Can fertility desires and expectations explain the association of education and occupation with childlessness?

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Abstract Although there are well-established relationships between women's higher education, labour force participation (LFP) and occupation with childlessness, the underlying reasons and the role that fertility desires and expectations play remains unclear. We use the National Longitudinal Survey of Youth in the United States (N=4,198 women). We apply both logistic regression models to examine the role of fertility desires early in life, and multilevel models for repeated measures to examine the role of fertility expectations throughout the life course. We find that higher educational attainment and LFP was positively associated with childlessness. However, we do not find that these higher educated and working women more often desired to remain childless, or expected to remain childless. In contrast, when looking at women who eventually remain childless, we found that women who work full time and have higher status occupations had higher expectations to have children throughout their life course. These results suggest that education and occupation produces constraints, resulting in postponement of childbearing which hinder women in realizing their fertility desires and expectations. Our findings stress the importance of the compatibility between payed work and family life, as many working women remain childless despite the desire to become a mother. It furthermore highlights the importance of increasing awareness on decreasing fecundity with age.

Keywords: childlessness, education, occupation, fertility desires, longitudinal research

INTRODUCTION

The prevalence of childlessness is generally greater amongst women who are highly educated, in higher status occupations or in full-time employment (Basu, 2002; Matysiak & Vignoli, 2008). Childlessness has also been shown to be the lowest amid women working in specific occupations, such as those with social and caring roles or better means of work-life reconciliation (Begall & Mills, 2013). It remains unclear, however, what drives the associations between education, labor market participation and occupational type with childlessness. Three key mechanisms underlying these associations, all three stressing a different role of fertility desires, have been posited, but to date there is a lack of evidence from an empirical longitudinal examination.

The first way in which desires could explain different levels of childlessness, could be that already at a young age, women differ in their desire to become a mother, and that young women who want to be successful in education and in their career less often have the desire to become parent (Hakim, 2002, 2003, 2006). A key characteristic of this approach is that the intrinsic values of women are seen as the driving causal factor for the relationship between childlessness and educational and occupational behavior.

The second way in which desires could explain the link between childlessness and education is that through socialisation via educational institutions (e.g., certain family norms are transmitted in school) and at work women change their desires into desiring to remain childless and having a successful career (Begall & Mills, 2011; Lesthaeghe & Surkyn, 1988). We acknowledge that also family modelling (e.g., growing up with a working mother) is an important socializing factor, and that socialization might occur with regard to child-rearing practices, but we will not examine these here.

A third and final mechanism stresses role conflict and how difficulties in combining educational and occupational roles are associated with childlessness (Bianchi, 2011; Keizer,

Dykstra, & Jansen, 2008). Being in education, working a full-time job or working in a high status job which carry many responsibilities are all time consuming and difficult to combine with family life. What is distinct about this explanation is that it considers actual ongoing life experiences and assumes no role of fertility desires.

Previous research shows difficulties in distinguishing between these mechanisms. For example, higher levels of voluntary childlessness among higher educated women can be interpreted as evidence for both socialization in school and intrinsic value differences. Furthermore, having fewer children than initially desired among working women could be due to socialization or role constraints. Of course the three mechanisms are not mutually exclusive and initial value differences between higher and lower educated women could be enforced by socialization in education, and role conflict in turn could make it even more likely for higher educated women to remain childless.

The only way to distinguish between these three partially overlapping mechanisms is to adopt a longitudinal approach that can disentangle the relationship between early family desires with later experiences. The current framework allows us to assess the role of all three mechanisms. Using data from the 1979 National Longitudinal Survey of Youth (NLSY79), we are able to follow American youth throughout their reproductive period. The study considers early fertility desires as well as fertility expectations throughout the life course and examines how these influence the relationship between education and occupational characteristics with childlessness. In the NLSY data, fertility desires are asked during the first two waves of data collection, whereas fertility expectations are asked in every wave. Therefore, with regard to early life differences we consider desires and with regard to changes throughout the life course we consider expectations. In this cohort of women born around 1960 in the United States, the association of education and employment with childlessness is very strong, and although this relationship seems to be fading such as in recent cohorts in Nordic countries, in many Western

countries childlessness is still higher among the higher educated and working women (Beaujouan & Berghammer, 2017; Hoem & Andersson, 2017; Matysiak & Vignoli, 2008; Wood, Neels, & Kil, 2014).

The current study expands existing knowledge in this area in three key ways. Firstly, by adopting an explicitly longitudinal perspective, we are able to unravel the relationship between education and fertility intentions and actual fertility. Not only do we examine fertility desires at young ages, but we also examine how fertility expectations evolve throughout the life course depending on educational and occupational experiences. Secondly, previous literature has typically focused on education, employment and fertility or desires. Our contribution is including a more fine-grained insight beyond simple labor market participation to examine occupational attainment as well as the occupational field in which women work. Finally, our focus on childlessness will be a further addition because less is known about the causes of childlessness compared to other fertility traits such as the timing or number of births. Childlessness is an increasingly relevant topic, as the percentage of women who remain childless in the US has doubled from the 1970s from 10% to around 20% in the mid-2000s (Frejka, 2017). Childlessness has likewise been linked to lower life satisfaction and well-being in later life (Hansen, Slagsvold, & Moum, 2009; Keizer, Dykstra, & Poortman, 2009).

In this article we test the three mechanisms using the NLSY79, by applying logistic regression models to explore the influence of fertility desires, and by applying multilevel models for repeated measures to examine socialization and postponement.

BACKGROUND AND HYPOTHESES

Multiple studies, both from the US and Europe, show higher rates of childlessness among highly educated women (Hagestad & Call, 2007; Koropecjy-Cox & Call, 2007; Kravdal & Rindfuss, 2008; Portanti & Whitworth, 2009; Wood et al., 2014). A recent 19 country study showed that

of those women who had reached the end of their reproductive period, around 10-15% of the lowest educated remained childless, whereas amongst the highest educated groups this was between 15-30% (Miettinen, Rotkirch, Szalma, Donno, & Tanturri, 2015). Furthermore, fertility is typically found to be the lowest among working women and highest among women who are out of the paid labor force (Bernhardt, 1993; Brewster & Rindfuss, 2000; Matysiak & Vignoli, 2008). Moreover, within the group of working women, full-time work is related to lower fertility than part-time work (Begall, 2013). Not only the amount of time that a woman spends in paid labor influences fertility, but also the kind of job has been shown to exert an influence: women with higher status occupations tend to have fewer children, have children later, and more often remain childless (Edwards, 2002; Hopcroft, 2006). Women in occupations related to caring and interpersonal skills often have low childlessness and high fertility (Begall & Mills, 2013; Martin Garcia, 2010).

Early life differences in desires

Prior research proposes that there is a set of intrinsic values that cause women to strive for high (or low) status occupations and at the same time desire family life less (or more), which is posited to generate the relationship between occupational behavior and childlessness (Hakim, 2002, 2003, 2006). This idea that self-selection to be home-, work-centered or adaptive is based on Hakim's preference theory (2002, 2003, 2006). According to this theory, home-centered women prefer not to work, adaptive women seek to combine work and family and work-centered women are fully committed to employment and will have the highest levels of childlessness. Preference theory emphasizes the importance of personal values and considers women as a heterogeneous group with different lifestyle preferences. In the same line of reasoning, Barber (2001) proposes that positive attitudes towards career and education would pair with low preferences for childbearing. These preferences influence women's behaviour

both with regard to labour force participation (LFP) and occupational choices as well as family related choices.

With regard to occupational status, expectations from preference theory would lead us to believe that women in higher status occupations are more often work-centered women, who had high occupational career ambitions and low desires for having children from a young age. A similar pattern holds for LFP: differences in preferences regarding both work and fertility behavior would explain the relationship between LFP and childlessness. Others have argued that the choice of educational discipline which leads to a particular occupational field can be seen as an indicator of preferences regarding future lifestyle not only with regard to one's occupation but also with regard to childbearing (Bavel 2010; Oppermann 2012; Begall & Mills 2013).

Although preference theory is an attractive heuristic to explain the link between occupational behavior and fertility, empirical support remains limited. In line with expectations from preference theory, research shows that women who have higher education, incomes and work in high status occupations are more often voluntarily childless (voluntary childlessness is defined in these studies as being childless and intending to have no children but being physically able to have children) (Abma & Martinez, 2006; Avison & Furnham, 2015; Martinez, Daniels, & Chandra, 2012; Tanturri & Mencarini, 2008; Warren & Pals, 2013). In contrast to expectations from preference theory, work-oriented women are found to have higher fertility preferences (Rabušić & Chromkova-Manea, 2008; Vitali, Billari, Prskawetz, & Testa, 2009) that are more often unmet (Berrington, Stone, & Beaujouan, 2015). Moreover, the idea that early life desires cause the link between fertility and career, is challenged by findings that even for career oriented women, having children likewise reduces LFP (Kan, 2007). These types of findings question the foundations of preference theory which implicitly suggests that there is no causal relationship between LFP and childlessness.

Despite mixed evidence, the will test the mechanism that: *Early desires to remain childless lead to both occupational and fertility behavior in later life, which explains why higher educated women, with high occupational status, high LFP and who do not work in social and caring occupations remain childlessness more often* (Hypothesis 1).

Changing desires and expectations

Another explanation for the widely observed negative relationship between education, occupation and fertility is that higher education causes low fertility desires through socialization in school. Within higher education, certain individualistic values or those that are less aligned with traditional and religious beliefs promoting family over career — are transmitted, and these values could decrease fertility desires (Heaton, Jacobson, & Holland, 1999; Lesthaeghe & Surkyn, 1988). Furthermore, higher educated men and women have more egalitarian gender roles (Goldscheider, Goldscheider, & Rico-Gonzalez, 2014) and more egalitarian gender norms are related to lower fertility (Arpino, Esping-Andersen, & Pessin, 2015) and lower fertility intentions (Kaufman, 2000). Similarly, occupational fields differ in the prevalence of traditional family values, which could result in changing fertility desires (Bavel 2010; Hoem et al. 2006; Oppermann 2012; Begall & Mills 2013). In female-dominated educational fields, more stereotypical images of motherhood and womanhood are transferred which in turn results in higher fertility desires and high fertility (Hoem et al., 2006).

Some research has found that women who are highly educated, have high incomes or are in managerial and professional occupations are more often voluntarily childless (Abma & Martinez, 2006; Avison & Furnham, 2015; Martinez et al., 2012; Tanturri & Mencarini, 2008; Warren & Pals, 2013). As discussed previously, this could be attributed to differences in intrinsic desires between groups of women, but also to socialization in education and at the workplace. The term “voluntary childless” would suggest that these women had lower fertility desires

(which could be due to socialization). However, in these studies, voluntarily childless women are classified as those who reported no problems with fecundity and who intent no children in the future, which does not exclude the option that these women had the desire to have children for a large part of their lives.

Although higher rates of voluntary childlessness among women who are higher educated and in high status occupations would lead us to believe that these women have lower fertility desires, empirical findings do not support this idea (Berrington & Pattaro, 2014; Musick, England, Edgington, & Kangas, 2009). For instance, some studies report that women who are highly educated, in high socioeconomic positions, and with lower employment insecurity have lower intentions to remain childless (Berrington & Pattaro, 2014; Miettinen & Szalma, 2014; Testa, 2014). These findings are in contrast with the proposed mechanism that socialization in higher education results in lower fertility desires (and also with expectations from preference theory). Another relevant finding is that higher educated women more often have fewer children than they desired in their early twenties (Berrington & Pattaro, 2014; Morgan & Rackin, 2010). This could be interpreted as an indication that during their working life, higher educated women adjust their desires downwards, resulting in childlessness (socialization), or that for higher educated women it is more difficult to realize their fertility desires.

The few longitudinal studies that have focused on changes in the desired number of children demonstrate that women who have a job, higher earnings, work more hours, and have higher levels of education decrease their desired fertility over time (Iacovou & Tavares, 2008; Liefbroer, 2009). However, in these studies desired fertility is based on both the actual and the desired number of children (Berrington & Pattaro, 2014; Heaton et al., 1999; Iacovou & Tavares, 2008; Liefbroer, 2009). As fertility is so strongly associated with educational and occupational outcomes, differences between educational/occupational groups in later life might

be a consequence of differences in achieved fertility rather than attributed to differences in desires for particular family sizes. We overcome this problem by examining fertility desires and expectations within the group of women who have yet to have children.

The mixed findings reported above provide only partial support for the socialization hypothesis. In our study we take a longitudinal approach by examining how these relationships change throughout the reproductive life course. We will investigate how education and occupational characteristics relate to both childlessness desires and expectations as well as outcomes. Although the evidence is mixed, theoretically it is proposed that socialization in education and occupations decrease fertility desires, and therefore we hypothesize that *higher education in women will increase the desire to remain childless, which results in higher likelihood of remaining childless* (Hypothesis 2a).

At ages above 20, we have information about the expectation to remain childless but not about the desire to remain childless. Therefore, we are not able to examine how labour force participation and occupational status result in changes in the desire to remain childless, because labour force participation mainly occurs after the age of 20. However, based on previous research we would also expect that due to socialization at work the expectation to remain childless is higher among women who are working in high status occupations, not in social and caring occupations and who work full-time. For this reason, we hypothesize that *high status occupations, continuous LFP, and the occupational field in which a woman works will increase the expectation to remain childless, which results in higher childlessness probabilities* (Hypothesis 2b).

Role conflict

A third mechanism argues that the negative relationship between education, occupation and fertility is due to role conflict in pursuing education, being employed and having a family. A

first reason is that highly educated women spend more time in school up to higher ages, and the roles of being a student and a parent are hard to combine (Kravdal & Rindfuss, 2008). Very few women have their first child during higher education studies, and most postpone childbearing until they have completed their final degree. Similarly, working outside the home and caring for children are both time-consuming and may be difficult to combine (Keizer et al., 2008). Given the gender-based division of household tasks (Jansen, Weber, Kraaykamp, & Verbakel, 2016), combining these two roles is particularly difficult for women. For that reason, this role conflict generated by employment is one of the most prominent reasons for fertility postponement (Mills, Rindfuss, McDonald, & te Velde, 2011). Particularly women in high status occupations, that often carry many responsibilities, find themselves in a position in which it is difficult to combine their job with family life (Shreffler, 2017). This branch of literature does not assume that higher educated women or women in demanding occupations have initially lower fertility desires, but that throughout the life course occupational characteristics result in women postponing childbearing or adjusting their fertility intentions.

Previous research has investigated this topic by examining to what extent educational and occupational attainment results in discrepancies between fertility desires and outcomes or in the adjustment of fertility intentions. Several studies showed that higher educated women more often have fewer children than initially desired (Berrington et al., 2015; Morgan & Rackin, 2010; Quesnel-Vallee & Morgan, 2003), which could be attributed to socialization and changing preferences as well as to role conflict. Women in high prestige occupations often intend to have more children, but postpone childbearing (Shreffler, 2017). Another study examined trajectories of fertility intentions over time and found no educational differences in changing intentions. This suggest that despite similar patterns of fertility expectations, higher educated women more often remain childless (Hayford, 2005) and that differences in desires are not the causal factor.

Furthermore, it has been observed that highly educated women, women in high prestige occupations, and those working full-time often have a higher age at first birth than lower educated women (Budig, 2003; Edwards, 2002; Kantorová, 2004; Kravdal & Rindfuss, 2008; S. P. Martin, 2000; Mills et al., 2011). Postponement of childbearing attempts could eventually result in involuntary childlessness due to decreased female fecundity with age (Dunson, Baird, & Colombo, 2004; Leridon, 2004). For example, the inability to naturally conceive within 12 months of unprotected intercourse increases from 8% among women between the age of 19 to 26, up to 13% for women aged 27-34 to 18% among women between age 35 and 39 (Dunson et al., 2004).

The extent to which women experience barriers in combining work and family are context dependent. Studies that compare the US and Western European countries to Nordic countries, show that the educational and occupational gradient in childlessness is much weaker in Nordic countries (Beaujouan & Berghammer, 2017; Hoem & Andersson, 2017; Matysiak & Vignoli, 2008; Wood et al., 2014). In these Nordic countries, availability and affordability of childcare is higher, attitudes towards working women are more positive and involvement of fathers in care and household tasks is higher (Hart, 2015). In the US, parental leave is virtually nonexistent and childcare is costly (Aisenbrey, Evertsson, & Grunow, 2009). Part-time work is quite uncommon (Jaumotte, 2003) and a sharper drop in labour force participation after having a child is observed in the US compared to Sweden (Anxo et al., 2007). Fathers in the US are less involved in childcare and household tasks than fathers in Nordic countries (Altintas & Sullivan, 2017). For these reasons it is likely that barriers in combining work and family are particularly pronounced in the US.

In conclusion, educational and occupational attainment may cause childlessness because of the role conflict and time constraints they put on women. Importantly, and in contrast to the mechanisms of endogeneity and socialization, differences in fertility desires do not play a causal

role; highly educated women, women in high status jobs and women with continuous LFP are not hypothesized to have different fertility desires. Instead, their current higher levels of educational pursuits and labor market attainment will result in postponement, which eventually leads to higher levels of childlessness. From this, we propose that *occupational status, LFP and occupational field result in the postponement of childbearing, potentially leading to childlessness despite the desire and expectation to become a mother* (Hypothesis 3).

DATA, MEASURES AND ANALYTICAL STRATEGY

Data

In our study, we used the National Longitudinal Survey of Youth 1979 (NLSY79), which follows the lives of 12,686 individuals (6,283 women) born between 1957 and 1964. Respondents were first interviewed in 1979, when their ages varied between 14 and 22. Respondents have been interviewed subsequently every year until 1994, and every two years after that. The last round of interviews that we used took place in 2012 (although recently another round has been added), when the respondents were between 47 and 56 years old. For the purpose of the current study, we only selected women over the age of 45 at the time of their last interview (not all women completed interviews up to 2012), because previous research shows that less than half a percent of the children are born to mothers after the age of 45 (Billari, Kohler, Andersson, & Lundström, 2007) and research using the NLSY data provided similar estimates; only 0.3% of the women had their last child after the age of 45 (Stulp, Sear, Schaffnit, Mills, & Barrett, 2016). For this reason childlessness at the age of 45 years and older will be very similar to lifetime childlessness. This results in a reduction of sample size from 5,382 to 4,198 women with an average age of 51 during their last interview (See supplemental material section 1 and 2 for more information about retention rates in the NLSY and our selection of respondents). For our various analyses, we used different subsets of women as explained in the

analytical strategy section. For the analysis on fertility expectations we followed women up to the age of 42, because after this age very few women expect to have a(n additional) child. Due to the sampling procedure, the NLSY79 includes an overrepresentation of poor black and Hispanic individuals. Because of this selection of women over 45, and to adjust for the sampling procedure of the NLSY we apply custom weights from the NLSY that gives weights according to the probability to be followed up to the age of 45 as well as the initial sample procedure.

Measures

Childlessness In every wave of data collection, respondents were asked the questions "*have you ever had any children?*" or "*how many children have you had since the last interview*". Based on responses to these questions, we constructed a variable representing the total number of children a respondent had at the time of the last interview (when they were over 45 years of age). We made the distinction between women who never had a child and women who had children.

Desired childlessness In 1979 and 1982, respondents were asked how many children they wanted to have. We made the distinction between women who wanted no children (desired childless) and women who wanted one or more children (desire for children). To increase the comparability of the answers, we used the 1979 answer for respondents born before 1961 and the 1982 measure for those born after 1961. This division leads to all respondents being between 18 and 22 when they reported on their desired number of children.

Expected childlessness Every wave respondents were asked how many children they expected to have. We made the distinction between women who expected to have no children (expected childless) and women who expected one or more children (expected children).

Educational level Educational level is based on the question: What is the highest grade or year of regular school that you have completed and got credit for? Answers are categorized

into five groups. Those who indicated finishing 11th grade or less are characterized as “not finished high school”, those who finished 12th grade are characterized as “high school”, those who finished 1 to 3 years of college are characterized as “some college”, those who finished the fourth year of college are characterized as “BSc” and those with 5 or more years of college as “>BSc”. In our longitudinal analysis we used this measure to represent highest completed education.

Labor force participation (LFP) In every wave, respondents were asked how many weeks they worked in the past year. Responses were categorized into 0, 1 to 13, 14 to 26, 27 to 39, 40 to 48, 49 to 51 and 52 weeks. For years in which the respondents were not interviewed, the status of the year before was imputed.

Lifetime LFP We used the information taken from the entire occupational trajectory from age 22 to 48. Women were classified into four clusters distinguishing between individuals who started working late, stopped working early, which are theoretically different groups, as well as women who virtually consistently worked 52 weeks per year and those who barely worked throughout their life course. These groups are similar to those found in previous research (García-Manglano, 2015). See Figure SM1 for a graphical distinction of the different groups and the technical details.

Occupational status Occupational status was measured by using information on the respondent’s occupation at the time of the interview. At each wave respondents were asked about their main job and the nature of this work. The NLSY coded these answers according to the occupational census. We recoded these variables according to the International Standard Classification of Occupations (ISCO88), and subsequently into the international Socio-Economic Index of occupational status (ISEI), which assigns a status value according to the required education and average income in the occupation (Ganzeboom, De Graaf, & Treiman, 1992). ISEI scores theoretically range from 0 to 100, and in our sample from 16 to 90. For the

cross-sectional analyses, the highest occupational status obtained between the age of 22 and 48 was used and for the longitudinal analyses we used their current occupational status.

Occupational field is similarly based on the (bi)yearly information about the respondent's main job. These jobs were categorized into 11 occupational groups: childcare (ISCO group 5131), clerks (ISCO group 4), health (ISCO group 222, 322, 324), lower level (ISCO groups 6,7,8, and 9), managers (ISCO group 1), nursing (ISCO group 223 and 323), personal service (ISCO group 5 except 52), professionals (ISCO group 2 except 222, 223 and 23), sales (ISCO group 52), teaching (ISCO group 23) and technician professionals (ISCO group 3 except 322, 323, 324 and 33). Our interest is in the comparison between social and caring occupations (childcare, health, nursing and teaching) relative to the other. For the cross-sectional analyses, we used the occupational field that was reported most often and for the longitudinal analyses, their current occupational field.

Control variables Potential confounders are included in our models to control for spurious relationships between education and work with childlessness and fertility expectations. In all analyses we controlled for the birth year of the respondent, self-reported ethnicity and religion. In our path models, we also included the age of the respondent during her last interview. In our longitudinal analyses we include the age at the interview and its squared term. We include partnership, but because some researchers suggest excluding marriage in models of fertility (intentions), because getting married could be seen as a result of the intentions to have a child (Hart, 2015) we will compare models in which we include partnership trajectories to those where we exclude it (see Supplementary Material 5).

Analytical strategy

KHB mediation analysis on the influence of early life values. To test whether differences in the desire to remain childless explains the relationship between educational and occupational

behavior and childlessness, we apply the Karlson-Holm-Breen (KHB) mediation method. Simply comparing coefficients across models with and without confounding factors (fertility desires) is not feasible, because unobserved heterogeneity differs between logistic regression models (Mood, 2010). We therefore apply the KHB method to equalize the scale of the log-odds across models (Karlson, Holm, & Breen, 2012). For this hypothesis we furthermore apply a logistics regression model to examine the relationship between the desire to remain childless and educational and occupational behavior. We apply weights according to the possibility of being in the data up to age 45.

Logistic regression model on socialization in education. To test whether socialization in education influences fertility desires (hypothesis 2a), we used regression models to examine changes in desired childlessness between 1979 and 1982. For these analyses we only included women who did not have children in 1982, resulting in a sample of 2,711 women (see SM Table 4). In this analysis we apply weights according to the possibility of being in the data in 1979 and 1982.

Multilevel repeated measures models to examine socialization. Secondly, we applied multilevel models for repeated measures using the lme4 package in R (Bates, Mächler, Bolker, & Walker, 2015). This method takes into account the nested structure of the data of repeated measurements within individuals (Snijders & Bosker, 2012). We examined how educational and occupational behavior related to fertility expectations throughout the life course. In these models we included women as long as they were childless, which comprises a total of 2,578 women at age 22-23, decreasing to 659 women at age 42-43 (see Supplementary Material Table 5 for the number of women at every age).

In all multilevel models, occupational status and occupational field refer to the respondents' current occupation at time point t , and LFP refers to the number of weeks the respondent worked in the past calendar year. Lagging of the other variables (i.e. using

occupational measurements of the period prior to the fertility measurements) was not desirable because of the structure of the data; from 1994 onwards respondents were only interviewed biyearly, which would have resulted in a lag of at least two years. Note that for this analyses, women are in the sample as long as they have not had a child or up to the age of 42. We used the age of 42 because after this age only very few childless women expect to have a child. Because in multilevel models applying weights is not straightforward, as a robustness check we analyze logistic regression models on the expectation to remain childless at different ages, and compare models with and without weights.

Multilevel repeated measures models to examine role conflict. We tested the hypothesis that the association between childlessness and educational and occupational behavior is due to role conflict and thus leads to postponement, rather than differences in desires for or expectations to have children (hypothesis 3), in two different ways. First, we estimated multilevel models for repeated measures on the expectation to remain childless. For these analyses we only included women who ended up without children, because this allowed us to examine how educational and occupational behavior have an effect on the false expectation of still having a child in the future. This results in a sample size of 654 women. We descriptively report the percentages of women who expect to have a child among women who eventually will remain childless (child desire mismatch) stratified by education, LFP and by occupation. Second, we examined how educational and occupational characteristics have an impact on the age at first birth (using linear regressions), controlling for the desired number of children. For these analyses we include women who did not have a child when asked about their fertility ideals, but who would not remain childless, which in total represent 1,829 women.

RESULTS

Descriptive statistics

In our sample 16% of women remain childless (see Figure 1a and SM Table 1). With respect to education, occupation and childlessness, we observed associations that are very similar to those previously reported (Basu, 2002; Matysiak & Vignoli, 2008). We found a clear educational gradient; among women who did not finish high school, childlessness was around 9% whereas women who finished more than a Bachelor's degree this was 29%. Women working in high status occupations were more likely to remain childless than women working in lower status occupations (21% and 12% respectively). Contrasting our expectations, women in social and caring occupations were slightly more often childless compared to women in other occupational fields (19% and 15% respectively). Among women who worked full-time throughout their lives, 22% remained childless, whereas only 7% of women who barely worked remained childless.

The picture was substantially different when we examined the desires to remain childless when women were between 18 and 22 years old (see the light grey bars in Figure 1b and SM Table 1). Overall 8% of women had the desire to remain childless, which is much lower than the eventual percentage of childlessness (16%). The desire to remain childless was highest among women who finished some college (10%) and lowest in women who would finish only high school (7%) (see Figure 1b). Similarly, women who would end up in high status occupations least often and women ending up in low status occupations most often held the desire to remain childless (7% and 9% respectively). Women who would end up in social and

FIGURE 1. THE RELATIONSHIP OF EDUCATION, OCCUPATION AND LABOUR FORCE PARTICIPATION WITH DESIRING AND REMAINING CHILDLESS.

Note. Panel A represents the percentage of women remaining childless. Results in panel A are based on all women in the sample (N=4,198). The number of women per group who remain childless are presented on top of the bars. Panel B represents the percentage of women who desired to remain childless (light grey bars) and the percentage of women who remained childless (white bars). Results in panel B are based on women who did not have children when they were asked about their ideals (N=3,101). The number of women who desired to remain childless per group are shown on top of the grey bars, and the number of women who remained childless (at age 45) per group are presented on top of the white bars. Occupational status is divided into tertiles, with women in the low category in the first tertile (occupational status below 53), medium category in the second tertile (occupational status between 53 and 67) and women in the high category in the third tertile (occupational status above 67).

caring occupations less often desired to remain childless compared to those working in other occupational fields (6% versus 9%). In contrast to the findings on actual childlessness, women who would work decreasing hours were most likely to desire to remain childless.

FIGURE 2A. FERTILITY EXPECTATIONS AND BEHAVIOR BY AGE

FIGURE 2B. FERTILITY EXPECTATIONS AND BEHAVIOR BY AGE AND EDUCATIONAL LEVEL

FIGURE 2C. FERTILITY EXPECTATIONS AND DESIRES BY AGE AND OCCUPATIONAL FIELD

FIGURE 2D. FERTILITY EXPECTATIONS AND DESIRES BY AGE AND LABOUR FORCE PARTICIPATION

FIGURE 2E. FERTILITY EXPECTATIONS AND DESIRES BY AGE AND OCCUPATIONAL STATUS

Note. For age 22 to 42, the proportion of women who had a child (green), who expect to have a child in the future and will have a child (light blue), who expect to have a child in the future but will not have one (dark blue) and who do not expect to have a child (black), overall (2a) and by educational level (2b), occupational field (2c), labour force participation (LFP) (2d) and occupational status (2e). Low LFP are women who did not work or who worked 1 to 13 weeks, medium LFP are women who worked 14 to 26, 27 to 39 or 40 to 48 weeks and high LFP are women who worked 49 to 51 or 52 weeks. Occupational status is divided into tertiles, with women in the low category in the first tertile, medium category in the second tertile and women in the high category in the third tertile (the cutoff points for the tertiles slightly differ by the age groups, as women get higher status occupations as they get older).

Regarding fertility expectations and behavior over the life course, Figure 2b shows that higher educated women have children much later than lower educated women, and that up to higher ages they more often still expect to have a child in the future, whereas this expectation is often not met. The same holds for women who work in social and caring occupations, with high labour force participation and women with high status occupations (Figure 2c-2e).

Early life differences in desires

We tested the hypothesis that early life differences in desires explain the relationship between educational and occupational behavior and childlessness (hypothesis 1), by estimating

mediation models. As expected, women who are higher educated more often remain childless (see Table 2, Reduced model; OR 1.852; 95%CI 1.299-2.642; for those who finished more than a Bachelor compared to those who only finished high school). Women who barely worked, who increased or decreased their working hours were less likely to remain childless than those who worked full-time throughout the life course (see Table 2, Reduced model; OR 0.323; 95%CI 0.19-0.551; for those who barely worked compared to those who worked full-time). The occupational status does not seem to matter, neither does the occupational field in which one works.

With regard to the desire to remain childless, we find that women who finished some college or more than a Bachelor are more likely to desire to remain childless than women who only finished high school (see Table 1, OR 1.52; 95%CI 1.009-2.292 for some college and OR 1.757; 95%CI 1.038-2.997 for more than Bachelor), which is not completely in line with the expectation that higher educated women more often had the desire to remain childless. LFP does not relate to fertility desires, whereas a higher occupational status is related to a lower desire to remain childless (OR 0.989; CI 0.977-1.002) and women working in social occupations less often desire to remain childless (OR 0.572; CI 0.345-0.946).]

Following our expectations stemming from Preference theory, we should expect that the effect of education and occupation would decrease when fertility desires would be added to the model. Even though we find that the desire to remain childless positively influences the chance of remaining childless (see Table 2, Full model; OR 3.00; 95%CI 2.13-4.24), the coefficient of education and labour force participation barely change when desires are included in the model (compare the reduced and full model in Table 2). None of the confounding percentages are significant, which indicates that the effect of education and occupation does not significantly change when the desires to remain childless is included in the model. From these findings we

can conclude that early life differences in desires are not the reason why higher educated and working women more often remain childless.

Table 1. *Logistic regression model on the role of education and occupation on childlessness desires*

	OR	95%CI
Intercept	0.045***	(0.027-0.076)
Birth year (centralized)	1.043	(0.909-1.196)
Age last interview (centralized)	0.984	(0.865-1.119)
Ethnicity (reference group is white)		
Black	0.952	(0.656-1.381)
Hispanic	0.885	(0.538-1.458)
Other	0.713	(0.381-1.336)
Religion (reference group is Protestant)		
Roman Catholic	0.639*	(0.422-0.969)
No religion	1.247	(0.551-2.822)
Other	1.28	(0.823-1.992)
Age marriage (reference is before 21)		
21-25	1.441	(0.865-2.401)
26-30	1.391	(0.762-2.536)
31-35	1.823	(0.863-3.849)
36-40	6.129***	(2.893-12.985)
41+	4.312***	(1.799-10.332)
never married	2.696***	(1.43-5.084)
only partnered	2.79***	(1.377-5.656)
unknown age	0.231†	(0.047-1.144)
Educational level (reference is finished high school)		
Not finished HS	1.583	(0.717-3.494)
Some college	1.52*	(1.009-2.292)
Bachelor	1.47	(0.893-2.419)
More than Bachelor	1.758*	(1.038-2.977)
Labour force participation (reference worked full-time)		
Decreasing hours	1.121	(0.728-1.726)
Barely worked	0.786	(0.411-1.504)
Increasing hours	1.12	(0.755-1.663)
Occupational status (ISEI centralized)	0.989†	(0.977-1.002)
Social field (reference is no)	0.572*	(0.345-0.946)
N	3066	
Pseudo R2	0.005	

Note. †p<0.1, *p<0.05, **p<0.01, ***p<0.001. In these models women who did not have children when asked about their fertility desires are included. Desires were asked when women were between 18 and 22 years of age.

Table 2. *KHB mediation analyses on the role of education and occupation on childlessness mediated by fertility desires*

	Reduced model		Full model		%
	OR	(95% CI)	OR	(95% CI)	confounding
Intercept	0.166***	(0.114-0.24)	0.161	(0.111-0.235)	
Birth year (centralized)	0.988†	(0.894-1.091)	0.987†	(0.892-1.092)	
Age last interview (centralized)	1.021	(0.933-1.116)	1.028	(0.939-1.126)	
Ethnicity (reference group is white)					
Black	0.478***	(0.342-0.667)	0.476***	(0.342-0.664)	
Hispanic	0.617*	(0.427-0.894)	0.64*	(0.44-0.93)	
Other	1.034	(0.683-1.565)	1.071	(0.708-1.62)	
Religion (reference group is Protestant)					
Roman Catholic	0.73*	(0.548-0.972)	0.738*	(0.553-0.986)	
No religion	1.025	(0.551-1.908)	1.024	(0.543-1.932)	
Other	1.233	(0.863-1.761)	1.198	(0.836-1.718)	
Age marriage (reference is before 21)					
21-25	0.827	(0.564-1.211)	0.788	(0.535-1.16)	
26-30	1.261	(0.818-1.943)	1.233	(0.8-1.899)	
31-35	3.582***	(2.241-5.724)	3.501***	(2.189-5.6)	
36-40	5.923***	(3.299-10.634)	4.871***	(2.72-8.722)	
41+	16.9***	(9.199-31.049)	15.264***	(8.282-28.133)	
Never married	27.235***	(17.68-41.93)	25.364***	(16.438-39.137)	
Only partnered	6.441***	(3.78-10.975)	5.734***	(3.364-9.774)	
Unknown age	2.007	(0.785-5.132)	2.121	(0.828-5.431)	
Educational level (reference is finished high school)					
Not finished HS	1.892	(0.83-4.106)	1.812	(0.835-3.931)	6.75
Some college	1.288	(0.94-1.766)	1.251	(0.912-1.715)	11.63
Bachelor	1.462*	(1.025-2.087)	1.428*	(1.001-2.037)	6.26
More than Bachelor	1.852***	(1.299-2.641)	1.786***	(1.253-2.547)	5.89
Labour force participation (reference worked full-time)					
Decreasing hours	0.51***	(0.356-0.729)	0.503***	(0.352-0.72)	-1.89
Barely worked	0.323***	(0.19-0.551)	0.324***	(0.19-0.553)	0.26
Increasing hours	0.496***	(0.36-0.682)	0.491***	(0.356-0.675)	-1.48
Occupational status (ISEI centralized)					
Social field (reference is no)	0.993	(0.982-1.003)	0.993	(0.983-1.004)	10.71
Desired childlessness	0.837	(0.617-1.134)	0.869	(0.641-1.178)	21.06
			3.003***	(2.127-4.239)	
N	3066		3066		
Pseudo R2	0.22		0.231		

Note. †p<0.1, *p<0.05, **p<0.01, ***p<0.001. In these models women who did not have children when asked about their fertility desires are included. Desires were asked when women were between 18 and 22 years of age.

Changing desires and expectations

To examine the evidence for the socialization hypothesis, we examined how educational and occupational behavior had an impact on changes in desires and expectations of having children. We found little support that higher levels of education increase the desire to remain childless (hypothesis 2a). Logistic regression revealed that education was not important in explaining changes in the desire to remain childless between 1979 and 1982 (see Table 3, Model 1; OR 1.045; 95%CI 0.55-1.97; for those who finished more than Bachelor compared to those who only finished high school). We did find that women changed their desire to remain childless based on changes in relationship status; women who had a partner less often transformed their desire to remain childless (see Table 3, Model 1; OR 0.027; 95%CI 0.004-0.21).

The expectation about having children was repeatedly asked across virtually the entire reproductive life span. With multilevel models, we examined whether women with high status occupations, women that work many weeks per year, and women that work in social and caring occupational fields more often expected to remain childless throughout the life-course (hypothesis 2b). In this model, women were included up to the age that they had a child. Results from this model were also at odds with the socialization hypothesis: higher education, occupational status, and LFP decreased the expectation to remain childless (see Table 4 M1; OR 0.571, 95% CI 0.392-0.831; for those who finished more than a Bachelor Degree compared to those who only finished high school, OR 1.471; 95% CI 1.016-2.132 for those who worked 1 to 13 weeks compared to those who worked 52 weeks, and OR 0.992; 95% CI 0.987-0.998 for occupational status). We did not find an effect of occupational field on the expectation to remain childless (Table 4 M1; OR 0.96, 95%CI 0.751-1.227). These findings do not support hypothesis 2 that education, LFP and occupational status increase the desire and expectation to remain childless.

Table 3. *Logistic regression model on change in the desire to remain childless between 1979 and 1982, by educational level*

	OR	%CI
Intercept	0.103	(0.066-0.161)
Birth year (centered)	0.944	(0.846-1.055)
Partnership (reference is single)		
Found partner	0.709	(0.371-1.353)
Separated	1.426	(0.36-5.65)
Partner	0.027***	(0.004-0.21)
Ethnicity (reference group is white)		
Black	0.501***	(0.304-0.826)
Hispanic	0.743	(0.338-1.633)
Other	0.579	(0.256-1.309)
Religiosity (reference group is Protestant)		
Roman Catholic	0.602†	(0.359-1.007)
No religion	0.953	(0.2-4.536)
Other	1.402	(0.764-2.571)
Educational level (reference not finished high school)		
High school	1.6	(0.476-5.379)
Some college	1.011	(0.582-1.755)
Bachelor Degree	0.704	(0.358-1.384)
More than Bachelor Degree	1.045	(0.553-1.974)
N	2419	
Pseudo R2	0.029	

Note. † $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. In these models, women who did not have children in 1982 are included (N=2,645). Women who desired children at both time points are contrasted with women who changed from desiring children to desiring childlessness. Therefore, we excluded women who desired childlessness in both waves (N=93) or who changed from desiring childlessness to not desiring childlessness (N=93) or who had missing information in 1979 or in 1982 (N=40) resulting in a sample of 2,419 women.

Role conflict

To examine whether postponement can be a plausible explanation for the association between education, occupation, and childlessness, we conducted a two tests. First, we examined how educational and occupational characteristics influenced the probability to have a child expectation mismatch (the expectation to have a child, but ending up childless). Second, we examined the age at first birth, controlling for fertility desires at early ages.

Multilevel models provided clear support for the role conflict hypothesis (see Table 4 M2). Among women who eventually remain childless, higher education is associated with a

Table 4. *Multilevel repeated measure models on the expectation to remain childless over the life course among women who have no children yet and those who will remain childless*

	M1: Women who have no children (yet)		M2: Women who will remain childless	
	OR ⁺	(95% CI)	OR ⁺	(95% CI)
Intercept	0.007***	(0.001-0.051)	0.454	(0.036-5.781)
Educational level (reference is finished high school)				
Not finished HS	1.371	(0.696-2.699)	1.262	(0.489-3.257)
Some college	0.855	(0.613-1.193)	0.683	(0.41-1.137)
Bachelor Degree	0.449***	(0.305-0.662)	0.352***	(0.196-0.633)
More than Bachelor Degree	0.571**	(0.392-0.831)	0.433**	(0.25-0.75)
Labour force participation (reference worked 52 weeks)				
0 weeks	0.964	(0.664-1.4)	0.992	(0.633-1.557)
1 to 13 weeks	1.471*	(1.016-2.132)	1.345	(0.834-2.17)
14 to 26 weeks	1.419*	(1.043-1.932)	1.32	(0.899-1.937)
27 to 39 weeks	1.226	(0.936-1.607)	1.212	(0.865-1.699)
40 to 48 weeks	0.931	(0.722-1.199)	0.91	(0.667-1.242)
49 to 51 weeks	1.13	(0.842-1.515)	1.039	(0.72-1.499)
Occupational status (ISEI centered)	0.992**	(0.987-0.998)	0.994.	(0.987-1.001)
Social field (reference is no)	0.96	(0.751-1.227)	0.985	(0.73-1.33)
Age (centered)	1.014	(0.892-1.152)	1.204*	(1.034-1.402)
Age^2	1.005***	(0.667-1.242)	1.002	(1-1.004)
Ethnicity (reference group is white)				
Black	0.679*	(0.72-1.499)	0.261***	(0.164-0.414)
Hispanic	0.966	(0.625-1.491)	0.598	(0.3-1.192)
Other	1.04	(0.635-1.705)	0.905	(0.423-1.936)
Religion (reference group is Protestant)				
Roman Catholic	0.495***	(0.356-0.687)	0.52*	(0.307-0.878)
No religion	0.959	(0.449-2.045)	0.956	(0.311-2.939)
Other	0.679†	(0.452-1.022)	0.503*	(0.283-0.895)
In a relationship (reference is no)				
Married	0.669***	(0.555-0.806)	0.916	(0.719-1.167)
Other	0.897	(0.285-2.817)	0.71	(0.177-2.846)
Partner	0.655**	(0.491-0.873)	0.725.	(0.51-1.03)
N measurements	11882		6403	
N individuals	2453		646	

Note. †p<0.1, *p<0.05, **p<0.01, ***p<0.001. We contrast women who expect to have children with women who do not expect children in time t, among women who have no children (yet) in model 1 and among women who will remain childless in model 2. In these models women who did not have children yet are included and women are dropped from the sample if they had a child. See SM Table 5 for the number of women included by age.

lower expectation to remain childless (Table 4 M2; OR 0.443; 95%CI 0.256-0.766 for more than Bachelor's degree compared to only finished high school), which means a child expectation mismatch. The effect of occupational status was small in magnitude but also consistent with the idea of postponement (see Table 4 M2; OR 0.994; 95%CI 0.987-1). These findings are graphically displayed in Figure 2b, 2c, 2d and 2e, where we see that the group of women who expect to have a child, but will eventually remain childless (the dark blue group in the figures) is largest for the higher educated women, those in social and caring occupations, with high LFP and with high occupational status, which is the case throughout the life course.

There was also clear evidence that women with higher education, occupational status, and LFP delayed the birth of their first child (controlling for the desired number of children and partnership; see Table 5). Women who have more than a Bachelor's degree on average had their first child 2.5 (95%CI 1.895-3.161) years later than women who only finished high school; women who barely worked had their children on average 1.15 (95%CI -1.831--0.473) years earlier than women who worked full time, and women with an occupational status of 40 had on average their first child about half a year earlier than women with an occupational status of 68 (ISEI scores ranging from 16 to 88). This is also visible in Figure 2b, 2c, 2d and 2e: women with lower levels of education, who are not in social occupations, who do not or barely work and who are in low status occupations already had a child at young ages (the green group in the figures). These two findings (later age at first birth and less often the expectation to remain childless) are both in line with the mechanism on postponement and role-conflict.

Table 5. *Linear model of age at first birth*

	Estimate	(95% CI)
Intercept	20.449	(19.328-21.57)***
Birth year (centered)	-0.042	(-0.428-0.344)
Age last interview (centered)	0.108	(-0.273-0.489)
Partnership (ref married before 21)		
Married 21-25	1.534	(1.052-2.016)***
Married 26-30	4.598	(4.005-5.191)***
Married 31-35	6.710	(5.878-7.541)***
Married 36-40	6.611	(5.309-7.913)***
Married over 41	7.200	(5.718-8.682)***
Never married	3.877	(2.949-4.805)***
Partnered	4.129	(3.193-5.066)***
Unknown age marriage	2.253	(0.996-3.509)***
Ethnicity (reference group is white)		
Black	-2.228	(-2.72--1.735)***
Hispanic	-1.334	(-1.89--0.779)***
Other	0.180	(-0.542-0.902)
Religion (reference group is Protestant)		
Roman Catholic	0.574	(0.115-1.033)*
No religion	-0.199	(-1.278-0.88)
Other	0.106	(-0.491-0.703)
Desired number of children	-0.102	(-0.228-0.023)
Educational level (reference finished high school)		
Not finished high school	-0.284	(-1.16-0.591)
Some college	0.702	(0.255-1.149)**
Bachelor's degree	2.316	(1.73-2.902)***
More than Bachelor's degree	2.528	(1.895-3.161)***
Labour Force Participation (reference group worked full-time)		
Decreasing hours	0.196	(-0.316-0.709)
Barely worked	-1.152	(-1.831--0.473)***
Increasing hours	-1.292	(-1.729--0.854)***
Occupational status (centered)	0.018	(0.003-0.034)*
Social and caring field (ref is no)	-0.155	(-0.663-0.354)

Note. [†]p<0.1, *p<0.05, **p<0.01, ***p<0.001. N= 2169 (total N of women who had no children when asked about their ideals is 3101, women are removed because they had no first birth or missing data on age at first birth). $R^2 = 0.182$, adjusted $R^2 = 0.173$. Only women who had children and who were asked about their ideals before they had children are included.

Robustness checks

To examine if our results could be influenced by attrition, age differences in fertility desires, the role of partnership trajectories, the selection and exclusion of respondents and differences

between fertility desires and expectations we conducted several extra analyses and robustness checks.

Attrition Even though retention rates are relatively high in the NLSY (of those who started the survey in 1979, 85% is followed up until the age of 45), retention seems to be related to having children, as women with children more often remain in the data (see SM Table 1 for characteristics of the complete and our selected sample and SM Section 1 for more information). For that reason, we apply weights for being followed up to age 45. For multilevel models weighting is not straightforward and therefore as a robustness check we analyze logistic regression models on the expectation to remain childless at different ages, and compare models with and without weights. The models with and without weights barely differ in their coefficients, and the negative effect of education and labour force participation on the expectation to remain childless is similar in both models (compare SM Table 2 and 3).

Fertility desires before age 18 For hypothesis 1 we were interested in whether differences in fertility desires explain the relationship between education and labour force participation and childlessness. For this analysis we selected only individuals who still did not have children when asked about fertility ideals. This selection results in a selective sample of women who are higher educated, in higher status occupations and who are born in later birth cohorts, because these women have children later (see Supplementary Material section 2 Table 4). To examine whether the relationship between education and LFP with fertility desires is similar before and after this selection, we examined this relationship at earlier ages. The association between education, LFP and childlessness desires was very similar when we only select <18, suggesting that our selection had not substantially influenced our results (see Supplementary Material section 2 Table 6).

The role of the partner Although partnerships and marriages play an important role in remaining childless, and are related to educational and occupational behavior, they do not

impact our models on the relationship between education, occupation and remaining childless and childlessness expectations (see Supplemental Material section 3). Women who marry at later ages or remain single more often desire to remain childless and more often remain childless (SM Table 7). Women who are higher educated, work full-time and in high status occupations get married at higher ages, but do not get married less often (SM Table 7). When excluding the information on partnership from our models on the influence of education and occupational behavior on childlessness, we see that the coefficients are very similar (compare Table 1 to SM Table 8). Similarly, when excluding information on partnership in the model on fertility desires between 1979 and 1982 (compare Table 3 to SM Table 9) and in the repeated measures models on childlessness expectations (compare Table 4 to Table 10) estimates are again very similar. This indicates that differences in partnership trajectories between higher and lower educated women and working and not working women do not explain differences in their chances to remain childless or in their desires or expectations to remain childless.

Age differences We examined age differences in fertility desires, because in our model on the influence of fertility desires on childlessness (H1), for some women we know their desires at age 18 and for other women at age 22. The prevalence of the desire to remain childless did not substantially differ between the ages of 18 and 22, nor did the correlation between this desire and remaining childless (see Supplementary Material Section 4 and SM Table 11).

In our multilevel model we examine the influence of educational and occupational characteristics on the intention to remain childless. In our analyses we included age interaction to examine whether the relation between educational and occupational characteristics with this expectation changes as women get older. We found that women who work in social and caring occupations less often expect to remain childless, but that this effect decreases with age (see Supplementary Material Section 4 and SM Table 12).

Desires and expectations In the NLSY, in 1979 and 1982 respondents were asked about their fertility desires as well as their fertility expectations. In the years that followed, however, only fertility expectations were asked. This meant that for our longitudinal analyses on changes over the life course of women we had to make use of the measurements on fertility expectations. For this reason, we examined the differences between fertility desires and expectations (see Supplementary Material section 5). When women are between 18 and 22 years of age (when both desires and expectations are measured), the correlation between the two is high (around 0.7) and both measures are approximately equally highly correlated with remaining childless (see Supplementary Material Table 11). Although at young ages the desires and expectations seem to overlap, it is likely that at higher ages those who remain childless are likely to desire to have children but also likely to not expect to have children. Put differently, an expectation to have children is likely to also imply a desire to have children, whereas an expectation for a childless life might mean either no desire and no expectation to have children or a desire but no expectation that the desire will be fulfilled. This in turn means that higher expectation can arguably be taken to denote higher desires and also that our estimates on the expectation to remain childless at different ages as shown in Figure 2 are likely higher than the proportion of women who desire to remain childless.

CONCLUSION AND DISCUSSION

The aim of this paper was to examine to what extent the relationship between educational and occupational behavior and childlessness is due to differences in fertility desires. We used information on fertility desires, fertility expectations and occupational behavior at different ages to test three complementary mechanisms. We observed a strong relationship between educational and occupational characteristics on the one hand and childlessness on the other, but this association did not seem to come about through inherent differences between these women

in their fertility preferences, neither due to different fertility desires transferred during education or worklife. Rather, we observed that women with higher education and higher occupational characteristics more often erroneously believed that they would still have children. These findings, combined with clear association between age at first birth and education and occupation, support the idea that the postponement of childbearing leads to involuntary childlessness.

There could be several explanations for our finding that higher educated and working women more often than lower educated women expecting to become a mother but remaining childless. It could be that women use their friends and co-workers as a reference group regarding their fertility behavior (Balbo & Barban, 2014). Women in high status occupations often have friends who obtained higher education and who are also working in higher status occupations, among which postponement of childbearing is quite common. At somewhat older ages (e.g., > 35) these women might notice that a large part of their reference group is still childless and therefore they do not have the feeling that they are “too late” and might still expect to have children. Among lower educated women, those who do not have children might in contrast see that most of their friends already have children which might lead to the impression that they are “too late” and adjust their fertility expectations downwards. Another reason might be that lower educated women have their first attempt to have a child at an earlier age. Those who have fecundity problems notice this already at a young age, resulting in downward adjustment of fertility desires, but higher educated women do not know this yet. Furthermore, social norms prescribe the ‘right’ time to start childbearing, which is usually when one has settled in a stable career, relationship, housing and financial situation (L. J. Martin, 2017). Especially higher educated women, who generally start cohabitating and enter marriage at higher ages (Manning, Brown, & Payne, 2014), likewise finish education and establish a career at higher ages, thereby

already often approaching the age at which social norms prescribe that it is ‘too late’ to have children or face biological difficulties in conceiving (Mills et al., 2011).

The reason why postponement of childbearing attempts can eventually result in childlessness could be due to both social and biological age constraints. On the one hand, there are biological age constraints, because as women get older their biological ability to have children decreases (te Velde, Habbema, Leridon, & Eijkemans, 2012). On the other hand, there are social age constraints surrounding childbearing, which is the perceived age after which women are considered too old to have children, which is usually around the age of 40 (Billari et al., 2011).

For occupational field the results are slightly different than for education and LFP. We found that those who work in social and caring occupations had a lower desire to remain childless, but these women do not less often remain childless. Although these findings are different than what we find for educational level, labour force participation and occupational status, they lead to the same substantial conclusion that differences in fertility desires between groups do not explain differences in childlessness levels. It is argued that for some women with high fertility intentions, choosing to work in social and caring occupations could be seen as a strategy to fulfill their intentions, because these fields are assumed to offer greater work-family compatibility. However, our findings indicate that this strategy is not effective for many women, because childlessness is just as common among women in social and caring occupations as in other occupations. However, we should interpret these findings with caution because we do not make detailed distinction between different occupations.

Methodological differences might underlie the inconsistencies between our results and those of other studies that have shown that higher educated and working women more often are voluntary childless and more often adjust their fertility intentions downward (Liefbroer, 2009; Martinez et al., 2012). First, studies on (in)voluntary childlessness often use problems with the

ability to conceive children as an indicator of involuntary childlessness, or they use a question of whether people intent to have a child in the future, which might not be a relevant indicator of fertility desires at older ages (Abma & Martinez, 2006; Avison & Furnham, 2015; Martinez et al., 2012; Tanturri & Mencarini, 2008; Waren & Pals, 2013). These previous studies probably use these measures because the distinction between voluntary and involuntary childlessness is not straightforward. Second, studies on fertility desires often conflate achieved and desired fertility (Berrington & Pattaro, 2014; Heaton et al., 1999; Iacovou & Tavares, 2008; Liefbroer, 2009). In such cases, high fertility ‘desires’ can mean either strong desires for children, or already having had children, and make comparisons between, for instance, high educated women (who typically have fewer children) and lower educated women (who typically have more children) very difficult. One study that controlled for the number of children women already have (where conflation is thus not a problem) observed that higher educated women more often adjust their desired family size downwards (Liefbroer, 2009). The difference between this study and our study is that this previous study examines total family size (which might be adjusted downward) whereas we consider childlessness expectations.

Although we do not find that socialization in education and at work result in lower desires to have children, we do acknowledge that there is another type of socialization that could influence fertility behavior. High status parents are known to invest more time in childrearing (Dotti Sani & Treas, 2016). Especially higher educated mothers have more intensive parenting ideologies and spend more time in rearing their children. Thus, socialization in education and at work might, as we find, not result in lower expectations to have children, but in higher child-rearing norms, which makes it difficult to combine having children with having a time-consuming job. These intensive parenting norms however might be more likely to prevent women from having large families and not from expecting to have a first child, which could explain why we do not find differences in the expectation to become a mother. Socialization

could also result in changing norms for example with regard to what is the right time to have a child or in desires for larger or smaller families.

As in many previous studies (see for example Liefbroer, 2009; Mencarini et al., 2015), our measures of fertility desires and expectations are based on one question: How many children do you desire/expect to have? These singular questions do not measure the strength of the preference. One study by Barber (2001) used multiple questions to measure both attitudes towards childbearing, the desired number of children and the strength of this desire. We acknowledge that with our measurements we do not measure the strength of fertility desires, and thus it might be the case that the desire to have a child is weaker for higher educated women. This however seems not in line with the finding that these women expect to have children for a longer time.

The desire to remain childless is only asked in the first waves of data collection and in the other waves fertility expectations are asked. Our finding that the expectation to remain childless does not increase more among highly educated and working women than among lower educated women does not necessarily imply that the same holds for the desire to remain childless. The situation in which a woman desires to have children but does not expect to have children seems intuitive, whereas a situation in which a woman does not desire to have children but does expect to have children is less straightforward. For that reason, our finding that many women, especially higher educated women, expect to have children for a large part of their life but eventually remain childless, likely indicated that these women had the desire to have children. (see Supplementary Material section 4).

The three proposed mechanisms for the association between education and occupation and childlessness differ quite substantially in whether they come at a cost of subjective well-being. If endogenous preferences or socializing experiences cause this association, then well-being is not affected; in this case, women are child-free because of their preferences and values.

In contrast, ending up childless after expecting to have children for significant periods of time, may come at cost of well-being. Indeed, a qualitative study examined well-being among childless women who postponed childbearing due to career constraints until it was too late, and found that these type of women often experienced distress (Hewlett, 2002). Many other studies associated childlessness with lower well-being (Tanturri, Mills, Rotkirch, & Sobotka, 2015). If a substantial fraction of women remains childless despite desires to have children, particularly among higher educated women and women in high status occupations, then policies should be aiming towards better compatibility of paid work and having children. Especially policies that increase quality, availability, acceptability and affordability of childcare have been found to effectively promote childbearing (Mills et al., 2011). In addition, our research is in line with previous research that finds that women are often overly optimistic about the probabilities of having children at advanced ages (Kudesia, Chernyak, & McAvey, 2017; Lampic, Svanberg, Karlström, & Tydén, 2006), because we find that women in our study frequently have expectations regarding their own fertility that eventually are not met. This highlights the importance of increasing awareness of declining fertility with age.

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Supplementary Material

Figure Supplementary Material 1: Categorization of Lifetime labour force participation (LFP)

Supplementary Material Section 1 Retention rates in the NLSY

- **Supplementary Material Table 1** Characteristics of the complete female NLSY sample eligible for follow up and of our selection of women interviewed after 45 years of age
- **Supplementary Material Table 2** Relationship between education and occupational behavior with the expectation to remain childless at different ages, *unweighted* model
- **Supplementary Material Table 3** Relationship between education and occupational behavior with the expectation to remain childless at different ages, *weighted* model

Supplementary Material section 2 Selection of respondents in our different models

- **Supplementary Material Table 4** Distribution of women who already had a child when asked about their ideals (which is in 1979 or in 1982, dependent on their birth year), in 1979 and 1982
- **Supplementary Material Table 5** Number of women who are still childless by age, used for the multilevel models of women who are still childless
- **Supplementary Material Table 6** Desire to remain childless by education and occupation at age 15 to 17 (before most childbearing and thus sample selection took place), between age 18 and 19 and between age 18 and 22 (used in our main analysis)

Supplementary Material section 3 The role of partnership trajectories

- **Supplementary Material Table 7** Relationship between partnership and age at first marriage with fertility, education and occupation
- **Supplementary Material Table 8** KHB mediation analysis without controlling for partnership
- **Supplementary Material Table 9** The relationship between education and change in the desire to remain childless without controlling for partnership status
- **Supplementary Material Table 10** Multilevel models for repeated measures on the expectation to remain childless excluding control for partnership

Supplementary Material section 4 Age differences in desires

- **Supplementary Material Table 11** Differences between desires and expectations and relation between desires and expectations with childlessness and fertility by age
- **Supplementary Material Table 12** Multilevel repeated measure models on the expectation to remain childless over the life course among women who have no children yet, including age interactions

Supplementary Material section 5 The differences between fertility desires and fertility expectations

Supplementary Material Figure 1 Categorization of Lifetime labour force participation (LFP). Results of the cluster analysis from a sequence analysis that clusters women in 4 groups based on their sequence of LFP. Every line represents the labour force sequence of one woman. Sequence analysis and Ward cluster analysis were used to classify respondents into different groups of LFP (Mills, 2011). A four cluster solution was chosen because it allowed meaningful interpretation and was supported by several cluster cut-off criteria (Hennig & Liao, 2013). These analyses were conducted in the TraMineR and the WeightedCluster packages in R (Gabadinho, Ritschard, Studer, & Müller, 2011; Studer, 2013).

The first group displays women who mainly worked full-time or part-time up to age 35 and then stopped working or reduced working hours. The second group of women is categorized by full-time work and some of these women work part-time in the beginning and later switch to full-time. The third group consists of women who barely worked; in some years some women worked but for the majority of the years these women did not work. The fourth group displays women who barely worked up to age 35 and started working full-time or part-time around the age of 35.

Supplementary Material Section 1 Retention rates in the NLSY

Retention rates in the NLSY are relatively high, thereby making the NLSY the golden standard when it comes to attrition (Olsen, 2005). Of the respondents who started the survey in 1979, 73.3% still participated in 2012 and the percentage of respondents who responded every survey wave is 50.4% in 2012 (<https://www.nlsinfo.org/content/cohorts/nlsy79/intro-to-the-sample/retention-reasons-noninterview>).

In 1979, in total 6,283 women were interviewed, part of this was an oversampling of 901 poor, non-hispanic/nonblack respondents and a military sample. These respondents were dropped from the sample in 1990, resulting in 5,382 women eligible for further interviews. Another part was an oversampling of respondents from the military, of which most dropped in 1984, resulting in 4,937 women eligible for further interviews. For our sample we removed women who did not fill in an interview after the age of 45, after which we retained 85.0% of the sample (4,198 of the 4,939, see SM Table1).

As in most longitudinal surveys, those remaining in the sample are higher educated younger (See SM Table1). They did, however, not differ in their fertility desires or desires regarding working and having a family. Those women who remained in the sample were less likely to be childless, and in analyses in which the drop out is related to the outcome of interest weights should be applied (Solon, Haider, & Wooldridge, 2015). Therefore in our model KBH model we apply weights that adjust for the initial sampling procedure as well as the probability to be in the followed up to age 45. In our model on changing desires between 1979 and 1982 we apply weights according to being in the data in 1979 and in 1982. Average weights for being in the sample up to age 45 are displayed in SM Table 1.

Because in multilevel models applying wages is not straightforward, we analyze logistic regression models on the expectation to remain childless at different ages, and compare models

with and without weights. The results are similar in the model with and without weights (SM Table 2 and 3). This indicates that the attrition of respondents does not influence our findings regarding the relationship between educational and occupational behavior and the expectation to remain childless.

Supplementary Material Table 1 Characteristics of the complete female NLSY sample eligible for follow up and of our selection of women interviewed after 45 years of age.

	Eligible sample	Selection 45+	Weights	Desired childless	Remained childless
	Prop	Prop	Mean	Prop	Prop
N	4937	4198	4198	3101	4198
Overall			391154	0.085	0.156
Prop desired childless 79/82	0.070	0.067	380317		
Prop expect childless 82	0.093	0.095			
Prop expect childless 86	0.118	0.117			
Prop expect childless 92	0.336	0.341			
Childless in 1980	0.799	0.783	410192		
Childless in 1986	0.469	0.455	440993		
Childless in 1992	0.244	0.237	431182		
Birth year					
1957	0.111	0.117	424807	0.061	0.140
1958	0.112	0.113	449123	0.075	0.154
1959	0.122	0.123	408092	0.042	0.136
1960	0.132	0.134	369946	0.104	0.176
1961	0.139	0.140	348956	0.121	0.165
1962	0.142	0.140	347661	0.086	0.143
1963	0.135	0.130	365865	0.084	0.164
1964	0.106	0.103	446703	0.094	0.169
Ethnicity					
White	0.503	0.495	628868	0.077	0.173
Black	0.299	0.310	177397	0.108	0.154
Hispanic	0.198	0.195	127518	0.073	0.115
Religion					
Protestant	0.498	0.511	402237	0.094	0.165
Roman Catholic	0.359	0.348	356358	0.064	0.133
No religion	0.032	0.035	426946	0.091	0.138
Other	0.110	0.107	441330	0.106	0.196
Age first marriage					
<21		0.285	416227	0.056	0.059
21-25		0.298	425026	0.074	0.087
26-30		0.132	416893	0.078	0.149
31-35		0.059	385416	0.074	0.243
36-40		0.024	421177	0.232	0.323
41+		0.026	337645	0.167	0.376
never married		0.096	266052	0.122	0.467
only partnered		0.060	279327	0.134	0.247
unknown age		0.020	345742	0.034	0.093

Supplementary Material Table 1 *Continued*

	Eligible sample	Selection 45+	Weights	Desired childless	Remained childless
	Prop	Prop	Mean	Prop	Prop
Education					
Not finished HS	0.118	0.083	294469	0.098	0.086
Finished HS	0.383	0.401	388618	0.068	0.112
Some college	0.267	0.273	365753	0.102	0.157
Bachelor Degree	0.120	0.124	443840	0.092	0.214
More than Bachelor Degree	0.112	0.119	471096	0.080	0.291
Labour force participation					
Full-time		0.463	412226	0.085	0.221
Decreasing hours		0.161	407755	0.096	0.129
Barely worked		0.122	311921	0.079	0.068
Increasing hours		0.254	380224	0.078	0.096
Occupational field					
Social and caring		0.140	425807	0.061	0.188
Other		0.860	385533	0.089	0.151
Max occupational status (mean)		58.580			
Max occupational status (categories)					
Low		0.387	331342	0.092	0.122
Medium		0.300	412832	0.080	0.141
High		0.313	444245	0.081	0.210

The first column represents the NLSY sample eligible for follow up. Information for the age at marriage, life-time labour force participation, main occupational field and highest occupational status cannot be displayed here because for these aspects women need to be followed up up to age 45. The second column represents our selected sample of women followed up to the age of 45. The third column represent the weights, weights are based on the probability to be in the initial sample and the probability to be in the sample up to the age of 45. The fourth column displays the relationship of our variables of interest with desiring to remain childless, this includes only women who are childless when asked about their desires. The fifth column the relationship with remaining childless at age 45. Occupational status is divided into tertiles, with women in the low category in the first tertile (occupational status below 53), medium category in the second tertile (occupational status between 53 and 67) and women in the high category in the third tertile (occupational status above 67).

Supplementary Material Table 2 Relationship between education and occupational behavior with the expectation to remain childless at different ages, *unweighted* model

Age	22	24	26	28	30	32	34	36	38	40	42
	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR
Intercept	0.125 *	0.192 *	0.233 *	0.455 *	0.975	2.200 *	3.414 *	5.618 *	9.622 *	15.313 *	31.355 *
Educational level (reference is finished high school)											
Not finished HS	1.405	1.184	1.178	1.171	2.191 *	0.615	0.929	1.368	1.473	0.693	1.363
Some college	1.140	1.154	1.246	0.91	0.745	0.732	0.815	0.781	0.727	0.551	0.942
Bachelor Degree	0.585 .	0.727	0.662 .	0.571 *	0.603 *	0.486 *	0.389 *	0.42 *	0.438 *	0.323 *	0.563
More than Bachelor Degree	1.052	0.959	0.629 .	0.614 *	0.625 *	0.609 *	0.481 *	0.603 .	0.553 .	0.376 *	0.816
Labour force participation (reference worked 52 weeks)											
0 weeks	1.111	0.974	1.103	1.687	1.478	1.579	0.519	0.696	0.768	0.795	0.553
1 to 13 weeks	1.175	1.027	2.273 *	1.842	2.444 *	2.359	1.388	0.766	0.519	2.006	0.135 *
14 to 26 weeks	1.605 .	1.075	1.872 *	1.283	1.229	1.019	1.235	0.994	0.721	1.739	0.919
27 to 39 weeks	0.675	0.989	1.445	1.602 .	1.021	0.993	2.040 .	1.511	1.916	3.071	0.371
40 to 48 weeks	0.779	0.542 *	1.162	1.585 .	0.798	1.015	1.077	0.934	0.493	0.669	0.52
49 to 51 weeks	0.755	0.547 .	1.616 .	1.337	0.541 .	1.113	0.763	1.893	1.000	1.828	1.132
Occupational status (ISEI centered)	0.995	0.99 .	0.983 *	0.991 .	0.996	0.984 *	0.991	0.99	0.991	0.994	0.99
Social field (reference is no)	1.119	0.888	0.563 *	1.072	0.892	0.855	0.867	1.305	1.220	1.421	0.595
Birth year (centered)	0.977	0.984	1.066 .	1.056	1.103 *	1.043	1.021	0.969	0.962	1.050	1.055
Ethnicity (reference group is white)											
Black	0.829	0.674 .	0.561 *	0.66 *	0.617 *	0.476 *	0.463 *	0.338 *	0.343 *	0.343 *	0.252 *
Hispanic	1.042	1.080	0.994	0.72	1.346	0.833	0.648	0.67	0.416 *	0.556	0.407 .
Other	0.952	1.191	1.106	0.999	1.111	0.939	0.991	0.789	0.518 .	0.704	0.427

Supplementary Material Table 2 *Continued*

Age	22	24	26	28	30	32	34	36	38	40	42
	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR
Religion (reference group is Protestant)											
Roman Catholic	0.562 *	0.502 *	0.711 .	0.629 *	0.412 *	0.525 *	0.576 *	0.67	0.722	0.65	0.662
No religion	1.223	1.153	1.016	0.699	0.529	0.766	1.267	0.662	1.125	1.000	1.000
Other	0.699	0.915	1.339	0.932	0.666 .	0.57 *	0.553 *	0.467 *	0.333 *	0.387 *	0.511 .
In a relationship (reference is no)											
Married	0.507 *	0.607 *	0.46 *	0.511 *	0.65 *	0.679 *	0.8	0.85	1.149	1.352	0.918
Other	1.000 *	0.6	0.845	2.460	1.000 *	1.000 *	0.612	0.876	1.000	1.000	1.000
Partner	1.012	0.668	1.048	0.447 *	0.919	0.605 .	0.853	0.536 .	1.286	0.816	0.408

† $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Supplementary Material Table 3 Relationship between education and occupational behavior with the expectation to remain childless at different ages, *weighted* model

Age	22		24		26		28		30		32		34		36		38		40		42	
	OR		OR		OR		OR		OR		OR		OR		OR		OR		OR		OR	
Intercept	0.118	*	0.171	*	0.175	*	0.327	*	0.774		2.259	*	3.100	*	7.024	*	9.371	*	7.760		231.67	
Educational level (reference is finished high school)																						
Not finished HS	1.967		3.066	*	2.974	*	3.956	*	8.771	*	0.865		1.452		3.893		1.000		1.000	*	1.000	*
Some college	1.472		1.253		1.576	.	1.396		0.964		0.786		0.71		0.923		0.816		4.274		5.054	
Bachelor Degree	0.747		0.771		0.68		0.757		0.762		0.514	*	0.389	*	0.488		0.646		1.948		0.312	
More than Bachelor Degree	1.093		1.128		0.885		0.803		0.566	*	0.75		0.458	*	0.521		0.545		1.796		0.33	
Labour force partipation (reference worked 52 weeks)																						
0 weeks	1.215		0.699		1.570		2.218	.	3.129	.	1.607		0.818		3.791		1.459		1.120		1.000	
1 to 13 weeks	1		1.023		3.382	*	2.647		1.395		1.668		5.291	.	0.602		0.365		1.000		0.111	
14 to 26 weeks	1.720		1.006		1.050		1.391		1.704		1.220		2.774		1.044		0.269		0.629		1.000	
27 to 39 weeks	0.432	.	1.087		1.783		1.848	.	1.117		0.483		1.620		4.696	.	1.000		1.000		1.000	
40 to 48 weeks	0.547		0.584		0.929		1.666		0.763		1.938	.	1.354		3.666		0.603		0.126		0.012	*
49 to 51 weeks	0.204	*	0.324	*	1.977	*	1.310		0.525		1.064		0.764		2.190		1.000		0.381		0	
Occupational status (ISEI centered)																						
Social field (reference is no)	1.193		0.877		0.637		0.958		1.148		0.608		0.649		1.441		15.957	*	6.152		3.635	
Birth year (centered)	0.914	.	0.957		1.003		1.096	*	1.125	*	1.118	*	1.057		1.106		1.055		0.915		0.952	

Supplementary Material Table 3 *Continued*

Age	22	24	26	28	30	32	34	36	38	40	42
	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR
Ethnicity (reference group is white)											
Black	0.612	0.781	0.706	0.702	0.556	0.499	0.362 *	0.155 *	0.215 *	0.075 *	0.058
Hispanic	1	1.584	0.522	0.676	0.418	1.326	0.639	0.707	0.11	0.013	1.502
Other	1.146	1.036	1.203	0.806	1.081	0.857	0.935	0.925	0.589	0.226	0.113
Religion (reference group is Protestant)											
Roman Catholic	0.621	0.554 *	0.671	0.623 *	0.374 *	0.427 *	0.442 *	0.401 *	1.207	0.339	0.054
No religion	2.154	1.518	1.485	1.209	0.829	1.449	1.356	0.65	1.000	1.000	1.000
Other	0.614	0.721	1.253	0.792	0.507 *	0.42 *	0.396 *	0.358 *	0.245 *	0.288	0.128
In a relationship (reference is no)											
Married	0.401 *	0.647	0.507 *	0.536 *	0.697	0.749	1.128	0.533 *	0.962	1.486	6.535
Other	1.000 *	0.692	2.026	2.557	1.000 *	1.000 *	0.604	0.229	1.000	1.000	
Partner	1.043	0.768	1.207	0.425 *	1.125	0.769	1.266	0.385	2.921	0.313	1.000

† $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Supplementary Material section 2 Selection of respondents in our different models

In our KHB mediation analysis, we included women who did not have children when asked about their desire to remain childless (Table 2 in main text). Also in our model on the socializing effect of education, we looked at the change in the desire to remain childless and included women who were still childless in 1982 (Table 3 in main text). In our multilevel models we included women up to the age at which they had a child (Table 4 M1 in the main text). Furthermore, in our descriptive Figure 1B on fertility desires we excluded women who already had a child when asked about their ideals. We thus made a selection of women in our analysis. The proportion of women excluded in these models is displayed in SM Table 4 and SM Table 5.

SM Table 4 shows that in our KHB models as well as in our model on changing desires, many women who did not finish high school, who are in low occupational status jobs, who are not working in social and caring occupations and who barely worked are excluded because they already had a child. For example, 58% of the women who did not finish high school already had a child when asked about their fertility ideals, 37% of the women who worked in low status occupation, 27% of the women who did not work in social and caring occupations and 44% of the women who barely worked.

This is related to the fact that these women have children at younger ages. However, this could lead to a bias in our data, because the women who remain in our sample are not a random selection of women, especially not the group of women who are lower educated, in low status occupations and barely working. The women in these groups who are still childless might actually be the group of women with lower fertility desires.

For this reason, we examined the relation between education, occupational status and field and labour force participation with the desire to remain childless for women when they were 15, 16

and 17 years of age, in other words, before this selection took place (SM Table 6). Among the women aged 15 to 17, only 2.8% already had a child.

In this sample we see, just as in our selected sample, no clear educational gradient on the desire to remain childless. Women who finished some years of college are the most likely to desire to remain childless, followed by women who finished more than a Bachelor Degree, followed by the groups who finished high school and who obtained a Bachelor Degree, women who did not finish high school are the least likely to desire to remain childless. For the group of women who did not finish high school we see that selection does play a role. When looking at women who did not have children when asked about their ideals (in Figure 1B), these women are the most likely to desire to remain childless. This indicates that for this group of women, selection influences our results.

In the sample of 15 to 17 year old girls, we see no influence of occupational status, similar to our selected sample. We see that women who are working in social and caring occupations less often desire to remain childless, which is similar to our previously described selected sample. Finally, with respect to labour force participation, we see that women who barely worked are the least likely to expect to remain childless, which is not the case in the selected sample. Also for this group, selection influences our results.

However, according to the theory on intrinsic value orientation and socialization, we would expect that the highest educated, those working most and in high status occupations would be the ones that most often harbor the desire to remain childless. We do not find this in our selected sample, and also not in our sample of women before selection. Therefore, we are confident that the selection of respondents does not influence the substantive conclusions of our paper.

Crucially, if we would not make a selection in our sample of only childless women when asked about their ideals, we would falsely conclude that highly educated women, in high status

occupations and who work full-time would most often desire to remain childless. This can be seen if we look at SM Table 6, which also includes all women who were asked about their desires between 18 and 22 (without selection). When comparing this to the influence of education, occupation and LFP before selection took place (between age 15 and 17), we see that this effect is likely due to the fact that the lower educated women in low status occupations who barely work more often already had a child, and therefore their desire to remain childless is automatically lower.

Supplementary Material Table 4 Distribution of women who already had a child when asked about their ideals (which is in 1979 or in 1982, dependent on their birth year), in 1979 and 1982

	N complete sample	Proportion child when asked ideals (18-22 years old)	Proportion child in 1979	Proportion child in 1982
Overall	4198	0.164	0.254	0.343
Birth year				
1957	492	0.394	0.394	0.561
1958	474	0.323	0.323	0.513
1959	515	0.260	0.260	0.461
1960	561	0.187	0.187	0.359
1961	589	0.357	0.095	0.358
1962	589	0.229	0.054	0.229
1963	544	0.178	0.022	0.179
1964	431	0.087	0.000	0.087
Education				
Not finished HS	349	0.578	0.398	0.659
High school	1685	0.325	0.199	0.434
Some College	1147	0.211	0.137	0.306
BSc	519	0.095	0.064	0.147
>BSc	498	0.060	0.048	0.109
Occupational status				
Low	1624	0.368	0.246	0.469
Medium	1258	0.235	0.123	0.329
High	1316	0.134	0.086	0.203
Social field				
No	3606	0.270	0.173	0.359
Yes	592	0.162	0.109	0.251
LFP				
Decreasing hours	676	0.258	0.160	0.345
Increasing hours	1068	0.328	0.224	0.450
Full time	1943	0.164	0.102	0.232
Barely worked	511	0.442	0.278	0.544
N	4198	3101	3509	2711

Supplementary Material Table 5 Number of women who are still childless by age, used for the multilevel models on women who are still childless

Age	Number of childless women
22-23	2,578
24-25	1,933
26-27	1,744
28-29	1,387
30-31	1,125
32-33	907
34-35	756
36-37	712
38-39	683
40-41	659
42-43	659

Supplementary Material Table 6 Desire to remain childless by education and occupation at age 15 to 17 (before most childbearing and thus sample selection took place), between age 18 and 19 and between age 18 and 22 (used in our main analysis)

	All 15-16-17	Childless 15-16-17	All 18 & 19	Childless 18 & 19	All between 18-22	Childless 18-22
N	1561	1517	1536	1285	4152	3101
% with child	0.028		0.163		0.253	
Overall	0.073	0.076	0.080	0.094	0.068	0.085
Education						
Not finished HS	0.055	0.060	0.913	0.137	0.050	0.098
High school	0.061	0.063	0.939	0.076	0.053	0.068
Some College	0.097	0.099	0.893	0.121	0.083	0.102
BSc	0.061	0.061	0.907	0.097	0.083	0.092
>BSc	0.087	0.088	0.937	0.067	0.077	0.080
Status						
Low	0.081	0.085	0.086	0.112	0.067	0.092
Medium	0.064	0.066	0.076	0.085	0.068	0.083
High	0.082	0.083	0.079	0.085	0.069	0.076
Social field						
no	0.074	0.077	0.085	0.100	0.070	0.089
yes	0.066	0.068	0.050	0.055	0.053	0.061
LFP						
decreasing hours	0.078	0.080	0.074	0.088	0.072	0.096
full time	0.075	0.076	0.081	0.089	0.075	0.085
barely worked	0.053	0.056	0.083	0.118	0.056	0.079
Increasing hours	0.077	0.080	0.082	0.101	0.058	0.078

Supplementary Material section 3 The role of partnership trajectories

From previous research it is well known that never being married, having a higher age at first marriage or a higher age of entering a stable union, having a short duration of cohabitation and marriage and having serial cohabitating relationships all increase the chance of remaining childless (Hagestad & Call, 2007; Jalovaara & Fasang, 2017; Keizer, Dykstra, & Jansen, 2008). On the one hand, some argue that this is causal; a later age at marriage is matched with biological constraints to have children. On the other hand, people who are less inclined to have a family might postpone marriage.

Furthermore, research shows that education, labour force participation and partnership trajectories are not independent and that we should have a closer look at how marital characteristics influence the effect of labour and educational characteristics on childlessness. Mynarska et al (Mynarska, Matysiak, Rybińska, Tocchioni, & Vignoli, 2015) for example, made typologies of childless women based on their educational, labour force and partnership behavior and distinguished between low educated single working women, married working women, disadvantaged women, education and work focused women, women in unstable employment, and stay-at-home wives. Another study makes similar groupings in Italy (Tocchioni, 2016), where they find clusters of single working women, of single unemployed lower educated women (disadvantaged women), married working women, stay-at-home wives, and highly-educated women with unstable unions. For this reason, some researchers suggest we should not include marriage into models on fertility (intentions), because getting married could be seen as a result of the intentions to have a child (Hart, 2015).

In this sensitivity analysis we will therefore examine two things: 1) How does partnering behavior relate to childlessness and desires to remain childless? and, 2) Do our analyses (path models and multilevel models) change when we exclude partnership information?

1) How does partnering behavior relate to childlessness and desires to remain childless?

As seen in SM Table 7, in our sample there is no clear relationship between ever getting married and educational level, labour force participation, occupational status and occupational field. In approximately all groups, around 85% of the women ever got married. The only thing that stands out is that the group of women in the lowest educational level, with the lowest labour force participation and lowest status occupation less often got married. It furthermore is clear that higher education, high labour force participation, working in high status occupations and in social occupations is related to a later age at marriage.

Furthermore, women who eventually get married had at a younger age were less likely to hold the expectation to remain childless (7,7% desired childlessness and 7,6% expected childlessness) compared to women who only had a partner (13.4% desired childlessness and 12.8% expected childlessness) and those who remained single (12.2% desired childlessness and 13.6% expected childlessness). The positive correlation between age at first marriage and desiring and expecting childlessness indicate that those who desired or expected to remain childless get married at older ages.

2) Do our analyses (path models and multilevel models) change when we exclude partnership information?

As shown in SM Table 8, 9 and 10, the effect of education, occupational status, LFP and occupational field on remaining childless, the desire to remain childless and on the expectation to remain childless do not substantially change when we exclude partnership information from our models. Regarding the effect on remaining childless (SM Table 8), we see that the effect of occupational status and LFP is still positive and significant, and both working in a social and caring occupation and educational level has no significant effect.

With regard to the expectation to remain childless, in SM Table 10 we see in the models that do not control for partnership that higher education and higher status occupations are related to a lower chance of expecting to remain childless. This is similar to what we find in our models in which we include partnership trajectories, which are Table 1, 3 and 4 in our main text.

We can therefore conclude that partnership trajectories and educational and occupational behavior are not independent. Fertility desires and marriage are likewise not independent. However, excluding marriage from our models does not change our effect of education and occupation on childlessness and childlessness expectations. This indicates that the relationship between higher education and higher labour force participation and occupational status is not mainly attributed to differences in partnership behavior. Furthermore, differences in their expectations on remaining childless are not mainly due to differences of whether women have a partner.

Supplementary Material Table 7 Relationship between partnership and age at first marriage with fertility, education and occupation

	Married	Partner	Single	Age first marriage+
Prop remaining childless	0.114	0.247	0.467	0.241
Prop desired childless	0.077	0.134	0.122	0.092
Prop expected childless	0.076	0.128	0.136	0.056
Education				
Not finished HS	0.782	0.115	0.103	22.318
High school	0.840	0.072	0.088	22.947
Some College	0.848	0.049	0.103	23.964
Bachelor	0.884	0.039	0.077	26.137
>Bachelor	0.851	0.028	0.120	26.409
LFP				
barely worked	0.734	0.110	0.157	23.593
decreasing hours	0.858	0.065	0.077	23.884
increasing hours	0.855	0.062	0.083	23.000
full time	0.863	0.044	0.094	24.699
Occupational status				
low	0.786	0.087	0.127	23.668
medium	0.878	0.049	0.072	23.586
high	0.884	0.036	0.081	24.778
Social occupational field				
no	0.841	0.064	0.095	23.965
yes	0.865	0.034	0.101	24.252

+ For age at first marriage we display correlations between age at first marriage and number of children, remaining childlessness, desired and expected number of children, and desiring and expecting childlessness. We display the mean age at first marriage for the educational and occupational groups.

Supplementary Material Table 8 KHB mediation analysis without controlling for partnership

	OR+	(95% CI)	OR	(95% CI)	% confounding
	Reduced model		Full model		
Intercept	0.293***	(0.226-0.38)	0.269	(0.207-0.351)	
Birthyear (centralized)	0.96	(0.881-1.045)	0.964	(0.881-1.054)	
Age last interview (centralized)	1.000	(0.926-1.080)	1.009	(0.93-1.094)	
Ethnicity (reference group is white)					
Black	1.193	(0.941-1.511)	1.158	(0.909-1.475)	
Hispanic	0.923	(0.652-1.307)	0.958	(0.67-1.369)	
Other	1.026	(0.703-1.495)	1.084	(0.749-1.570)	
Religion (reference group is Protestant)					
Roman Catholic	0.726*	(0.559-0.944)	0.728	(0.558-0.95)	
No religion	1.282	(0.722-2.275)	1.229	(0.707-2.136)	
Other	1.204	(0.878-1.651)	1.180	(0.857-1.626)	
Educational level (reference is finished high school)					
Not finished HS	2.019*	(1.125-3.624)	1.923*	(1.072-3.452)	6.91
Some college	1.255	(0.947-1.663)	1.212	(0.914-1.607)	15.21
Bachelor	1.580***	(1.148-2.176)	1.524**	(1.107-2.098)	7.92
More than Bachelor	2.214***	(1.619-3.030)	2.102***	(1.537-2.875)	6.55
Labour force participation (reference worked full-time)					
Decreasing hours	0.457***	(0.333-0.629)	0.453***	(0.33-0.623)	-1.1
Barely worked	0.346***	(0.214-0.558)	0.349***	(0.216-0.563)	0.9
Increasing hours	0.431***	(0.322-0.577)	0.431***	(0.322-0.578)	0
Occupational status (ISEI centralized)	0.990†	(0.980-1.000)	0.991†	(0.981-1.001)	9.46
Social field (reference is no)	0.832	(0.622-1.114)	0.871	(0.65-1.166)	24.8
Desired childlessness			3.390***	(2.448-4.696)	
N	3066		3066		
Pseudo R2	0.048		0.070		

† $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. In these models women who did not have children when asked about their fertility desires are included. Desires were asked when women were between 18 and 22 years of age.

Supplementary Material Table 9 The relationship between education and change in the desire to remain childless without controlling for partnership status

	OR	% CI
Intercept	0.089***	(0.06-0.131)
Birth year (centered)	0.969	(0.874-1.075)
Ethnicity (reference group is white)		
Black	0.527***	(0.321-0.865)
Hispanic	0.756	(0.348-1.643)
Other	0.578	(0.256-1.301)
Religiosity (reference group is Protestant)		
Roman Catholic	0.611	(0.365-1.025)
No religion	0.963	(0.204-4.541)
Other	1.4	(0.769-2.549)
Educational level (reference not finished high school)		
High school	1.426	(0.448-4.541)
Some college	1.05	(0.609-1.809)
Bachelor Degree	0.78	(0.395-1.54)
More than Bachelor Degree	1.14	(0.626-2.076)
N	2419	

† $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. In these models, women who did not have children in 1982 are included ($N=2,419$). Women who desired children at both time points are contrasted with women who changed from desiring children to desiring childlessness. Therefore, we excluded women who desired childlessness in both waves ($N=93$) or who changed from desiring childlessness to not desiring childlessness ($N=93$) or who had missing information in 1979 or in 1982 ($N=40$) resulting in a sample of 2,419 women.

Supplementary Material Table 10 Multilevel models for repeated measures on the expectation to remain childless, without controlling for partnership

	OR	95% CI
Intercept	0.004***	(0.001-0.026)
Age (centered)	0.98	(0.863-1.114)
Age^2	1.005***	(1.003-1.007)
Ethnicity (reference group is white)		
Black	0.743.	(0.538-1.026)
Hispanic	1.008	(0.654-1.555)
Other	1.039	(0.634-1.702)
Religion (reference group is Protestant)		
Roman Catholic	0.498***	(0.359-0.692)
No religion	0.977	(0.46-2.075)
Other	0.677.	(0.45-1.019)
Educational level (reference is finished high school)		
Not finished HS	1.316	(0.668-2.594)
Some college	0.875	(0.628-1.22)
Bachelor Degree	0.457***	(0.31-0.674)
More than Bachelor Degree	0.596**	(0.41-0.867)
Labour force participation (reference worked 52 weeks)		
0 weeks	0.963	(0.663-1.397)
1 to 13 weeks	1.469*	(1.015-2.127)
14 to 26 weeks	1.407*	(1.034-1.914)
27 to 39 weeks	1.233	(0.941-1.615)
40 to 48 weeks	0.929	(0.721-1.197)
49 to 51 weeks	1.128	(0.841-1.511)
Occupational status (ISEI centered)	0.992**	(0.987-0.998)
Social field (reference is no)	0.953	(0.746-1.218)
N measurements	11882	
N individuals	2453	

*†p<0.1, *p<0.05, **p<0.01, ***p<0.001. We contrast women who expect to have children with women who do not expect children in time t, among women who have no children (yet).*

Supplementary Material section 4 Age differences in desires and expectations

Women in our sample were asked about their desires and expectations to remain childless at different ages, between age 18 and 22. Furthermore, when examining the change in the expectation to remain childless between 1979 and 1982, women are between the ages of 14 and 25. Therefore, in SM Table 11 we show how high fertility desires and expectations correlate with remaining childless, at different ages between 18 and 22.

When looking at women who were still childless when asked about their ideals (upper part of SM Table 11), we see an age gradient in the correlation between the expectation to remain childless and remaining childless. For women who were 18 when asked about their expectation, this correlation is 0.07 and for women of 19 and 20, this is 0.12 and those of 21 and 22 years of age, it is 0.16. This shows that the expectation to remain childless is a slightly better predictor of remaining childless for women who are questioned at later ages. The relationship between desire to remain childless and remaining childless does not show this age gradient. In this table we furthermore see that the desire and expectation to remain childless does not increase as women get older. The correlation between the desire to remain childless and the expectation to remain childless also does not increase as women age.

Finally, in SM Table 12 we examine if there are age differences in the role that education, occupation and LFP play in the expectation to remain childless. We find no structural age effect for most effects. We do find that women with some college more strongly adjust their fertility expectations down than women with high school (OR for main effect is 0.806 and for interaction is 0.961) and that women who work 14 to 26 weeks expect to remain childless more often than women working 52 weeks, but this effect decreases as women get older (OR for main effect is 1.301 and interaction is 0.937, (at age 30 OR is 1.301 and age 36 $1.301 \times (0.937^6) = 0.88$). Furthermore, women in social and caring occupations less often expect to remain childless (OR

0.914), but that this effect decreases with age (OR 0.914 at age 30, at age 36 this is $0.914 \times (1.053^6) = 1.24$).

Supplementary Material Table 11 Differences between desires and expectations and the relation between desires and expectations with childlessness and fertility by age

Age Asked Ideals	Overall	18	19	20	21	22
Childless sample						
N	3101	388	897	825	692	298
Proportions						
Desired childless	0.08	0.09	0.09	0.07	0.10	0.06
Expected childless	0.08	0.10	0.09	0.07	0.09	0.08
Correlation desire and expectation	0.69	0.70	0.74	0.69	0.66	0.60
Predictive power (correlations)						
Desire and remain childless	0.13	0.15	0.11	0.09	0.17	0.13
Expected and remain childless	0.13	0.07	0.12	0.12	0.16	0.16
Complete sample						
N	4198	431	1105	1104	1063	492
% childless	0.26	0.10	0.19	0.25	0.35	0.39
Proportions						
Desired childless	0.07	0.09	0.08	0.05	0.08	0.04
Expected childless	0.07	0.09	0.07	0.06	0.07	0.05
Correlation desire and expectation	0.67	0.69	0.75	0.68	0.61	0.54
Predictive power (correlations)						
Desire and remain childless	0.15	0.15	0.13	0.11	0.18	0.14
Expected and remain childless	0.16	0.18	0.14	0.15	0.18	0.20

Supplementary Material Table 12 Multilevel repeated measure models on the expectation to remain childless over the life course among women who have no children yet and among women who will remain childless, including age interactions

	M1: Women who have no children (yet)		M2: Women who will remain childless	
	OR	95% CI	OR	95% CI
Intercept	0.01***	(0.001-0.077)	0.592	(0.041-8.476)
Age (centered)	1.058	(0.923-1.212)	1.246**	(1.059-1.465)
Age^2	1.004***	(1.002-1.007)	1.002	(0.999-1.004)
Ethnicity (reference group is white)				
Black	0.661*	(0.476-0.917)	0.257***	(0.16-0.411)
Hispanic	0.956	(0.618-1.48)	0.603	(0.299-1.213)
Other	1.049	(0.638-1.725)	0.91	(0.421-1.964)
Religion (reference group is Protestant)				
Roman Catholic	0.496***	(0.356-0.69)	0.512*	(0.301-0.872)
No religion	0.986	(0.46-2.112)	0.993	(0.318-3.099)
Other	0.689.	(0.457-1.04)	0.505*	(0.282-0.906)
In a relationship (reference is no)				
Married	0.662***	(0.549-0.799)	0.905	(0.708-1.156)
Other	0.887	(0.279-2.82)	0.726	(0.178-2.967)
Partner	0.645**	(0.483-0.861)	0.705.	(0.495-1.004)
Educational level (reference is finished high school)				
Not finished HS	1.289	(0.648-2.567)	1.226	(0.467-3.218)
Some college	0.806	(0.574-1.134)	0.666	(0.397-1.119)
Bachelor Degree	0.437***	(0.295-0.648)	0.352***	(0.194-0.639)
More than Bachelor Degree	0.545**	(0.371-0.801)	0.415**	(0.237-0.728)
Labour force participation (reference worked 52 weeks)				
0 weeks	0.957	(0.66-1.387)	0.957	(0.606-1.51)
1 to 13 weeks	1.477.	(0.99-2.203)	1.369	(0.809-2.318)
14 to 26 weeks	1.301.	(0.951-1.778)	1.16	(0.781-1.724)
27 to 39 weeks	1.36*	(1.011-1.828)	1.415.	(0.96-2.087)
40 to 48 weeks	0.945	(0.73-1.223)	0.922	(0.668-1.274)
49 to 51 weeks	1.179	(0.869-1.599)	1.106	(0.748-1.635)
Occupational status (ISEI centered)	0.992**	(0.986-0.997)	0.994.	(0.987-1.001)
Social field (reference is no)	0.914	(0.708-1.181)	0.969	(0.711-1.32)
Age interactions				
Educational level (reference is finished high school) * Age				
Not finished HS	0.993	(0.927-1.063)	1.002	(0.926-1.085)
Some college	0.961*	(0.926-0.996)	0.962.	(0.923-1.004)
Bachelor Degree	0.972	(0.932-1.014)	0.97	(0.923-1.019)
More than Bachelor Degree	0.995	(0.954-1.039)	0.994	(0.946-1.044)

Supplementary Material Table 12 *Continued*

	M1: Women who have no children (yet)		M2: Women who will remain childless	
	OR	95% CI	OR	95% CI
Labour force participation (reference worked 52 weeks)*Age				
0 weeks	0.944.	(0.889-1.002)	0.946	(0.882-1.015)
1 to 13 weeks	0.987	(0.924-1.054)	0.998	(0.922-1.08)
14 to 26 weeks	0.937*	(0.889-0.988)	0.934*	(0.877-0.994)
27 to 39 weeks	1.033	(0.979-1.09)	1.045	(0.982-1.113)
40 to 48 weeks	0.991	(0.946-1.038)	0.997	(0.943-1.053)
49 to 51 weeks	1.018	(0.959-1.081)	1.03	(0.957-1.109)
Occupational status (ISEI centered)*Age	1	(0.999-1.001)	1	(0.999-1.001)
Social field (reference is no)*Age	1.053*	(1.01-1.097)	1.056*	(1.006-1.109)
N measurements	11882		6403	
N individuals	2453		646	

[†] $p < 0.1$, $*p < 0.05$, $**p < 0.01$, $***p < 0.001$. We examine the expectation to remain childless among women who have no children (yet) in model 1 and among women who will remain childless in model 2.

Supplementary Material section 5 The differences between fertility desires and fertility expectations

In the NLSY, in 1979 and 1982 respondents were asked about their fertility desires as well as their fertility expectations. In the years that followed, however, only fertility expectations were asked. For that reason, in our path model we could include a measure of fertility desires between age 18 and 22, and in our model on the socializing effect of education we could focus on the change in fertility desires between 1979 and 1982. However, in our longitudinal analysis on changes over the life course of women we had to make use of the measurements on fertility expectations. For this reason, we now examine the differences between fertility desires and expectations.

There is considerable literature on the meaning of fertility ideals, desires and expectations. In 1971, Ryder and Westoff (Ryder & Westoff, 1971) used the 1965 National Fertility Study and measured number of children intended, expected, desired and ideal. Expectations and intentions were considered more predictive than the desires and ideals. This is in line with the Trait-Desires-Intentions-Behavior framework (Miller, Rodgers, & Pasta, 2010), according to which a trait would result into desires, these desires would in turn influence your decision making process which would influence your intentions. These intentions in turn would result in behavior which would result in achieving or not achieving your intentions. Generally intentions and expectations are considered the most direct predictors of behavior (Ajzen & Klobas, 2013; Mencarini, Vignoli, & Gottard, 2015).

In our NSLY sample, the correlation between the desire to remain childless and expectation to remain childless is 0.69 (see SM Table 11). Approximately 8% desired to remain childless and 8% expected to remain childless. The expectation and desire to remain childless have about equal predictive power for remaining childless (correlation of 0.13 for those who have no

children yet). For those who have children, the predictive power of expectations (0.16) is higher than desires (0.15).

Generally, we can conclude that in the NLSY sample in the years in which both desires and expectations were asked, there are no large differences between the two measures. Furthermore, it seems unlikely that this relatively low expectation to remain childless would coalesce with a high desire to remain childless, thereby not impacting our substantive conclusion that highly educated women are not more likely to expect that they will remain childless.

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