Attitudes and Low Fertility: Reflections based on Danish Twin Data

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Introduction

Attitudes about childbearing clearly matter for fertility patterns in the United States. This relevance of attitudes for childbearing is convincingly demonstrated by Barber & Axinn (2003) by combining theoretical support from Fishbein and Aizen's framework on "reasoned action and planned behavior" (Fishbein & Ajzen, 1975) with fascinating empirical findings based on the Detroit Intergenerational Panel Study of Parents and Children. Some of the key findings presented by Barber & Axinn include: (*a*) attitudes toward children and childbearing are strong predictors of first-birth timing, with positive attitudes increasing and negative attitudes decreasing birth rates; (*b*) the influence of attitudes towards children and childbearing is limited to maritally conceived first birth; (*c*) some attitudes seem to influence the first-birth rates of women but not that of men; (*d*) positive attitudes towards behaviors that compete with childbearing reduce fertility, specifically premarital fertility; (*e*) while education experiences explain part of the effect of attitudes on premarital fertility, early adulthood experiences do not seem to provide much of the impact of attitudes on marital childbearing behavior. Most of the impact of the impact of attitudes toward childbearing on marital childbearing is therefore net of experiences with school, cohabitation, marriage and work. These findings are consistent with other studies on attitudes, norms and demographic behavior (e.g., Lesthaeghe, 2002). In addition, the analyses in Barber & Axinn (2003) provide a nice contrast to some of the ideational-change literature that argues that shifts towards postmodern family preferences (e.g., van de Kaa, 2001), or postmodern value orientation, favor primarily reductions in fertility. While Barber & Axinn acknowledge that changes in attitudes towards childbearing have contributed to the fertility decline in the U.S. in recent

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decades, they perceive changes in attitudes less unidirectional. Future trends may see a reversal of ideational change to more traditional value orientations (see also Lesthaeghe & Moors, 1995) as well as movements that discourage behaviors, such a premarital sexual activity, that are frequently seen as defining features of "modern" demographic behavior (e.g., Bearman & Brückner, 2002).

Barber & Axinn (2003), as well as other studies in the literature, leave few doubts about the association of attitudes with variation in childbearing patterns. This association is particularly important during the demographically dense years in yearly adulthood when formal education, partnerships formation, entry into the labor market and children compete for the time and attention of young adults. These years during young adulthood have also been the focus of attempts to understand lowest-low fertility levels with total fertility rates below 1.3 (Kohler et al., 2002), where social interaction processes—in part related to the formation and transformation of norms and attitudes regarding the timing of childbearing—have been emphasized as a mechanism leading to the rapid delay in childbearing that occurs across many European and other developed countries. Similarly, Barber & Axinn argue that changes in the attitudes towards childbearing have been a relevant factor in the decline of fertility in the U.S. during the last decades. The dynamics of future changes in attitudes and preferences for childbearing may therefore be an important determinant of potential limits to the decline of fertility, and of variation in fertility levels across developed countries (for a related discussion, see Morgan & King, 2001). Understanding the variation of attitudes within populations and the transformation of attitudes over time and/or across cohorts, therefore, has the potential to provide an important link towards understanding patterns of low fertility and their potential future developments. Barber & Axinn (2003) state several mechanisms that lead to this variation in attitudes across individuals or over time, including (*a*) the family of origin and specifically parent's attitudes regarding family, children and the relevance of female career orientation, (*b*) the behavior of parents and siblings with respect to fertility, marriage, divorce, etc., (*c*) the attitudes and behaviors of peers, (*d*) the life experiences of young adults during the transition to adulthood, (*e*) the structure and opportunities of the social, economic and institutional context, and (*f*) biological factors such as hormone levels or genetic dispositions.

There are some obvious problems or concerns that are arise in the type of analyses that are discussed in Barber & Axinn (2003), and these issues potentially complicate inferences about the relevance of attitudes and their long-term implications. As the authors are well aware of, problems in assessing the role of attitudes in their analyses—as well as in many other studies—include, for instance, the difficulties of assessing (*a*) the causal contribution of attitudes on behavior, especially given the fact that some attitudes are likely to be affected by the socioeconomic context as well as past and/or anticipated experiences during the life-course,

(*b*) the contribution of attitudes on fertility behavior net of other influences such as changes in female wages, the returns to human capital or other socioeconomic determinants of fertility and related behavior, and (*c*) the determinants of past or future dynamics of attitude changes. Addressing these issues is very challenging, and Barber & Axinn can hardly be criticized for not resolving more empirical concerns as they already have. There study is already based on a remarkable multi-generation longitudinal dataset that has become a bench-mark for other researchers interested in studying attitudes and demographic behavior. In Europe, for instance, where the concept of the Second Demographic Transition leading to a transformation of values towards more individualistic and post-materialistic orientations is often used to explain low fertility (Lesthaeghe & van de Kaa, 1986; van de Kaa, 1987), no comparable data exist to study the role of attitudes in similar detail. Future data collection as part of the Gender and Generations Program (GGP), which are strongly inspired by the Detroit Intergenerational Panel Study of Parents and Children, may overcome this limitation and provide possibilities for comparative cross-country research on attitudes and childbearing in low fertility contexts.

Instead of providing additional reviews or empirical analyses on the connection between attitudes and fertility behavior, I present in these comments to Barber & Axinn some specific perspectives on low fertility and the potential role of attitudes that are based on my work using Danish twin data. The first set of analyses further investigates the mechanisms through which parents influence the fertility of their children, with a specific focus on the distinction between influences mediated by socialization in the household and influences due to genetic dispositions. While this study does not draw explicitly on attitudinal data, the underlying mechanisms of this intergenerational transmission likely to be closely connected with the intergenerational transmission of attitudes, personality traits and preferences. The second set of analyses focuses on the relation between subjective well-being and fertility behavior. On the one hand, subjective well-being is partially a relatively stable characteristic of individuals that is closely related to personality traits; on the other hand, subjective well-being is affected by the partnership and childbearing experiences during adulthood and respondent's reports about happiness reflect differential experiences. The analyses can therefore reveal the extent to which children affect happiness at different parities, which in turn illuminates some of the underlining motivations to have children and the attitudes that may be supportive of childbearing at different parities.

The institutional conditioning of parental influences

Parents are an important factor contributing the the formation of norms and attitudes early in life, and the effect of these norms and attitudes exerts important influences on the demographic behavior during the transition to adulthood. This importance of parents in this contexts stems from two pathways of intergenerational transmission. First, the parental household contributes to the formation of attitudes through socialization and social control. The former refers to the fact that parents influence children's attitudes and preferences; that is, through socialization parents shape how children would like to behave. The latter refers to the fact that parents provide incentives and constraints for their children's behavior to make them behave in ways that parents find appropriate. Second, parents have an important influence on attitudes through biological inheritance. This biological pathway is clearly much less controlled by parents, but it may nevertheless be of considerable relevance. For instance, personality traits, childbearing motivation and fertility expectations have been shown to have an important genetic etiology (e.g., Bouchard, 1994; Bouchard & McGue, 2003; Miller et al., 2000; Rodgers & Doughty, 2000), and personality traits have also been directly linked to childbearing motivations (Miller, 1992).

This dual influence of the parents on the attitudes and demographic behavior immediately suggests the question of about the relative contributions: Which pathway, transmission through socialization in shared environments or transmission through genetic dispositions, is more important? Twins studies provide one possibility to address this relative importance of shared environments—including the effects of the shared socialization in the same household—and genetic dispositions on behavior. Some of our earlier research on this topic (e.g., Kohler et al., 1999) suggests that the answer to this question is "it depends". The relative contribution of these pathways is contingent on the demographic context, and the changes in fertility and marriage behavior in recent decades in Denmark have been associated with a transformation of how nature and nurture contribute to variation in fertility. Our prior studies, however, have primarily focused on complete fertility. Since attitudes are an important determinant of fertility behavior in early adulthood, it is important to investigate separately the patterns of early fertility, that is, fertility behavior that in concentrated in the early years of adulthood and occurs relatively soon after the separation from the parental household. In Kohler et al. (2003) we therefore follow up on some of our earlier studies with a particular focus on early fertility. This focus on early fertility matches the focus in Barber & Axinn (2003) on the first birth, and it is also important because early adulthood constitutes a period when attitudes are particularly likely to influence fertility behaviors.[1]

[Figure 1 about here.]

The analyses use the female twins cohorts born 1945–68 from the Danish Twin Register (Kyvik et al., 1996, 1995). Figure 1 present the results of the behavior genetic analyses of the *level of early fertility*, defined as the number of children at the age at which 25 per cent of cohort members have had a first child. Fertility in our analyses is therefore measures around age 21 for the female cohorts born in 1945, and around age 25 for the cohort born in 1968. This indicator of early fertility has the advantage that it is not affected by the delay in childbearing and reflects the same notion of early fertility across cohorts: it indicates that a woman belongs to the first in her birth cohort who have any children.[2] The figure shows that a substantial fraction of the variation in early fertility among women, between 60% (cohorts 1945–52) and 43% (cohorts 1961–68), is due to individual-specific experiences of the twins. The remaining fraction is related to influences mediated by the parents, comprising both social and genetic pathways. This fraction attributed to parents has not changed substantially across the cohorts 1945–68. Most importantly, however, the results in Figure 1 reveal a striking transformation in the relative contributions of social and genetic factors to the determinants of early fertility behavior: For female cohorts born 1945–52, shared environmental factors constitute the most important influence that leads to within-cohort variation in the level of early fertility, and heritable factors are virtually absent. This pattern reverses for the female cohorts born 1961–68. Genetically-mediated differences among individuals emerge as the most important determinant of within-cohort variation in the level of early fertility, and the influence of shared environmental factors vanishes almost completely.

The Danish female twin cohorts born 1945–68, which underlie our investigation of early fertility in Figure 1, attained early adulthood during a period during which the societal context of early demographic behavior was profoundly transformed as part of the Second Demographic Transition. For instance, during the period from 1960 to 1995, the mean age at first birth in Denmark increased from 23.1 to 27.5 years, the proportion of out-of-wedlock births increased from 7.8 per cent to 46.5 per cent, and cohabitation prior to marriage has become commonplace (Eurostat, 1998; Knudsen, 1993). The cohorts born around 1945 experienced merely the beginning of this transformation in early adulthood, as the youngest cohorts in our study (born 1968) faced a social and demographic context of early fertility that differed substantially from that experienced by their predecessors born 23 years earlier. In the presence of strong social and normative influences of fertility and marriage behavior, as well as in the presence of tight economic conditions that restrict individuals' choices in early demographic behavior, genetic influences on fertility precursors may not translate to genetic influences on fertility outcomes. In these situations the socioeconomic and cultural

context of early fertility is likely to dominate in demographic outcomes. This environmental pressure leaves little room for genetically-mediated differences to express themselves in early fertility behavior. As a consequence, heritability h^2 is low, while shared environmental influences c^2 are of considerable relevance. This "constraint" on genetic influences exerted by the environment is likely to lessen during the second demographic transition and the trend towards low fertility. For instance, Udry (1996, p. 335) predicted this interaction between the importance of biological factors and the societal context argued that low-fertility societies are better suited for studying biological factors: "Low-fertility societies provide wide behavior choice. Where behavior choice is broad and opportunities are egalitarian, biological variables, reflecting natural differences in behavioral dispositions, explain increasing variations in behavior. Applications of this principle to demographic research suggests that, increasingly, gendered behavior, fertility, contraception, abortion, nuptiality, occupational choice and other behaviors of interest to demographers will be influenced by biological choice."[3]

The findings in Figure 1 are consistent with a strong influence of parents on the early childbearing experiences of their children. The sum of shared-environmental and genetic influences on early fertility is substantial, and it is even larger in the younger cohorts as compared to the older cohorts. Although we cannot identify this in our study, an important aspect of this variation may be related to attitudes towards childbearing, attitudes towards competing behaviors such as professional careers, and fertility preferences. The above results, however, seem to suggest an important shift in the pathways through which this influence operates. Socialization has lost relevance in the younger cohorts born (1961–68) as compared to the older cohorts (born 1945–52), while genetic factors have increased in importance. While the influence of parents on variation in early fertility in these Danish cohorts, therefore, has not diminished, the extent to which parents consciously affect the early childbearing experiences of their children has diminished: biological pathways are mostly outside the conscious control of parents.[4] In terms of the research on attitudes, this finding suggests that attitudes that are closely linked to relatively stable personality traits, for instance extraversion or agreeableness, gain in importance for childbearing behavior in young cohorts, while some attitudes that are more closely related to processes of socialization may loose relevance.

Attitudes and low fertility: Do children provide happiness?

In this section we turn our attention from the variation in fertility across individuals to the determinants and consequences of fertility and its potential implications for subjective well-being. These analyses are linked to the studies in Barber & Axinn on the role of attitudes for childbearing, but they approach the

issue from a different perspective. In particular, instead of investigating the role of attitudes on childbearing from the null-hypotheses that these influences are absent, one could equally ask the question of why the attitudes matter *so little* for childbearing. For instance, while period fertility started to drop significantly below replacement fertility during the 1970s and 1980s, most fertility surveys, value studies and opinion polls have found that the number of children considered ideal for society or one's own family has remained above two per children, with declines in the desired fertility size being noticeable only in the most recent data for some countries such as Germany and Austria (e.g., Goldstein et al., 2003). If the desired fertility stated in the surveys is—among other aspects—a reflection of attitudes towards childbearing, the question immediately arises of why individuals seem to fail to achieve their desired family sizes, and in particular, why the achieved family size often falls substantially short of the stated intentions.

The unexpected obstacles of life, the coordination of couples, career surprises, health difficulties, problems with conception, are often cited as an explanation why populations on average rarely have as many children as their members say they prefer. In other words, the attitudes towards childbearing and/or families are partially constrained by the social and institutional context, and these constraints may therefore weaken the relation between attitudes and childbearing. Barber & Axinn (2003), for instance, state: "To the extent these relationships [between attitudes and childbearing] are strong, individuals are able to achieve the outcomes they want. To the extent these relationships are weak, other factors are preventing individuals from achieving the outcomes they want. In a complex society filled with numerous behavioral choices, low fertility is, at least in part, a reflection of preferences for alternatives to childbearing and childrearing."

The empirical evidence presented in Barber & Axinn (2003) on the role of attitudes on childbearing for childbearing pertains primarily to first births and marriage. First births are interesting since most women in the U.S. and elsewhere continue to have at least one child, and large differences in first-birth fertility pertain to the timing of the first child and the context (non-marital or marital) in which this first birth occurs. A large part of the evidence presented in Barber & Axinn (2003), therefore, pertains to the timing of fertility, not necessarily the level of fertility. This fact makes it difficult to assess the extent to which changing attitudes towards childbearing or competing behaviors have contributed to the fertility decline in the U.S. or other developed countries, and Barber & Axinn (2003) are cautious about the extent to which they attribute fertility trends during the last decades to changes in attitudes. As a result, it is difficult to assess the extent to which changes in attitudes have altered the motivations to have children, and to which extent the motivations to have children differ across parities.

In order to understand these motivations for children, including children in addition to the first child,

Kohler & Behrman (2003) look the consequences of partnerships and childbearing on subjective well-being. In particular, Kohler & Behrman argue that if individuals (*i*) do not have systematic misconceptions about the benefits of children and partnerships, and (*ii*) make conscious and informed choices about the formation of partnerships and their level of fertility, the relation "Partner + Children = Happiness" should hold: individuals form unions or have children because these decisions increase—at least on average—their subjective well-being or "happiness".

The analyses in Kohler & Behrman are conducted using Danish twins aged 25–45 years who were interviewed in 2002 in an omnibus survey that included the question "How satisfied are you with your life, all things considered?" with responses ranging from very satisfied to not satisfied at all. This question about subjective well-being, or "happiness", is interesting because it combines two different components. On one hand, an important finding in the recent literature on subjective well-being is the remarkable stability of happiness over the life-course and the surprising insensitivity of subjective well-being with respect to variations in income, education or occupation (e.g., Argyle, 2001). Related studies have therefore argued that "happiness" is much more similar to a trait rather than to a state (Lykken & Tellegen, 1996).[5] Moreover, happiness has been shown to be related to stable personality characteristics that have a substantial genetic etiology (Diener et al., 1999). A substantial fraction of variation in well-being and related personality traits across individuals is therefore due to unobserved genetic factors. Individuals' responses to the above question about the satisfaction with life, therefore, partially reflect variation in attitudes and personality characteristics: the responses in part distinguish between persons with an innately more optimistic or positive evaluation of life from those that have an innately more pessimistic or negative assessment.

Subjective well-being is therefore likely to be a cause and a consequence of fertility and related behaviors. It "causes" some fertility-related behaviors since it partially reflects a general attitude towards life that affects the transition into marriage (or cohabiting unions) and the fertility behavior during adult years; it is also a "consequence" of the life-experiences as differential fertility and partnership experiences are likely to leave footprints on respondents' evaluation of their lives. Kohler & Behrman (2003) attempt to disentangle this dual role of subjective well-being using data on monozygotic and dizygotic twin pairs that provide a possibility to (*a*) estimate behavioral genetic models that decompose variation in outcomes/behaviors within a population into variance consistent with genetic, shared-environmental and individual-specific factors, and (*b*) use within-MZ twin pair analyses, that is fixed-effect analyses within identical monozygotic twin pairs, to control for unobserved social and/or genetic dispositions that affect both fertility/partnership behavior and subjective well-being.

The bivariate behavior genetic analyses in Kohler & Behrman (2003) reveal for males a systematic positive association between the genetic components of variation in subjective well-being and of variation in fertility/partnership behaviors: genetic dispositions that tend to increase subjective well-being—say, dispositions towards a "happy personality"—are associated with a higher number of partnerships (particularly at ages 25–45), a higher probability of being currently in a partnership, and a larger number of children. For females the correlations tend to be weaker and less uniform, and the correlations for closely related partnership behaviors—such as currently in partnership and the total number of partnerships—can even be in opposite directions.

[Figure 2 about here.]

In the within-MZ twin pair analyses, Kohler & Behrman control for this stable long-term effect of satisfaction on fertility and partnership behavior by focusing on within-MZ twin pair differences in fertility behavior and well-being. These within-MZ analyses regress the difference in subjective well-being *within* a MZ twin pair on the difference in indicators of fertility behavior and union status.[6] Figure 2 shows these within-MZ estimates of the effect of fertility on a happiness index that is constructed as 0 = not satisfied or not particularly satisfied, 1 = rather satisfied and 2 = very satisfied. The bars in this figure represent the effect on happiness of the variables (*i*) whether a respondent has at least one child and the first child is a boy; (*ii*) whether a respondent has at least one child and the first child is a girl; and (*iii*) the number of remaining children. Standard OLS estimates, which do not control for endowments, are reported for comparison to our preferred within-MZ twin pair estimates.

For females (left graph), the first-born child—independent of its sex—has a large positive effect on subjective well-being: having at least one child improves happiness by .20–.23, which is equivalent to 35–39% of one standard deviation. This effect of the first child is substantially underestimated by standard OLS regressions. In contrast to the large positive effect of the first child on well-being, additional children beyond the first child are not associated with higher levels of happiness; instead, the within-MZ results for females in Figure 2 reveal that additional children beyond the first tend to be associated with *lower* levels of happiness for females. Each child beyond the first decreases the happiness indicator by 13% of one standard deviation for females, and three children almost completely compensate for the positive effect resulting from the first child. The corresponding analyses for males (right graph) result in a strikingly different pattern. First, there is an important sex difference associated with the happiness gains resulting from a first child: first-born boys have an effect on happiness that equal to .172 (29% of one standard deviation of well-being) and almost twice as large as that of a first-born girl (.099 or 17% of one standard deviation). This effect

is important since there is no revealed sex-preference in parity progression probabilities: the probability of having a second child as well as the overall number of children does not significantly differ between male twins having a boy or girl as their first child. While males therefore enjoy greater happiness from a first-born son than a first-born daughter, this does not translate into higher levels of fertility—perhaps, because their female partners do not share the same sex-specific pattern of happiness gains derived from the first child. Second, additional children beyond the first child have virtually no effect on subjective well-being. Males therefore do not suffer the same declines in happiness with additional children than do females.

These findings are important since they are consistent with evidence from earlier studies of the costs and satisfactions associated with childbearing (e.g., Fawcett, 1983). In particular, respondents' motivation for the first child emphasize family status, role, and emotional rewards for the parent, while the values motivating second births are strongly associated with providing companionship for the first child. Consistent with the focus on emotional rewards and family status, first children are associated with significant increases in parents' well-being, with males enjoying higher happiness gains from first-born boys than first-born girls. The differential motivations for higher order children, which focuses on companionship for the first child, however, is also reflected in the results presented in Figure 2. For females, additional children beyond the first decrease well-being, and for males the effect of additional children is not distinguishable from zero. Hence, motivations other than subjective well-being seem underly the progression to additional children after the first child.

In addition, our results suggest that the attitudes influencing the progression to the first child may differ significantly from those affecting the progression to the second or higher order children. The attitudes investigated in Barber & Axinn primarily pertain to aspects that can be categorized under family status and emotional fulfillment, that is, attitudes are likely to matter most importantly for the first child. Attitudes that affect childbearing for the second and higher order children may differ significantly. In addition, our findings on the happiness-gains due to children in Figure 2 are consistent with several studies in the literature that suggest that parents substantially value to have at least one child, and that this continues to be the case even in contexts with low or lowest-low fertility. The happiness gains resulting from this first child may therefore limit the extent to which fertility declines are driven by reductions in first-birth fertility. Several studies, for instance, have shown that the declines to low or lowest-low fertility levels are primarily due to the combination of postponed first births and reductions in the parity progression probabilities to additional children (e.g., Kohler et al., 2002). The findings on subjective well-being also shed light on the potential intrinsic motivations for this pattern: The first child is clearly associated with large increases in well-being,

and first children therefore seem to provide an important part of individual's fulfillment in life. Second and higher order children, on average, do not have this important role. If individual or couples behavior is constrained and childbearing is associated with important trade-offs in terms of competing goals, second and higher order children may therefore be easier to forego than first children.

In additional analyses, not reported here in detail, Kohler & Behrman also show a male-female difference with respect to the role of children on well-being after controlling for the current partnership. Females derive happiness gains from children even after controlling for the current partnership status. The happiness of males, however, depends primarily on the partnership status; once the current partnership status is controlled for, men's happiness does not vary systematically with fertility. These findings suggests a somewhat provocative interpretation about the motivations of men and women to engage in partnerships: in particular, the results can be interpreted to suggest that women are in partnerships, among other reasons, in order to have children that increase their subjective well-being. Males, on the other hand, have children in order to remain in the partnerships that strongly affect their happiness. Having children are a strong predictor of currently being in partnerships for males (as well as for females), but conditional on the current partnership status, children do not contribute to men's subjective well-being. This differentiation may also provide an explanation why attitudes towards children seem to be primarily relevant for the marital first birth rates for females and not for males. Conditional on a current partnership, it is primarily women in our data who derive additional happiness gains from having children.

Conclusions

Barber & Axinn provide a fascinating review of the role of attitudes on childbearing behavior. One of the challenges that are ahead in this research, as well as in the research on low fertility more generally, is to understand to processes of how variation in attitudes about fertility emerges, and how attitudes towards childbearing change over time and matter differently for first and higher order children. In these comments, I have used some of my research on the fertility of Danish twins to shed some light on these questions from a different perspective as in the analyses by Barber & Axinn. While explicit measures of attitudes are lacking in these investigations, the processes underlying the results are closely related to the attitudes and preferences emphasized in Barber & Axinn.

The first set of analyses is based on behavior genetic models to decompose the components leading to variation in early fertility, that is, fertility behavior that is likely to be strongly affected by attitudes. The important results from these analyses is that the influence of parents on variation in early fertility has not

changed markedly—between 40–57% of the variation are related to parents—but the pathways through which parents influence their children has changed markedly. In cohorts born 1945–52 the variation is primarily related to differential social experiences of individuals in the parental household, while for cohorts 1961–68 the influence operates primarily through genetic pathways. While the analyses cannot provide direct evidence, this may suggest important changes in the attitudes that matter most for early childbearing. In the older cohorts it is more likely to be related to attitudes shaped by parents through socialization, while younger cohorts is may be more related to attitudes that are linked to different personality characteristics, innate abilities or fixed preferences. In the second set of analyses, we focus on the interaction between subjective well-being and fertility behavior. Subjective well-being is interesting in the context of attitudes because it is a cause as well as a consequence of fertility and related behaviors: it partially reflects personality traits and stable personal attitudes that affect the probability of forming unions and having children, and it also affected by an individual's experiences over the life-course. On the one hand, Kohler & Behrman show that unobserved endowments that affect well-being have important influences on the probability to form partnerships and have children, consistent with the results presented in Barber & Axinn. On the other hand Kohler & Behrman also show that the motivation for having first and higher order children differ substantially. First birth are clearly associated with substantial increases in well-being for both males and females, while additional children have negative (for women) or no effect (for males) on happiness. This is consistent with the finding that self-realization is an important motivation to have at least one child, while concerns for children or other consideration besides subjective well-being of the parents provide the motivation for additional children.

In addition, the analyses discussed in these comments emphasize the role of endowments, including processes of socialization in the parental household and genetic dispositions, are an important consideration in addressing the role of attitudes and/or personality factors for childbearing in low fertility contexts. Personality traits, and potentially also attitudes, are importantly related to these endowments. The presence of these unobserved factors can distort inferences about the relevance of attitudes or personality characteristics for childbearing, and the interaction between endowments, attitudes and fertility behavior may constitute an important field of future research.

Notes

[1]Unfortunately our data do not contain explicit information regarding attitudes towards childbearing to address the formation of attitudes towards childbearing through social and genetic pathways in detail. Nevertheless, as argued above, it seems plausible that attitudes are an important mechanism of how parents influence their children's behavior.

[2]Because this fertility measures is concentrated on 0, 1, 2 children, the standard methodology in twin studies for continuous outcomes is not optimally suited for our purpose. For this reason we choose a different methodology developed for the analysis of binary and ordered outcomes (Kohler & Rodgers, 1999) that is based on bivariate ordered probit models. The heritabilities and shared environmental effects therefore pertain to the latent propensity to have children.

[3]Comparable analyses of the level of early fertility in male cohorts, which are not reported here, yield a statistically significant estimate of .30 for heritability. The results thus indicate that genetic influences on an early onset of fertility seem to be present also for males. At the same time, the analyses cannot conclusively support a time trend towards an increasing relevance of genetic factors. Neither the main effect for shared environmental factors is statistically significant in the different birth cohorts if we conduct the analyses in Figure 1 for males, nor are the differences between the heritability estimates h^2 in the three cohorts. The results for males therefore suggest the presence of genetic influences on an early onset of fertility, but they do not suggest that these genetic influences are subject to a clear trend across cohorts.

[4]The selection of partners is probably the most important mechanism through which parents can take influence on the genetic dispositions of children, but conditional on the current partner the influence absent. Reproductive technologies may offers some further possibilities in the future.

[5]For example, Lykken & Tellegen (1996) report that variation in the well-being component of the Multidimensional Personality Questionnaire (MPQ) for twins in the Minnesota Twin Register in the 1980s is primarily associated with genetic variation, with neither socioeconomic status, schooling, family income, marital status, nor religious commitment accounting for more than 3% of the variance in well-being.

[6]See Kohler & Behrman (2003) for details. The model assumes that happiness of twin i in pair j can be

related to fertility and partnerships of twin i in pair j in the form

$$\text{Happiness}_{ij} = \beta_0 + \beta_1 \times \text{partner}_{ij} + \beta_2 \times \text{fertility}_{ij} + \beta_3 \times X_{ij} + \mu_j + \varepsilon_{ij}$$

where "partner$_{ij}$" is our representation of partnership behavior—for instance, currently married/cohabiting or the number of marriages or cohabitations—and "fertility$_{ij}$" is our representation of fertility behavior (e.g., at least one child, number of children, etc.). The term X_{ij} represents the influence of observed socioeconomic characteristics on happiness, and the term μ_j represents the influence of unobserved endowments that are common to both twins in pair j. In MZ twin pairs, the term μ_j thus captures the influence of *all* genetic dispositions as well as the influences of shared environments such as those associated with the parental household. The term ε_{ij} reflects additional unobserved influences on happiness that are specific to twin i in pair j. The within-MZ twin pair analyses eliminate (*a*) the influence of μ_j from the above relation for happiness, and (*b*) the influence of μ_j on the partnership and fertility indicators that are included on the right-hand-side of the regression. The within-MZ twin approach hence has the advantage that it identifies the relevant coefficients, namely the coefficients β_1 and β_2 that reflect the influence of partnerships and fertility on subjective well-being, even if the unobserved endowments, μ_j, in this relation simultaneously affect partnership and fertility behavior. Standard analyses with survey data are biased in this context.

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List of Figures

1 Genetic and shared environmental influences on the level of early fertility in female Danish twin pairs

Note: Results are taken from Kohler et al. (2003). Heritability h^2 is the proportion of variance in fertility that is attributed to genetic factors, and c^2 is the proportion of the variance that is attributed to shared environments. Estimates for cohorts born 1945–52: $c^2 = .393$ ($SE = .039$, $p < .001$) and h^2 is constrained to zero because no genetic effects are present; estimates for cohorts born 1961–68: $c^2 = .058$ ($SE = .095$, $p = .54$) and $h^2 = .517$ ($SE = .117$, $p < .001$). Cohort-specific influences are captured by birth-year dummies and are included in the estimated shared-environment effects c^2. 19

2 Effect of children on subjective well-being for females and males.

Note: Based on Kohler & Behrman (2003). Subjective well-being is measures as 0 = not satisfied or not particularly satisfied, 1 = rather satisfied and 2 = very satisfied with life in general. Significance levels are indicated as + $p \leq 0.10$; * $p \leq 0.05$; ** $p \leq 0.01$. 20

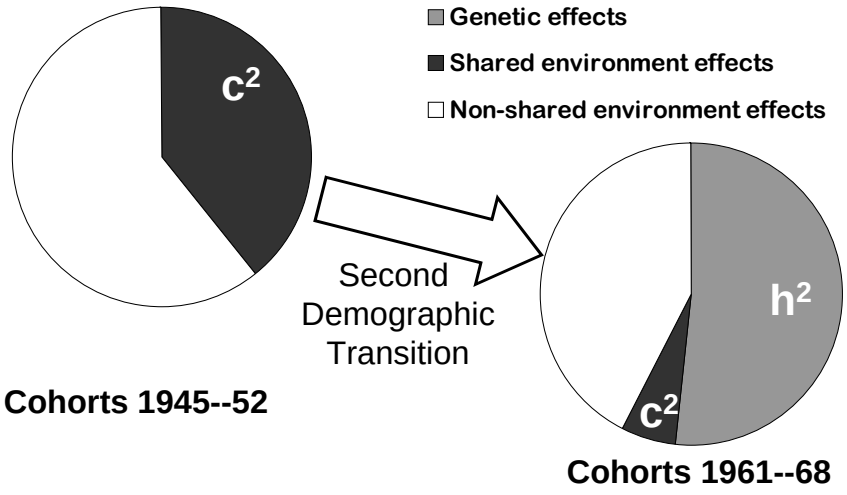

Figure 1: Genetic and shared environmental influences on the level of early fertility in female Danish twin pairs

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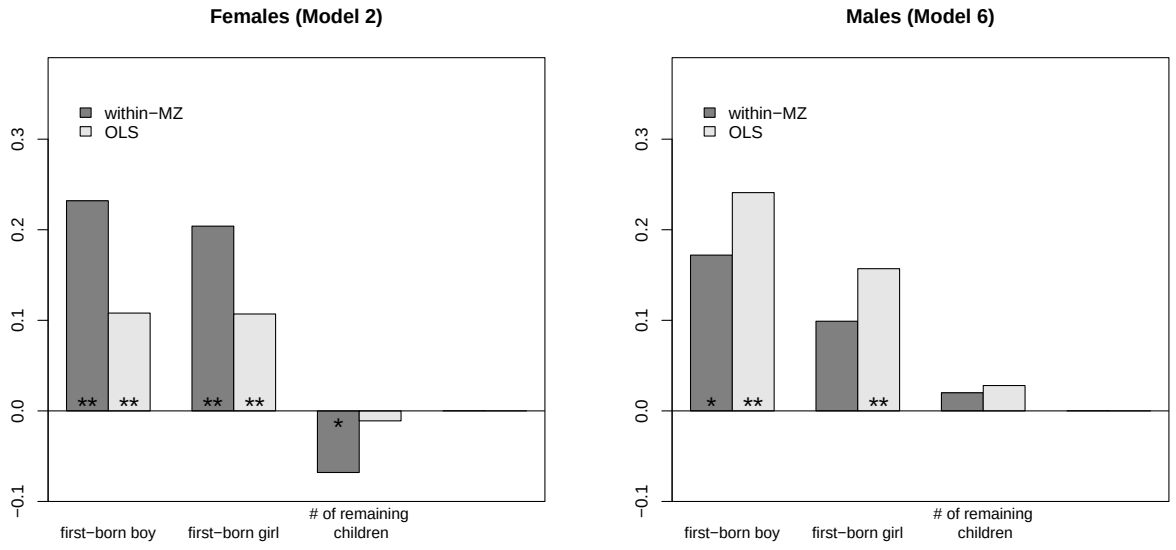

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