore, field of education and fertility might depend on one underlying pattern of preferences or personality trait. The selection of a field of education might be an expression of anticipated working conditions and/or aspects of the compatibility of occupation with parenthood. Following this argument, educational fields not only influence opportunity costs, but it is also the case that anticipated opportunity costs already determine the choice of educational field. The selection of an educational field has an impact on the social environment during education and adult life (and the anticipation of the latter) which impact upon and shape a person's preferences (Hoem et al., 2006a; Martín-García and Baizán, 2006; VanBavel, 2010). The connection between education and fertility therefore is assumed to be constitutive of “dynamically interactive processes that mutually determine each other” (Hoem et al., 2006b: 382).



Source: own representation

Figure 1: Theoretical Model of the Relationship between Educational Field and Parenthood

² Compatibility and job security of course only matter for people who want to combine parenthood and employment.

Based on this theoretical basis I expect to find that:

- (1) the field of education matters for the transition to parenthood;
- (2) high compatibility of parenthood and employment in a field, indicated by a high share of women, increases the probability of having a child for both women and men;
- (3) job security leads to less childlessness. Job security is indicated by the probability of a field to lead to public sector employment;
- (4) low compatibility, indicated by a low share of part-time employment, reduces the probability of having a child only for women, not for men.

4. Data and Method

The data for the analysis come from the German Socio Economic Panel (SOEP, 1984–2010) (Wagner et al., 2007). The data were partly extracted using the Add-On package PanelWhiz for Stata®³.

Educational Fields

To measure the educational field, variously coded information on fields of vocational and university degrees were re-classified using the Klassifikation der Berufe 2010 (KldB2010). The KldB2010 groups jobs according to their content; this classification therefore represents what is understood by “field of education” in this paper⁴.

Several field characteristics are assumed to be of importance for the connection between educational fields and fertility. For each educational field in every year of the SOEP, the share of women, the share of public sector employment and the share of part-time employment were calculated⁵. The

³ 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.

⁴ The KldB2010 is ordered hierarchically with different levels of abstraction (Bundesagentur für Arbeit (BA), 2011a, 2011b). Ten main fields at the top (one-digit level) and 1,286 job classes at the bottom (five digits). Here, the two-digit level is used that contains thirty-seven categories. One distinction: 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.

⁵ A minimum of ten observations per year and field are the prerequisite for calculation of a characteristic-value in this field/year. The data were weighted with the cross-sectional weight provided by the SOEP.

means of these characteristics are used to group the fields by their stand-out characteristic. Fields that have outstanding values on more than one characteristic are assigned according to the characteristic that differs most from the mean.

Table 1

**The Assignment of Educational Fields to Six 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"> ● non-medical health care, hygiene, wellness, medical technology ● textile and leather ● medical health care
male-dominated fields share of women $\leq 40\%$ (70/782)	<ul style="list-style-type: none"> ● construction above and below ground ● building maintenance ● interior fitting ● metal production and processing ● plastic production, woodworking ● primary production, glass and ceramic ● geology, geography, environment protection ● architecture and construction planning ● computer science, information and communication technology
public-sector fields public sector employment $\geq 40\%$ (467/200)	<ul style="list-style-type: none"> ● protection, security, observation ● pedagogy and child care, social and home economics, theology ● teaching and training ● performing and entertainment ● law and administration
private-sector fields public sector employment $\leq 15\%$ (558/383)	<ul style="list-style-type: none"> ● paper and printing ● product design, arts and crafts ● sales ● purchase, distribution, and trade ● advertising, marketing, media ● tourism, hotel and restaurant ● food production and processing ● technical research, development and construction
job-only fields part-time employment $\leq 15\%$ (690/1,274)	<ul style="list-style-type: none"> ● mathematics, biology, chemistry, physics ● transport and logistics (without driving) ● language, literature, humanities, social sciences ● company management and organization ● financial service, accountancy and tax advice ● agriculture, forestry ● economics ● machine and automotive engineering ● mechatronics, energy, electronics ● transport and vehicle driving
non-distinctive attributes fields (28/31)	<ul style="list-style-type: none"> ● cleaning ● gardening and floristry

Source: SOEP 1984–2010, own calculations.

Event History Models

To test the hypotheses, a subsample of the SOEP waves from 1984 to 2010 was constructed using data from annual individual questionnaires as well as biography questionnaires (since 2001). The subsample was restricted to respondents who have completed vocational or university education in a known field and did not have a child before graduation. A time discrete logistic regression model is applied (Yamaguchi, 1991). Individuals leave the sample after becoming parents, females leave at age forty-five, and males at sixty or when they are no longer observed by the SOEP. These observations are right censored.⁶

The dependent variable is the transition to parenthood. The female sample contains 2,381 persons, 18,897 person-years, and 1,103 events (i.e., birth of a first child); the male sample contains 2,766 persons, 24,579 person-years, and 995 events. The years since graduation are used as the time axis⁷. The models also contain a variable with the logarithm of the number of years since graduation, to model an increased probability of childbirth in the first years after graduation. The models control for respondents' age at the time of graduation, marital status, level of general education, vocational education vs. university degree, episodes of further educational enrollment, and migration background. The models include people who lived in Western Germany at the time of graduation and control for possible movement to Eastern Germany. The models are unweighted; therefore samples of the SOEP that are not random are excluded, namely samples G and I. The models control for the sample a respondent belongs to as well as the birth cohort.

Analysis

Two strategies were applied to test for a general 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 significantly improves due to the addition of dummy variables for educational field (33 for women and 35 for men⁸). A Wald-test and a likelihood-ratio test are applied. Both tests show significant improvement for the models of women (5% level), but not for men. The second strategy is a multi-level approach using the educational fields as level-two-units, modeling individuals nested in fields (Hox, 2010). The results confirm the previous findings, showing a small but significant (0.1% level) variance in the transition rates for women but not men.

⁶ The oldest respondents in the sample were born in 1950 and the youngest in 1989.

⁷ Using the years since graduation as the time axis already controls for a part of the effect the level of education has on the timing of first birth (institutional effect).

⁸ For these models, fields with fewer than five persons per field were excluded.

To examine the impact of the grouped educational fields, two models were calculated for women and men separately. The first only contains all other variables that might impact the transition to parenthood, and the second adds the six groups of educational fields. For women, a likelihood-ratio test shows a significant improvement of the models (0.1 % level)⁹.

Table 2

The Association between Educational Fields and the Transition to Parenthood for Western German Women (discrete time logit model, average marginal effects)

	(1) transition to first birth	(2)
years since graduation	-0.00475*** (-7.23)	-0.00464*** (-7.08)
ln years since graduation	0.0185*** (6.80)	0.0183*** (6.78)
age at graduation	-0.00119+ (-1.90)	-0.0011+ (-1.80)
married	0.175*** (26.17)	0.175*** (26.19)
Abitur	-0.0105* (-2.30)	-0.0088+ (-1.88)
university degree	0.00145 (0.25)	0.00356 (0.58)
female-dominated fields		Ref.
male-dominated fields		0.0001 (-0.01)
public-sector fields		-0.0124** (-2.72)
private-sector fields		-0.0014 (-0.31)
job-only fields		-0.014*** (-3.40)
non-distinctive fields		-0.0353*** (-4.63)

⁹ The group “non-distinctive fields” is rather small; the coefficients of the other groups do not change direction or significance if the model is calculated without this group. The model also still improves significantly (1 % level).

Table 2 (continued)

	(1) transition to first birth	(2)
<i>N</i> (person years)	18,897	18,897
<i>N</i> (persons)	2,381	2,381
<i>N</i> (events)	1,103	1,103
pseudo R^2	0.196	0.199
chi ²	1,649.4	1,674.3

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.

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

The order of the transition rates is only partly in line with the expectations. Even though the transition rates of women educated in female-dominated fields are high, the transition rates of women educated in male-dominated or private-sector fields do not significantly differ from them. Contrary to expectation, women educated in public-sector fields have significantly lower transition rates than women educated in female-dominated fields. On average, the difference between them is 1.24%¹⁰. Low transition rates are observed among women educated in job-only fields which is in line with expectation. On average, their transition rate is 1.4% lower than for women educated in a female-dominated field.

Adding the educational fields to a model does not improve its explanatory power for men. In contrast with the findings for women, men holding a university degree have a higher probability of becoming a father than men with a vocational education, everything else being equal. This finding indicates that for men a positive income effect of the level of education can be observed.

Summarizing the findings with regard to the hypotheses, it can be stated that the educational field does matter for the transition to parenthood for Western German women, but does not for men. For women, two out of three hypotheses on how the field of education influences fertility are confirmed: High compatibility in a field, indicated by a high share of women, positively impacts on the transition to parenthood; women educated in fields with low compatibility, indicated by a low share of part-time employment (job-only), have lower transition rates than women educated in female-dominated fields. An assumed high job security in fields with a high share of public sector employment did not impact positively on women's transition rates to parenthood.

¹⁰ To display the results of the event history analysis, average marginal effects (AME) were calculated using the STATA-ado `margeff` (Bartus, 2005; see also Mood, 2010).

5. Discussion

The starting point for the present analysis was the question of how educational fields influence the transition to parenthood in Western Germany. The results show different patterns for women and men. For women, the educational field matters for the probability of becoming a mother¹¹. This finding is robust across different methods for analysing the impact of educational field on transition rates.

The finding of high transition rates among women educated in female-dominated fields is in line with the hypotheses as well as previous findings (Hoem et al., 2006a; Rønsen/Skrede, 2010; Van Bavel, 2010). The high transition rates of women educated in male-dominated fields are a little surprising, but this was already found in Sweden (Hoem et al., 2006a). One possibility is that these women have opted for a traditional division of labor and became housewives, so compatibility does not matter anymore¹². The finding of low transition rates of women educated in public-sector fields was unexpected. Unexpected not only because of higher workplace security but especially because women educated in teaching or pedagogy belong to this group. In studies of other countries, women educated in these fields have high transition rates (Begall/Mills, 2012; Hoem et al., 2006a; Rønsen/Skrede, 2010). A possible explanation could be that for Germany job security is not defined by public or private sector employment but rather by differences between marginal employment (*geringfügige Beschäftigung*), employment subject to social security (*sozialversicherungspflichtige Beschäftigung*) or – especially – civil servant status (*Beamtenstatus*).

The overall finding of this paper is that educational field matters for women's transition to parenthood, but not for men's. Revisiting the theoretical model, the question arises whether the model only applies to women. It might be, that opportunity costs influenced by the field of education matter for women's fertility behavior, but not for men's. The results also highlight that findings from one country cannot easily be transferred to another country.

¹¹ This result seems to point in the opposite direction than Maul (2012). Maul's clustering of occupations does not fully exclude effects of the level of education (e.g., nearly all academic professions are grouped in one cluster), therefore the results can hardly be compared or interpreted as conflicting.

¹² The current employment status cannot be controlled for with the data used for this analysis because parts of the data were collected retrospectively and provide information only on a yearly basis.

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. doi:10.1553/populationyearbook2010s51.
- Bartus, T.* (2005): Estimation of marginal effects using `margeff`, *The Stata Journal* 5(3), 309–329.
- Becker, G. S.* (1991): *A treatise on the family*, Cambridge.
- Begall, K./Mills, M. C.* (2012): The Influence of Educational Field, Occupation, and Occupational Sex Segregation on Fertility in the Netherlands, *European Sociological Review*. doi:10.1093/esr/jcs051.
- 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.
- Brewster, K. L./Rindfuss, R. R.* (2000): Fertility and women's employment in industrialized nations, *Annual Review of Sociology* 26, 271–296. doi:10.1146/annurev.soc.26.1.271.
- 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*, 194–215, Berlin.
- 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/Dokumentationen/Generische-Publikationen/KldB2010-Printversion-Band1.pdf>.
- Bundesagentur für Arbeit (BA)* (2011b): *Klassifikation der Berufe 2010 – Band 2: Definitorischer und beschreibender Teil*. Retrieved June 3, 2012, from <http://statistik.arbeitsagentur.de/Navigation/Statistik/Grundlagen/Klassifikation-der-Berufe/KldB2010/Dokumentationen-Nav.html>.
- Dorbritz, J.* (2008): Germany: Family diversity with low actual and desired fertility. *Demographic Research* 19, 557–597.
- Haisken-DeNew, J. 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/>.
- 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.
- Klein, T. (2003): Die Geburt von Kindern in paarbezogener Perspektive, *Zeitschrift für Soziologie* 32(6), 506–527.
- Kravdal, O./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.
- Lappegard, 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. doi:10.1007/s10680-004-6756-9.
- 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 Demographie* 15(1), 45–75. doi:10.1023/A:1006137104191.
- 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.
- 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. doi:10.1093/esr/jcp006.
- 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.
- 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.
- Tesching, K. (2012): Education and fertility: dynamic interrelations between women's educational level, educational field and fertility in Sweden, Stockholm. Retrieved from <http://urn.kb.se/resolve?urn=urn:nbn:se:su:diva-63761>.
- 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 – Zeitschrift für Wirtschafts- und Sozialwissenschaften* 127(1), 139–169.
- Yamaguchi, K. (1991): *Event History Analysis*, London, New Delhi.