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Explaining the Associations of Education and Occupation with Childlessness: The Role of Desires and Expectations to Remain Childless

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Abstract

Although there are well-established relationships between women's higher education, labour force participation (LFP), and occupation on the one hand and childlessness on the other hand in the US, the underlying reasons and the role that childlessness desires and expectations play remain unclear. We use the National Longitudinal Survey of Youth in the United States (N=4,198 women) and apply both logistic regression models to examine the role of childlessness desires early in life, and multilevel models for repeated measures to examine the role of childlessness expectations throughout the life course. We find that higher educational attainment and LFP are positively associated with childlessness. We do not find, however, that higher educated and working women more often desire or expect to remain childless. In contrast, we find that among women who ultimately remain childless, those women who work full-time and have higher status occupations have higher expectations to have children throughout their life course. These results suggest that education and occupation produce constraints, resulting in the postponement of childbearing which hinders women in realizing their desires and expectations. Since many working women remain childless despite the desire and expectation to become a mother, our findings stress the importance of work-life reconciliation. It furthermore highlights the importance of increasing public awareness regarding the decrease in fecundity with age.

Keywords

Childlessness, education, occupation, fertility desires, longitudinal research

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Introduction

In the United States, but also in many other Western countries, the prevalence of childlessness is generally greater amongst women who are highly educated, in higher status occupations, or engaged in full-time employment (Basu, 2002; Matysiak & Vignoli, 2008). Furthermore, childlessness is the lowest amid women working in specific occupations, such as those with social and caring roles or employed in jobs with working conditions with favourable work-life reconciliation (Begall & Mills, 2013). It remains unclear, however, what drives the associations between education, labour market participation, and occupational type on the one hand and childlessness on the other hand. The development and adjustment of the childlessness desires (whether women want to have children or not) and childlessness expectations (whether women expect to have children or not) over time has been posited as one of the central factors underlying the relationship between educational and occupational characteristics with childlessness, with three key mechanisms put forward.

First, differential levels of childlessness may be explained by initial motherhood desires that women already form at a young age. This follows work on preference theory which argues that young women aspiring for educational and career success have lower parental desires (Hakim, 2002, 2003, 2006). In this approach, endogenous preferences of women are seen as the driving causal factor behind the relationship between childlessness with educational and occupational characteristics.

A second mechanism is via socialisation that occurs via educational institutions (e.g., certain family norms are transmitted in school) but also in the workplace, where women alter their motherhood desires to remain childless in response to desiring a successful career (Begall & Mills, 2011; Lesthaeghe & Surkyn, 1988). Family role modelling (e.g., growing up with a working mother) and family socialization (Kolk, 2014) are other important socializing factors and socialization might also occur concerning child-rearing practices, but these aspects fall outside the auspices of the current study.

A third and final mechanism stresses role conflict and how difficulties in combining educational and occupational roles are associated with postponement of childbearing which may eventually result in childlessness (Bianchi, 2011; Keizer et al., 2008). Being enrolled in education, working full-time, or being employed in a high-status job with considerable responsibilities are all time-consuming and often clash with family life. What is distinct about this explanation is that it considers actual ongoing life experiences and does not place any prominence on the role of the desire to remain childless.

Previous research has struggled to empirically distinguish between these mechanisms. For example, higher levels of voluntary childlessness among higher educated women can be interpreted as evidence for both socialization in educational institutions and endogenous preferences. Furthermore, having fewer children than initially desired among working women could be attributed to socialization or role conflict. We recognize that the three mechanisms are not mutually exclusive. Initial differences in motherhood desires between higher and lower educated women might be reinforced by socialization in educational institutions, and role conflict for higher educated women during education or in the labour market could enhance the chance they remain childless.

The only approach that can disentangle these interrelated mechanisms is a longitudinal one that can map the relationship between early family desires and expectations with later educational and employment experiences. The longitudinal approach adopted in the current paper allows us to assess the role of all three of these mechanisms. Using data from the 1979 National Longitudinal Survey of Youth (NLSY79), we are able to follow American women throughout their reproductive period. In the NLSY data, fertility desires are asked during the first two waves of data collection, whereas fertility expectations are asked

at each wave. This allowed us to examine desires in the early life course and then examine how expectations evolve throughout the life course. In this cohort of women born around 1960 in the United States, the associations between education with childlessness and employment with childlessness is very strong, and although this relationship seems to be fading in recent cohorts (Rybińska, 2020a) or even reversing in Nordic countries (Jalovaara et al., 2018), 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 et al., 2014).

Two recent studies have also longitudinally examined the desires and expectations that precede childlessness among women (Gemmill, 2018; Rybińska & Morgan, 2018). Rybinska and Morgan (2018) show that about half of childless women expect children up to age 30 after which they expect to remain childless, while the other half has more variable expectations. They furthermore show that highly educated women less often expected to remain childless throughout their life course. Gemmill (2018) also shows that about half of childless women expected childlessness before age 30 and that, different to the findings from Rybinska and Morgan (2018), the other half is mainly characterized by expecting childlessness later in their life. Gemmill also shows that highly educated women are less often in the group who expected childlessness before age 30.

Our study contributes uniquely to this literature by specifically focusing on the mediating role of these desires early in life and expectations throughout the life course on the link between educational and occupational behavior on the one hand and childlessness on the other hand. Moreover, whereas previous literature has typically focused on education which is fixed early in life, our contribution includes a more fine-grained insight beyond education, by focusing on ongoing life experiences regarding labour market participation, occupational status, and the occupational field in which women work.

Desires and expectations

In this study, we will consider the role of both the desire to remain childless and the expectations of remaining childless. Desire is measured by asking respondents how many children they want to have, and expectations via how many children respondents expect to have. The distinction between these two terms is that desires are thought to be less influenced by possible obstacles, whereas expectations take into account not only desires but also the feasibility of achieving these desires (Miller et al., 2010). Previous studies that focused on the differences between these two concepts generally found that expectations are more predictive of behaviour than desires (Ajzen & Klobas, 2013; Mencarini et al., 2015; Miller et al., 2010; Ryder & Westoff, 1971). However, other studies showed generally small or even no differences between the concepts (Bhrolcháin & Beaujouan, 2018).

Background and hypotheses

Multiple studies, both from the US and Europe, show higher rates of childlessness among highly educated women (Hagestad & Call, 2007; Koropecykj-Cox & Call, 2007; Kravdal & Rindfuss, 2008; Portanti & Whitworth, 2009; Wood et al., 2014). A recent study in 19 European countries 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 et al., 2015). Furthermore, fertility is typically found to be the lowest amongst working women and highest among women who are out of the paid labour force (Bernhardt, 1993; Brewster & Rindfuss, 2000; Matysiak & Vignoli, 2008). Moreover, within the group of working women, full-time work is related to lower fertility more than part-time work (Begall, 2013). Not only does the amount of

time that a woman spends in paid labour influences fertility, but also the kind of job has been shown to exert an influence; women with higher status occupations (which are occupations that generally require a high level of education and generally result in high incomes) tend to have fewer children, have children later, and remain childless more often (Edwards, 2002; Hopcroft, 2006). Women in occupations related to caring and interpersonal skills have been shown to have lower levels of childlessness and higher fertility (Begall & Mills, 2013; Martin Garcia, 2010).

Mechanism 1: Endogenous preferences: Early life differences in desires: Prior research proposes that there is a set of intrinsic values that instigate women to strive for high (or low) status occupations and at the same time desire family life less (or more), which according to the preference theory generates the relationship between occupational characteristics with childlessness (Hakim, 2002, 2003, 2006). Using the same line of reasoning, Barber (2001) proposes that positive attitudes towards career and education would pair with lower preferences for childbearing. These preferences influence women's behaviour both concerning education, labour force participation (LFP), and occupational choices as well as family related choices.

Concerning occupational status, expectations from preference theory would lead us to expect that women in higher status occupations are more often work-centered women, have high occupational career ambitions, and have low desires for having children already at a young age. A similar pattern holds for LFP: differences in preferences regarding both work and fertility behaviour would explain the relationship between LFP with childlessness. Others have argued that the choice of educational discipline which leads to a particular occupational field is an indicator of preferences or selection into future lifestyles that enable an occupation amenable to childbearing (e.g., teaching) (Bavel 2010; Oppermann 2012; Begall & Mills 2013). These would all lead to the expectation that desires early in life are the driving cause explaining the relationships between education with childlessness and occupational characteristics with childlessness.

Although the idea that early life desires explain the link between occupational characteristics and fertility is an attractive heuristic, empirical support remains limited. Even though research shows that women who are higher educated, have higher incomes, and work in high-status occupations are more often voluntarily childless (Abma & Martinez, 2006; Avison & Furnham, 2015; Martinez et al., 2012; Tanturri & Mencarini, 2008; Waren & Pals, 2013), this does not automatically entail that these women had the desire to remain childless already early in their life. This may be explained by voluntary childlessness being defined in these studies as being childless and intending to have no children somewhat later in life (up to age 44). The actual intention or ideal to have no children is, however, still quite uncommon (Miettinen & Szalma, 2014; Morgan & Rackin, 2010). Findings regarding the association between education and LFP with the desire to remain childless are mixed, as studies show that higher educated more often desire to remain childless (Rybińska, 2020), but also that there are no educational differences in the desire to have no children (Berrington & Pattaro, 2014; Testa, 2014), and even that higher educated individuals less often desire or intend to remain childless (Miettinen & Szalma, 2014). Regarding LFP, findings indicate that full-time working women are most likely to intend to have children compared to part-time working or inactive women (Berrington & Pattaro, 2014), while other research shows that unemployed individuals are most likely to intend to remain childless (Miettinen & Szalma, 2014). Instead, qualitative research indicates that especially personality traits or feelings about children are reasons why people desire to remain childless (Park, 2005).

Overall, these findings question the idea that early life desires cause the relationship between childlessness and educational and occupational characteristics. Despite mixed evidence, we will test the mechanism that:

Early life desires to remain childless explain why women with high education, high LFP, high occupational status, and who do not work in social and caring occupations remain childless more often (Hypothesis 1). See Figure 1 for a graphical representation of the hypotheses.

Mechanism 2: Socialization: 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 and at work. Within higher education, certain individualistic values or those that are less aligned with traditional and religious beliefs of promoting family over career, are transmitted, and these values could in turn decrease fertility desires (Heaton et al., 1999; Lesthaeghe & Surkyn, 1988). Furthermore, higher educated men and women have more egalitarian gender roles and norms (Goldscheider et al., 2014), which also are related to lower fertility (Arpino et al., 2015) and lower fertility intentions (Kaufman, 2000). However, these associations differ across contexts (Raybould & Sear, 2021), and especially in countries such as the United States, where little policy support is available to combine work and family for women, there is an association between more gender equity and lower fertility intentions (Aisenbrey et al., 2009; McDonald, 2000). Also, more generally, education is believed to be socializing individuals into greater tolerance of unconventional behavior (Ohlander, Batalova, & Treas, 2005), such as childlessness. Similarly, occupational fields differ in the prevalence of traditional family values, which could result in differences in fertility desires (Bavel 2010; Hoem et al. 2006; Oppermann 2012; Begall & Mills 2013). In female-dominated educational fields, such as social and caring occupations, more stereotypical images of motherhood and womanhood are transferred which may also breed higher fertility desires and high fertility (Hoem et al., 2006).

The few longitudinal studies that have focused on changes in the desired and expected number of children demonstrate that women who have a job, higher earnings, work more hours, and have higher levels of education report a decreasing desired and expected total family size over time more than lower educated and non-working women (Iacovou & Tavares, 2008; Liefbroer, 2009). In many of these studies desired and expected fertility is based on the sum of the actual number of children women already have, and the additionally desired/expected number of children (Berrington & Pattaro, 2014; Heaton et al., 1999; Iacovou & Tavares, 2008; Liefbroer, 2009). However, lower educated women and non-working women have more children and have children earlier. Therefore, lower educated women at for example age 35 are less likely to fall in the category of women who do not intend to become parents, while actually, it might be the case that among only childless women, lower and higher educated are just as likely to intend to remain childless at age 35. We overcome this issue by examining fertility desires and expectations within the group of women who have yet to have children or remain childless. In one study that compared childless individuals who kept expecting to become a parent, to those who changed into expecting childlessness, it seemed that highly educated individuals more often kept expecting to become parents (Heaton et al., 1999).

The mixed findings reported above provide only partial support for the socialization hypothesis. We attempt to overcome this by investigating 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 would decrease fertility desires, and therefore we hypothesize that *women who are longer enrolled in education will increase the desire to remain childless* (Hypothesis 2a).

Above the age of 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 amongst women who are working in high-status occupations, who are not in social and caring occupations, and who work full-time. For this reason, we hypothesize that *high LFP, high-status occupations, and not working in social and caring occupations will increase the expectation to remain childless* (Hypothesis 2b). See Figure 1 for a graphical representation of the hypotheses.

Mechanism 3: Role conflict leading to postponement: The third mechanism holds that the negative relationship between education, occupation, and fertility is due to role conflict in pursuing education, being employed, and having a family, which in turn leads to postponement and eventually to childlessness. The first reason is that highly educated women spend more time in school, with the roles of being a student and a parent being difficult to combine (Kravdal & Rindfuss, 2008). Very few women have their first child when they are in education, particularly in the U.S., 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 that generally in high-income contexts women still perform the majority of household and childcare tasks despite increasing labour force participation (Anxo et al., 2007), 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 et al., 2011). Particularly women in high-status occupations, that often carry many responsibilities, find it difficult to combine their job with family life (Shreffler, 2017).

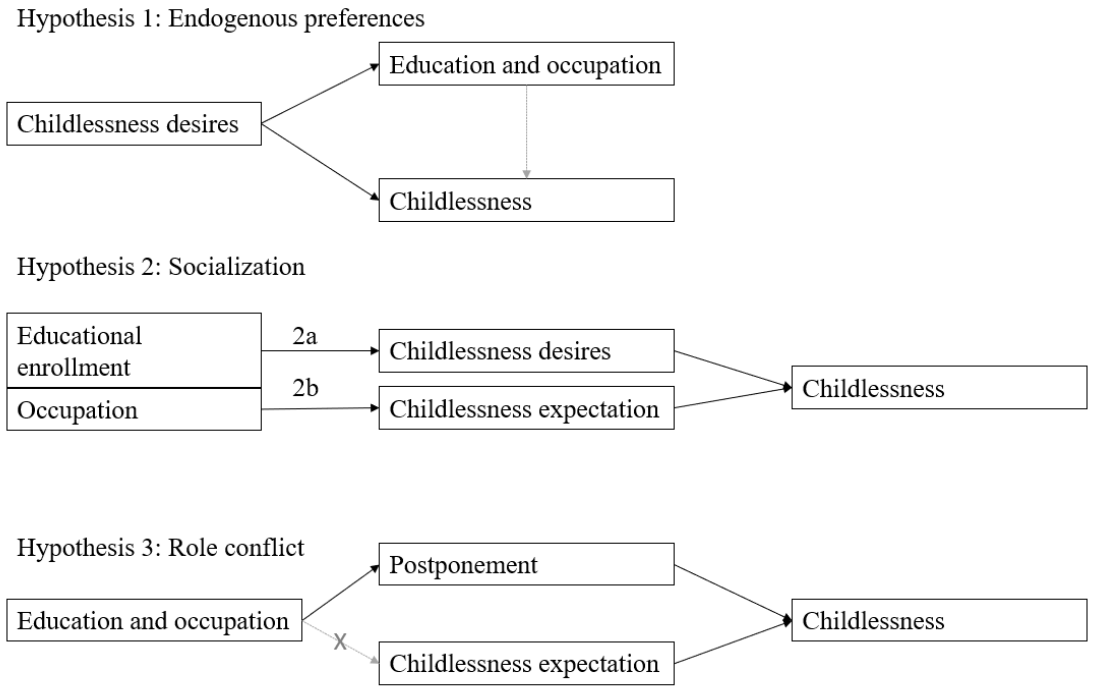
This branch of literature does not assume that higher educated women or women in demanding occupations have lower fertility desires initially, but rather that occupational characteristics throughout the life course are related to why women postpone childbearing. In other words, although many of these women have expectations that they will have children for a large portion of their lives, they remain childless (Shreffler, 2017). However, it could also theoretically be the case that women who initially desire and expect to have children adjust their fertility expectations downwards due to role conflict. This idea finds little support in the literature, as previous studies showed that women who experience more role conflict between work and family do not have lower fertility intentions (Begall & Mills, 2011; Shreffler et al., 2010). Also, childless women who work more hours, with little flexibility, and who work at a stressful workplace (which are all possible causes of role conflict between work and family), do not want to remain childless more often, do not have smaller preferred family sizes or lower intentions to have a child (Buber-ennser et al., 2013; Yu & Kuo, 2017), except for a small group of women who work over 50 hours per week (Buber-ennser et al., 2013).

Previous research has examined to what extent educational attainment and occupation result in discrepancies between the desired number of children at a young age and the actual number of children at the end of the reproductive period. Other studies have focused on the adjustment of fertility intentions. Several studies showed that higher educated women more often have fewer children than initially desired (Berrington et al., 2015; Berrington & Pattaro, 2014; Morgan & Rackin, 2010; Quesnel-Vallee & Morgan, 2003) and are more often childless despite desiring children (Beaujouan & Berghammer, 2017), which could be attributed to socialization and changing preferences as well as role conflict. Another study examined trajectories of fertility intentions over time and found no educational differences in changing intentions. This suggests that despite similar patterns of fertility expectations, women who are highly educated more often remain childless (Hayford, 2005) and that differences in expectations are not the causal factor.

Furthermore, based on previous research we can assume that indeed postponement of childbearing could be a reason for childlessness among highly educated women, women in high prestige occupations, and those working full-time, as it has been observed that these women often have a higher age at first birth than lower educated women (Budig, 2003; Edwards, 2002; Kantorová, 2004; Kravdal & Rindfuss, 2008; Martin, 2000; Mills et al., 2011). The high ages at parenthood of highly educated women suggest that this group of women is postponing childbearing. Postponement of childbearing attempts could for some women eventually result in involuntary childlessness due to decreased female fecundity with age (Dunson et al., 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 ages 35 and 39 (Dunson et al., 2004). If a couple would like to have at least one child, advice suggests that they should start before the age of 35 (Habbema et al., 2015).

The extent to which women experience barriers in combining work and family are of course context dependent. In the Nordic countries, availability and affordability of childcare are higher, attitudes towards working mothers 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 et al., 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.

FIGURE 1. GRAPHICAL REPRESENTATION OF THE 3 HYPOTHESES



In conclusion, educational and occupational attainment may cause childlessness because of the role conflict and time constraints they put on women which causes postponement of childbearing which eventually might result in childlessness. Importantly, and in contrast to the mechanisms of endogenous

preferences and socialization, differences in the desire and expectation to remain childless 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 or expectations. Instead, their higher levels of educational pursuits and labour market attainment will result in postponement, which eventually leads to higher levels of childlessness. From this, we propose that *a high educational level, LFP, occupational status, and not working in social and caring occupations does not relate to higher expectations to remain childless over the life course* (Hypothesis 3). See Figure 1 (previous page) for a graphical representation of the hypotheses.

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. For the current study, we only selected women over the age of 45 at the time of their last interview, since previous research shows that less than half a percent of the children are born to mothers after the age of 45 (Billari et al., 2007). Research using the NLSY data provided similar estimates that only 0.3% of women had their last child after the age of 45 (Stulp et al., 2016). For this reason, childlessness at the age of 45 years and older will be very similar to lifetime childlessness. Therefore, the last round of interviews that we used took place in 2012 (although other rounds have been added recently), when the respondents were between 47 and 56 years old. 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 (SM) section 2 and 3 for more information about retention rates in the NLSY and our selection of respondents).

For our various analyses, we used different subsets of women which is explained in the analytical strategy section. For the longitudinal analysis on expectations to remain childless, we use the information of women up to age 42, because very few women expect to have an (additional) child after this age. However, in the longitudinal model on women who remain childless, we use the age of 45 as a required age for follow-up. Due to the sampling procedure, the NLSY79 includes an overrepresentation of black and Hispanic individuals. Because of the selection of women over 45, and to adjust for the sampling procedure of the NLSY we apply custom weights from the NLSY that weights according to the probability to be followed up to the age of 45 as well as the initial sampling 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 at age 18-22. In 1979 and 1982, respondents were asked how many children they wanted to have (without a specific time frame being specified). 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. Due to this division, all respondents were between 18 and 22 when they reported on their desired number of children.

Expected childlessness. At every wave, respondents were asked how many children they expected to have (without a specific time frame being specified). For each wave, we made the distinction between women who expected to have no children (expected childless) and women who expected to have one or more children (expected children).

Highest 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? This question was asked every wave, and we coded this as a time-invariant variable using the highest grade ever reported by age 45. We chose a time-invariant measure of education because for most women across the ages 22–45, education is relatively time-invariant and for those who are still enrolled in education at age 22, one could argue in such a case that the educational level that women eventually obtain by being enrolled in their education is more appropriate than their previously obtained degree. Answers are categorized into five groups. Those who indicated finishing 11th grade or less are characterized as “not finished high school” (these are ISCED levels 1 and 2, and are generally categorized as low education), those who finished 12th grade are characterized as “high school” (ISCED level 3, or medium education), those who finished 1 to 3 years of college are characterized as “some college” (ISCED level 4 and 5, or medium to high education), those who finished the fourth year of college are characterized as “BSc” (ISCED level 6, or high education) and those with 5 or more years of college as “>BSc” (ISCED level 7, or high education).

Educational enrollment. In every wave, respondents are asked if they are enrolled in education. Respondents could either indicate that they are enrolled in high school, enrolled in college, not enrolled and graduated from high school, or not enrolled and not graduated from high school. We use this information to examine how enrollment between 1979 and 1982 influences changes in desires between these waves.

Labour force participation (LFP). In every wave, respondents were asked how many hours they worked each week in the past year. Responses of every week are categorized as 0 hours, 1-19 hours, 20-39 hours, 40-49 hours, and 50+ hours. We chose to group LFP into these five categories because this led to five relatively large groups that distinguish between substantially different types of labour force participation (namely inactive, small part-time jobs, large part-time jobs/almost full-time, full-time jobs, and large full-time jobs). We summarized this for every year, by using the number of hours they worked for most weeks in the past year (if they worked 40–49 hours in 47 weeks, and 50+ hours in 3 weeks and 0 hours in 2 weeks, we categorize this as 40–49 hours).

Lifetime LFP. We used the information taken from the entire occupational trajectory from age 22 to 42. Women were classified into four clusters using sequence analysis and cluster analysis (see SM Figure 1 for a graphical distinction of the different groups and the technical details). We distinguished between individuals with increased LFP (who had an interrupted LFP up to age 30 and more stable full-time LFP after age 30), those who barely worked throughout their life course, women who (almost) consistently worked 40–49 hours per week, and those with interrupted LFP (characterized by many years of not working, as well as years of working full-time and part-time). These groups largely overlap with those found in previous research (García-Mangano, 2015).

Occupational status. Occupational status was measured by using the information of 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 et al., 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 ages of 22 and 48 was used and for the longitudinal analyses, we used their *current occupational status*. In our models we standardize the 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 occupations. 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 expectations. In all analyses, we controlled for the birth year of the respondent, self-reported ethnicity (White, Black, Hispanic, and other), and religion (Protestant, Roman Catholic, no religion, and other). In our mediation 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 information about partnerships, more specifically age at marriage and whether respondents ever got married in our mediation model, and for current relationship status (single, married, with a partner or other) in our longitudinal model, but also compare models where we include partnership trajectories to those where we exclude it (see SM 4). This is because some researchers suggest excluding marriage in models of fertility (expectation) since getting married could be seen as a result of the intention to have a child (Hart, 2015).

Analytical strategy

Karlson-Holm-Breen (KHB) mediation analysis on the influence of endogenous preferences. To test our first hypothesis of whether differences in the desire to remain childless explains the relationship between occupational characteristics with childlessness, we apply the method of KHB mediation. Comparing coefficients across logistic regression models with and without confounding factors (in our case the desire to remain childless) possibly results in a bias due to differences in unobserved heterogeneity between models (Mood, 2010). Therefore, we apply the KHB method to equalize the scale of the log-odds across models (Karlson et al., 2012). Since we examine the role of the desire to remain childless at ages 18-22, we only include women in the model who were childless when asked about this desire. We apply weights according to the possibility of being in the data up to age 45. The KHB models show the coefficients for education and occupation from the reduced model (without childlessness desires included) and the full model (in which childlessness desires are included). Finding a large reduction of the effect of education, LFP, and occupational status on childlessness once childlessness desires are included in the model would provide support for hypothesis 1.

Logistic regression model on socialization in education. To test our second hypothesis of whether socialization in education influences the desire to remain childless (hypothesis 2a), we apply logistic regression models to examine the role of educational enrollment on changes in desired childlessness between 1979 and 1982. Women who were between 16 and 18 in 1979 either finished high school and stopped education between these two waves, stayed in high school, stopped after some college, stopped during high school, or went from high school to college. Finding that women who went from high school to college more often change into desiring childlessness compared to women who stopped after high school would provide support for hypothesis 2a and the idea of socialization. Women who were 19 or 20 in 1979 either already finished education in 1979 and were thus not enrolled, stopped their education after a few years of college, or stayed in college between 1979 and 1982. We compared those who stopped college to those who stayed in college. Finding that women who stayed in college would more often change into desiring childlessness compared to women who stopped college would provide support for hypothesis 2a and the idea of socialization. Almost all women who were 15 in 1979 remain in high school in both waves and are therefore excluded from the analysis. Women who were over 21 rarely were enrolled in education in 1979 and are therefore also removed from the analysis. For these analyses, we only included women who did not have children in 1982 (because for them a change in the desire to have children could not be biased on having a child), see SM Table 7 for the proportion of women who were still childless in these waves. 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 or role conflict leading to postponement. Secondly, to test our hypothesis 2b as well as hypothesis 3, we applied multilevel models for repeated measures, with a random intercept and fixed slopes, using the lme4 package in R (Bates et al., 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 characteristics relate to the expectation to remain childless throughout the life course. Finding that women who obtained a high educational level, with high LFP, a higher status occupation, and who do not work in a social occupational field would more often expect to remain childless would be support for hypothesis 2b, while finding that they do not more often expect to remain childless would be support for hypothesis 3. 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 SM Table 8 for the number of women at every age). We use this selection criterion because otherwise differences between having a child or not would be difficult to distinguish from differences in the expectation to remain childless.

In our multilevel model, occupational status and occupational field refer to the respondents' current occupation at time point t , and LFP refers to the number of hours per week the respondent worked in the past calendar year. Lagging of the other variables (i.e., using occupational measurements of the period before the fertility measurements) was not desirable because of the structure of the data; from 1994 onwards, respondents were only interviewed bi-yearly, which would have resulted in a lag of at least two years. Since the use of weights in multilevel models 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 (see SM Table 5 and 6).

From all our models, we display the average marginal effects (AME) (Leeper, 2017) for our variables of interest, which gives the change in probability of remaining childless, averaged across all individuals

in the data. Marginal effects are estimated using the margins package in R (for the logistic regression and multilevel model) and the margin package in STATA (for the KHB mediation model).

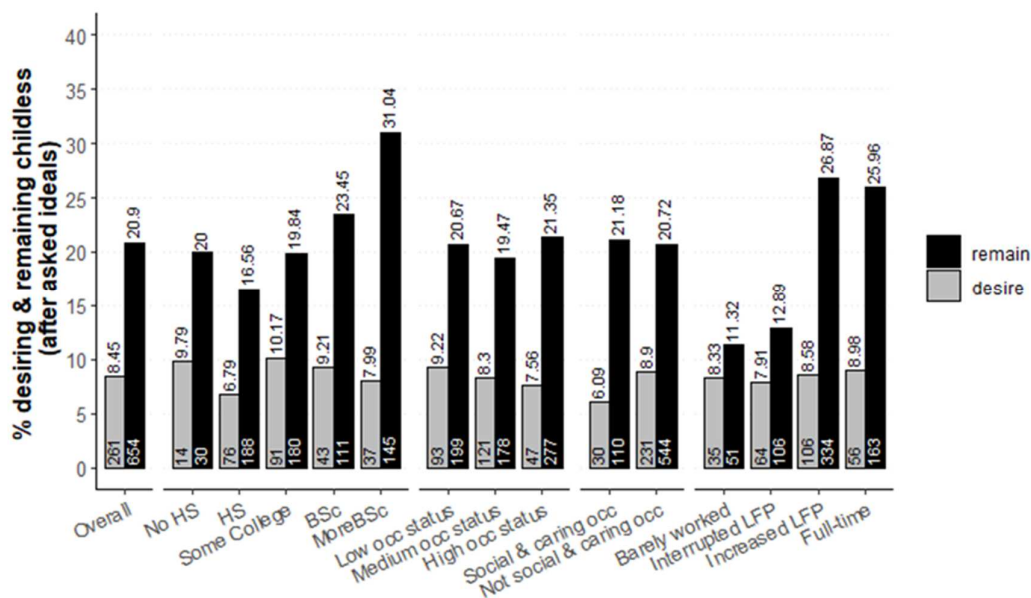
Results

Descriptive statistics

In our sample, 16% of women remain childless (see SM Table 4). Concerning the relationship between education and occupation on the one hand with childlessness on the other hand, 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 for women who completed more than a Bachelor’s degree, it corresponded to 29%. Women working in high-status occupations were also 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 grey bars in Figure 2 and SM Table 4). 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 among women who would finish only high school (7%) (see Figure 2). Similarly, women who were employed in higher status occupations the least often and those

FIGURE 2. THE RELATIONSHIP OF EDUCATION, OCCUPATION, AND LABOUR FORCE PARTICIPATION WITH DESIRING TO BE CHILDLESS AT AGE 18-22 AND REMAINING CHILDLESS AT AGE 45 (SELECTION OF RESPONDENTS CHILDLESS AT AGE 18-22).



Note. The grey bars represent the percentage of women who desired to remain childless and the black bars the percentage of women who remained childless. Results are based on women who did not have children when they were asked about their desires (N=3,101). The number of women per category is displayed in the bars and the percentage on top of the bars. Occupational status is divided into tertiles, with women in the low category in the first tertile (occupational status below 53), the 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).

in lower status occupations most often held the desire to remain childless (7% and 9% respectively). Women employed in social and 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, there were only small differences in the desire to remain childless by women’s LFP.

Regarding the expectation to remain childless and actual childlessness over the life course, Figure 3a shows that at age 22, among women who will remain childless, the vast majority expects to become a mother. At around age 32, half of the women still harbor this expectation, while at age 42 barely any women who will remain childless still expect to become a mother. Figure 3b 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 unmet. The same holds for women who work in social and caring occupations, with high labour force participation, and women with high-status occupations (Figure 3c-3e).

FIGURE 3A. CHILDLESSNESS EXPECTATIONS AND BEHAVIOUR BY AGE

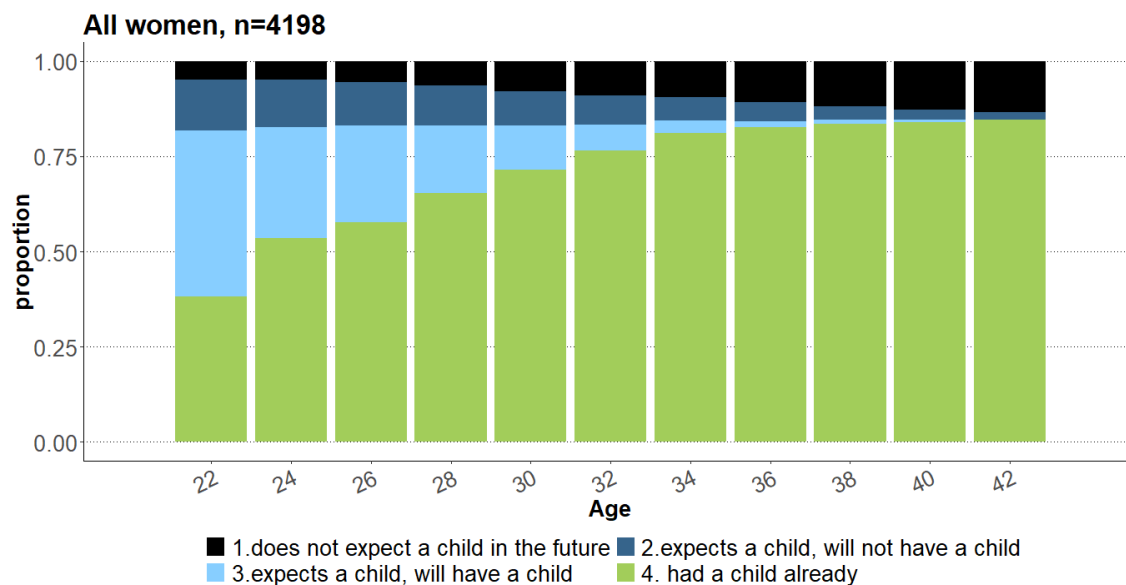


FIGURE 3B. CHILDLESSNESS EXPECTATIONS AND BEHAVIOUR BY AGE AND EDUCATIONAL LEVEL

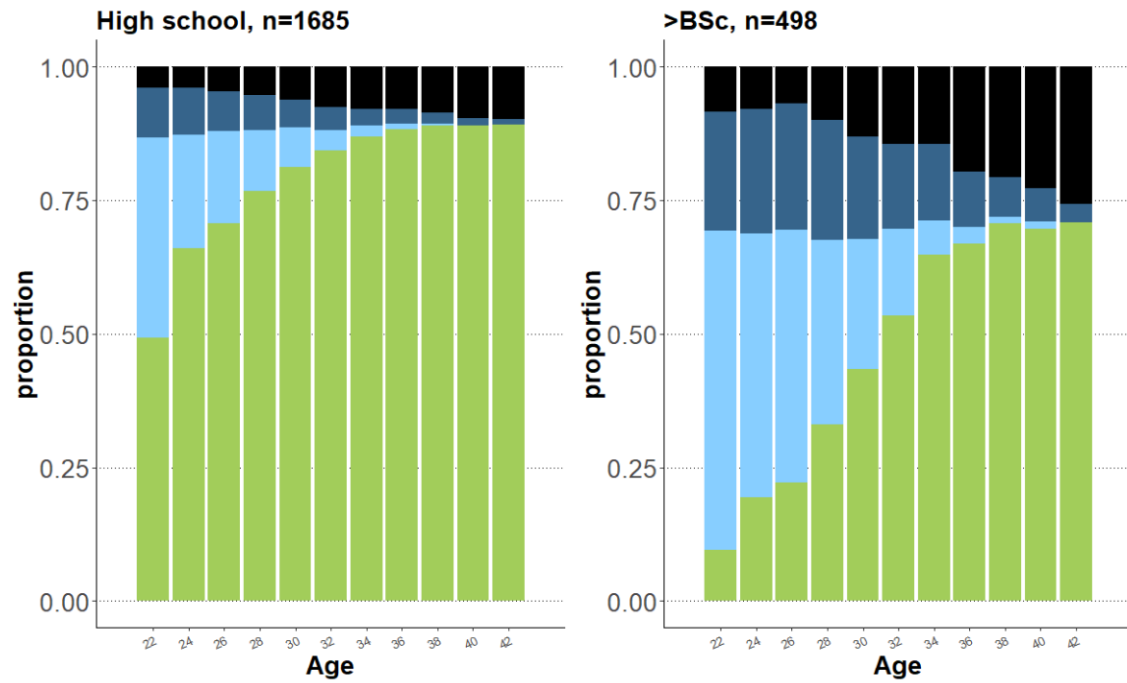


FIGURE 3C. CHILDLESSNESS EXPECTATIONS AND BEHAVIOR BY AGE AND OCCUPATIONAL FIELD

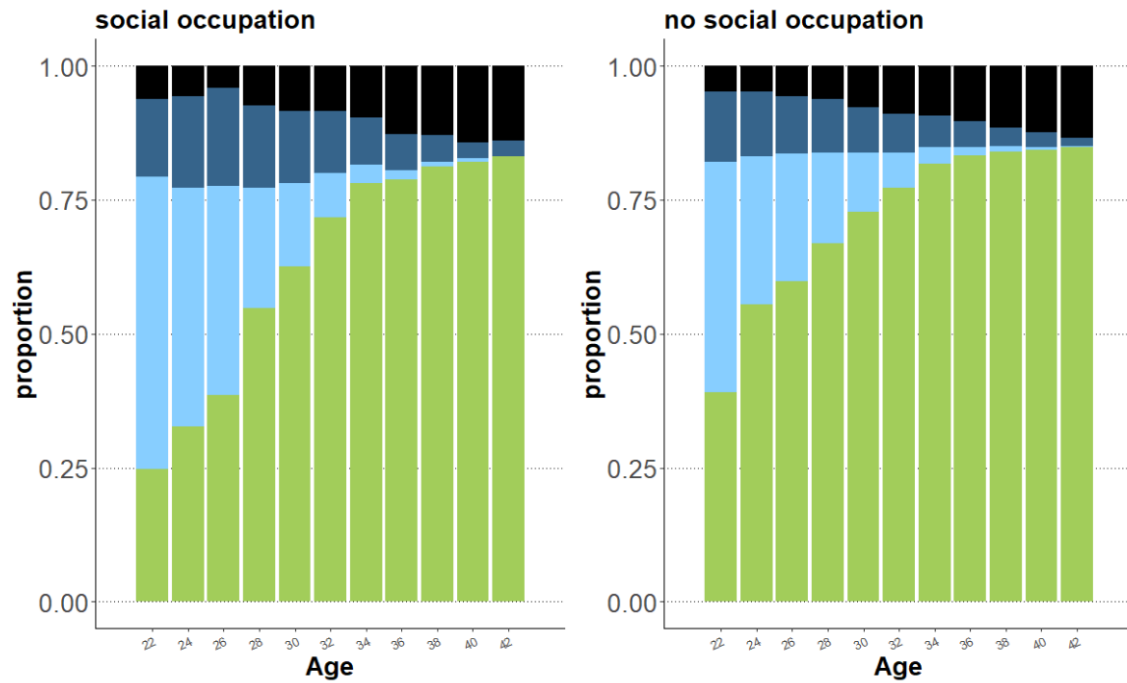


FIGURE 3D. CHILDLESSNESS EXPECTATIONS AND BEHAVIOUR BY AGE AND LABOUR FORCE PARTICIPATION

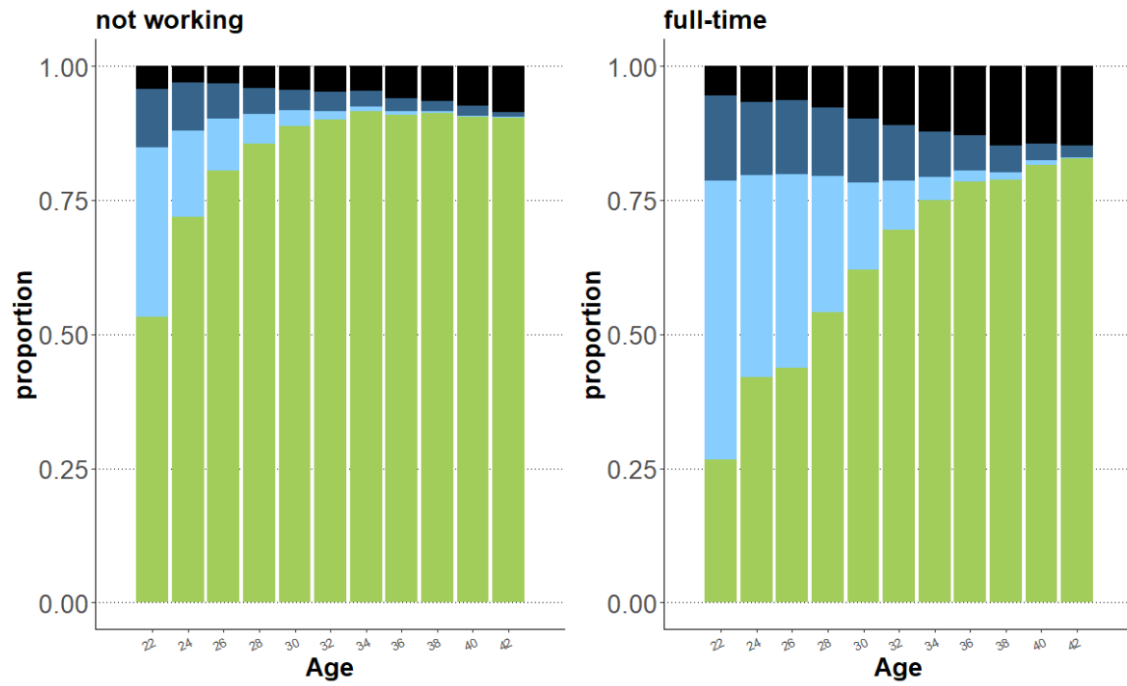
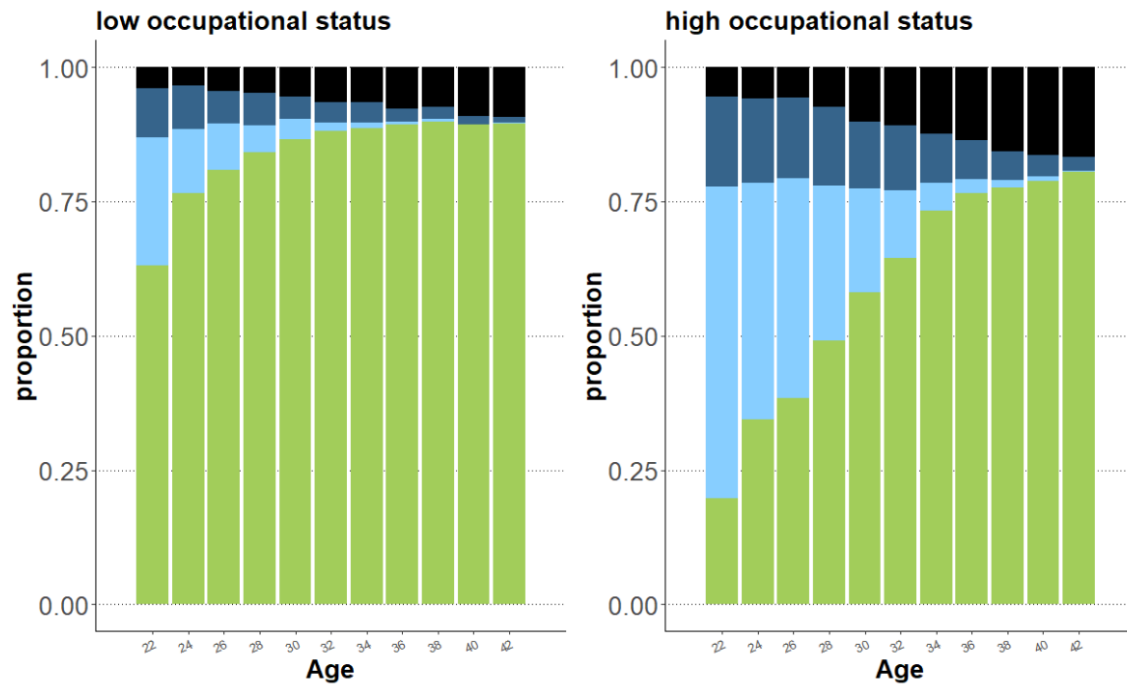


FIGURE 3E. CHILDLESSNESS EXPECTATIONS AND BEHAVIOUR BY AGE AND OCCUPATIONAL STATUS



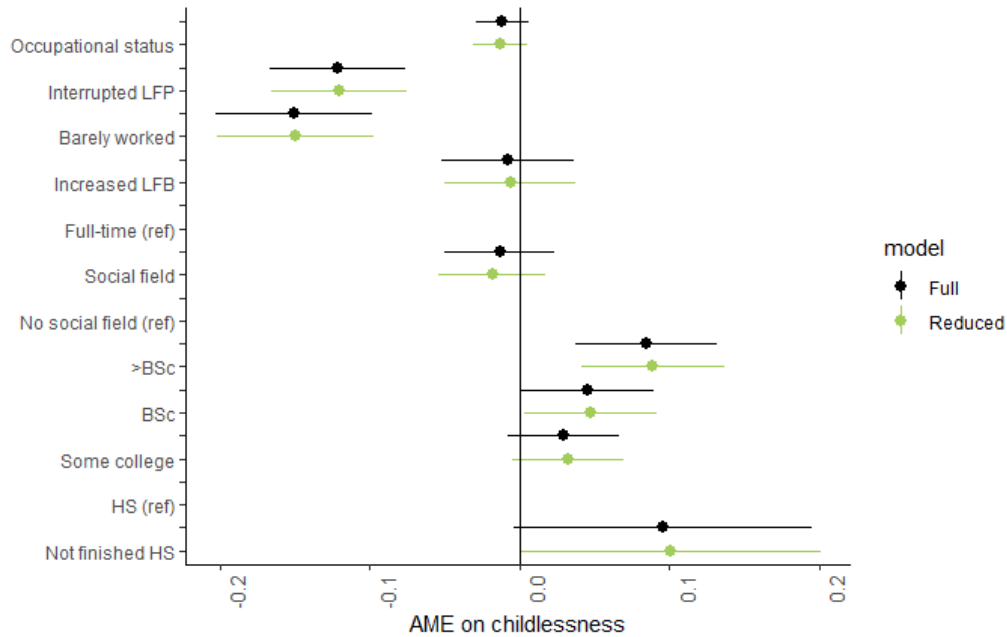
Note. For age 22 to 42, the proportion of women who had a child (green), who expect to have a child in the future and will have a child (light blue), who expect to have a child in the future but will not have one (dark blue) and

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. Occupational status is divided into tertiles, with women in the low category in the first tertile, the medium category in the second tertile (not displayed), 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).

Endogenous preferences: Early life differences in desires

We tested the first hypothesis that early life differences in desires (at age 18-22) explain the relationship between educational and occupational characteristics on the one hand with childlessness the other hand, by estimating mediation models. Women who are higher educated more often remain childless (see Figure 4, reduced model; AME 0.089; 95%CI 0.041-0.137; for those who finished more than a Bachelor's degree compared to those who only finished high school). Women who barely worked or who had an interrupted labour market career were less likely to remain childless than those who maintained full-time employment throughout the life course (see Figure 4, Reduced model; AME -0.149; 95%CI -0.202- -0.097; for those who barely worked compared to those who worked full-time). The highest obtained occupational status does not seem to matter, neither does the occupational field in which one works. In line with what we could expect based on our descriptive findings, those who had the desire to remain childless do not differ in their labour force participation and occupational status from women who did not have the desire to remain childless (see SM Table 16). Women who had the desire to remain childless are less likely to work in social and caring occupations later in their life (OR 0.613, see SM Table 16) and more likely finished some college compared to HS (OR 1.099, see SM Table 16).

FIGURE 4. AVERAGE MARGINAL EFFECTS AND 95% CI ON REMAINING CHILDLESS OF KHB LOGISTIC MEDIATION MODELS



Note: Reduced refers to the model without desires included, and full refers to the model in which childlessness desires are included. None of the differences in estimates from the reduced and full models are significant. In these models, we include women who were childless when they were asked about their childlessness desires. Desires were asked when women were between 18 and 22 years of age. The models control for birth year, age last interview, ethnicity, religion, and age at first marriage. The full model can be found in SM Table 1.

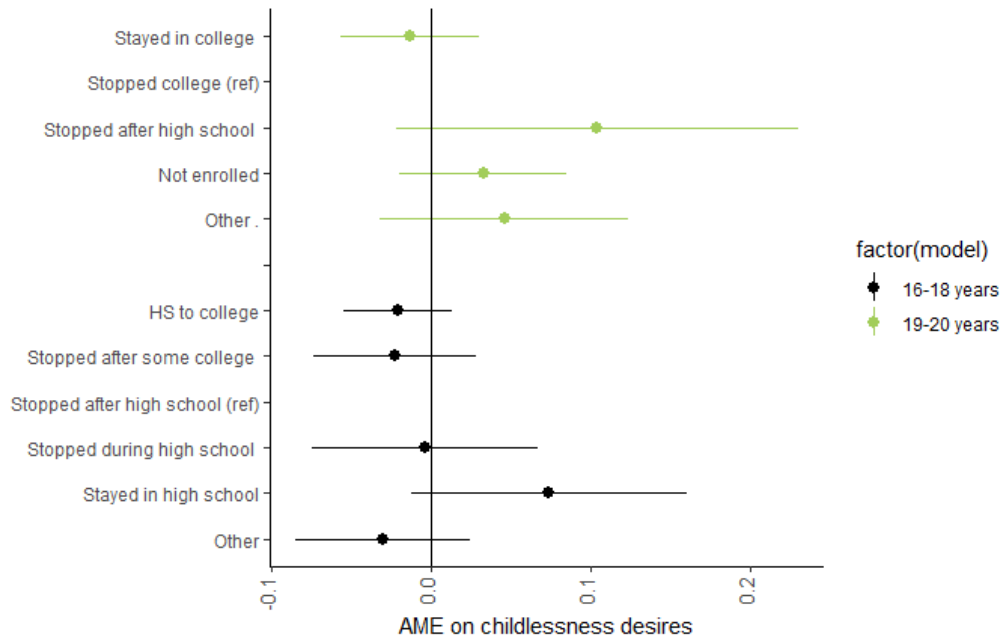
Following our first hypothesis, we would expect that the effect of educational and occupational characteristics would decrease when childlessness desires are added to the model. Even though we find that the desire to remain childless positively influences the chance of remaining childless (see SM Table 1, Full model; OR 3.00; 95%CI 2.13-4.24), the coefficients of education and labour force participation barely change when desires are included in the model (i.e., comparing the reduced and full model in Figure 4). None of the differences in estimates from the reduced and full models are significant, which indicates that the effect of occupation and education does not significantly change when the desire 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 working women and highly educated women more often remain childless.

Socialization: Changing desires

To examine the evidence for the socialization hypothesis, we examined how education had an impact on changes in desires of having children (hypothesis 2a). We examined the role of enrollment in education between 1979 and 1982, on changing desires between 1979 and 1982. We found little support that remaining in education, and thus being exposed to socialization in education, increase the desire to remain childless (hypothesis 2a). Logistic regression revealed that remaining education was not important in explaining changes in the desire to remain childless between 1979 and 1982. Among women aged 16 to 18 in 1979, those who went to college after high school were not more likely to change their desire to remain childless than those who finished education after high school (see Figure

5, black lines, AME -0.021; 95%CI -0.055-0.014; for those who went from high school to college compared to those who stopped education after high school).

FIGURE 5. AVERAGE MARGINAL EFFECTS AND 95% CI ON CHILDLESSNESS DESIRES OF LOGISTIC REGRESSION MODELS



Note: In these models, women who did not have children in 1982 are included. In the bottom (black) model only women aged 16 to 18 in 1979 (total N=1257) and in the top (green) model women who were between 19 and 20 years in 1979 (total N=629) are included. Women who desired children at both time points (N=1,051 in M1 and N =535 in M2) are contrasted with women who changed from desiring children to desiring childlessness (N =76 in M1 and n=36 in M2). Both models control for birth year, partnership, ethnicity and religion. The full table can be found in SM Table 2.

Also among women aged 19 and 20 in 1979 we do not find that those who stayed in college were more likely to change their desire to remain childless than those who stopped after some college (see Figure 5, green lines, AME -0.013; 95%CI -0.057-0.031 for those who stayed in college compared to those who stopped after some years of college). We did find that women changed their desire to remain childless based on changes in relationship status and that women who had a partner less often transformed their desire to remain childless (see SM Table 2, Model 1; OR 0.394; 95%CI 0.151-1.028).

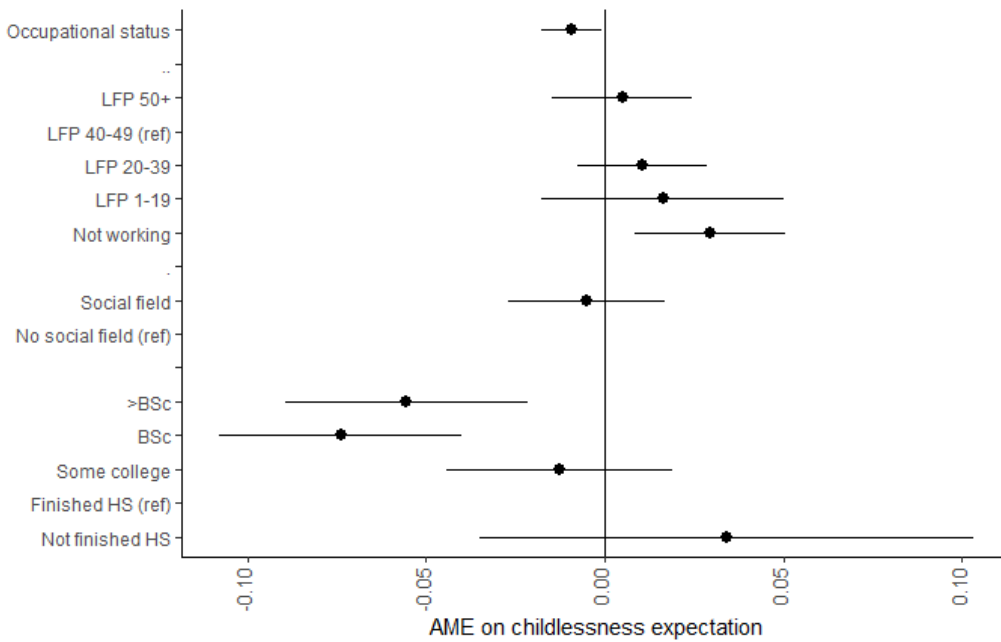
Changing expectations vs role conflict

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 do not work in social and caring occupational fields expected to remain childless more often throughout the life-course (which would support hypothesis 2b) or if they did not more often expect to remain childless (which would support hypothesis 3). In this model, women who had no children (yet) were included. Findings indicate that higher education, high occupational status, and high LFP are associated with a lower expectation to remain childless (see Figure 6; AME -0.055, 95% CI -0.089- -0.022; for those who finished more than a Bachelor's degree compared to those who only finished high school, AME 0.029; 95% CI 0.008-0.051 for those who did not work

compared to those who worked full-time, and AME -0.009; 95% CI -0.018- -0.001 for occupational status). We did not find an effect of the occupational field on the expectation to remain childless. These findings do not support hypothesis 2b that high LFP, high occupational status and not working in a social and caring occupation increase the expectation to remain childless. Instead, they are in line with the hypothesis that a high educational level, high LFP, high occupational status, and not working in social and caring occupations do not relate to lower childlessness expectations over the life course (Hypothesis 3).

These findings echo the descriptive Figures 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 stable throughout the life course. Furthermore, in line with hypothesis 3 as well as with previous research, we find that women with higher education, occupational status, and LFP had their first child at higher ages (see SM Table 17).

FIGURE 6. AVERAGE MARGINAL EFFECTS AND 95% CI ON CHILDLINESS EXPECTATIONS OF MULTILEVEL LOGISTIC REGRESSION MODEL



Note: We contrast women who expect to have children with women who do not expect children in time t . Women who did not have children yet are included and women are dropped from the sample if they had a child. The model controls for ethnicity, religion, age, age², and relationship status. The full table can be found in SM Table 3.

Robustness checks

To examine if our results could be influenced by attrition, the sample selection and exclusion of respondents who already had children when asked about their ideals, the role of partnership trajectories, age differences in childlessness desires, and differences between desires and expectations we conducted several additional analyses and robustness checks.

Attrition

Although 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. Women with children more often remain in the data (see SM Table 4 for characteristics of the complete and our selected sample and SM Section 2 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 5 and 6).

Sample selection of childless women when asked about desires

For hypothesis 1 we were interested in whether differences in childlessness desires explain the relationships between education with childlessness and labour force participation with childlessness. For this analysis, we selected only individuals who still did not have children when asked about desires. 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 SM section 3 Table 7). To examine whether the relationships between education with childlessness desires and LFP with childlessness desires are similar before and after this selection, we examined this relationship at earlier ages. The associations between childlessness desires at young ages (<18 years) and educational attainment and LFP later in life, was very similar when we only select <18 years, suggesting that our selection had not substantially influenced our results (see SM Section 3 Table 9).

The role of the partner

Although partnerships and marriages play an important role in remaining childless and are related to educational and occupational characteristics, they do not impact our models on the relationship between education and occupation with remaining childless or childlessness expectations (see SM Section 4). Women who marry at later ages or remain single more often desire to remain childless and more often remain childless (SM Table 10). 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 10). When excluding the information on partnership from our models on the influence of education and occupational characteristics on childlessness, we see that the coefficients are very similar (compare Table 1 to SM Table 11). The only exception is that the positive relationship between not finishing HS and remaining childless is stronger when excluding information about the partnership, which indicates that differences in partnership can partly explain why the lowest educated women remain childless more often.

When excluding information on partnership in the model on childlessness desires between 1979 and 1982 (compare Table 3 to SM Table 12) and in the repeated measures models on childlessness expectations (compare Table 4 to SM Table 13), estimates are again very similar. This is in line with findings from Nitsche and Hayford (2020) who do not find that marriage timing is key in explaining educational differences in underachieved fertility. 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 difference

We examined age differences in childlessness desires, because in our model on the influence of desires on childlessness (hypothesis 1), 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 SM Section 5 and SM Table 14).

In our multilevel model, we examine the influence of educational and occupational characteristics on the expectation to remain childless. In our analyses, we included an 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 SM Section 5 and SM Table 15).

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. For this reason, we examined the differences between childlessness desires and expectations (see SM section 6). 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 SM Table 14). Although at young ages the desires and expectations seem to overlap, it is possible that at higher ages those who remain childless are likely to desire to have children but also likely to not expect to have children. Unfortunately, we cannot assess this.

Conclusion and discussion

This paper aimed to answer the question of whether the desire and expectation to remain childless can explain the association between education and occupation on the one hand with childlessness on the other hand. The simple answer to this question is: no. We used information on the desire to remain childless, the expectation to remain childless, and educational and occupational characteristics 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. This association, however, did not seem to come about through inherent differences between these women in their desire to remain childless stated early in life (endogenous preferences), nor was it attributable to changing desires regarding childlessness transferred during education or changing expectations during their working lives (socialization). Rather, we observed that women with higher education and higher

occupational characteristics more often erroneously believed that they would still have children. These findings support the idea that the (possibly voluntary) postponement of childbearing due to role conflict leads to unplanned childlessness. These findings add to previous research that showed that highly educated women do not more often expect to remain childless (Gemmill, 2018; Rybińska & Morgan, 2018), by showing that throughout the life course a high occupational status and high labour force participation are also associated with lower expectations to remain childless. This research further adds to the literature by showing that women do not adjust their expectations to remain childless as they continue in pursuing education.

The mismatch between desiring to have children and remaining childless

Many women in our sample desired to have children but eventually remained childless, which is probably due to the postponement of childbearing. The reason why the 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 et al., 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).

There could be several explanations for our finding that higher educated and working women more often than lower educated women expect to become a mother but in turn remain childless. It could be that women use their friends and co-workers as a reference group regarding their fertility behaviour (Balbo & Barban, 2014). Women in high-status occupations often have friends who obtained higher education and who are also working in higher-status occupations, where 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 they adjust their fertility expectations downwards. Another reason might be that lower-educated women had their first attempt to have a child at an earlier age. Those who have fecundity problems are already aware of this at a younger age, resulting in a downward adjustment of fertility desires and expectations.

For the type of occupation, the results are slightly different than for education and LFP. We found that those who work in social and caring occupations less often desired to remain childless, but do not remain childless less often. Although these findings are different than what we find for educational level, labour force participation, and occupational status, they lead to a similar substantive conclusion that differences in childlessness desires between groups do not explain differences in childlessness levels. For some women with high fertility desires, choosing to work in social and caring occupations could be seen as a strategy to fulfill their desires, because these fields are assumed to offer greater work-family compatibility (Bavel, 2010). 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. Since we do not make detailed distinctions with different occupations, we should interpret these findings with caution.

Limitations

Some limitations should be kept in mind when interpreting our findings. First, although we do not find that socialization in education and in the workplace results in lower desires to have children, we do acknowledge that there is another type of socialization that could influence fertility behaviour, which goes beyond the auspices of this current study. 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 even more difficult to combine having children with having a time-consuming job.

Another limitation, is that 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 inevitably miss 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 does not seem to be in line with the finding that these women expect to have children for a longer period of their lives.

Implications

The three proposed mechanisms for the association between education and occupation on the one hand and childlessness on the other hand, differ quite substantially in whether they come at a cost of subjective well-being. If endogenous preferences or socializing experiences are the reason behind 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 take a toll on well-being. Indeed, qualitative research showed that women who postponed childbearing due to career constraints until it was too late often experience distress (Hewlett, 2002). Other studies also found a link between childlessness and lower well-being (Tanturri et al., 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, 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 et al., 2017; Lampic et al., 2006). Women in our study frequently have expectations regarding their own fertility that eventually are unmet. This highlights the importance of increasing awareness of declining fertility with age.

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