Field of Study and Fertility Patterns Among U.S College Graduates

Katherine Michelmore
Kelly Musick

PWP-CCPR-2012-012

Latest Update: August 27, 2013
January 7, 2013

California Center for Population Research
On-Line Working Paper Series

Field of Study and Fertility Patterns Among U.S. College Graduates

Katherine Michelmore

Kelly Musick

Cornell University

January 7, 2013

Short title: U.S. Field of Study and Fertility Patterns

Katherine Michelmore
Department of Policy Analysis and Management
Cornell University
3M11B Martha Van Rensselaer Hall
Ithaca, NY 14853-4401 (km459@cornell.edu)

Kelly Musick
Department of Policy Analysis and Management and Cornell Population Center
Cornell University
254 Martha Van Rensselaer Hall
Ithaca, NY 14853-4401 (musick@cornell.edu)

Field of Study and Fertility Patterns Among U.S. College Graduates

ABSTRACT. Building on recent European studies, we use the Survey of Income and Program Participation to provide the first broad, descriptive portrait of fertility differences within the U.S. college-going population by undergraduate field of study. We rely on multilevel event history models to investigate potential mechanisms linking field of study to delayed fertility and childlessness. We find a 10 percentage point difference in levels of childlessness across fields, with women in health and education having the lowest levels of childlessness, women in science and technology falling in the middle, and women in arts and social sciences having the highest levels, consistent with European patterns. Institutional and selection mechanisms are assessed with measures of motherhood employment penalties, gender composition, family attitudes, and marriage patterns characteristic of fields of study. Childlessness is higher among women in fields with moderate male representation, less traditional family attitudes, and late age at first marriage.

Keywords: childlessness, delayed childbearing, education, fertility, field of study

Introduction

The fertility patterns of U.S. college graduates are increasingly distinct from those of women with lower levels of education. Whereas women of all education levels have postponed marriage, only college-educated women have delayed childbirth to the same extent (Ellwood and Jencks 2004; McLanahan 2004). The gap in age at first birth has grown, and by the end of the reproductive years, college-educated women are more likely to be childless and have fewer children overall (Rindfuss et al. 1996; Martin 2004; Musick et al. 2009). Interest in the family formation process in the United States tends to focus on early childbearing among women with the lowest levels of education (e.g., Ribar 1999; Furstenberg 2003; Carlson et al. 2004; Edin and Kefalas 2005), with relatively little research looking closely at the later and lower fertility pattern characteristic of U.S. college graduates. Increasing college enrolments among women in the U.S. and other advanced industrialized countries (Buchmann and DiPrete 2006; Bhrolchain and Beaujouan 2012) underscore the importance of better understanding variation in the effects of college on family life.

Undergraduate field of study is one critical dimension on which we might expect variation in fertility patterns among college graduates. Fields of study lead to career trajectories that differ in their economic rewards, demands, and norms around the importance of work and family. Research has begun to explore this potential source of heterogeneity in the European context (Lappegård 2002; Lappegård and Rønsen 2005; Hoem et al. 2006a, 2006b; Martín-García and Baizán 2006; Neyer and Hoem 2008; Van Bavel 2010), but to our knowledge, no systematic investigation of links between field of study and fertility exists for the United States. European studies find that fertility is indeed highly structured by field of study. Subsequent childbearing is at least as closely associated with field of study as level of education in Norway

(Lappegård 2002; Lappegård and Rønsen 2005), Spain (Martín-García and Baizán 2006), and Sweden (Hoem et al. 2006a, 2006b).

In our paper, we build on recent European research in an effort to better understand variation in the fertility patterns of U.S. college-educated women. The expansion of women's educational achievement and employment in the United States and Europe has unfolded in very different labour market and policy contexts. European welfare regimes are relatively generous in their provision of policies aimed at supporting women's labour force participation, such as paid family leave, subsidised child care, and part-time work (Gornick et al. 1997; Waldfogel 2001; Gornick and Meyers 2003). The United States ranks low in work-family policy supports, but there may be trade-offs in terms of greater flexibility in labour markets, gender equality in access to jobs and pay, and cheaper private sector child care (Morgan 2005; Mandel and Semyonov 2006; Pettit and Hook 2009; Mandel and Shalev 2009a, 2009b). These trade-offs may favour college graduates (Mandel and Shalev 2009a, 2009b; Mandel 2010). Despite weak policy supports, labour force attachment and fertility rates in the U.S. remain high relative to those in Europe (Brewster and Rindfuss 2000; Morgan 2003; Morgan 2005; Misra et al. 2011).

We use large, nationally representative samples from the 2001, 2004 and 2008 Survey of Income and Program Participation (SIPP) to provide the first broad, descriptive portrait of variation in U.S. fertility patterns within the college-going population by undergraduate field of study. We rely on multilevel event history models to investigate potential mechanisms linking field of study to delayed fertility and childlessness, tapping institutional and selection processes. Indicators at the field level include motherhood employment penalties, gender composition, and early marriage as measured by the SIPP, as well as early attitudes about family roles as measured by the National Longitudinal Survey of Youth 1979 (NLSY79).

Background

How might field of study matter?

A growing line of research focuses on the potential importance of institutional accommodations for easing competing demands on women's time (Bianchi 2000; Joshi 2002; DiPrete et al. 2003; Morgan 2003; Rindfuss et al. 2003; Morgan and Taylor 2006). The notion is that the easier it is for women to combine motherhood and employment—as opposed to having to choose between them—the weaker the constraints on childbearing. Indeed, at the aggregate level, the long-held negative relationship between women's labour force participation and completed fertility has reversed in developed countries, such that high female labor force participation rates are also associated with high fertility (Brewster and Rindfuss 2000; Billari and Kohler 2004). Conditions that reduce work-family conflict include greater flexibility and smaller penalties for time out of the labour force (England 1992; Glass and Camarigg 1992; Goldin and Katz 2008b). We assess workplace accommodations by measuring differences in labor force participation across fields of study between mothers with children under five and all other women. We posit that fields of study leading to jobs with smaller motherhood employment penalties should impose fewer constraints on childbearing and result in earlier and higher overall fertility.

Institutional perspectives suggest causal mechanisms linking field of study and family formation behaviour, but there are inarguably also selection processes at work. Hakim (2000) emphasizes the importance of heterogeneity in women's lifestyle preferences—particularly the degree to which women are home or work-centred—for understanding women's fertility decisions. She posits that home-centred women obtain education as a form of social capital, work-centred women invest heavily in training geared specifically to careers, and a middle group of adaptive women obtain education with an eye toward working, although investing less than

the work-centred. The adaptive group in particular may select fields of study based on their perception of how easy it is to balance work and family obligations in the jobs characteristic of those fields. Family orientation may also be associated with individual characteristics like nurturance and preferences for working with people, which may select women into the caring and helping professions: teaching, health, and social work (Fortin 2008; Folbre 2010). These selection processes may be reflected in the gender composition of fields, as well as the family role attitudes of women in fields.

To the extent that field of study affects fertility, effects may be indirect, working through variation in marriage timing. Fertility remains very tightly linked to marriage among U.S. college graduates, with just 7 per cent of births to this group occurring out of marriage (Kennedy and Bumpass 2011). As such, differences in marriage rates across fields may be a key factor in shaping patterns of childlessness across fields. Fields linked to less stable career trajectories or lengthier training periods may delay marriage formation (Oppenheimer, Kalmijn, and Lim 1997), as might fields with weaker ties to particular jobs (Hoem et al. 2006b). Fields may also provide different opportunities on the marriage market, either promoting or deterring marriage formation. For example, fields with a very high share of men may shape marriage prospects via the availability of prospective partners, with more prospective partners leading to earlier marriage and, in turn, childbearing. This suggests that the gender composition of fields may reflect more than selection into fields; it further suggests potential nonlinearities in the relationship between gender composition and childbearing.

Previous research

A handful of studies have explored the association between field of study and fertility in Europe. Hoem et al. (2006a, 2006b) found that Swedish women who studied in the health and teaching

fields had lower rates of childlessness and higher overall fertility than women who studied in other fields. Similarly, Austria (Neyer and Hoem 2008), Norway (Lappegård 2002; Lappegård and Rønsen 2005), and Spain (Martín-García and Baizán 2006) all report earlier and higher overall fertility among women in fields related to the care of individuals. Field generally appears to be equally or more important than education level in differentiating fertility patterns. For example, among Swedish women with the equivalent of a college degree, 10 per cent graduating in health and teaching fields were childless, relative to 30 per cent in fields with the highest levels of childlessness. The childlessness gap across education levels was 5 points (13 per cent among those with less than a high school education compared to 18 per cent among those with high tertiary or college degrees). In contrast, among U.S. women ages 40–44 in 2008, the childlessness gap across education levels was substantially higher at 9 points: 15 per cent of those without a high school degree were childless, compared to 24 per cent of those with a college degree (U.S. Census Bureau 2010).

Based on European data, childlessness appears to be highest among women studying in the arts and humanities, then the social sciences, and mid-range for women in science and technology (Lappegård 2002; Hoem et al. 2006b; Neyer and Hoem 2008). There is much concern in the U.S. over the small share of women in science and technology fields, and considerable debate over how family roles and preferences factor in (Ceci and Williams 2007; Ceci et al. 2009; Sassler et al. 2011). How the fertility experiences of U.S. women in science and technology fields compares to women in the European context is an open question. Women graduating in disciplines with high concentrations of men are generally more likely to remain childless and tend to have fewer births on average, although there are exceptions. Hoem et al. (2006b) suggest that the relatively weak ties to future occupations in the arts and humanities

(which typically offer no special job training or teaching qualification) might explain the high rates of childlessness in these fields, despite their relatively high levels of female representation.

Van Bavel (2010) further explored how field of study relates to fertility postponement across 21 European countries, focusing on gender composition, family attitudes, and earnings potential as mechanisms linking field of study and fertility. Using multilevel conditional probability models with women cross-classified by country and field of study, this analysis reported earlier transitions among those graduating in fields characterized by a higher representation of women and more traditional family attitudes. It also reported later transitions to motherhood among women in fields with higher earnings potential (as indicated by the expected starting wage and the steepness of the earnings profile), consistent with the notion that higher wages translate into higher foregone earnings in the event of childbirth and thus higher opportunity costs to having children. While a significant factor in Van Bavel's study of women across education levels and countries, wages likely play a weaker role in differentiating fertility patterns by field of study among our sample of U.S. college graduates, for whom wages are relatively homogeneous (indeed, this was borne out by sensitivity tests including information on field-specific wages). Evidence from previous research suggests that differences in fertility are driven by a mix of causal and selection effects. That is, fields both exert causal effects on attitudes and career prospects (and in turn fertility behaviour), and women select into fields based on attitudes and orientations toward family. Women's attitudes evolve with age and experience (Thornton et al. 1983; Fan and Marini 2000), and Van Bavel's measure of family attitudes was assessed while men and women were in school, thus already potentially altered by the social environments of fields.

We know of no broad examination of U.S. undergraduate field of study and fertility. The most closely related is recent work by Goldin and colleagues documenting fertility differences among elite college-goers by advanced degree holding and career trajectory. Comparing three cohorts of Harvard graduates with advanced degrees, they found that those who earned a doctorate generally had the smallest families and physicians had the largest (Goldin and Katz 2008b). Physicians took the briefest non-employment spells after having a child and experienced the smallest earnings penalty for time off. Goldin reports similar results based on a broader sample of graduates from the College and Beyond entering class of 1976 (Goldin 2006). She and Katz conclude (2008b, p. 7) that 'women in careers with the greatest predictability and the smallest financial penalty for time out have the most children.' Advanced degree holding and career trajectories are more proximate to the causal mechanisms (institutional characteristics) potentially linking field of study and fertility, but they also unfold further into the life course and are themselves affected by family formation.

Given the lack of research on U.S. field of study and fertility, how might we expect the field-fertility link in the United States to compare to that in Europe? As noted at the outset, the United States ranks low relative to Europe in work-family policies such as paid leave and subsidised child care, and high in labour market flexibility (e.g., Gornick and Meyers 2003; Mandel and Semyonov 2006). An unintended consequence of paid leave policies in particular appears to be lower wages and greater occupational segregation disproportionately affecting highly skilled women (Mandel 2010; Misra et al. 2011). The 'mommy track' may thus be less constraining to U.S. college graduates than to their counterparts in the more developed welfare states of Western Europe. The U.S. educational system is also less rigid, lacking the strong vocational and apprenticeship programmes of many of the European systems (Goldin and Katz

2008a; Mandel and Shalev 2009). The more general approach to education and overall greater flexibility in job opportunities suggest that fields of study in the United States may be less tied to specific occupational characteristics, potentially resulting in smaller differences in fertility patterns across undergraduate fields of study.

Our approach

We explore how field of study relates to fertility delay and childlessness among U.S. college-educated women, relying primarily on data from the SIPP. We expand the investigation of potential mechanisms linking field and fertility to include measures tapping selection processes discussed in past European work, as well as indicators of institutional accommodations not examined elsewhere. Our analyses focus on college graduates, as there is little educational specialization before college enrolment in the United States (the European studies on the field-fertility link reviewed above include women of various education levels). Data from the SIPP are available on the timing of first births to women only, precluding analysis of men's transitions to childbirth. The SIPP is well suited to our study, with large enough samples to investigate field-level variation and detailed information on fertility, education, earnings, employment, and marriage.

We start by laying out the descriptive groundwork and then explore the potential factors linking field of study and family formation, estimating discrete-time multilevel event history models of first birth among women ages 20–48 as a function of individual-level socio-demographic controls and field-level characteristics. Most of our field-level characteristics were generated from 21–55 year-olds in the SIPP, including motherhood employment penalties, gender composition, and early marriage. Family role attitudes were assessed using data from the NLSY79, a panel survey of 14–21 year-olds in 1979. Attitudes were observed at the first wave of

data collection, before college enrolment for most and thus largely before the contaminating effects of the field environment, offering a relatively strong proxy for selection into fields. We further explored the role of field-level differences in marriage timing (per cent married at age 26), testing the extent to which these drive differences in the timing of first birth. Finally, we flesh out our findings using model results to predict proportions childless varying field-level characteristics.

Our data and modelling approach allow us to empirically examine the institutional, selection, and intervening variable perspectives outlined earlier. To summarize:

(1) Following the institutional perspective, accommodations that reduce the cost of combining motherhood and employment weaken constraints on childbearing, implying that smaller motherhood employment penalties should be positively associated with first birth transitions.

(2) The selection perspective suggests that women choose fields of study based on factors that simultaneously predict earlier transitions to motherhood; for example, traditional family orientations or preferences for work in the (female-dominated) caring and helping professions. The gender composition of fields may further reflect mate availability, potentially resulting in nonlinearities in its relationship with fertility.

(3) Marriage timing may play a mediating role linking field of study and fertility, in particular, the per cent women married at 26 should be associated with earlier birth transitions.

These need not be competing explanations for the field-fertility link; all may be at play, some potentially offsetting, and others mutually reinforcing. Of course our measures are but rough

proxies for these various perspectives; we discuss their limitations in greater detail in the discussion section.

Data and method

Survey of Income and Program Participation

The SIPP is a multi-part U.S. survey conducted every four months via in-person interviews with all individuals over age 15 in the household (U.S. Census Bureau 2009). In 2001, 36,700 households were followed over 36 months; in 2004, 46,500 households were followed over 48 months. The 2008 SIPP followed 52,000 households over 40 months. The primary purpose of the SIPP is to gather information about sources of household income, but specific topical modules are also collected. We relied on the second topical module for retrospective fertility and marital histories and details about schooling, including degrees earned, timing of degree completion, and attributes of educational programmes. SIPP person weights account for differential nonresponse and panel attrition and are applied in all descriptive analyses.

We restricted our individual-level sample to female respondents born between 1960–79 (ages 20–48 at interview) who completed a four-year college degree by age 25 and were childless at degree completion (field-level characteristics were generated from somewhat broader samples, described in greater detail below). Excluding women who did not finish their degrees by age 25 resulted in a loss of about 15 per cent of the college-educated sample, and excluding those who had their first child before completing their degree resulted in an additional loss of 5 per cent. These restrictions produced a slightly more advantaged sample than the overall population of college graduates, limiting to some extent the generalizability of our results but ensuring that college field of study temporally preceded the transition to first birth. Pooling over the 2001, 2004 and 2008 SIPP's yielded a final sample of 8,895 women. We transformed the

dataset into a person-year file for our event history analysis, with one record for every year of age from degree to first birth, yielding 79,664 person-years.

The 1960–79 birth cohort provided a reasonably large sample of college-educated women and allowed us to follow some women to the end of their fertile years. Yet, this 20-year span represents a quite recent snapshot of college graduates and their fertility behaviours. The oldest of them were coming of age in the late 1970s, with increases in college enrolment, labour force participation, fertility postponement, and childlessness well underway (Bianchi 2000; Martin 2004; Goldin et al. 2006). We left out earlier cohorts whose experiences in school, work, and family were quite different (Goldin 2004).

National Longitudinal Survey of Youth (NLSY79)

The NLSY79 is a nationally representative panel study following nearly 13,000 men and women ages 14–21 in 1979, representing the 1958–65 birth cohort (U.S. Bureau of Labor Statistics 2008). The NLSY79 includes attitudinal measures that are not in the SIPP, but samples are considerably smaller (with just 1,258 female college graduates), making it difficult to examine fertility patterns across even broad fields of study. Supplementing our main data file with field-level attitudes from the NLSY79 allowed us to combine its richness with the large samples of the SIPP. We used a sample of 3,572 women who had some college experience and a reported college major by the 2008 wave. We collapsed the more detailed fields of study reported in the NLSY79 to match SIPP definitions.

Measures

Fertility. Women over age 15 were asked about their number of children ever born and the year of their first and final births. Lacking information on the timing of men's births or women's intermediate births, our analysis was restricted to women's first birth transitions.

Field of study. Individuals completing a Bachelor's degree indicated which of 18 major fields of study they undertook in school. We eliminated pre-professional majors, whose numbers were too small to analyse separately. We included data on the remaining 17 specific fields in our final models to maximize variation but collapsed them into 7 broader categories to describe field-level patterns: arts and humanities; education; general studies; health sciences; private and public administration; science and technology; and social sciences (see detailed description of fields in the appendix). These broad categories are consistent with definitions from past work (Hoem et al. 2006a, 2006b; Neyer and Hoem 2008; Van Bavel 2010). One limitation with this categorization, also pointed out in European studies, is that we were able to identify women in teaching only if they majored in education. It is possible that women in other fields, such as history or English, go on to attain teaching credentials.

Characteristics of field of study. We aggregated data on working-age college graduates (ages 21–55) from the 2001, 2004, and 2008 SIPP to generate all field-level characteristics except family role attitudes (which we derived from the NSLY79). The motherhood employment penalty was measured as the percentage point difference in labor force participation between mothers with children under five and all other women, measured as having at least some positive hours of work. Gender composition was measured simply as the per cent of men having graduated in a given field of study, entered as a quadratic to allow for nonlinearities in its association with fertility. Finally, the timing of early marriage was assessed by the per cent married at age 26.

We constructed field-level measures of family role attitudes using data on NLSY79 college-going women. Relevant questions were asked in 1979 and 1982; we relied on the 1979 questions when available and supplemented with information from 1982 in the case of missing

earlier reports. Respondents were asked to indicate their agreement to the following, ranging from *1* = strongly disagree to *4* = strongly agree: 1) a woman's place is in the home, not the office or shop, 2) a wife with a family has no time for outside employment; 3) employment of wives leads to more juvenile delinquency; 4) it is much better if the man is the achiever outside the home and the woman takes care of the home and family; 5) men should share the work around the house with women; 6) women are much happier if they stay home and take care of children. We reverse-coded item 5, dropped individuals missing 3 or more of the 6 items, and averaged over available items to generate an index of traditional family role attitudes ($\alpha = .91$), with higher values corresponding to more traditional family role attitudes. We included the standardized version of this index in multivariate models to facilitate interpretation, representing change in standard-deviation units. Because this measure comes from a different data source than our main analytic sample of women, it is likely to be measured with more error, which would tend to attenuate estimated effects. Women in the NLSY79 sample are also slightly older than the women in our main analytic sample. As attitudes were becoming more progressive over this period (Thornton et al. 1983), we may be capturing somewhat more traditional family role attitudes with the NLSY79. Nonetheless, barring rapid *differential* change in attitudes across fields, our measure should capture relevant field-level differences. Finally, we use a broader sample to estimate field-level family role attitudes, i.e., college-goers as opposed to college graduates. This yielded larger samples (3,572 observations versus 1,258) and thus more stable field-level estimates, and our results were not sensitive to sample definition.

Individual-level demographic controls. We generated time-invariant indicators for the respondent's race and ethnicity: non-Hispanic White, non-Hispanic Black, and Hispanic. We

also constructed a time-invariant quantitative variable for the year in which the respondent earned her Bachelor's degree to account for cohort differences in fertility patterns.

Multilevel event history model

We examined the timing of first birth with a discrete-time multilevel event history model that nests individual person-years within fields of study. Our baseline duration is a function of age, specified categorically to allow for flexibility in fertility patterns by age: 20–24, 25–29, 30–34, 35–39, and 40+. All models include time-invariant individual-level controls (race/ethnicity and year of degree) and field-level motherhood employment penalties, gender composition, and family role attitudes. Some models include field-level indicators for marriage timing. The model can be written as a basic logistic function, in terms of the log odds of a first birth:

$$\log [(p_{ijt} / (1 - p_{ijt})] = \gamma_{00} + \gamma_1 \mathbf{A}_t + \gamma_2 \mathbf{X}_{ij} + \gamma_3 \mathbf{Z}_j + \upsilon_{0j} \quad (1)$$

where p_{ijt} is the probability that individual i in field j has a first birth in person-year t. $\mathbf{A}_t$ is a vector representing the five age categories specified above, $\mathbf{X}_{ij}$ is a vector representing our time-invariant individual-level controls, and $\mathbf{Z}_j$ is a vector of field-level characteristics. These covariates are represented by fixed slopes γ_1, γ_2, and γ_3, respectively. γ_{00} is an overall intercept term, and υ_{0j} is a field-specific random error term with variance σ^2_μ, intended to capture heterogeneity across fields of study unexplained by our covariates (Teachman 2011).

We generated model-based predicted probabilities to illustrate results in more intuitive terms than logits or odds ratios. Applying estimated coefficients and sample means to a transformation of equation 1, we calculated age-specific predicted probabilities of first birth. We in turn multiplied these conditional probabilities to yield the predicted probability of having a first birth—the inverse of which is childlessness. Predicted age-specific birth probabilities from models run separately by field illustrate field differences in the timing of first birth, and estimates

of permanent childlessness (at age 44) from these same field-specific models demonstrate differences in the incidence of birth. Applying results from main models pooled over field, we altered values on field-level covariates to simulate variation in permanent childlessness based on different assumptions about the characteristics of fields. These simulations flesh out the substantive significance of key findings.

Results

Descriptive results

First birth timing and incidence. We ran field-specific discrete-time event history models of first birth to explore differences in the timing of fertility by field of study among women in our main analytic sample (timely college graduates who were childless at degree completion, born between 1960–79, ages 20–48 at interview). We regressed the logit of first birth on a cubic term for age to impose some structure on our descriptive results (weighting models and including no other controls). We used model estimates as just described to generate age-specific predicted probabilities of first birth, and we plot in Figure 1 the rate of childlessness at age 44. The figure shows that the lowest predicted rates of childlessness are among women in education and health, at 16.4 and 18.5 per cent, respectively. The highest rates are among women in arts and humanities and general studies, at 25.2 and 26.4 per cent. Childlessness among women in administration (22 per cent), science and technology (22.1 per cent), and social sciences (23.1 per cent) fall in the middle. Differences are generally statistically significant across these three clusters, and patterns overall are similar to those found in Europe. We also show the overall predicted rate of childlessness in our sample, at 22.4 per cent. This estimate is reasonably close to the 24 percent childless among U.S. college-educated women from the CPS cited above (U.S. Census Bureau 2010); the difference in estimates reflects differences in the measurement

approach, with ours a period-based estimate derived by cumulating age-specific rates of women progressing through their childbearing years, and the CPS a cohort estimate based on completed fertility of women 40-44 in 2008 (ours thus reflecting the fertility behavior of somewhat younger cohorts).

[Figure 1 about here]

Figure 2 shows more detail on patterns of childlessness, namely, how age-specific rates cumulate up to estimates of childlessness at age 44. The figure clearly shows that women in education and health make the earliest transitions to first birth, displaying higher birth probabilities than other college graduates until the early 30's, when probabilities fall and attain a similar slope as the other fields of study. Still, because these women make earlier transitions into childbearing, they remain more likely to have had a child at each age, and are less likely to be childless at age 44. Women in science and technology and public administration appear to make up for slower transitions to first birth with relatively high probabilities of birth in the mid to late 30's, resulting in moderate levels of childlessness. Women in the arts make relatively slow transitions to first birth without any obvious 'catch up' in the later years. In regression models not shown, we found that women in science and administration had significantly lower odds of a first birth compared to women in education only under the age of 30, while all other fields had significantly lower odds of having a first birth at all ages, compared to women in education.

[Figure 2 about here]

Field characteristics. Table 1 summarizes key characteristics of field of study that might account for the field-fertility association: motherhood employment penalties, gender composition, and traditional family attitudes. Fields are shown across the columns and measures are listed down the rows.

[Table 1 about here]

If high-fertility fields (i.e., education and health) are more accommodating of work-family balance, we should see smaller motherhood employment penalties. The data bear this out in part: The gap in employment between mothers with young children and all other women is lowest in health (9.2 percentage points), followed by education (12.3 percentage points). The education and health fields are heavily dominated by women (sixth row, Table 1), with men earning just 22.9 and 20.7 per cent of degrees, respectively. By contrast, the science and technology field is heavily dominated by men, with men earning 70.6 per cent of degrees. But for the difference between education and health, all differences in gender composition among broad fields are statistically significant. We found the per cent men in a field correlated positively with field-level traditional family role attitudes, with education and health (the most female-dominated fields) also scoring highest on traditional attitudes (1.98). Women in general studies, private and public administration, science and technology, and social sciences are all significantly less traditional in their family attitudes. Finally, women in education and health are more likely to be married at age 26, with 54.4 and 46.4 per cent married, respectively. This is significantly higher than the 37–39 per cent of women married at 26 in all other fields, consistent with the earlier first births and lower levels of childlessness in education and health.

Multivariate results

Table 2 reports odds ratios from our discrete-time multilevel event history models. Odds ratios indicate how changes in a given covariate are associated with changes in the odds of having a first birth, with values above 1 indicating a positive association and those below 1 a negative association. The top panel shows covariates at the individual level, including age, degree year, and race and ethnicity. The bottom panel shows field-level characteristics for 17 specific fields

(as opposed to the 7 used in our descriptive analysis above). The table presents three models: Model 1 includes only demographic information at the individual-level, Model 2 includes our key field-level measures, and Model 3 adds indicators of early marriage. All models include a random effect at the field level to allow for unobserved correlations within fields of study, and the standard deviation of this term (shown at the bottom of Table 2) represents heterogeneity across fields unexplained by controls.

[Table 2 about here]

Socio-demographic variables in Model 1 operate as expected (and change little across models): the odds of first birth are highest for women between ages 30–34, and Hispanic graduates are 1.3 times as likely to transition to motherhood at any given age, relative to non-Hispanic Whites (with the odds for Blacks statistically indistinguishable from Whites). Adding key field-level characteristics in Model 2, we find that motherhood employment penalties are not significantly associated with the odds of first birth, that is, our measure of work-family inflexibility does not appear to constrain family formation as expected. Model 2 further shows a statistically significant association between per cent men in a field and the odds of a first birth. The association, however, is not linear: the terms for per cent men suggest that the concentration of men in fields is negatively associated with first birth probabilities, but that the association declines at higher concentrations of men. As expected, we also find a positive association between traditional family attitudes and first birth probabilities. A one standard deviation increase in traditional attitudes is associated with a 6 per cent increase in the odds of a first birth.

Finally, Model 3 adds the field-level indicator for marriage timing, examining the extent to which field characteristics work through intervening life events. Not surprisingly, per cent married at 26 is strongly, positively associated with the odds of first birth. Accounting for field-

level marriage timing, per cent men drops to statistical insignificance, and the coefficient on traditional family attitudes drops in magnitude (although retains statistical significance). This suggests that these mechanisms may indeed operate at least in part through differences in marriage timing; in particular, it appears that marriage is important in accounting for the association between field-level gender composition and fertility.

As noted, all models include a random effect at the field level to allow for unobserved heterogeneity within fields of study, and standard deviations of this term are presented at the bottom of Table 2. With no field-level controls, the standard deviation of the random intercept at the field level is 0.14. Once we add our key field-level controls in Model 2, the standard deviation drops in half, to .078, indicating that field-level characteristics account for about half of the variation across fields of study. Finally, once we include the share of women married by age 26, the standard deviation drops to .023, indicating that our field-level controls account for the vast majority of the variation in timing of first birth across fields of study. For comparison, in a model controlling for age, education, and a country-level intercept but no field characteristics, Van Bavel (2010) reported a field-level standard deviation of 0.22, which changed little with additional field-level controls. The contrast provides some evidence of stronger field-level differences in Europe, but again the difference may be explained by Van Bavel's broader sample of women across education levels and countries.

Simulations

To illustrate our findings in more intuitive terms, we ran simulations of childlessness based on Model 2 (Table 2) results, before including marriage as an intervening mechanism. For each of our significant field-level variables, we generated predicted levels of childlessness at age 44, varying field-level characteristics at their minimum, median and maximum values and holding

all other covariates at their mean values. Figure 3 illustrates the results of this exercise. Modelling per cent men as a quadratic captures the non-linear relationship between the share of men in a field and timing to first birth. This is illustrated by the relatively high childlessness among women in fields at the median per cent men relative to those in fields at either the minimum (21 per cent men in health) or maximum (86 per cent men in engineering). The gap in rates of childlessness between the highest and lowest values of per cent men is only 2 percentage points, while the gap between the minimum and the median values is nearly 9 percentage points. Differences are larger when varying traditional family role attitudes, producing a gap in childlessness of 13 percentage points between the least traditional and the most traditional fields.

[Figure 3 about here]

Discussion

We set out to examine variation in the timing and occurrence of first births among U.S. college graduates by undergraduate field of study and, further, to explore potential mechanisms linking field-level differences to fertility. To our knowledge, this is the first U.S. study to provide a broad descriptive portrait of childbearing patterns by field of study. Previous research on U.S. fertility primarily focused on early births to women with little education (e.g., Edin and Kefalas 2005), or to fertility differences across education levels (e.g., Musick et al. 2009); little work has explored variation among college graduates (Goldin's work, e.g., 2004, is an exception). We argue that field-level variation is a useful dimension on which to analyse fertility patterns, as fields are chosen before childbearing for the vast majority of college graduates and offer insight into future career paths that may exert varying effects on fertility intentions and outcomes. We posited three key mechanisms to account for the association between field of study and fertility: 1) institutional factors as measured by field-level motherhood employment penalties; 2) selection factors as measured by gender composition and early family attitudes of field members; and 3)

intervening life events as measured by field differences in marriage timing. We further speculated that—beyond selection processes that should dampen fertility—a high share of men in a field could reflect greater mate availability and thus increase women's fertility (potentially in a nonlinear fashion) via earlier marriage. We drew primarily on the SIPP, taking advantage of large samples and detailed information on fertility, schooling, and employment to generate measures at both the individual and field levels. We supplemented our field-level indicators with data on family role attitudes from the NLSY79, measured before college major choice for most respondents.

In descriptive analyses, we found significant differences in the timing and occurrence of first births across fields of study. Women in education and health made the earliest transitions to motherhood, while women in science and technology appeared to follow a pattern of delay and catch-up. Women in education and health also had the lowest levels of childlessness at age 44, 10 percentage points lower than those majoring in arts and humanities and general studies. Childlessness among women in science and technology, social studies, and administration fell in the middle. These patterns are consistent with those reported in Europe (Lappegård 2002; Hoem et al. 2006b; Neyer and Hoem 2008), nonetheless we were surprised by the relatively high probabilities of first birth among women in science and technology, a field whose imbalanced gender composition receives considerable attention and sparks much debate in the United States (e.g., Ceci and Williams 2007).

We estimated multilevel event history models to assess the importance of field-level characteristics in accounting for individual-level variation in the transition to motherhood. Following the institutional perspective, we postulated that fields of study leading to jobs with smaller motherhood penalties, measured by employment differences between women with young

children and all other women, should impose fewer constraints on childbearing. These may reflect workplace accommodations that make it easier to combine work and family—and may signal to childless women information about the career costs of childbearing. We found little support for this perspective, at least as operationalized, with no significant association between motherhood employment penalties and first birth timing.

We used field-level gender composition and traditional family role attitudes to proxy individual characteristics like nurturance, preferences for working with people, and family orientations that potentially select women both into the 'caring' fields and earlier transitions to motherhood. Our measure of family role attitudes (generated from the NLSY79) was assessed early in the life course (at ages 14-21), largely before the potentially contaminating effects of college major, thus lending itself to a reasonably straightforward selection interpretation. Because this measure was generated from a different data source than our main analytic sample, it is likely measured with more error, which would tend to attenuate estimated effects. Still, we found that traditional family role attitudes were strongly associated with earlier transitions to motherhood, with simulations showing a 13-point difference in levels of childlessness between the least traditional and the most traditional fields, all else equal. Differences remained statistically significant when we included controls for field-level marriage patterns.

The gender composition of fields was also significantly associated with first birth timing, although both its empirical patterns and substantive interpretation are somewhat more complicated. We found a curvilinear relationship between per cent men in a field and motherhood: childlessness was higher in fields with middle-level shares of men than fields with either low or high shares. The curvilinear pattern is consistent with higher probabilities of first birth among women in science and technology, a field heavily dominated by men (over 70 per

cent male), relative to women in fields like arts and social sciences that are in the mid-range of per cent men (about 40 per cent). Van Bavel (2010) reported a negative relationship between per cent men and first birth transitions across Europe, but no account was taken of potential nonlinearities, and exceptions to the general rule of higher fertility in more female-dominated fields have been discussed elsewhere (e.g., Hoem 2006b). We noted earlier the possibility that a high share of men may reflect selection processes, but may also mean greater mate availability and a marriage market that clears faster for women. For example, the presence of a large number of men with similar interests may result in women in science and technology marrying earlier than women in fields with moderate shares of male graduates. Approximately 40 per cent of women in science and technology were married at age 26—higher than those in arts and humanities, general studies, or social sciences. The share of men in a field could further reflect differences in the link between fields and subsequent careers unaccounted for by other controls. For example, a tight link between fields and predictable, stable career paths might explain the relatively low levels of childlessness among women in science and technology (despite its low representation of women) (Hoem 2006b; Goldin and Katz 2008b).

Our results suggest an important role of marriage timing in mediating the link between field of study and fertility, with early marriage associated with earlier transitions to first birth. Early marriage appears to account fully for the relationship between gender composition of fields and fertility. Controlling for the per cent married by age 26 in Model 3, the per cent men in the field dropped to statistical insignificance, and the coefficient on field-level family role attitudes dropped in magnitude (although remained statistically significant). Indeed, given very low rates of nonmarital fertility among U.S. college graduates, it is not surprising that field characteristics operate in substantial part through marriage timing.

The United States ranks low relative to Europe in work-family policies such as paid leave and subsidised child care, and high in terms of flexibility in educational systems and labour markets (e.g., Gornick and Meyers 2003; Mandel and Semyonov 2006, 2009; Goldin and Katz 2008a). But despite these differences, our findings are largely in line with European studies (e.g. Hoem et al. 2006a, 2006b, Neyer and Hoem 2008, Van Bavel 2010). That is, the pattern of childlessness across fields of study is similar, although the magnitude of differences across fields appears narrower in the United States. For example, in the United States, the lowest estimated levels of childlessness were among women in education and health (16.4 and 18.5 per cent, respectively) and the highest were among women in arts and general studies (25.2 and 26.4 per cent, respectively), resulting in a gap across fields of 10 percentage points. By contrast, the analogous comparison in Sweden is approximately 10 per cent childless in education and health versus 30 per cent in the arts and humanities, for a gap of 20 percentage points (Hoem et al 2008b).

We rely on rich sources of data with relatively large samples, providing the best evidence to date on U.S. fertility differences across fields and the mechanisms potentially at play. Nonetheless, there are limitations to our data and approach. We found some support for institutional and selection mechanisms; causal pathways, however, are clearly difficult to sort out. The SIPP contains limited individual-level characteristics relevant to fertility decisions, and these unobserved characteristics may confound our estimates of field-level associations. Our measures at the field level are only proxies for the mechanisms potentially linking fields and fertility. For example, we used motherhood employment penalties to assess institutional features of the jobs characteristic of fields, but a more nuanced examination would include more direct field-level indicators such as parental leave policies, job flexibility, and other aspects of working

conditions (unmeasured by the SIPP). Further, field-level characteristics are in large part themselves proxies for future career paths, and fields likely differ in the heterogeneity of pursuits following college graduation.

Relatively little research has been devoted to the increasingly distinct fertility behaviour of U.S. college graduates. We focused here on variation in the fertility patterns of college graduates by field of study in an attempt to address this limitation. Our findings lend support to the notion that women choose fields of study based on factors that simultaneously predict earlier transitions to motherhood, namely, traditional family orientations. Our findings also highlight the importance of marriage timing in accounting for differential patterns of fertility across fields of study. This analysis serves as a starting point for better understanding the interplay between the institutional factors that potentially constrain or facilitate family formation and the selection factors that shape women's outlooks on work and family.

References

Becker, Gary. 1981. *A Treatise on the Family*. Boston: Harvard University Press.

Bianchi, Suzanne. 2000. Maternal employment and time with children: Dramatic change or surprising continuity?, *Demography* 37: 401–414.

Billari, Francesco and Hans-Peter Kohler. 2004. Patterns of low and lowest-low fertility in Europe, *Population Studies* 58(2): 161–176.

Brewster, Karen L. and Ronald R. Rindfuss. 2000. Fertility and women's employment in industrialized countries, *Annual Review of Sociology* 26: 271–296.

Bhrolcháin, Máire Ní and Éva Beaujouan. 2012. Fertility postponement is largely due to rising educational enrolment, *Population Studies: A Journal of Demography* 66(3): 311–327.

Buchmann C, and T. A. DiPrete. 2006. The growing female advantage in college completion: The role of family background and academic achievement, *American Sociological Review* 71(4): 515–541.

Carlson, Marcia, Sarah McLanahan, and Paula England. 2004. Union formation in fragile families, *Demography* 41(2): 237–261.

Ceci, Stephen J. (Ed) and Wendy M. Williams (Ed). 2007. *Why aren't more Women in Science: Top Researchers Debate the Evidence*. Washington, DC, US: American Psychological Association. xx, 254 pp.

Ceci, Stephen J., Wendy M. Williams, and Susan M. Barnett 2009.Women's underrepresentation in science: Sociocultural and biological considerations, *Psychological Bulletin* 135(2): 218–261.

Diprete, Thomas A., S. Philip Morgan, Henriette Engelhardt, and Hana Pacalova. 2003. Do cross-national differences in the costs of children generate cross-national differences in fertility rates?, *Population Research and Policy Review* 22: 439–477.

Edin, Kathryn and Maria Kefalas. 2005. *Promises I Can Keep: Why Poor Women Put Motherhood Before Marriage*. Berkeley: University of California Press.

Ellwood, David and Christopher Jencks. 2004. The spread of single-parent families in the United States since 1960, *KSG Working Paper* No. RWP04–008.

England, Paula. 1992. *Comparable Worth: Theories and Evidence.* Hawthorne, NY: Aldine de Gruyter.

Fan, Pi-Ling and Margaret Marini. 2000. Influences on gender-role attitudes during the transition to adulthood, *Social Science Research* 29: 258–283.

Folbre, Nancy. 2010. Why girly jobs don't pay, Economix *New York Times*. 8/16/2010. http://economix.blogs.nytimes.com/2010/08/16/why-girly-jobs-dont-pay. Viewed on 9/17/2010.

Fortin, Nicole M. 2008. The gender wage gap in the United States: The importance of money vs. people, *Journal of Human Resources* 43(4): 884–918.

Furstenberg, Frank E. Jr. 2003. Teenage childbearing as a public issue and private concern, *Annual Review of Sociology* 29: 23–39.

Glass, Jennifer and Valerie Camarigg. 1992. Gender, parenthood, and job-family compatibility, *American Journal of Sociology* 98: 131–151.

Goldin, Claudia. 2004. The long road to the fast track: Career and family, *The Annals of the American Academy of Political and Social Science* 596: 20–35.

Goldin, Claudia. 2006. The quiet revolution that transformed women's employment, education, and family, *AEA Papers and Proceedings* 96(2): 1–21.

Goldin, Claudia, Lawrence F. Katz, and Ilyana Kuziemko. 2006. The homecoming of American college women: The reversal of the gender gap in college, *Journal of Economic Perspectives* 20: 133–156.

Goldin, Claudia and Lawrence F. Katz. 2008a. *The Race Between Education and Technology*. Cambridge, Massachusetts: Harvard University Press. pp. 247–284.

Goldin, Claudia and Lawrence F. Katz. 2008b. Transitions: Career and family life cycles of the educational elite, *American Economic Review: Papers and Proceedings* 98(2): 363–369.

Gornick, Janet C., Marcia K. Meyers, and Katherin E. Ross. 1997. Supporting the employment of mothers: Policy variation across fourteen welfare states, *European Social Policy* 7(1): 45–70.

Gornick, Janet C. and Marcia K. Meyers. 2003. *Families that Work: Policies for Reconciling Parenthood and Employment*. New York: Russell Sage Foundation.

Hakim, Catherine. 2000. *Work-Lifestyle Choices in the 21st Century*. Preference theory. Oxford: Oxford University Press.

Hoem, Jan M., Gerda Neyer, Gunnar Andersson. 2006a. Education and childlessness: The relationship between educational field, educational level, and childlessness among Swedish women born in 1955–59, *Demographic Research* 14(15): 331–380.

Hoem, Jan M., Gerda Neyer, and Gunnar Andersson. 2006b. Educational attainment and ultimate fertility among Swedish women born in 1955–59, *Demographic Research* 14(16): 381–404.

Joshi, Heather. 2002. Production, reproduction, and education: women, children, and work in a British perspective, *Population and Development Review* 28(3): 445–474.

Kennedy, Sheela and Larry Bumpass. 2011. Cohabitation and trends in the structure and stability of children's family lives. Paper Presented at the Annual Meeting of the Population Association of America, Washington, DC.

Lappegård, Trude. 2002. Educational attainment and fertility patterns among Norwegian women, Statistic Norway, Department of Social Statistics. http://www.ssb.no/emner/02/02/10/doc_200218/doc_200218.pdf. Viewed 9/17/2010.

Lappegård, Trude and Marit Rønsen. 2005. The multifaceted impact of education on entry into motherhood, *European Journal of Population* 21: 31–49.

Mandel, Hadas. 2010. Winners and losers: The consequences of welfare state policies for gender wage inequality, *European Sociological Review.* 0(0):1–22.

Mandel, Hadas and Moshe Semyonov. 2006. A welfare state paradox: State intervention and women's employment opportunities in 22 countries, *American Journal of Sociology* 111(6): 1910–1949.

Mandel, Hadas and Michael Shalev. 2009a. How welfare states shep the gender pay gap: A theoretical and comparative analysis, *Social Forces* 87(4): 1873–1911.

Mandel, Hadas and Michael Shalev 2009b.Gender, class and varieties of capitalism, *Social Politics.* 16(2): 161–181.

Martin, Steven P. 2004. Delayed marriage and childbearing: Implications and measurement of diverging trends in family timing, in Kathryn Neckerman (ed.), *Social Inequality*, New York: Russell Sage, pp. 79–119.

Martín-García, Teresa, and Pau Baízan. 2006. The impact of the type of education and of educational enrollment on first births, *European Sociological Review* 22(3): 259–275.

McLanahan, Sara. 2004. Diverging destinies: How children are faring under the second demographic transition, *Demography* 41(4): 607–627.

Misra, Joya, Michelle Budig, and Irene Boeckmann. 2011. Work-family policies and the effects of children on women's employment and earnings, *Community, Work and Family*. 14(2): 139–157.

Morgan, Kimberly J. 2005. The 'production' of child care: How labour markets shape social policy and vice versa, *Social Politics* 12 (2): 243–263.

Morgan, S. Philip. 2003. Is low fertility a twenty-first century demographic crisis?, *Demography* 40(4): 589–603.

Morgan, S. Philip and Miles G. Taylor. 2006. Low fertility at the turn of the twenty-first century, *Annual Review of Sociology* 32: 375–399.

Musick, Kelly, Paula England, Sarah Edgington, and Nicole Kangas. 2009. Education differences in intended and unintended fertility, *Social Forces* 88(2): 543–572.

Neyer, Gerda and Jan M. Hoem. 2008. Education and permanent childlessness: Austria vs. Sweden. In: Surkyn, J., J. van Bavel and P. Deboosere (eds). *Demographic Challenges for the 21st Century. A Tribute to the Continuing Endeavours of Prof. Dr. Em. Ron Lesthaeghe in the Field of Demography*. Brussels: VUB Press.

Oppenheimer, Valerie Kincade, Matthijs Kalmijn and Nelson Lim. 1997. Men's career development and marriage timing during a period of rising inequality, *Demography* 34: 311–330.

Pettit, Becky and Jennifer L. Hook. 2009. *Gendered Tradeoffs: Family, Social Policy, and Economic Inequality in Twenty-One Countries.* New York: Rusell Sage Foundation.

Ribar, David C. 1999. The socioeconomic consequences of young women's childbearing: reconciling disparate evidence, *Journal of Population Economics* 12: 547–565.

Rindfuss, Ronald R., S. Philip Morgan, and Kate Offutt. 1996. Education and the changing age pattern of American fertility: 1963–1989, *Demography* 33(3): 277–290.

Rindfuss, Ronald R., Karen Benjamin Guzzo, and S. Philip Morgan. 2003. The changing institutional context of low fertility, *Population Research and Policy Review* 22: 411–438.

Sassler, Sharon, Jennifer Glass, Yael Levitte, and Katherine Michelmore. 2011. The missing women in STEM: Accounting for gender differences in entrance into STEM occupations, *Population Association of America Presentation* 2011.

Teachman, Jay. 2011. Modeling repeatable events using discrete-time data: Predicting marital dissolution, *Journal of Marriage and Family* 73: 525–540.

Thornton, Arland, Duane F. Alwin, and Donald Camburn. 1983. Causes and consequences of sex role attitudes and attitude change, *American Sociological Review* 48: 211–227.

United States Bureau of Labor Statistics. 2008. National Longitudinal Survey of Youth 1979 user's guide. Washington D.C.: http://www.nlsinfo.org/nlsy79/docs/79html/tableofcontents.html. Viewed on 6/12/2012

United States Census Bureau. 2009. Survey of Income and Program Participation user's guide chapter 2, `revisions. Washington D.C.: http://www.census.gov/sipp/usrguide/ch2_nov20.pdf. Viewed on 6/12/2012.

United States Census Bureau. 2010. *Fertility of American Women: 2008*, Table 2: Completed fertility for women 40 to 44 years old by selected characteristics: June 2008.

Van Bavel, Jan. 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.

Waldfogel, Jane. 2001. International Policies Toward Parental Leave and Child Care, *Future of Children* 11(1): 99–111.

Table 1. Characteristics of U.S. collegiate fields of study, aggregated data from the 2001, 2004, and 2008 Survey of Income and Program Participation and the 1979 National Longitudinal Survey of Youth

	Arts and humanities	Education	General studies	Health sciences	Private and public administration	Science and technology	Social sciences
2001, 2004, 2008 Survey of Income and Program Participation							
Motherhood employment penalty	15.70	12.30	13.90	9.20	15.80	15.20	16.30
Per cent men	42.20	22.90	50.20	20.70	55.80	70.60	36.70
Per cent married by 26	37.00	54.40	37.20	46.40	39.00	39.80	37.20
1979 National Longitudinal Survey of Youth							
Traditional family attitudes	1.92	1.98	1.88	1.98	1.92	1.86	1.85
Number of Observations	2,586	3,100	3,166	1,527	3,555	2,183	2,103

Source: 2001, 2004, and 2008 Survey of Income and Program Participation (SIPP) and the 1979 National Longitudinal Survey of Youth (NLSY79). SIPP women ages 21–55 completing at least a Bachelors degree as of SIPP interview. NLSY79 women ages 14–21 in 1979 completing at least some college by the 2008 interview.

Note: Motherhood employment penalty calculated as the difference in labor force participation rates between women with children under the age of five and all other women in each field. Per cent men and motherhood employment penalty are calculated using 2001, 2004 and 2008 SIPP sample of college graduates aged 21–55. Attitudes from the NLSY79 measured in 1979, when individuals were 14–21 years old. 1982 attitudes were used in case 1979 values were missing.

Table 2. Results from discrete-time event history models, U.S. college-educated women born 1960–79, aged 21–48, odds ratios

	M1: Demographics		M2: Field characteristics		M3: Full model	
Individual characteristics						
Degree year	0.998		0.998		0.998	
	(0.003)		(0.003)		(0.003)	
Race (White non-Hispanic omitted)						
Black, non-Hispanic	0.957		0.960		0.963	
	(0.058)		(0.058)		(0.058)	
Hispanic	1.289	***	1.290	***	1.290	***
	(0.105)		(0.105)		(0.105)	
Age 20-24	0.207	***	0.207	***	0.207	***
	(0.010)		(0.010)		(0.010)	
Age 25-29	0.652	***	0.652	***	0.652	***
	(0.022)		(0.022)		(0.022)	
Age 30-34 (reference)						
Age 35-39	0.648	***	0.647	***	0.647	***
	(0.037)		(0.037)		(0.037)	
Age 40+	0.184	***	0.184	***	0.184	***
	(0.026)		(0.026)		(0.026)	
Field of study characteristics						
Motherhood employment penalty			1.000		1.000	
			(0.008)		(0.006)	
Per cent men			0.974	***	0.998	
			(0.007)		(0.007)	
Per cent men squared			1.000	***	1.000	
			(0.000)		(0.000)	
Per cent women married by age 26					1.020	***
					(0.004)	
Traditional family attitudes (from NLSY79)			1.058	**	1.042	**
			(0.025)		(0.019)	
Random effects intercepts						
Field of study (standard deviation)	0.143		0.078		0.023	
Wald Chi2 (df)	1123.9		1142.75		1239.91	
Observations	79,664		79,664		79,664	

Source: 2001, 2004 and 2008 Survey of Income and Program Participation, sample of timely female college graduates with no children at degree completion, women born between 1960–79.

Note: Gender role attitudes are based off of 6 questions in the 1979 National Longitudinal Survey of Youth regarding attitudes towards family roles. See text for description of questions. Scale runs from 1–4 with higher values indicating more traditional family role attitudes. Measure was then standardized for ease of interpretation. A one-unit increase in the traditional family role attitudes represents a one standard deviation increase in traditonal family role attitudes. * p<.10 **p<.05 ***p<.01

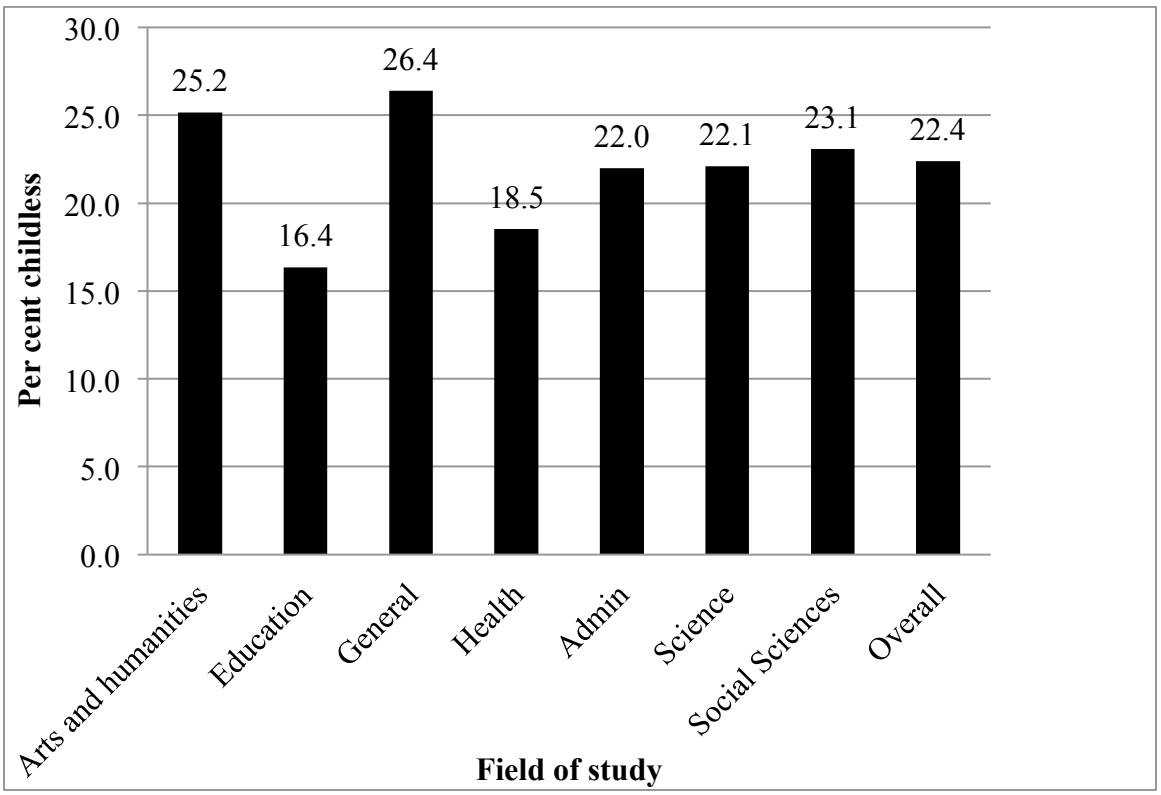

Figure 1. Predicted probabilities of childlessness for U.S. college-educated women by field, derived from field-specific discrete time event history models of first birth

Sources: 2001, 2004 and 2008 Survey of Income and Program Participation, sample of timely female college graduates with no children at degree completion, women born between 1960–79.

Note: Separate, weighted models run for each field of study. Logit of first birth regressed on cubic function of age.

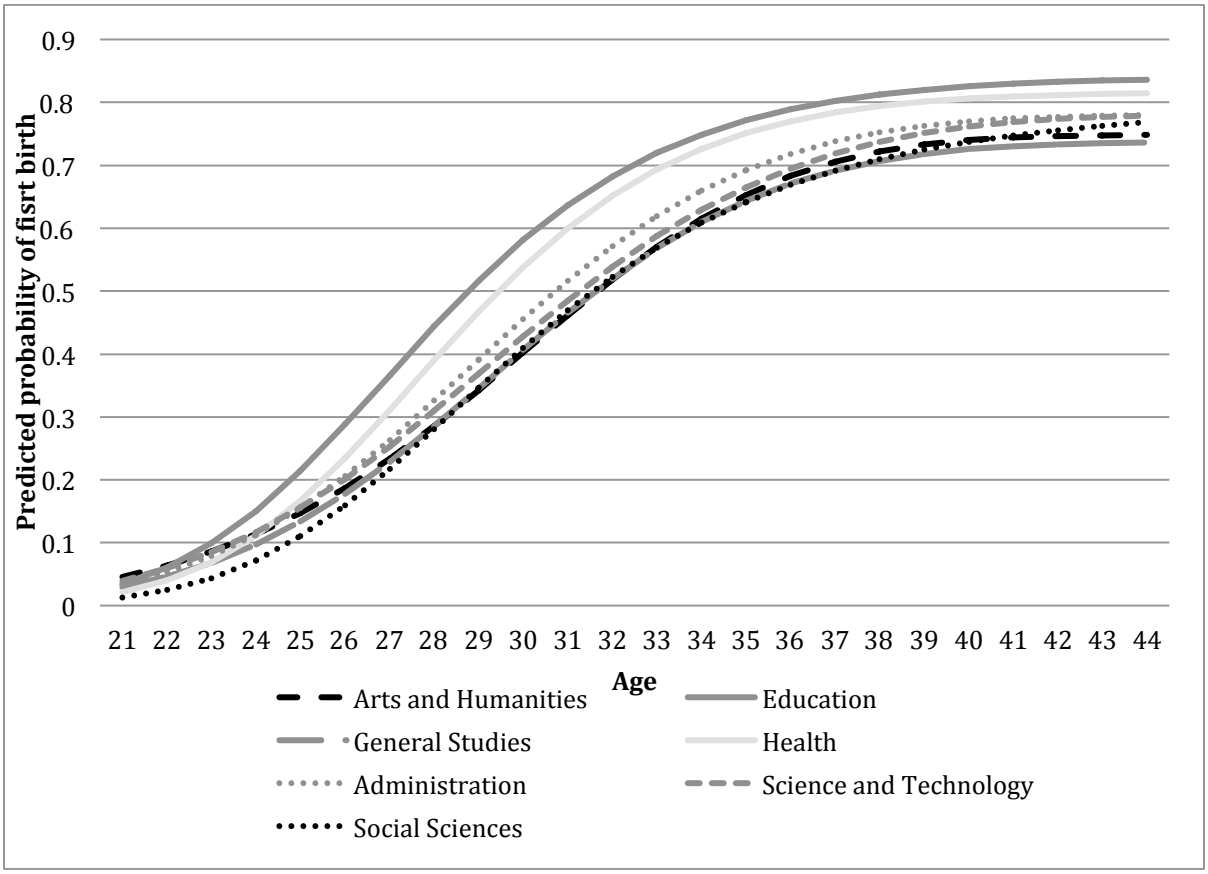

Figure 2. Cumulated predicted probabilities of first birth for U.S. college-educated women by age and field, derived from field-specific discrete time event history models of first birth

Sources: 2001, 2004 and 2008 Survey of Income and Program Participation, sample of timely female college graduates with no children at degree completion, women born between 1960–79.

Note: Separate, weighted models run for each field of study. Logit of first birth regressed on cubic function of age.

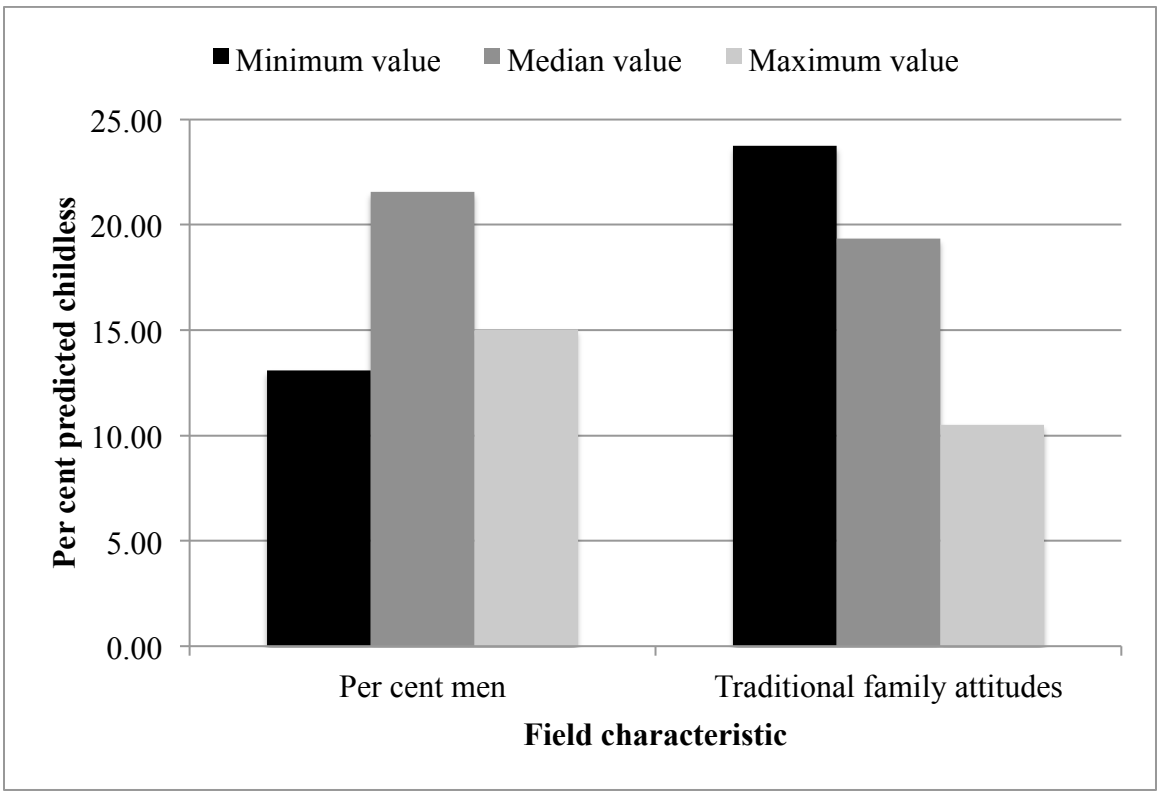

Figure 3. Predicted probability of childlessness at age 44 for U.S. college-educated women derived from Model 2, varying key field-level characteristics.

Source: 2001, 2004 and 2008 Survey of Income and Program Participation, sample of timely female college graduates with no children at degree completion, women born between 1960–79.

Note: Estimates generated from Model 2 in Table 2. Field-level characteristics in turn set to their minimum, median, and maximum values while all other covariates held at their mean values.

Appendix. Detailed fields of study, grouped by broad field

Specific Field	Broad Field
Art/Architecture	Arts and humanities
Literature	Arts and humanities
Foreign language	Arts and humanities
Liberal arts	Arts and humanities
Theology	Arts and humanities
Education	Education
General studies	General studies
Health sciences	Health sciences
Business	Private and public administration
Communications	Private and public administration
Agriculture	Science and technology
Computers and IT	Science and technology
Engineering	Science and technology
Mathematics	Science and technology
Natural and biological sciences	Science and technology
Psychology	Social sciences
Social sciences	Social sciences

Source: 2001, 2004, and 2008 Survey of Income and Program Participation. Fields in the first column indicate the 17 specific fields of study included in the survey questionnaire and used in our models. The second column created to illustrate broader patterns.