

# DO MORE EDUCATED INDIVIDUALS PREFER SMALLER FAMILIES?\*

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## Abstract

*This study analyzes the relationship between individuals' educational attainment and desired family size. We present estimates based on large individual-level data-sets from West Germany in 1988 and 1994/95 and from the EU 15 countries in 2001. Consistent with patterns of greater polarization of realized fertility among the more-educated, we find that the distribution of desired family size is more dispersed among more educated West Germans. However, evidence from bivariate and multivariate analysis rejects the idea that more educated individuals want to have smaller families on average. We find that individuals with upper secondary or tertiary education are more likely to prefer three or more children over two than individuals with average educational attainment. The relationship is robust even after accounting for differences in individuals' benefits and costs of children as well as tangible and social resources. Replication in a sample of women from the EU 15, using a measure of personal ideal family size, indicates that this relationship holds more broadly in Western Europe.*

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Measures of completed cohort fertility indicate that the average number of children per woman has fallen below replacement level in most developed societies (e.g., Frejka and Calot 2001). Consistent with the fall in actual fertility, average desired family size has also declined (Lutz 1996, Bongaarts 2001) and recent evidence on the personal ideal number of children suggests that desired fertility may now be below replacement level in the German-speaking parts of Europe (Goldstein et al. 2003). One development that has received particular attention among population researchers trying to explain the decline in fertility is the rise in educational attainment.

While a negative association between women's educational attainment, in particular post-secondary schooling, and *average* completed fertility has been documented in a number of Western European countries (Björklund 2006 for Sweden, Norway, West Germany, Belgium and France), the role of educational attainment in childbearing likely is much more complex. Various findings (Kravdal 1992, 2001, Huinink 1989, 1995, 2001, and Kreyenfeld 2002, Hoem 1996, Hoem et al. 2001) indicate that well-educated women who start a family typically realize the same number of children or even larger families compared to women of average educational attainment.

If education is a force behind the observed decline in desired and actual fertility, for example because it increases the (opportunity) costs of having children (Becker 1960, Becker and Lewis 1973, Willis 1973) or reduces how much individuals value a larger family in their quest for personal fulfillment (van de Kaa 1987, 2001, Lesthaeghe and Surkyn 1988), then we would expect the better-educated to lead the trend towards smaller families. On the other hand, there are reasons to suspect that education increases the number of children a person wants, as a larger family may be more affordable and manageable to individuals with high educational attainment since they are more able to provide material resources, may be more efficient in producing positive child outcomes, and more likely to have a partner with the same qualities. In that case, education may increase wanted family size.

Despite the fact that education is seen as a key factor in demographic processes and in childbearing in particular (e.g., Rindfuss et al. 1996), its role in the formation of fertility desires (wanted or desired family size) has received little systematic attention. Using data from large individual-level surveys from West Germany in 1988 and 1994/95 and the EU 15 nations in 2001, we investigate the relationship

between educational attainment and fertility preferences, in particular whether the more educated prefer to have fewer children. We provide bivariate evidence and discuss estimates from Multinomial Logit Models that explore the robustness of the correlation between education and desired family size to controls for individuals' benefits and costs of children as well as personal tangible and social resources.

## **BACKGROUND**

Fertility research conceptualizes childbearing as the outcome of a decision-process that involves (1) biology (age and fecundity), (2) control over contraception (availability, knowledge, cost, social factors), (3) chance (fertility as unintended outcome of sexual activity; contraception and abortion have reduced the number of chance births), and (4) a person's desire or preference for children (e.g., Friedman et al. 1994, Rindfuss et al. 1988, p.17). This suggests that fertility desires are associated with individuals' actual childbearing behavior,<sup>1</sup> especially in developed countries where there is less concern over lack of control over conception.<sup>2</sup>

How many children a person wants (desires) will depend on his or her ranking of the different family sizes and the (expected) resources. Following Bongaarts (1990, p.488), the family size a woman desires or wants is "the number of children a woman would choose to have at the time of the survey, based on her assessment of the costs and benefits of childbearing and with complete control over her fertility," (also Easterlin 1978, McClelland 1983). Children are costly to the parents as a result of developmental needs that put demands on parental time and financial resources (Becker 1960, Becker and Lewis 1973, Willis 1973). On the other hand, children provide pleasures to their parents that may be hard to

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<sup>1</sup>The predictive validity of preference data has been debated controversially for at least four decades (see Blake 1966, 1974, Westoff et al. 1957, Westoff and Ryder 1977, Freedman et al. 1980, Thornton et al. 1984, the collection by Hendershot and Placek 1981 for early critiques based on US data and van Hoorn and Keilman, 1997, Joyce et al. 2002, and Hagewen and Morgan, 2005 for recent surveys of this literature). Measures of individuals' desired fertility tend to have greater predictive validity for subsequent fertility behavior than other individual characteristics (Westoff and Ryder 1977, van Horn and Keilman 1997).

<sup>2</sup>Attained fertility and wanted fertility could diverge if there are significant social influences that are reflected in attained fertility but not in wanted fertility. As discussed in Bongaarts (1990, 2001), actual and wanted fertility can also differ due to biological forces, chance, or competing objectives. Recent evidence from European populations using different measures of wanted or desired fertility shows that achieved family size tends to fall short of the desired one (Noack and Østby 2002, van Peer 2000, Symeonidou 2000, van Horn and Keilman 1997).

substitute (Becker 1960, Becker and Lewis 1973, Willis 1973, Caldwell 1982). For example, parents may value children because of their ability to extend the parents' legacy and to provide stimulation, an element of surprise, an opportunity to teach and exercise control, etc. (e.g., Hoffman and Manis 1979, Schoen et al. 1997, Friedman et al. 1994). Children may also be valued because of their ability to be productive and provide support to the parents, e.g. by transferring resources at old age (e.g., Caldwell 1982) or by extending the parents' social network (e.g., Schoen et al. 1999, Astone et al. 1999, Huinink 1995), potentially offsetting their costs as perceived by the parents.

The information about the costs and benefits associated with different family arrangements and regarding the resources required to realize them used by individuals to form their desired family type may be collected as early as during a person's upbringing (e.g., Duncan et al. 1965), updated by life course events (e.g., Udry 1983), and modified by individual characteristics. Consistent with the idea that family life experiences shape a person's views regarding her own family life, studies have documented effects of parental preferences and behavior on fertility preferences (Huestis and Maxwell 1932, Kantner and Potter 1954, Hendershot 1969, McAllister et al. 1974, Stolzenberg and Waite 1977). Axinn et al. (1994) found that the fertility behavior of an older sibling also affects a person's fertility preference. Udry (1983) considered adjustments to individuals' intended family size by parity and finds evidence in favor of a sequential adjustment of fertility plans over the life course. Many studies since then have documented at least some influence of life course events including spousal preferences (Bumpass and Westoff 1970, Morgan 1985, Thomson et al. 1990, Thomson 1997, Thomson and Hoem 1998, van Peer 2002, Voas 2003) and own childbearing (Bumpass 1967, Miller and Pasta 1995, Heiland et al. 2007).

## **EXISTING EVIDENCE**

Despite the importance of education in research on attained fertility, the relation between education and family size desires has received little attention.<sup>3</sup> However, several studies on fertility preferences

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<sup>3</sup>The literature on fertility preferences is broad and has its longest tradition in the United States where the first data on desired fertility took place in 1936 by the American institute of Public Opinion (see Gallup and Robinson 1938). For

exist that comment on the role of education using a variety of preference instruments. Earlier evidence is primarily based on cross-tabulations and while the education effects reported in some of the more recent studies are obtained from multivariate analysis. We focus on findings from the US and Europe, with emphasis on the evidence from West Germany and Austria.

Hoffman and Manis (1979) find no differences by education in attitudinal data on child benefits from the US. In a sample of high school students from two southern counties in the US, Gustavus and Nam (1970, Table 2, p.47) find that 12th-graders report an average of 3.23 children as personal ideal compared to 2.90 children reported by 6th-graders. Udry (1983) provides some evidence from multivariate models that education ('going back to school') has a positive effect on the intended family size at parity 1 using a sample of white married American women in 1970 (the analysis does not control for household income). Miller (1992, Table 3, p.275) finds a positive effect of education on childbearing desires. More recently, Schoen et al. (1997, Appendix Table) find that college educated white women have a significantly greater intention to have a (another) child at parity 0 and 1 compared to those with a high school degree. However, they find no significant differences by education for men and black women at any parity and for white women at higher parities.

Similarly, the evidence from Europe suggests either no or a positive relationship. Among married women in Austria, Gisser et al. (1985) report desired fertilities of 2.39 and 2.18 among women with basic and intermediate high school degrees, and 2.24 among those with college-prep high school ('Matura') or college degrees. However, controlling for employment, independence from the husband, and urban residence, Gisser et al. (p.77) find a strong positive relationship between education and total desired family size. Using more recent data on women in Austria, Engelhardt (2004) finds a positive but not statistically significant relationship between college preparatory high school degree and total desired fertility. Using Bulgarian and Hungarian data, Philipov et al. (2004) find no effect of educational attainment on the intention of ever having a first child for those without children but a positive effect on ever having a second child for those with one child. Van de Kaa (2001, Table 6) documents a mixed picture among young women in the early 1990s in Canadian data and the European Fertility and surveys of the literature on fertility preferences in developing countries see Bongaarts (1990) and Pritchett (1994).

Family Surveys. Using different instruments, desired fertility among women with higher secondary education (or more) is lower in some regions (Finland, France, Netherlands, and Sweden) and higher or about the same in others (Canada, Spain, Austria) compared to women with only elementary education or less (a comparison to the group with intermediate levels of schooling, 'upper secondary' and 'post-secondary non-tertiary', is not presented).

In what appears to be the first study on family size preferences and desires in West Germany, Freedman et al. (1959) report a mean expected number of children of 2.3 for married adults under age 45 with college preparatory high school degree ('Abitur') compared to 2.0 children for those with only a basic high school degree. Some evidence for a U-shaped relationship is found, as those who only completed elementary school expect to have 2.2 children on average. Average desired fertility ("if financial and other conditions of life were very good") was reported at 2.9 for more educated West Germans compared to 2.7 for others (results by sex were not reported). Jürgens and Pohl (1975, p.46), in a 1969 survey of families in three states (Hamburg, Schleswig-Holstein and Rhineland-Palatinate) find that 55% of women with Abitur want (expect) to have three or more children, compared to 49% women with a basic high school degree (the majority). Based on a sample of 20 to 29 year old West German men and women from the 1988 wave of the DJI Familysurvey, Löhr (1991) presents descriptive evidence of a polarization of total desired fertility by quality of the secondary degree. Among individuals with the more advanced college preparatory high school degree a stronger desire for two or more children as well as for childlessness and the single child family was found, compared to respondents with only a basic high school degree.

## **HYPOTHESES**

While existing bivariate studies typically do not report statistical significance and the multivariate studies differ widely in the inclusion of controls, overall, the results suggest either similar or greater levels of total desired fertility among the more-educated compared to individuals with average attainment. With the exception of Freedman et al. (1959), the previous literature has not formulated hypotheses

or interpretations regarding the relationship between education and desired fertility. Freedman et al. (p.148) interpret their bivariate finding of a positive association between education (and occupation) and expected number of children in West Germany as a (positive) income effect: “lower status groups may limit family size more rigidly in order to conserve resources to win for themselves and their children the higher standard of living to which they aspire along with other members of the population.” In addition to hypotheses that relate a person’s educational attainment to the availability of resources, we can develop hypotheses relating education to the (expected) costs and benefits of having a (large) family, as indicated in the conceptual discussion above.

Resources: As suggested by the interpretation of the education effect in Freedman et al. (1959), greater (expected) family income of more educated individuals may make a larger family more affordable.<sup>4</sup> Education is expected to affect material resources at the family level by improving the person’s earnings ability as well as his or her likelihood of having a partner (Becker 1973). In addition to tangible (material) resources to cope with the costs of children, education may also yield intangible resources by making individuals more efficient (productive) in providing home-produced goods such as child care (e.g., Schultz 1963, Michael 1973) and more likely to attract a partner with similarly useful qualities (Becker 1973, Lewis and Oppenheimer 2000, Blossfeld and Timm 2003, Schwartz and Mare 2005). More educated individuals may also have access to greater social resources (material and otherwise), through their family (parents and siblings share endowments, see e.g., Behrman and Taubman 1989, Bowles and Gintis 2001) and friend (assortative matching, Becker 1973) network.<sup>5</sup>

Benefits of Children: Some have conjectured that the decline in fertility reflects a decline in the value (benefit) of children to gain status and achieve personal fulfillment (van de Kaa 1987, 2001, Preston 1987, Lesthaeghe and Surkyn 1988). Friedman et al. (1994) assume that individuals seek to reduce uncertainty in their lives and conjecture that having children competes with having a stable career as

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<sup>4</sup>Becker and Lewis (1973) argue that greater income does not necessarily lead to larger families. According to their child quantity vs. quality model, a person with greater (expected) family income may plan for a smaller family (less child quantity) and concentrate resources towards enhancing the achievement of each child (child quality). Their idea of the fertility quantity-quality tradeoff is akin to an individual who moves from a three-bedroom flat into a two-bedroom luxury apartment rather than into a four-bedroom flat after getting a raise. Estimating the effect of income on the demand for children is challenging; carefully specified models by Borg (1989) suggest that the income effect is positive.

<sup>5</sup>As discussed in Schoeni (1997), there is evidence that individuals with more schooling both make and receive greater monetary transfers.

important strategy to "reduce uncertainty by embedding actors in recurrent social relations" (p.382).<sup>6</sup> If higher education is associated with a lower value of having a (large) family but greater and more stable career opportunities, then the desire for childlessness (smaller families) should be more widespread among individuals with higher educational attainment according to these arguments. Schoen et al. (1997) and Huinink (2000) argue that children provide their parents with unique opportunities for personal exchange, networking, and emotional satisfaction, aspects that may be more valued (especially at old age) in the process of modernization,<sup>7</sup> but a relationship between these types of child benefits and the education of a person has not been documented to our knowledge. Lastly, there could also be innate behavioral predispositions to value offspring (Udry 1996, Kohler et al. 1999, Miller et al. 1999, Morgan and King 2001). However, Kohler et al. (1999), find no evidence that the educational attainment of a person serves as an important mediator of genetic influences in a study of attained fertility.

Costs of Children: Schooling facilitates the acquisition of skills (human capital) that are valued in the labor market, resulting in more educated individuals earning higher wages and benefits than individuals with less education. According to this opportunity cost argument, the former face a higher cost (foregone income) for allocating time towards childbearing and rearing (Becker 1960, Becker and Lewis 1973, Willis 1973). Children also have a number of direct costs including expenses for child care, housing, clothes, food, transportation, toys, education, etc. (e.g., Hank and Kreyenfeld 2003). To the extent that these direct child costs are higher for more-educated individuals, perhaps because they live in more urban environments where prices are higher, more educated individuals may face higher costs, which provides a greater disincentive to have larger families. Finally, there may be a social stigma of having no children or only one child. This would represent an additional cost to individuals who desire a family size below the societal norm.<sup>8</sup> If education helps in coping with this social stigma, more educated individuals who desire smaller families may be more likely to state a lower desired

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<sup>6</sup>The theory only generates hypotheses regarding the decision to have children or not (Friedman et al., p.384). It has been criticized by Huinink (2001), who argues that (p.8) "People want to have both, a family and a gainful work experience, because it might be rational to try to reduce uncertainty concerning the future life course by gaining stable economic prospects of both partners and therefore being confident in regard to the affordability of a subsequent parenthood."

<sup>7</sup>Schoen et al. (1997, p.349) find "strong support for the hypothesis that persons for whom relationships created by children are important considerations in childbearing decisions are more likely to intend to have a (another) child."

<sup>8</sup>Rindfuss et al. (1988, p.20) argue that there are subtle ways such as "nagging, pity, exclusion from some activities, slightly higher tax rates, and other irritating mechanisms," by which childlessness is sanctioned.

family size.

In the remainder of the article, we explore the relationship between education and desired family size using data from West Germany and the EU 15 nations. In addition to providing bivariate evidence, we use multivariate analysis to explore the source of the correlation between education and desired family size. Specifically, we investigate how the relationship changes when we control for measures related to the perceived costs and benefits of having children, the level of available tangible personal resources (including household income and partnership status and history), as well as available social resources (including parents' education and the number of siblings), in order to distinguish between the different hypotheses and implied mechanisms.

## **DATA, SAMPLES AND METHODS**

### **West German Data and Sample**

We constructed samples based on the 1988 and the 1994/95 wave of the DJI Familysurvey (1988, 1994/95). The 1988 wave is a random sample of 10,043 German citizens of age 18 to 55 who resided in West Germany. The 1994/95 survey (West German part) contains 4,997 first-wave respondents and 2,002 additional respondents from a random sample of the resident population age 18 to 30.<sup>9,10</sup> Since we are concerned with small sample sizes in the analysis for some subgroups of interest (e.g., no high school or college preparatory high school degree), we pool data from both waves to minimize the chance that we fail to reject that no effect exists. We excluded individuals who grew up without their biological parents (511 cases or 3%). In addition, records with missing information on desired fertility (809 records or 4.7%), educational attainment or training (18), health status (30), labor force status (116), actual number of children (2), and values (112) are dropped from the analysis. Table 1 (and a similar table in the appendix) presents the definitions of the variables and the corresponding summary

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<sup>9</sup>For details on the sampling see Bender et al. (1996).

<sup>10</sup>We do not utilize the East German sample in this article. Using data from the East and West German 1961-1972 birth cohorts based on the 1992 Family and Fertility Survey, Kreyenfeld (2001) finds that East Germans are more certain that they want children and they want to have their first child earlier than West Germans. At the same time, she finds that East Germans are less likely to want a large family than West Germans.

statistics for women and men in the 1988 survey (columns 1 and 2), for the subsample of women in their prime reproductive years (age 18-35; column 3) from the 1988 survey and for all women in the 1994/95 survey (column 4).

In the 1994/95 wave all respondents answered *Q20(1994/95)*. *If it was entirely up to you: How many children in total do you want or would you have wanted?*<sup>11</sup> The answers are coded on a scale from zero to four (four or more) children.<sup>12</sup> In the 1988 wave of the survey the same question was only given to respondents who either had children at the time of the interview ("yes" on *Q8(1988)*) or those without children who answered "yes" or "depends" to the following question: *Q9(1988)*. *Do you want to have children or would you have liked to have children?.* Based on the answers to this set of questions in 1988 and question *Q20(1994/95)* in 1994/95, we generated the variable 'Desired' with scale "none", "one", "two", "three" and "four or more". For the 1988 round we classified individuals who answered "no" in *Q9(1988)* as "none".<sup>13</sup> As shown in Table 1 the two child family is the most frequently desired family size.

Given the qualification "if it was entirely up to you", the instrument emphasizes the individual's own wanted fertility and may hence have a greater tendency to abstract from the influence of a potential partner, the parents, or society.<sup>14</sup> Of course, individuals may have internalized external views on the acceptable family sizes as a result of (social) interaction and sanctioning as discussed above (Rindfuss et al., 1988, p.20). Since the instrument is designed to measure wanted fertility of respondents of all ages, including those who have completed their reproductive period, older individuals will respond to the retrospective part ("How many children in total would you have wanted?"). It is not clear that this

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<sup>11</sup>Coombs' (1974, 1978) scale of family size preference captures a person's first, second and third preference over the number of children while desired fertility only captures the most preferred family size. Questions that would enable us to construct Coombs' scale are not available in the surveys used here.

<sup>12</sup>Comparison with a similar instrument from the 2001 Eurobarometer indicates that top-coding at four affects no more than 1% of the respondents. The maximum family size reported in the West German 2001 Eurobarometer is seven children.

<sup>13</sup>Morgan (1981, 1982) suggests that respondents who answer "don't know" to questions relating to fertility intentions are an important group that should not be discarded. Unfortunately, in the DJI Familysurvey a distinction between "don't know" and missing for other reasons in *Q19(1988)/20(1994/95)* cannot be made. Hence, we do not include this group in our analysis.

<sup>14</sup>Ryder and Westoff (1969) compared responses to questions on desired, intended and expected number of children among American women and found no significant differences between intended and expected number of children and only slightly higher desired numbers of children. Freedman et al. (1959) find higher desired than expected fertility among West Germans, but their question on desired fertility is qualified by *if financial and other conditions of life were very good*, which suggests a more hypothetical situation where having children is less costly.

affects how individuals respond to the question, but in order to minimize interpretational concerns, we conduct the analysis separately in age groups and control for age in the multivariate models.

We constructed six binary indicators to measure different levels of completed education at the time of the interview: (1) no high school degree, (2) lowest or middle track high school degree ('Volks-/Hauptschule' or 'Realschule'), (3) lowest or middle track high school degree with job training/apprenticeship ('Lehre', 'Berufsfachschule', 'Volontariat', 'Laufbahnprüfung', or equivalent), (4) college preparatory (college track) high school degree ('Fachhochschulreife' or 'Hochschulreife'), (5) college preparatory high school degree with training, (6) and college/technical college degree or higher ('Fachhochschule', 'Universität' or equivalent). The ranking is based on the level of *general* schooling (basic secondary=ISCED2A, upper secondary=ISCED3A, tertiary/college=ISCED5A/5B/6) differentiated by additional vocational or job training programs.<sup>15</sup> For individuals who were still participating in a program at the time of the interview (about 14% of women in 18-35 age group) we code the highest completed attainment at that time and control for non-completion via the labor force status indicator 'In School'. As shown in Table 1, the most common educational attainment completed in the sample is the combination of basic high school degree and a job training program. We also constructed a rich set of control variables as show in the Data Appendix and explained below.

## **EU 15 Country Data and Sample**

To examine whether the relationship between education and desired family size holds more broadly in Western Europe, we also present multivariate evidence from the 2001 Eurobarometer (EUROSTAT 2001), a collection of identical surveys in EU 15 countries. This data-set contains individual-level information on a representative sample of approximately 1,000 respondents from each EU 15 country (West Germany, East Germany, Austria, Finland, Denmark, Belgium, Luxembourg, France, Greece, Italy, Spain, Ireland, UK, Netherlands, Portugal, Sweden), with independent sampling in the regions of (former) East and West Germany. The Eurobarometer instrument measures the respondent's personal

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<sup>15</sup>The ISCED codes stand for the education attained according to the International Standard Classification of Education. For a helpful summary of the German education system see: <http://www.ed.gov/pubs/GermanCaseStudy/chapter1a.html>.

ideal number of children:Q61. *And for you personally, what would be the ideal number of children you would like to have or would like to have had?*<sup>16</sup> This instrument may abstract to a greater extent from child costs than the one in the German data since respondents may take *ideal* to mean under ideal circumstances.

The survey collects respondents' age at completion of full-time education rather than the highest level of formal schooling completed. We construct the categories of educational attainment 'no upper secondary', 'completion of upper secondary', '(some) first stage tertiary education', or 'second stage tertiary education (advanced research qualification) completed' by relating this information to each country's typical entry age for upper secondary programs (ISCED3A) and second stage tertiary programs (ISCED6) from the 1997 International Standard Classification of Education (ISCED-1997) report. First stage tertiary education roughly corresponds to the college/technical college stage in the German data. The most frequent attainment is the lowest classification which corresponds to a basic high school (or less) education under the German system.

## Methods

We model individual's desired family size as the outcome of a Multinomial Logit (MNL) discrete choice problem (Theil 1969, 1970, McFadden 1974). This multivariate strategy is motivated by the idea that preferred family sizes correspond to distinct family type categories (family arrangements and life styles). The MNL model accounts for the discrete nature of the alternatives and allows the effect of the explanatory variables on the desired family type to differ by family type (with one arrangement as reference category). Specifically, we consider a model with four desired family size outcomes (d): no children (d=0), one child (d=1), two children (d=2), or three or more children (d=3).<sup>17</sup>

We will present the empirical results using the complementary odds-ratio and the total probability form of the MNL model. Following the convention, we use the most frequent category, i.e. the two

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<sup>16</sup>This question follows a question on the ideal number of children in general. A detailed discussion of the data can be found in Goldstein et al. (2003).

<sup>17</sup>We also conducted the analysis using five family size types: 0=childless, 1=one child, 2=two children, 3=three children, 4=four or more children. We opted for the present model, since the more general specification does not shed much additional light on the determinants of larger family sizes but would have made the exposition significantly more difficult.

child family ( $d=2$ ), as reference or base category for the odds-ratios. The probability that family size type  $j$  ( $j \in \{0, 1, 3\}$ ) is chosen takes the following form

$$P(d = j|x, \beta) = \exp(x\beta_j) / \left[ 1 + \sum_{h \in \{0,1,3\}} \exp(x\beta_h) \right], \quad j = 0, 1, 3 \quad (1)$$

where  $x$  is a set of explanatory variables and  $\beta_j$  is the coefficient vector associated with preference type  $j$ . Since the response probabilities must sum to unity, for identification the probability of the base category ( $j = 2$ ) is normalized to  $P(d = 2|x, \beta) = 1 / [1 + \sum_{h \in \{0,1,3\}} \exp(x\beta_h)]$ . The log-odds-ratio is defined by

$$\ln \frac{P(d = j|x, \beta)}{P(d = 2|x, \beta)} = x\beta_j, \quad j = 0, 1, 3. \quad (2)$$

From expression (2) it is easy to see that the change in the log-probability ratio due to a one unit change in the explanatory variable  $x_k$  is  $\beta_{j,k}$ . Hence, a *positive* estimate  $\beta_{j,k}$  implies an increasing relationship between  $x_k$  and the log-odds of desiring family size  $d = j$  relative to the base category of desiring the two-child family. Also, this effect is greater the larger the coefficient.

An important assumption of the MNL model is that the outcome categories must satisfy Independence of Irrelevant Alternatives (IIA). IIA requires that the exclusion of alternative categories does not alter the effect of a covariate on the odds-ratio of a category. In our context, it means, for example, that we assume that the effect of educational attainment on the chances of favoring the one child over the two child family is the same regardless of whether or not desiring childlessness or the three or more children is included in the model (cf. expression (2)). Based on Hausman tests (cf. Hausman and McFadden 1984) we found no evidence that the IIA assumption is violated in the samples used below.<sup>18</sup>

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<sup>18</sup>For example, we tested for equality of the effects on the risk of favoring the one child family over the two child family using estimates from the full model and a model that excludes the childless and three or more children categories. In the pooled sample of West German women, the  $\chi^2$  distributed test statistic was 42.8 which falls short of the critical value of 82.53 that corresponds to the 5% significance level (given 63 degrees of freedoms). As a result the null hypothesis of equality (validity of IIA) could not be rejected.

# RESULTS

## Descriptive Findings from West Germany

Figure 1 displays the distribution of desired fertility by educational attainment for 25 to 55 year old women based on the 1988 and 1994/95 survey.<sup>19,20</sup> Among women with the average educational attainment of basic high school (with or without training) about 10.4% desire four or more children, 20.3% desire three children, 11.9% desire one child, 4.2% prefer childlessness and the remaining 53.3% desire two children in 1988. Compared to this group, more educated women show greater dispersion about the two-child family size desire.<sup>21</sup>

Specifically, women with the most advanced high school degree (a college preparatory high school degree, 'Abitur', with or without training) are less likely to desire one or two children (8.5% and 46.9% vs. 11.9% and 53.3%), more likely to desire three or more (35.5% vs. 30.7%), and more likely to desire no children (9.1% vs. 4.2%). The desired family size is similarly polarized among college educated women. Their desire to be childless is slightly higher (6.2% vs. 4.2%) while fewer women desire one or two children compared to women with average education. Most interestingly, college educated women are also significantly more likely to desire three children (24.6% vs. 20.3%) or four or more children (15.1% vs. 10.4%) compared to women with only a basic high school degree.

The bivariate analysis provides no evidence that more educated women want smaller families on average, casting doubt on the hypotheses that they may have lower benefits or greater costs of having a larger family. Across surveys (1988 vs. 1994/95) the greater desire for larger families among more educated West German women in the 25-55 year age range persists while the desire for childlessness increases. The patterns are similar for men (not shown). For college educated men, we also find a greater desire for three or more children compared to men with a basic high school degree. Across

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<sup>19</sup>We chose 25 years as the lower bound in this statistic because the typical graduation age in tertiary education in Germany is 25-26 years (OECD, Education at a Glance, OECD Indicators 2003, <http://www1.oecd.org/publications/e-book/9603061E.PDF>).

<sup>20</sup>The table reports significance of difference in means with basic high school as reference group: \*Statistically significant at the .10 level (two-tailed test); \*\*at the .05 level (two-tailed test); \*\*\*at the .01 level (two-tailed test).

<sup>21</sup>We cannot reject the hypothesis that the fractions for women who did not complete a basic high school degree are the same as for women with average education, but we note that the former group constitutes only about 2% of the sample.

surveys (cohorts) about one in three highly educated men want three or more children compared to slightly more than one in five average educated men. Childlessness among men appears unrelated to education.

## **Multivariate Findings from West Germany**

Table 2 reports MNL coefficients of the full specifications for all age groups. They control for health and age, and sets of variables related to the perceived benefits of children (being Catholic, self-expression and quality of life using the Inglehart (1997) scale of post-materialism, gender-role views), tangible resources (household income, labor force status, marital and partnership status and history, parental education), social resources (education of the parents, number of siblings, growing up with both parents), and child costs (population density and state).<sup>22</sup> Table 3 reports selected estimates for women age 18 to 35 under different specifications as explained below. The results are reported not controlling for actual family size (columns 1-3) and controlling for it (columns 4-6) to show the robustness of the effects to realized fertility.<sup>23</sup> The models that control for realized family size fit the preference data best (pseudo  $R^2$  ranging from 0.12 to 0.26), consistent with previous evidence that realized fertility is an important determinant of fertility preferences (Bumpass 1967, Miller and Pasta 1995, Heiland et al. 2007). The reported standard errors are robust using a Huber-White variance estimator that accounts for clustering due to individuals who are in both survey waves.

### **Women's Desire for three or more Children**

The results reject the idea that West German women with above-average educational attainment have lower desired fertility. There is evidence that women with higher educational attainment prefer a family of three or more children over the two child family. For example, a college educated woman in the 18-

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<sup>22</sup>The models also control for missing cases for income, Inglehart scale, parents' education, and siblings. We also account for potential survey year effects and for systematic attrition by including a binary indicator for individuals who are member of the panel and did not attrite. In both cases we do not find strong evidence of such effects.

<sup>23</sup>We only report the estimates of the education effects for women. The full results for men and women are presented in an update of the Vienna Institute of Demography Working Paper 03/2005 version of this paper.

35 age group is 77% more likely<sup>24</sup> to favor three or more children over two children compared to a woman with the reference education of basic high school degree and job training (Table 2, column 6). Women with a college preparatory high school degree (with or without training) are also more likely to favor a large family over the two-child family than women with average schooling in most specifications. There is also evidence that this pattern holds across age groups (cohorts) as well.

Table 3 illustrates how the relationship between education and desired family size changes as additional controls are included. Model 1, the baseline specification, only controls for age and health status to account for health-related differences in the costs of having children. When factors that may capture differences in the perceived benefits of children (Catholic, post-materialistic views, and gender-role views) are also controlled for, then the correlation between education and larger families becomes less pronounced (see Model 2). Further analysis reveals that having post-materialistic values is significantly more common among more educated individuals and associated with a desire for a larger family.<sup>25</sup> This casts doubt on the hypothesis that more educated individuals are less likely to perceive a (large) family as a source of value or fulfillment (cf. van de Kaa 1987, 2001, Lesthaeghe and Surkyn 1988).

The relationship between education and desired fertility weakens further as tangible family resources (household income, employment, and partnership status) as well as measures of social resources (growing up with both parents, parents' education, number of siblings) are controlled for. This is consistent with the idea that more educated individuals count on their greater own tangible resources (including the partner) as well as their social resources to afford a larger family (cf. Freedman et al. 1959). Model 5 repeats the results from the full specification in Table 2 which add population density (degree of urbanization) and the state of residence to Model 4, in an attempt to capture potential differences in child costs including housing. The education effect increases somewhat, which reflects the fact that more educated individuals are more likely to live in urban (i.e. high cost) areas which tend to be associated with smaller desired fertility.

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<sup>24</sup>This change in the odds-ratio is obtained from exponentiating the reported log-odds coefficients and subtracting 1:  $e^{0.570} - 1 = 0.768$  or 77%. In general we are computing  $\frac{P(d=j|x_k=1,\beta)}{P(d=2|x_k=1,\beta)} - \frac{P(d=j|x_k=0,\beta)}{P(d=2|x_k=0,\beta)} = e^{1\cdot\beta_{j,k}} - e^{0\cdot\beta_{j,k}} = e^{\beta_{j,k}} - 1$  using Expression (2) to determine the change in the odds-ratio  $j$  over 2 due to  $x_k$ .

<sup>25</sup>Consistent with this finding, van de Kaa (2001, Table 7) reports similar average levels of desired fertility among young post-materialistic and materialistic women from European Fertility and Family Survey (FFS) data.

The analysis shows that the greater propensity to desire three or more children rather than two among the more-educated remains visible even after controlling for some aspects of tangible and social resources, child benefits and costs as well as health and age. The positive relationship is inconsistent with an increased opportunity cost of time or a lower benefit from a larger family (for personal fulfillment or to reduce uncertainty relative to career and stable employment) interpretation. As discussed above, these hypotheses imply a negative relationship between education and desired fertility. Given that our results already control for tangible personal and social resources, the positive relation more likely reflects the effects of education on intangible resources. In particular, there are potential gains in individual ability and productivity that facilitate dealing with the complex tasks of family and are neither captured by the (present) partnership, income, and employment situation, nor family characteristics.

### **Women's Desire for Childlessness and Single Child Family**

As shown in Table 1, about 10% of the women in the sample desire the one child family arrangement and 5% wish to be childless. Comparing the one child family to the two child family we find that the odds of favoring the single child family over the two child family are smaller for women with upper secondary or tertiary education. While the individual coefficients are only statistically significant in the baseline specification, the direction of the effects is consistent with a positive association between education and family size. Further analysis indicates that the greater likelihood to prefer childlessness over two children among more educated women suggested by the raw data (Figure 1) and the baseline specification (Model 1, Table 3) masks a greater likelihood of desiring childlessness among women who are single, a group that contains a greater fraction of more educated women.

### **Findings for Men and Robustness Checks**

As for women, we can reject that more education is associated with a desire for smaller families among male respondents, and there is some evidence that highly educated men are more likely to desire large families than men with average educational attainment and training. Men with a college degree are

typically found to be significantly less likely to favor childlessness, less likely to favor the single child, and more likely to favor three or more children over two than their less educated counterparts. Estimates from full specifications indicate that college educated men are about twice as likely to favor three or more children than men with a basic high school degree and training.

We obtained qualitatively similar results to the ones shown here when conducting the analysis in the larger sample, including children who did not grow up with their parents, when estimating the MNL models with data from each wave separately, and when using basic high school and training and lower attainments combined as reference category. Models with additional controls for parent's age at first birth, attitudes towards children (13 measures), and attitudes towards marriage (9 measures), as well as models excluding contemporaneous and subsequent influences (marital status, income, and age, etc.) or background factors (parental education and siblings) provided qualitatively similar results. We also estimated linear regression models of the desired number of children. These models assume that the effect of education on wanted fertility is linear and do not account for the discrete nature of the dependent variable, but they do not require a distributional assumption (the MNL model assumes that the errors follow the extreme-value distribution, see Theil 1969, 1970, McFadden 1974). We estimated these models with the same right-hand-side variables as the MNL models discussed above, as well as by realized parity following the observation by Udry (1983) and Namboodiri (1983) that fertility plans are made sequentially. The results confirm that individuals with above-average educational desire more children. Lastly, while we found that the more-educated are less likely to have missing preference data, estimates from models using imputed values from available attitudinal data and estimates from Heckman-type selection-correction models provided no evidence that the results presented here are not representative of the education-desired fertility relationship among all West Germans at that time.

## **Countries of the EU 15**

Table 4 shows the MNL coefficients of the effect of educational attainment on the personal ideal number of children for 5,949 women in different age groups from the EU 15. The reference category for the education effects in Table 4 is the lowest attainment, no completion of upper secondary education. The

reference category is also the most common attainment in the sample as shown in column 1.

As in the West German sample, we find no evidence of a negative relationship between education and fertility desires. The many positive and statistically significant coefficients of higher educational attainments (ISCED3A or higher) on the odds of favoring three or more children over the two-child family in the specification that controls for realized fertility suggest that, on average, better educated women in the EU 15 are more likely to prefer a larger family to the two-child family than those without upper secondary education. We note that the 36-45 year olds in the EU 15 display the latter effect to a similar extent as the 18-35 year olds in the earlier West German data and they represent approximately the same cohorts. For the latest cohorts in the EU 15, there is no evidence in support of a positive effect of upper secondary education on the preference to have three or more children relative to two children but women with first stage tertiary education, by far the most common post-secondary attainment and comparable to college in the West German data, are significantly more likely to desire a large family over the two-child family.

Also consistent with a positive relationship between education and family size ideal, we find that the EU 15 women with higher educational attainment are more likely to favor the two-child family over the single child family. However, this effect is only statistically significant for older women. Finally, for age groups 18 to 35 and 36 to 45 we find mostly positive associations of higher education on the odds of considering childlessness ideal relative to having two children, but the estimates are not statistically significant at conventional significance levels.<sup>26</sup>

## **DISCUSSION AND CONCLUSION**

Using data from West Germany, we find no evidence that individuals with upper secondary or tertiary educational attainment desire smaller families on average, compared to individuals with average education and training. Consistent with a polarization of actual fertility (high levels of childlessness and of

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<sup>26</sup>To investigate the robustness of the pattern in Table 4 we also looked at models using a measure of the years of full-time schooling. Using this continuous variable and its square we again found some evidence of a positive association between education and a family size ideal of three or more children. The models for the men of the EU 15 show a similar pattern.

higher fertility) among more educated women in several European countries including (former) West Germany (cf. Huinink 1989, 1995, 2001, Kreyenfeld 2002, Dorbritz 2003), the distribution of total desired fertility shows above average desires for childlessness as well as for three or more children among better educated West German women. Multivariate analysis confirms that individuals with upper secondary or tertiary education are more likely to prefer three or more children over two compared to individuals with average educational attainment. Our finding that the more-educated do not prefer smaller families on average and may in fact want to have larger ones is not an isolated result. As we showed, replication in a sample of women from the EU 15, using a measure of personal ideal family size, suggests that this relationship holds more broadly in Western Europe. In addition, all studies on fertility intentions or preferences that we are aware of have documented either no or a positive relationship.

Given the positive relationship that is robust to controls for perceived child benefits, costs of children, and availability of personal tangible and social resources, our results suggest the importance of intangible resources. The effects of these type of resources have been widely observed in the literature: Education raises a person's analytic ability (e.g., Pascarella et al. 1996), productivity (Schultz 1963, Michael 1973), and helps attract a more educated partner (Becker 1973, Lewis and Oppenheimer 2000, Blossfeld and Timm 2003, Schwartz and Mare 2005), facilitating the production of desired family outcomes (e.g., Grossman and Kaestner 1997, Currie 2000). For example, Pearlin and Schooler (1978) and Mirowsky (1995) document greater psychological coping resources and sense of control among more educated individuals. Consistent with this interpretation, using attitudinal data from the same survey, we found that college educated men and women in West Germany are least likely to agree with the statement that children cause problems with neighbors, during travel, or in public.

The relationship between education and desired fertility that we document may not be entirely causal. More educated individuals may have higher ability endowments (genetically or socially). In that case, those initial endowments lead to the greater intangible resources rather than formal education. While this is entirely possible, we note that we control for the educational attainment of the parents which should account for intergenerationally shared endowments. Although we controlled for a large

number of potentially confounding factors, there are certainly those that we had to omit because of lack of data. Future research may attempt to investigate the mechanisms behind the relationship further, for example using panel data to account for individual-specific unobserved effects or other data sources with richer sets of covariates.

This leaves the important question why more educated individuals tend to have lower fertility than those with less education. Our multivariate analysis also points to a number of factors including higher likelihoods of being single, being attached to the labor force, and of living in a more urban environment that are associated with smaller desired families and are more common among better educated individuals. Not surprisingly, these factors are also associated with lower *actual* fertility (Kreyenfeld 2002, 2004, Kohler et al. 2002) and may contribute to the gap between wanted and attained family size (see also Noack and Østby 2002, van Peer 2000, Symeonidou 2000, van Horn and Keilman 1997). The greater career opportunities and prospects for a higher and more stable living standard that more formal education offers, compete with high fertility desires as a result of longer schooling, later entry into employment, and greater difficulties to find a matching partner. While fertility policies have had limited success (e.g., Gauthier 1996), in light of our findings, we believe that the efforts currently underway in Germany to lower the high school and college graduation ages may be effective in fostering conditions for higher fertility among the more-educated provided that the returns to these shorter programs do not decline.

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Table 1: Means of Variables<sup>a</sup> (West German Data)

| Variable Name                | Definition  | Survey: 1988     |                |                  | 1994/95          |
|------------------------------|---|------------------|----------------|------------------|------------------|
|                              |   | Women<br>(18-55) | Men<br>(18-55) | Women<br>(18-35) | Women<br>(18-61) |
| <i>Desired Fertility</i>     |   |                  |                |                  |                  |
| Desired                      | total desired number of children                  | 2.21             | 2.03***        | 2.14***          | 2.21             |
| None Desired                 | desired no children                               | 0.05             | 0.07***        | 0.06**           | 0.05             |
| One Desired                  | desired one child                                 | 0.11             | 0.12           | 0.10             | 0.10             |
| Two Desired                  | desired two children                              | 0.53             | 0.59***        | 0.56***          | 0.54             |
| Three Desired                | desired three children                            | 0.21             | 0.17***        | 0.20             | 0.20             |
| Four+ Desired                | desired four or more children                     | 0.10             | 0.06***        | 0.08***          | 0.11             |
| <i>Education<sup>b</sup></i> |   |                  |                |                  |                  |
| No HS                        | has no high school diploma                        | 0.02             | 0.02           | 0.02             | 0.01***          |
| HS                           | has only high school diploma                      | 0.22             | 0.09***        | 0.18***          | 0.17***          |
| HS+Training                  | received high school diploma and training         | 0.57             | 0.61***        | 0.56             | 0.58             |
| CP                           | received only college preparatory diploma         | 0.05             | 0.07***        | 0.09***          | 0.05             |
| CP+Training                  | received college preparatory diploma and training | 0.06             | 0.07**         | 0.09***          | 0.09***          |
| College                      | graduated from university or technical college    | 0.08             | 0.15***        | 0.07             | 0.10***          |
| Sample Size                  |   | 5,058            | 4,056          | 2,474            | 3,558            |

Notes: Testing equality of means relative to women in 1988 survey: \*Statistically significant at the .10 level (two-tailed test); \*\* at the .05 level (two-tailed test); \*\*\* at the .01 level (two-tailed test). <sup>a</sup>Mean among individuals with complete information. Information relates to the time of the interview. <sup>b</sup>Highest Education/Training completed.

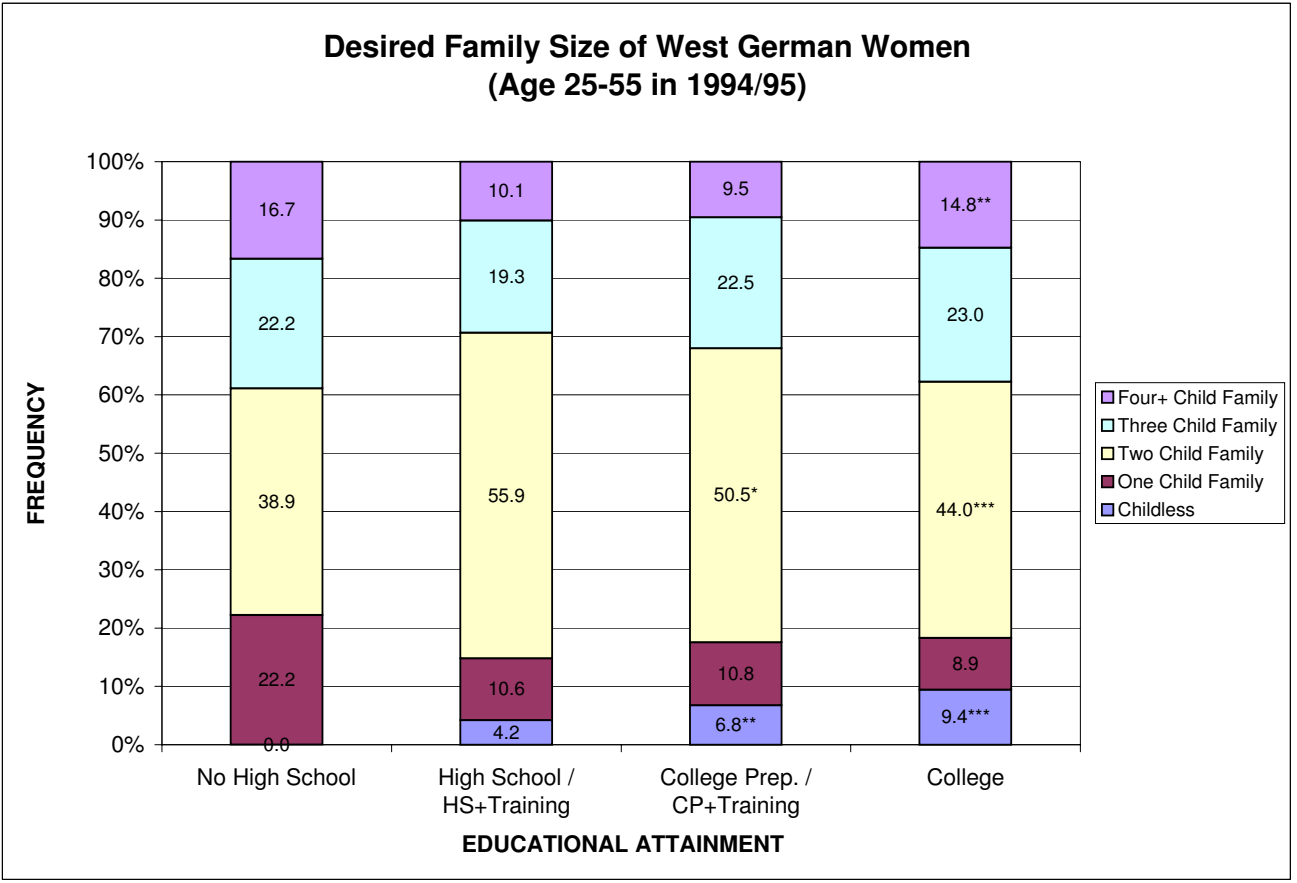
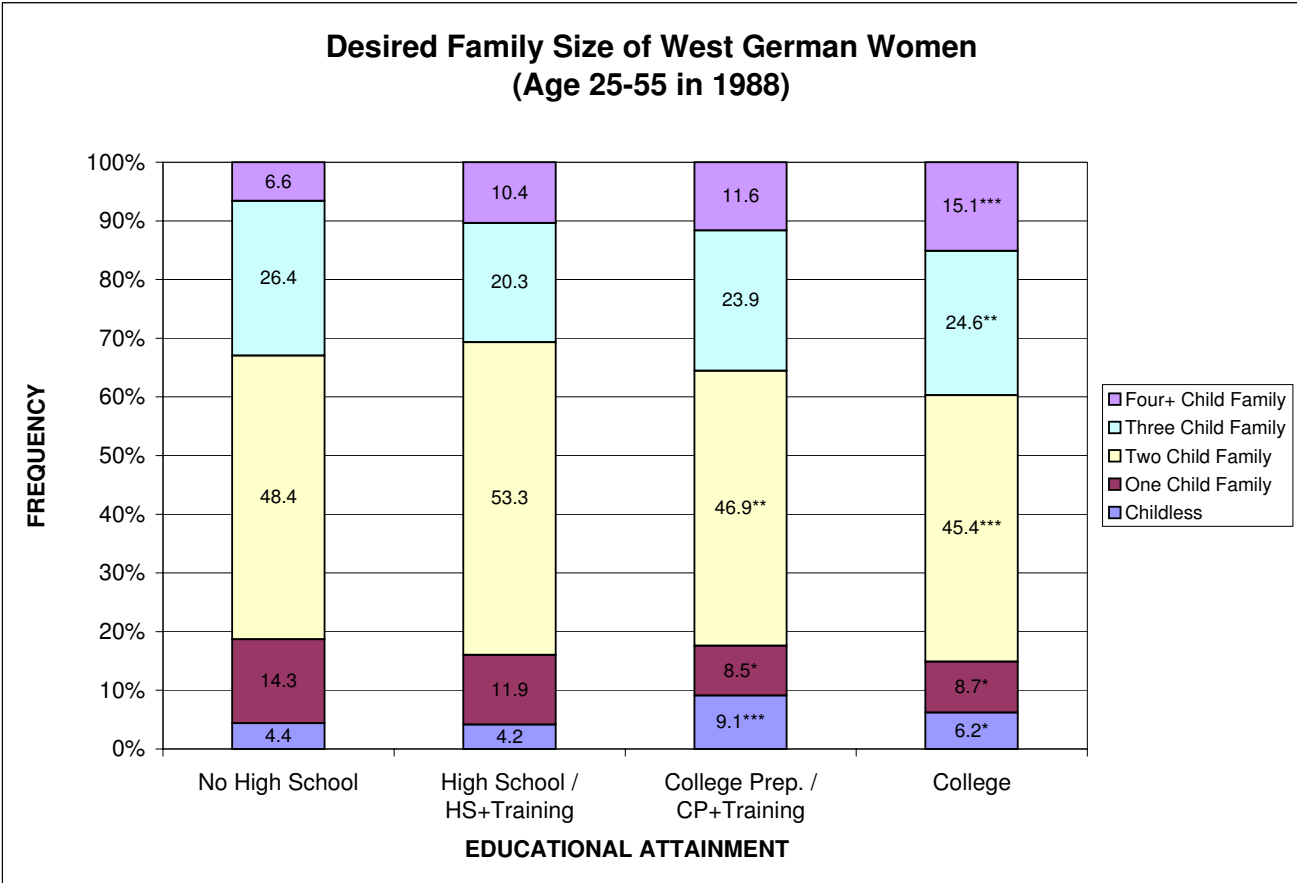


Figure 1: Desired Family Size of West German Women by Education (Source: Authors' calculations from DJI Familiensurvey 1988 and 1994/95)

Table 2: Effect of Education on Desired Fertility in West Germany: Women by Age (Full Models)

| Variable Name                   | Not Controlling for Children |                           |                            | Controlling for Children   |                            |                             |
|---------------------------------|------------------------------|---------------------------|----------------------------|----------------------------|----------------------------|-----------------------------|
|                                 | 0                            | 1                         | 3,4+                       | 0                          | 1                          | 3,4+                        |
| <b>18-35 Year Old (N=4,150)</b> |                              |                           |                            |                            |                            |                             |
| No HS                           | <b>0.200</b><br>(0.822)      | <b>0.192</b><br>(0.515)   | <b>0.243</b><br>(0.330)    | <b>0.597</b><br>(0.790)    | <b>0.141</b><br>(0.521)    | <b>0.207</b><br>(0.347)     |
| HS (no training)                | <b>0.058</b><br>(0.268)      | <b>0.205</b><br>(0.162)   | <b>0.060</b><br>(0.121)    | <b>0.183</b><br>(0.290)    | <b>0.202</b><br>(0.170)    | <b>-0.102</b><br>(0.130)    |
| HS+Training (Ref.)              |                              |                           |                            |                            |                            |                             |
| CP                              | <b>-0.079</b><br>(0.285)     | <b>-0.144</b><br>(0.279)  | <b>0.373**</b><br>(0.168)  | <b>-0.157</b><br>(0.292)   | <b>-0.126</b><br>(0.286)   | <b>0.294*</b><br>(0.172)    |
| CP+Training                     | <b>0.003</b><br>(0.235)      | <b>-0.358*</b><br>(0.216) | <b>0.384***</b><br>(0.139) | <b>-0.161</b><br>(0.240)   | <b>-0.433**</b><br>(0.215) | <b>0.452***</b><br>(0.142)  |
| College                         | <b>-0.249</b><br>(0.276)     | <b>-0.218</b><br>(0.235)  | <b>0.446***</b><br>(0.150) | <b>-0.247</b><br>(0.283)   | <b>-0.360</b><br>(0.241)   | <b>0.570***</b><br>(0.154)  |
| R <sup>2</sup>                  |                              | 0.084                     |                            |                            | 0.157                      |                             |
| <b>36-45 Year Old (N=2,261)</b> |                              |                           |                            |                            |                            |                             |
| No HS                           | <b>0.087</b><br>(0.987)      | <b>1.283**</b><br>(0.576) | <b>0.138</b><br>(0.503)    | <b>0.840</b><br>(0.920)    | <b>0.903</b><br>(0.623)    | <b>-0.103</b><br>(0.479)    |
| HS (no training)                | <b>-0.235</b><br>(0.355)     | <b>-0.138</b><br>(0.203)  | <b>0.093</b><br>(0.144)    | <b>0.021</b><br>(0.394)    | <b>-0.201</b><br>(0.222)   | <b>-0.091</b><br>(0.168)    |
| HS+Training (Ref.)              |                              |                           |                            |                            |                            |                             |
| CP                              | <b>0.194</b><br>(1.181)      | <b>0.631</b><br>(0.566)   | <b>0.364</b><br>(0.425)    | <b>-0.305</b><br>(1.165)   | <b>0.477</b><br>(0.720)    | <b>-0.102</b><br>(0.416)    |
| CP+Training                     | <b>0.239</b><br>(0.595)      | <b>-0.639</b><br>(0.436)  | <b>0.067</b><br>(0.280)    | <b>0.414</b><br>(0.641)    | <b>-0.723</b><br>(0.473)   | <b>0.133</b><br>(0.276)     |
| College                         | <b>0.303</b><br>(0.385)      | <b>-0.109</b><br>(0.273)  | <b>0.455***</b><br>(0.173) | <b>0.209</b><br>(0.399)    | <b>-0.065</b><br>(0.285)   | <b>0.450**</b><br>(0.187)   |
| R <sup>2</sup>                  |                              | 0.075                     |                            |                            | 0.225                      |                             |
| <b>46-61 Year Old (N=2,205)</b> |                              |                           |                            |                            |                            |                             |
| No HS                           | <b>1.734**</b><br>(0.702)    | <b>0.650</b><br>(0.494)   | <b>0.069</b><br>(0.369)    | <b>2.543***</b><br>(0.621) | <b>0.502</b><br>(0.590)    | <b>-0.482</b><br>(0.420)    |
| HS (no training)                | <b>0.050</b><br>(0.375)      | <b>0.180</b><br>(0.204)   | <b>-0.188</b><br>(0.129)   | <b>0.510</b><br>(0.437)    | <b>0.141</b><br>(0.219)    | <b>-0.494***</b><br>(0.145) |
| HS+Training (Ref.)              |                              |                           |                            |                            |                            |                             |
| CP/CP+Training                  | <b>-0.426</b><br>(0.861)     | <b>0.163</b><br>(0.460)   | <b>0.359</b><br>(0.262)    | <b>-0.641</b><br>(0.876)   | <b>0.164</b><br>(0.430)    | <b>0.501*</b><br>(0.300)    |
| College                         | <b>0.295</b><br>(0.560)      | <b>-0.281</b><br>(0.441)  | <b>0.479**</b><br>(0.227)  | <b>0.193</b><br>(0.568)    | <b>-0.454</b><br>(0.496)   | <b>0.509**</b><br>(0.248)   |
| R <sup>2</sup>                  |                              | 0.087                     |                            |                            | 0.236                      |                             |

Notes: Table reports estimated effects on log-odds ratios. All models also include regional controls and the set of background and contemporaneous measures described in the text. Robust standard errors that correct for clustering of individuals who interviewed in both survey rounds are in parentheses. \*Statistically significant at the .10 level (two-tailed test); \*\*at the .05 level (two-tailed test); \*\*\*at the .01 level (two-tailed test).

Table 3: Effect of Education on Desired Fertility in West Germany: Women Age 18-35 (N=4,150)

| Variable Name  | Not Controlling for Children |                           |                            | Controlling for Children   |                            |                            |
|--|------------------------------|---------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
|  | 0                            | 1                         | 3,4+                       | 0                          | 1                          | 3,4+                       |
| <b>Model 1 (Baseline Specification)</b>                |                              |                           |                            |                            |                            |                            |
| HS+Training (Ref.)                                     |                              |                           |                            |                            |                            |                            |
| CP   | <b>0.944***</b><br>(0.216)   | <b>-0.178</b><br>(0.238)  | <b>0.600***</b><br>(0.135) | <b>0.560***</b><br>(0.212) | <b>-0.153</b><br>(0.242)   | <b>0.649***</b><br>(0.140) |
| CP+Training  | <b>0.685***</b><br>(0.211)   | <b>-0.233</b><br>(0.206)  | <b>0.403***</b><br>(0.127) | <b>0.225</b><br>(0.213)    | <b>-0.314</b><br>(0.205)   | <b>0.557***</b><br>(0.132) |
| College  | <b>0.666***</b><br>(0.235)   | <b>-0.119</b><br>(0.220)  | <b>0.555***</b><br>(0.134) | <b>0.144</b><br>(0.252)    | <b>-0.303</b><br>(0.226)   | <b>0.771***</b><br>(0.139) |
| R <sup>2</sup>   |                              | 0.012                     |                            |                            | 0.117                      |                            |
| <b>Model 2 (Baseline + Benefits of Children)</b>       |                              |                           |                            |                            |                            |                            |
| HS+Training (Ref.)                                     |                              |                           |                            |                            |                            |                            |
| CP   | <b>0.668***</b><br>(0.221)   | <b>-0.143</b><br>(0.244)  | <b>0.502***</b><br>(0.138) | <b>0.320</b><br>(0.221)    | <b>-0.105</b><br>(0.246)   | <b>0.546***</b><br>(0.143) |
| CP+Training  | <b>0.498**</b><br>(0.217)    | <b>-0.204</b><br>(0.207)  | <b>0.344***</b><br>(0.129) | <b>0.082</b><br>(0.218)    | <b>-0.276</b><br>(0.206)   | <b>0.492***</b><br>(0.134) |
| College  | <b>0.336</b><br>(0.252)      | <b>-0.055</b><br>(0.224)  | <b>0.412***</b><br>(0.137) | <b>-0.125</b><br>(0.273)   | <b>-0.224</b><br>(0.230)   | <b>0.623***</b><br>(0.142) |
| R <sup>2</sup>   |                              | 0.022                     |                            |                            | 0.126                      |                            |
| <b>Model 3 (Model 2 + Tangible Personal Resources)</b> |                              |                           |                            |                            |                            |                            |
| HS+Training (Ref.)                                     |                              |                           |                            |                            |                            |                            |
| CP   | <b>0.108</b><br>(0.274)      | <b>-0.043</b><br>(0.272)  | <b>0.353**</b><br>(0.164)  | <b>0.002</b><br>(0.280)    | <b>-0.024</b><br>(0.277)   | <b>0.277*</b><br>(0.168)   |
| CP+Training  | <b>0.151</b><br>(0.227)      | <b>-0.230</b><br>(0.212)  | <b>0.347***</b><br>(0.133) | <b>-0.026</b><br>(0.231)   | <b>-0.295</b><br>(0.210)   | <b>0.424***</b><br>(0.137) |
| College  | <b>-0.121</b><br>(0.268)     | <b>-0.145</b><br>(0.226)  | <b>0.447***</b><br>(0.142) | <b>-0.211</b><br>(0.278)   | <b>-0.291</b><br>(0.233)   | <b>0.571***</b><br>(0.145) |
| R <sup>2</sup>   |                              | 0.057                     |                            |                            | 0.135                      |                            |
| <b>Model 4 (Model 3 + Social Resources)</b>            |                              |                           |                            |                            |                            |                            |
| HS+Training (Ref.)                                     |                              |                           |                            |                            |                            |                            |
| CP   | <b>-0.048</b><br>(0.284)     | <b>-0.100</b><br>(0.277)  | <b>0.354**</b><br>(0.166)  | <b>-0.153</b><br>(0.291)   | <b>-0.082</b><br>(0.283)   | <b>0.273</b><br>(0.171)    |
| CP+Training  | <b>0.074</b><br>(0.236)      | <b>-0.316</b><br>(0.214)  | <b>0.336**</b><br>(0.138)  | <b>-0.112</b><br>(0.242)   | <b>-0.383*</b><br>(0.213)  | <b>0.408***</b><br>(0.140) |
| College  | <b>-0.215</b><br>(0.275)     | <b>-0.202</b><br>(0.232)  | <b>0.418***</b><br>(0.147) | <b>-0.266</b><br>(0.282)   | <b>-0.350</b><br>(0.240)   | <b>0.533***</b><br>(0.151) |
| R <sup>2</sup>   |                              | 0.073                     |                            |                            | 0.148                      |                            |
| <b>Model 5 (Model 4 + Child Costs)</b>                 |                              |                           |                            |                            |                            |                            |
| HS+Training (Ref.)                                     |                              |                           |                            |                            |                            |                            |
| CP   | <b>-0.079</b><br>(0.285)     | <b>-0.144</b><br>(0.279)  | <b>0.373**</b><br>(0.168)  | <b>-0.157</b><br>(0.292)   | <b>-0.126</b><br>(0.286)   | <b>0.294*</b><br>(0.172)   |
| CP+Training  | <b>0.003</b><br>(0.235)      | <b>-0.358*</b><br>(0.216) | <b>0.384***</b><br>(0.139) | <b>-0.161</b><br>(0.240)   | <b>-0.433**</b><br>(0.215) | <b>0.452***</b><br>(0.142) |
| College  | <b>-0.249</b><br>(0.276)     | <b>-0.218</b><br>(0.235)  | <b>0.446***</b><br>(0.150) | <b>-0.247</b><br>(0.283)   | <b>-0.360</b><br>(0.241)   | <b>0.570***</b><br>(0.154) |
| R <sup>2</sup>   |                              | 0.084                     |                            |                            | 0.157                      |                            |

Notes: Table reports estimated effects on log-odds ratios. All models also include a the set of background and contemporaneous measures described in the text. Robust standard errors that correct for clustering of individuals who interviewed in both survey rounds are in parentheses. \*Statistically significant at the .10 level (two-tailed test); \*\*at the .05 level (two-tailed test); \*\*\*at the .01 level (two-tailed test).

Table 4: Effect of Education on Desired Fertility in EU 15: Women by Age (Full Models)

| Variable Name                   | Fraction | Not Controlling for Children |                            |                           | Controlling for Children    |                            |                            |
|---------------------------------|----------|------------------------------|----------------------------|---------------------------|-----------------------------|----------------------------|----------------------------|
|                                 |          | 0                            | 1                          | 3,4+                      | 0                           | 1                          | 3,4+                       |
| <b>18-35 Year Old (N=2,669)</b> |          |                              |                            |                           |                             |                            |                            |
| No Upper Second. (Ref.)         | 35.1     |                              |                            |                           |                             |                            |                            |
| Upper Secondary                 | 29.4     | <b>0.404</b><br>(0.285)      | <b>-0.034</b><br>(0.169)   | <b>-0.167</b><br>(0.135)  | <b>0.295</b><br>(0.292)     | <b>-0.033</b><br>(0.178)   | <b>-0.096</b><br>(0.141)   |
| 1st Stage Tertiary              | 31.7     | <b>0.434</b><br>(0.293)      | <b>-0.162</b><br>(0.194)   | <b>0.190</b><br>(0.136)   | <b>0.245</b><br>(0.294)     | <b>-0.237</b><br>(0.201)   | <b>0.283**</b><br>(0.143)  |
| 2nd Stage Tertiary              | 3.8      | <b>0.409</b><br>(0.561)      | <b>-0.913*</b><br>(0.493)  | <b>0.030</b><br>(0.274)   | <b>0.223</b><br>(0.548)     | <b>-0.739*</b><br>(0.434)  | <b>0.115</b><br>(0.300)    |
| $R^2$                           |          |                              | 0.097                      |                           |                             | 0.153                      |                            |
| <b>36-45 Year Old (N=1,366)</b> |          |                              |                            |                           |                             |                            |                            |
| No Upper Second. (Ref.)         | 42.1     |                              |                            |                           |                             |                            |                            |
| Upper Secondary                 | 23.8     | <b>0.143</b><br>(0.419)      | <b>0.397*</b><br>(0.234)   | <b>0.355**</b><br>(0.171) | <b>0.217</b><br>(0.478)     | <b>0.400</b><br>(0.261)    | <b>0.479**</b><br>(0.195)  |
| 1st Stage Tertiary              | 26.4     | <b>0.822**</b><br>(0.390)    | <b>0.076</b><br>(0.258)    | <b>0.167</b><br>(0.173)   | <b>0.392</b><br>(0.434)     | <b>-0.178</b><br>(0.268)   | <b>0.334*</b><br>(0.193)   |
| 2nd Stage Tertiary              | 7.6      | <b>0.449</b><br>(0.619)      | <b>-0.201</b><br>(0.423)   | <b>0.084</b><br>(0.272)   | <b>-0.191</b><br>(0.675)    | <b>-0.441</b><br>(0.440)   | <b>0.331</b><br>(0.286)    |
| $R^2$                           |          |                              | 0.103                      |                           |                             | 0.279                      |                            |
| <b>46-61 Year Old (N=1,914)</b> |          |                              |                            |                           |                             |                            |                            |
| No Upper Second. (Ref.)         | 56.9     |                              |                            |                           |                             |                            |                            |
| Upper Secondary                 | 18.8     | <b>-0.660*</b><br>(0.356)    | <b>-0.551**</b><br>(0.252) | <b>-0.037</b><br>(0.149)  | <b>-0.622*</b><br>(0.356)   | <b>-0.494*</b><br>(0.273)  | <b>0.162</b><br>(0.167)    |
| 1st Stage Tertiary              | 18.9     | <b>-0.965**</b><br>(0.445)   | <b>-0.150</b><br>(0.236)   | <b>0.366**</b><br>(0.151) | <b>-1.322***</b><br>(0.498) | <b>-0.545**</b><br>(0.260) | <b>0.589***</b><br>(0.167) |
| 2nd Stage Tertiary              | 5.3      | <b>-1.215*</b><br>(0.707)    | <b>-0.495</b><br>(0.408)   | <b>0.605**</b><br>(0.252) | <b>-1.182</b><br>(0.749)    | <b>-0.538</b><br>(0.439)   | <b>0.966***</b><br>(0.294) |
| $R^2$                           |          |                              | 0.117                      |                           |                             | 0.280                      |                            |

Notes: See the explanation in the text for details on the construction of the education variables. All models also include controls for the EU 15 countries/regions (West Germany, East Germany, Austria, Finland, Denmark, Belgium, Luxembourg, France, Greece, Italy, Spain, Ireland, UK, Netherlands, Portugal, Sweden), political orientation scale, in school, age and partnership measures comparable to the ones used in the analysis for West Germany, labor force status indicators (self employed, employed, not working), location (village or rural, small town, large town or city), a four category adjusted household income scale and controls for 'don't know' (political scale and income) and refusal (political scale and partnership). Robust standard errors are presented in parentheses. \*Statistically significant at the .10 level (two-tailed test); \*\* at the .05 level (two-tailed test); \*\*\* at the .01 level (two-tailed test).

Data Appendix: Means of Variables<sup>a</sup> (West German Data)

| Variable Name               | Definition   | Survey: 1988     |                |                  | 1994/95          |
|-----------------------------|--|------------------|----------------|------------------|------------------|
|                             |  | Women<br>(18-55) | Men<br>(18-55) | Women<br>(18-35) | Women<br>(18-61) |
| <i>Fertility</i>            |  |                  |                |                  |                  |
| Actual                      | total number of biological children                        | 1.39             | 1.04***        | 0.89***          | 1.41             |
| No Child                    | has/had no child at time of interview                      | 0.29             | 0.44***        | 0.47***          | 0.29             |
| One Child                   | has/had one child at time of interview                     | 0.25             | 0.21***        | 0.24             | 0.22***          |
| Two Children                | has/had two children at time of interview                  | 0.31             | 0.24***        | 0.23***          | 0.34**           |
| Three Children              | has/had three children at time of interview                | 0.10             | 0.08***        | 0.05***          | 0.11             |
| Four+ Children              | has/had four+ children at time of interview                | 0.05             | 0.03***        | 0.01***          | 0.05             |
| <i>Characteristics</i>      |  |                  |                |                  |                  |
| Catholic                    | respondent's religious affiliation is Catholic             | 0.43             | 0.43           | 0.45**           | 0.42             |
| Both Parents                | grew up with both parents                                  | 0.88             | 0.88           | 0.92***          | 0.88             |
| Traditional                 | 'women should work less in labor market than men'          | 0.11             | 0.16***        | 0.09***          | 0.08***          |
| Ingle Type <sup>b</sup> PPM | strong post-materialistic views on Inglehart Scale         | 0.32             | 0.38***        | 0.36***          | 0.30**           |
| Ingle Type PMP              | intermediate post-materialistic views on Inglehart Scale   | 0.17             | 0.18           | 0.18             | 0.17             |
| Ingle Type PMM              | weak post-materialistic views on Inglehart Scale           | 0.09             | 0.08           | 0.08             | 0.11***          |
| Ingle Type MPP              | weak materialistic views on Inglehart Scale                | 0.20             | 0.19           | 0.20             | 0.20             |
| Ingle Type MPM              | intermediate materialistic views on Inglehart Scale        | 0.11             | 0.10**         | 0.10**           | 0.12             |
| Ingle Type MMP              | strong materialistic views on Inglehart Scale              | 0.11             | 0.08***        | 0.08***          | 0.10             |
| Ingle Missing               | Inglehart missing  | 0.01             | 0.01           | 0.01             | 0.01             |
| Health Status               | self-reported health scale (1-5; 1=very good, 5=poor)      | 2.18             | 2.08***        | 1.94***          | 2.18             |
| Rural                       | residential category (0-9; 0='>0.5 mill.', 9='< 2,000.') ) | 3.28             | 3.41*          | 3.34             | 3.49***          |
| <i>Labor Force Status</i>   |  |                  |                |                  |                  |
| Employed                    | in labor force and employed                                | 0.49             | 0.83***        | 0.49             | 0.59***          |
| Unemployed                  | in labor force and unemployed                              | 0.03             | 0.03           | 0.04*            | 0.03             |
| In Household                | not in labor force and at home                             | 0.37             | 0.00***        | 0.30***          | 0.26***          |
| In School                   | not in labor force and in school                           | 0.06             | 0.09***        | 0.13***          | 0.08***          |
| Other Status                | not in labor force and other activity (incl. retired)      | 0.04             | 0.04           | 0.05             | 0.04             |
| <i>Income<sup>c</sup></i>   |  |                  |                |                  |                  |
| Income 0-2                  | household monthly real disposable income is 0-2000         | 0.20             | 0.15***        | 0.25             | 0.16***          |
| Income 2-4                  | household monthly real disposable income is 2000-4000      | 0.68             | 0.71***        | 0.67             | 0.50***          |
| Income 4+                   | household monthly real disposable income is 4000+          | 0.12             | 0.14**         | 0.08***          | 0.34***          |
| Inc. Missing                | household disposable income info missing                   | 0.10             | 0.08***        | 0.10             | 0.12***          |
| Survey 88                   | respondent is in 1988 wave of the survey                   | 1.00             | 1.00           | 1.00             | 0.00             |
| Panel                       | respondent is in both waves of the survey                  | 1.00             | 1.00           | 1.00             | 0.74             |
| Sample Size                 |  | 5,058            | 4,056          | 2,474            | 3,558            |

Notes: Testing equality of means relative to women in 1988 survey: \*Statistically significant at the .10 level (two-tailed test); \*\* at the .05 level (two-tailed test); \*\*\* at the .01 level (two-tailed test). <sup>a</sup>Mean among individuals with complete information. Information relates to the time of the interview. <sup>b</sup>Ranking of two post-materialistic (P) versus two materialistic (M) objectives: first letter expresses highest priority and last letter expresses lowest. <sup>c</sup>Categorization based on 1988 Deutschmarks. 1988 and 1994/95 are made comparable using the CPI (Preisindex für die Lebenshaltung—Alle Privaten Haushalte') for West Germany.

Data Appendix: Means of Variables<sup>a</sup> (West German Data), continued

| Variable Name                         | Definition                                       | Survey: 1988     |                |                  | 1994/95          |
|---------------------------------------|--|------------------|----------------|------------------|------------------|
|                                       |  | Women<br>(18-55) | Men<br>(18-55) | Women<br>(18-35) | Women<br>(18-61) |
| <i>Age</i>                            |  |                  |                |                  |                  |
| Age at Int.                           | age at interview in years                        | 36.0             | 36.3           | 27.5***          | 37.6***          |
| Age20                                 | age group 20 (18 ≤ age ≤ 20)                     | 0.05             | 0.05           | 0.09***          | 0.05             |
| Age25                                 | age group 25 (21 < age ≤ 25)                     | 0.14             | 0.13           | 0.28***          | 0.10***          |
| Age30                                 | age group 30 (25 < age ≤ 30)                     | 0.15             | 0.17***        | 0.31***          | 0.20***          |
| Age35                                 | age group 35 (30 < age ≤ 35)                     | 0.16             | 0.14**         | 0.32***          | 0.12***          |
| Age40                                 | age group 40 (35 < age ≤ 40)                     | 0.15             | 0.13***        |                  | 0.14*            |
| Age45                                 | age group 45 (40 < age ≤ 45)                     | 0.11             | 0.12           |                  | 0.12             |
| Age50                                 | age group 50 (45 < age ≤ 50)                     | 0.12             | 0.13           |                  | 0.08***          |
| Age60                                 | age group 60 (50 < age ≤ 61)                     | 0.12             | 0.12           |                  | 0.19***          |
| <i>Partnership</i>                    |  |                  |                |                  |                  |
| Married                               | married at time of interview                     | 0.70             | 0.61***        | 0.57***          | 0.68**           |
| Marriedt                              | married and together                             | 0.68             | 0.60***        | 0.55***          | 0.66*            |
| Marrieds                              | married and separated                            | 0.02             | 0.01***        | 0.02             | 0.02             |
| Divorced                              | divorced at time of interview                    | 0.07             | 0.05**         | 0.04***          | 0.06             |
| Divorcep                              | divorced and with a partner                      | 0.03             | 0.03           | 0.02**           | 0.03             |
| Divorcenp                             | divorced and without a partner                   | 0.03             | 0.02***        | 0.02***          | 0.03*            |
| Widowed                               | widowed at time of interview                     | 0.03             | 0.01***        | 0.01***          | 0.03             |
| Single                                | single at time of interview                      | 0.21             | 0.33***        | 0.39***          | 0.24***          |
| Singlep                               | single and with a partner                        | 0.12             | 0.16***        | 0.24***          | 0.14***          |
| Singlenp                              | single and without a partner                     | 0.08             | 0.17***        | 0.15***          | 0.09             |
| <i>Parents' Education<sup>b</sup></i> |  |                  |                |                  |                  |
| No HSF                                | father has no high school diploma                | 0.09             | 0.08           | 0.08             | 0.07***          |
| HSF                                   | father has only high school diploma              | 0.14             | 0.13**         | 0.13             | 0.12**           |
| HSF+Training                          | father received high school diploma and training | 0.65             | 0.67**         | 0.67*            | 0.67**           |
| College PrepF                         | father received college preparatory diploma      | 0.02             | 0.03**         | 0.02             | 0.02             |
| CollegeF                              | father graduated from college                    | 0.10             | 0.09           | 0.10             | 0.12**           |
| EDUF Missing                          | father's educational attainment info missing     | 0.09             | 0.07***        | 0.10             | 0.11**           |
| No HSM                                | mother has no high school diploma                | 0.09             | 0.08           | 0.08             | 0.07***          |
| HSM                                   | mother has only high school diploma              | 0.46             | 0.48*          | 0.39***          | 0.41***          |
| HSM+Training                          | mother received high school diploma and training | 0.41             | 0.39           | 0.47***          | 0.45***          |
| College PrepM                         | mother received college preparatory diploma      | 0.02             | 0.02           | 0.03             | 0.08***          |
| CollegeM                              | mother graduated from college                    | 0.02             | 0.02           | 0.02             | 0.03***          |
| EDUM Missing                          | mother's educational attainment info missing     | 0.12             | 0.11           | 0.11             | 0.11             |
| <i>Siblings<sup>c</sup></i>           |  |                  |                |                  |                  |
| Num. Siblings                         | number of siblings                               | 1.80             | 1.74***        | 1.79             | 1.98***          |
| No Siblings                           | has/had no siblings                              | 0.10             | 0.11*          | 0.09             | 0.14***          |
| One Sibling                           | has/had one sibling                              | 0.33             | 0.34*          | 0.34             | 0.32             |
| Two Siblings                          | has/had two siblings                             | 0.24             | 0.23           | 0.26*            | 0.25             |
| Three+ Siblings                       | has/had three siblings                           | 0.33             | 0.31*          | 0.31*            | 0.29***          |
| Sib. Missing                          | sibling info missing                             | 0.00             | 0.00           | 0.00             | 0.03***          |
| Sample Size                           |  | 5,058            | 4,056          | 2,474            | 3,558            |

Notes: Testing equality of means relative to women in 1988 survey: \*Statistically significant at the .10 level (two-tailed test); \*\*at the .05 level (two-tailed test); \*\*\*at the .01 level (two-tailed test). <sup>a</sup>Mean among individuals with complete information. Information relates to the time of the interview. <sup>b</sup>Highest Education and Training completed. <sup>c</sup>The number of siblings is higher in the 1994/95 survey since it also counts step-siblings.