

The Changing Links Between Socioeconomic Status and Single Women's Entry into Parenthood

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ABSTRACT

Objective. We examined how education and income impacted the likelihood of single women having a first child at younger (<35) and later ages (35+).

Background. Single women's fertility remains understudied despite its prevalence and increasing relevance in the context of rising (involuntary) childlessness. Meanwhile, some studies have investigated a small but growing number of women who decided to have a child alone, often at later ages, as their fecundity declines.

Method. We used Belgian administrative data from 2005 to 2015 to estimate the hazards of first childbirth among single women aged 25 to 48 (587,390 women), according to their education and income. Further analyses were conducted on single, still-childless women aged 35 and older (165,700 women), as advancing age heightened their risk of permanent childlessness.

Results. At younger ages (<35), high education and income decreased the risk of having a child while single, while at later ages (35+), high education increased it. The income effect at later ages varied by education—higher income raised the risk of single-childbearing only for long-tertiary educated women. Among single women aged 35 and older, those with low education were most likely to remain childless.

Conclusion. Socioeconomic disparities shape family-formation pathways throughout the life course. Having a child alone may be a strategy to catch up on delayed fertility, but this option is primarily available to women with high SES.

INTRODUCTION

Fertility trends in many high-income countries have been characterized by an increase in childlessness and declining fertility rates (Kreyenfeld & Konietzka, 2017; Tanturri et al., 2015). In Europe and the United States, rates of female childlessness at ages 40-44 range from around 10% to 20% (Miettinen et al., 2015). Childlessness among women is often attributed to the continuous postponement of motherhood until the biological limits of fecundity (Beaujouan et al., 2017; Lemoine & Ravitsky, 2015). As childbearing is generally considered to be a couple's bargaining matter (Balbo et al., 2013), several studies have looked into factors that enable or discourage childbearing among couples (e.g., Dommermuth et al., 2017; Kaufman & Bernhardt, 2012; Rijken & Knijn, 2009). Other authors investigated individuals' transitions to parenthood, with union status as a control variable (e.g., Lundström & Andersson, 2012; Miettinen & Jalovaara, 2020). Few studies have examined childbearing among single individuals—here defined as those who are neither married nor cohabiting with a partner—likely due to its relative infrequency compared to childbearing while in a partnership. Yet single-childbearing has long existed and is increasingly relevant in light of the growing separation of childbearing from marriage. This research addressed this literature gap by analyzing the likelihood of having a first child among single adult women according to their age and socioeconomic status (SES: education and income). This study further analyzed the combined effect of education and income on having a first child among single women aged 35 and older, who face greater risks of permanent childlessness due to the sharp decline in fecundity from their mid-30s onward (Balasch, 2010; Lemoine & Ravitsky, 2015; Mills & Lavender, 2011). To our knowledge, this is the first register-based study to longitudinally examine the transitions to parenthood of single adults.

Having a child while single is often a result of less-than-ideal circumstances—unintended pregnancies, breakups, or the death of a partner. Moreover, single mother-headed

households have higher risks of poverty compared to other families (Jordan et al., 2019; OECD, 2022). Such risks may be more pronounced for women who have a child while single, as many are younger than 25 and have attained only primary education (Brzozowska, 2014; Messer, 2011; Régnier-Loilier & Wierup, 2019). Both low personal and low parental education have been found to increase the likelihood of single-childbearing (Koops et al., 2021; Perelli-Harris et al., 2010). These patterns reinforce a stereotype that women who have a child while single are young and disadvantaged.

Alternatively, single-childbearing may be borne out of active decision-making. Some women may decide to keep an unintended pregnancy with a stranger or acquaintance, or carry a pregnancy to term following the breakdown of a relationship (Van Gasse & Mortelmans, 2020). In the US, women who kept unintended pregnancies reported being motivated by an already-existing desire to be a mother, advancing age, or feeling capable enough to raise a child alone (Jones, 2008). Having a baby on the way may also encourage women to leave partners unwilling to take responsibility for the child or to escape abusive relationships (Lenouvel, 2024). Several studies have also investigated a small but growing number of women who found ways to have a child on their own, becoming “solo mothers,” sometimes referred to as “single mothers by choice” (Golombok, 2015; Hertz, 2008; Jadva et al., 2009; Mannis, 1999; Volgsten & Schmidt, 2021). These women often conceive via donor sperm, but may also conceive with an acquaintance or adopt a child (Golombok, 2015; Van Gasse & Mortelmans, 2020). Solo mothers tend to be in their late 30s to early 40s at the time of having a child, highly educated, and financially stable (Golombok, 2015; Golombok et al., 2016; Jadva et al., 2009; Mannis, 1999; Volgsten & Schmidt, 2021). These characteristics contrast with the earlier-described low-SES women and highlight the understudied heterogeneity among single mothers.

The current research utilized Belgian administrative data (2005-2015) to investigate how SES influenced women's likelihood of having a child while single versus remaining

childless from ages 25 to 48, and how these associations changed with age. In the second part of the analysis, we shifted the focus to single-childbearing at an “advanced maternal age”—defined in literature as ages 35 and up (Delbaere et al., 2007; Mills & Lavender, 2011). This allowed us to reflect on how SES may be associated with catching up on delayed fertility through non-normative entry into parenthood. Our analyses, which include education, income, and their interactions, aimed to disentangle the financial from ideational factors associated with single-childbearing.

We conducted our analyses on the Belgian population, where rates of single-childbearing have remained stable in previous years and where single women have legal access to state-funded medically-assisted reproduction (MAR) treatments. These suggest that single-childbearing is generally accepted in the country. Further, the availability of high-quality Belgian register data allowed us to study individuals' transitions to parenthood through a longitudinal approach.

This study contributes to our understanding of fertility among single women, childlessness risks at later ages (35+), and to broader discussions on socioeconomic differences in responding to fertility postponement. The findings also prompt us to reflect on how policies may address unequal opportunities that limit family-formation options throughout the life course.

THEORETICAL AND EMPIRICAL BACKGROUND

Childbearing decisions are influenced by norms and social expectations (Elder et al., 2003; Huinink & Kohli, 2014; Liefbroer & Billari, 2010). Women are normatively expected to bear children (Szekeres et al., 2023; Ulrich & Weatherall, 2000) within a socially defined age window (Billari et al., 2021; Lazzari et al., 2024), and starting motherhood while single is discouraged (Liefbroer & Billari, 2010). Alignment with these norms depends on opportunities,

constraints, and perceived tradeoffs throughout the life course (Elder et al., 2003; Huinink & Kohli, 2014), which are often influenced by socioeconomic factors.

Education and Single-Childbearing

Negative Relationship: Education and Single-Childbearing at Younger Ages (<35)

Less educated women are found to be more likely to have a child while single (Koops et al., 2021; Perelli-Harris et al., 2010), particularly at younger ages, due to unintended pregnancies linked to limited access to contraception and abortion (Goossens et al., 2016; Pratt et al., 2014; Régnier-Loilier & Wierup, 2019) and less supportive views on pregnancy termination (Dutta et al., 2024; Loll & Hall, 2019; Osborne et al., 2022). Moreover, the Value of Children theory (Friedman et al., 1994) suggests that childbearing may be a way to cope with an uncertain future. Hence, less educated young women with limited socioeconomic prospects may welcome childbearing, even outside of marriage, as a way to gain personal fulfillment amidst restricted social mobility (Friedman et al., 1994; Kearney & Levine, 2012, 2014). Partnership breakdowns, which are more common among less-educated individuals (Jalovaara, 2013; Karney, 2021), may also lead to a birth while single. Friedman and colleagues hypothesized that childbearing in an unstable relationship may be an attempt to strengthen the partnership (Friedman et al., 1994). This is reflected in narratives of women keeping unintended pregnancies, hoping to improve their relationship with the child's father (e.g., Hertz, 2008; Jones, 2008). Furthermore, an unintended pregnancy may be more accepted during ideal childbearing ages (e.g., as mentioned by respondents in Jones, 2008), which in Europe are around ages 25 to 28 (Billari et al., 2021).

Positive Relationship: Education and Single-Childbearing at Later Ages (35+)

According to the Second Demographic Transition theory, the expansion of access to education fostered individualistic values and a stronger desire for self-realization, which placed

family formation in stronger competition with other life pursuits (Lesthaeghe, 2014). Fertility postponement has become a norm, and this is reflected in the shift to later ages of perceived childbearing limits for both men and women (Lazzari et al., 2024). Individuals with higher personal or parental education generally report later ideal ages and age deadlines for having children (Badolato et al., 2024; Kim & Cho, 2021; Liefbroer & Billari, 2010). Better-educated individuals are more likely than their less educated counterparts to hold off on marriage and childbearing at younger ages, due to greater perceived trade-offs in further education, career-building, or leisurely activities (Becker & Lewis, 1973; Sobotka et al., 2018). They also tend to have more liberal attitudes (Liefbroer & Billari, 2010) and are more accepting of abortion (Loll & Hall, 2019). Highly educated women may also be disadvantaged in a partnership market where men prefer women with lower SES (Greitemeyer, 2007), especially if they are from older cohorts (De Hauw et al., 2017) or are in less gender-egalitarian contexts (Bellani et al., 2017; Kalmijn, 2013). Women who are single at later ages confront a shrinking pool of available partners (Rapp, 2018), further limited by men's preference for younger women (Alterovitz & Mendelsohn, 2011; Grow & Van Bavel, 2015; Hitsch et al., 2010).

Although age norms discourage childbearing beyond women's early 40s (Billari et al., 2011, 2021; Lazzari et al., 2024), many individuals in later ages maintain their intentions to have children (Beaujouan & Sobotka, 2022; Australia: Beaujouan et al., 2019; Austria: Beaujouan, 2022). Amid the partner squeeze and their advancing "biological clock" (Hertz, 2008; Jones, 2008; Volgsten & Schmidt, 2021), women who wish to be mothers may consider welcoming a child alone (e.g., solo mothers: Hertz, 2008; Jadvá et al., 2009; Jones, 2008; Mannis, 1999; Volgsten & Schmidt, 2021). Highly educated women would be in the best position to be solo mothers at these later ages. According to the Ready-Willing-Able framework (Coale, 1973; Lesthaeghe & Vanderhoeft, 1997), childbearing is influenced by one's readiness, willingness, and ability to become a parent. Highly educated women may feel ready for

children due to career stability and the urgency posed by declining fecundity. They would also be more willing to go against normative paths to parenthood (Liefbroer & Billari, 2010). Lastly, they would have better access to MAR or adoption services that would allow them to have a child on their own. Education in itself is an empowering tool that allows individuals to find means to reach their fertility targets (Lutz, 2018). Highly educated women may thus even bypass external services and opt for self-insemination or natural conception with an acquaintance to fulfill their desire to be parents. Meanwhile, lower-educated individuals who find themselves still single and childless at later ages may face greater barriers to later-age childbearing due to stricter adherence to norms and socioeconomic constraints. In Denmark, Norway, and Sweden, childlessness, which was previously associated with the highly educated, is now most prevalent among the least educated women (Jalovaara et al., 2019).

Considering the above, we hypothesize that *compared to lower-educated single women, highly educated single women are less likely to have a first child at younger ages (<35), but are more likely to have a first child at later ages (+35) (H1).*

Financial Resources Matter in Childbearing Decisions, and Interactions with Education

Financial resources are an important consideration when deciding to have a child. Apart from supporting costs associated with childrearing, financial resources enable access to fertility services for those facing conception difficulties. The impact of income on fertility has often been discussed from the perspective of the couple (Becker, 1960; Berninger, 2013; Santarelli, 2011; Schmidt et al., 2012; Siegel, 2017; Weeden et al., 2006) where negotiations on pooling resources take place. However, single women may likewise consider their income when assessing their readiness to enter relationships and to eventually form a family. This may manifest in everyday decisions such as continuing or stopping contraception, and in more significant ones such as terminating or keeping an unintended pregnancy.

There is evidence supporting a positive relationship between income and childbearing. Richer individuals are better able to afford the rising costs of having a child (Becker, 1960; Becker & Lewis, 1973). In Sweden, those with higher lifetime earnings have been found to bear more children than their less wealthy peers (Kolk, 2023), and in the Netherlands, the income-fertility relationship has become increasingly positive, particularly for first births (van Wijk, 2024). Conversely, low income may be a barrier to childbearing. In Germany, individuals delayed having a first child when faced with marginal employment or unemployment, likely due to unstable income (Schmitt, 2021).

One's income level may also reflect certain situations at different stages of the life course. At younger ages, although high income may provide sufficient resources for starting a family, it may also signal ongoing career advancement, access to unique opportunities, hence a busy lifestyle that may be challenging to combine with childbearing. Meanwhile, at later ages, high income may reflect career and financial stability. Moreover, for single and childless women at later ages who may be confronted with declining fecundity, high income opens alternative paths to childbearing and provides the means to externalize childcare. Hence, we hypothesize that, similar to the effect of education, *when compared to single women with lower income, higher-earning single women are less likely to have a first child at younger ages (<35), but are more likely to have a first child at later ages (35+) (H2a).*

The income-childbearing relationship may also vary by educational attainment, as education may influence one's quality of life expectations. In some European countries, unstable income via unemployment or precarious employment did not delay childbearing for low-educated women (Kreyenfeld & Andersson, 2014; Miettinen & Jalovaara, 2020; Vignoli et al., 2020). Unemployment, hence low income, has even been found to increase the likelihood of first births among low- and medium-educated women (Wood & Neels, 2017). For those who

do not expect much personal upward mobility, there may be fewer motivations to delay childbearing when income is low.

In contrast, highly-educated individuals may prefer higher standards of living for the families they envision building—expectations likely shaped by their own upbringing in families with high economic and cultural capital (Bourdieu, 1986). As Duesenberry (1960) pointed out in response to Becker's early work on fertility, the links between income and childbearing depend on (future) parents' desired standard of living, defined by social class. Highly educated individuals may have higher income requirements for starting parenthood, as they may wish to raise "high-quality" children (Becker & Lewis, 1973) who fit upper-class circles. Highly educated individuals may also expect greater financial returns from their qualifications. Hence, at later ages, when financial resources are key to alternative paths to childbearing, we expect that *the positive association between income and having a first child while single is stronger for higher compared to lower-educated women (H2b)*. Highly educated women may also prefer more advanced yet more expensive childbearing methods (e.g., conception via in-vitro fertilization/IVF).

THE BELGIAN CONTEXT

Belgian birth records (2011-2022) show that 15,000 to 17,000 children are born yearly to women who declared to be single (not-in-union; not based on household composition), comprising around 12% to 14% of newborns (Statbel, n.d.). The share of children born to single mothers aged 35+ increased from 19% in 2011 to 24% in 2022. Regional disparities are striking. In 2022, births to single mothers were 20% of all births in the Brussels Capital Region, 18% in Wallonia, and only 9% in Flanders (Statbel, 2022). Flanders' higher economic development may have led to better access to contraception and abortion, and a wider range of economic opportunities for women, hence lower rates of single-childbearing. The region's

historically conservative views on newer family structures (Lesthaeghe, 1985) may also reinforce stricter norms against single motherhood.

Contraceptive prevalence is high in Belgium, and costs are well-covered by health insurance. Sexuality education is compulsorily taught, but content and quality vary by school (Alves, 2024).

Modeled estimates suggest that 31% of pregnancies in Belgium are unintended (2015–2019), with 37% of these ending in abortion (Bearak et al., 2020; Guttmacher Institute, n.d.). Until 2018, abortions were only allowed for patients “in a state of distress,” and doctors could refuse to perform them under a “conscience clause” (Woelfle, 2023)—these restricted access to abortion and morally stigmatized it. In 2008, only 6% of Belgians (N = 1,509) believed that abortion is “always justified” (EVS, 2022). Currently, abortion is publicly funded and permitted until 12 weeks post-conception for those without serious health risks. Doctors who are unwilling to carry them out are now required to direct patients to providers who offer the procedure (Woelfle, 2023). Women seeking later-term abortions travel abroad, particularly to the Netherlands, but face cost and language barriers (Comité scientifique en charge de l'évaluation de la loi et de la pratique de l'avortement en Belgique, 2023). Belgium's abortion policies are also criticized for the mandatory six-day waiting/reflection period, said to undermine women's autonomy (Center for Reproductive Rights, 2020; VUB Dilemma, 2024).

On the side of enabling childbearing, women in Belgium may access MAR until age 47, regardless of union status. Since 2003, public funding has been covering up to six cycles of insemination, IVF, or intracytoplasmic sperm injection (ICSI) for women younger than 43. Public funding covers up to 80% of the cost of each cycle. One clinic estimates that patients with Belgian health insurance pay 500–700 EUR per IVF/ICSI cycle (Brussels IVF, 2025), and less for insemination. A subsidized IVF/ICSI cycle takes up less than 20% of the median gross

monthly salary (3,728 EUR in 2022: Statbel, 2024). However, donor material (300-500 EUR per tube of sperm) is not covered by public funding (The Brussels Times, 2023).

Access to MAR for single women was legally confirmed in 2007, though fertility clinics have been serving single clientele since the 1980s. Single women may conceive either with gametes from an anonymous donor or from someone they know. While medical egg freezing is subsidized in select cases, social egg freezing is entirely patient-funded (De Proost et al., 2022). In recent years, fertility clinics have reported a growing demand for treatment from single women (Moller-Nielsen, 2023; Torfs, 2022), with inseminations increasing by 36% and IVF by 47% from 2016 to 2019 (Moller-Nielsen, 2023).

New parents in Belgium receive a one-off birth/adoption premium worth 1,200 to 1,300 EUR (Rizzi & Rees, 2023). Maternity leave lasts up to 15 weeks, although individuals only receive up to 82% of their regular salary during this period. Single parents are entitled to the same benefits as partnered ones: monthly child allowances, housing support, tax relief for childcare, and parental leave. Additional aid is available for single parents with income below a certain threshold. However, parents face challenges in reconciling work and family life. Daycare spots are notoriously difficult to secure. In Wallonia and Brussels, for instance, a representative survey found that 33% of parents with young children ($N = 220$) were unable to enroll their child in daycare when they needed to (Service Études et Action Politique - La Ligue des Familles, 2024).

DATA AND METHODS

Data, Analytic Sample, Period of Analysis

This study used anonymized individual data from Belgian national registers (2005 to 2015) linked to the 2011 census and to tax declarations (2005 to 2015) (Directorate-general Statistics – Statistics Belgium, 2021d, 2021b, 2021e). We modeled the risks of having a first

child among adult single women aged 25 to 48, from January 2005 to January 2015. We set the lower age limit to 25 to capture a larger number of women with completed tertiary education. This also allowed us to focus on the adult life course, given the significantly different context of adolescent- and early adult fertility. The upper age limit was set to 48, considering that fecundity rapidly declines from around age 35, and that the legal maximum age for MAR treatments in Belgium is 47.

We followed 587,390 women during months when they were single, i.e., not married nor in a cohabiting partnership. Starting with a large monthly dataset, we compressed consecutive months where no time-varying variable changes occurred, keeping the start- and end- months of each interval. This resulted in 2,268,536 observations (intervals of months), representing 23,386,112 person-months at risk.

The analytic sample initially included 1,224,502 women born between 1956 (turned 49 in 2005) and 1990 (turned 25 in 2015), and who were childless in 2005. Women entered the sample either on January 2005, on the month they turned 25, or upon migration into Belgium. We removed women who had a child upon entry into the sample (59,293). Women were at risk of single-childbearing only for periods when they were single and in Belgium. They were censored for intervals when they were partnered, with unknown partnership status, or were out of the country. We thus removed women who, from 2005 to 2015, were never single (441,274), did not have an identified residence in Belgium (16,807), or had combinations of both (119,634). We also removed women who did not have an identified place of birth (104). Those who were censored due to partnership or emigration could re-enter the sample if they were still childless after a divorce/separation or after returning to Belgium (170,229 re-entry observations out of 2,268,536 observations). Women permanently exited the study in the month after their first childbirth (146,829 women), their 49th birthday (4,965 women), or death (3,119 women). Otherwise, they remained in the study population until the end of the observation period.

The lexis diagram (Figure 1) demonstrates periods of inclusion and exclusion in the analyses. The event of interest (having a child while single) could only occur during the periods under risk (single).

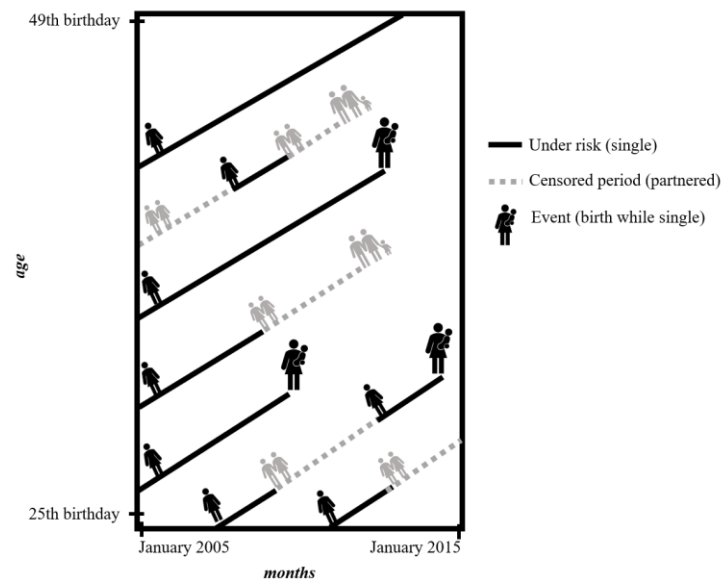


FIGURE 1. LEXIS DIAGRAM OF THE STUDY DESIGN

Measures

Singlehood/Partnership

Women's partnership status was a monthly, time-varying variable based on a combination of marital status and household composition from the yearly population registers. We had information on a reference person in each household and their relationships with other members, allowing us to reconstruct some intra-household relationships. A woman was considered "single" if she was unmarried and lived alone, with family members, or with several unrelated individuals. On the other hand, she was "partnered" if she was married or in a registered partnership, regardless of the sex of her spouse/partner. We considered marriage to be a stable arrangement, and thus classified married women who did not live with their spouses as partnered. We relied on assumptions to identify unmarried, cohabiting couples who were not

in registered partnerships, following work by Damiens and colleagues (Damiens et al., 2024). A woman was considered to be in a cohabiting partnership if she resided in a two-person household with an unrelated individual who was over the age of 16, regardless of the other person's sex. This criterion excluded individuals living in a two-person household with their parent, child, sibling, in-laws, or other relatives. Although we likely overestimated the number of same-sex couples through this approach, less than 1% of the Belgian population (0.32% to 0.53%) were in "same-sex childless couples" from 2005 to 2015. With these assumptions, we produced estimates of births to single women that align with figures from birth records. Further information on cohabiting couples is included in Note S1 of the online supporting materials.

Dependent Variable

The event of interest was having a first child while single. Using register data, we checked whether each woman in our sample was ever recorded as someone's legal parent in Belgium. The date of having a first child was determined as the earliest birthdate among her registered children. Women were considered childless before this date.

SES: Education

Women's highest level of education was retrieved from the 2011 census, and recoded into five categories: low, medium, short-tertiary, long-tertiary, and unknown. Following Eurostat definitions (Eurostat, 2023), low education included no formal education, primary, and lower secondary education. Medium education included upper secondary and post-secondary education. We then split higher education into two categories, considering the expanding access to tertiary education among women. Short-tertiary education covered bachelor's studies of approximately three years in non-university institutions (i.e., higher education institutions/*haute école*) and post-secondary degrees of less than four years. Long-tertiary education included university-level degrees, specialized licenses (e.g., for doctors or

engineers), bachelors-to-masters studies of three to five years in non-university institutions, and university master's or PhD degrees. 120,341 women in the sample (20% of the total) had unknown educational attainment, 85% of whom were born abroad and may not have been covered by the 2011 census. Controlling for place of birth in the models captured some migration-related factors that would otherwise have been solely attributed to missing education data.

SES: Income

We used women's yearly personal income lagged by one year to account for their financial situation before possible childbirth. Personal income was retrieved from yearly tax declarations that reflect net taxable income. This includes revenue from professional activities, movable and non-moveable properties, taxable social security transfers such as illness and unemployment benefits, and other miscellaneous sources. In our final dataset, 98% of non-missing income observations ($n = 1,995,324$) were primarily sourced from professional activities.

Our income variable measured women's economic prosperity relative to others, and not their actual purchasing power. Personal income was originally coded in 5,000 EUR intervals (e.g., 0 to <5000, 5000 to <10000, etc.). We reclassified personal income into four categories: low, moderate, comfortable, and prosperous. First, we defined moderate income as the income range that encompasses the guaranteed minimum income in Belgium, along with the income range above it. The minimum income was at around 12,000 EUR in 2005 (1,102 EUR/month, set in 1993), augmented to 15,000 EUR in 2007 (1,284 EUR/month), then to 16,000 EUR in 2008 (1,387 EUR/month) (Conseil national du travail, 1993, 2007, 2008). The low-income ranges were those that fell below moderate. The comfortable income ranges included the four income ranges above moderate, while prosperous income covered the highest income range.

We also kept unknown income as a separate category. Twelve percent of observations ($N = 2,268,536$) were from women with unknown income. Sixty-four percent of unknown income observations ($n = 273,212$) were linked to foreign-born women. As with education, controlling for place of birth helped mitigate some potential bias caused by missing income data. The ranges for each income category are included in Table S1 of the online supporting materials.

Controls

The models were controlled for women's proximity to parents, as measured by residence in the same municipality as one or both parents during the beginning of the year. This intended to capture the availability of nearby family support for lone parents. Research has shown that single women evaluate support from social networks when deciding to keep or initiate a pregnancy (Jones, 2008; Mannis, 1999; Van Gasse & Mortelmans, 2020), and that women were more likely to move closer to their mothers during a first pregnancy (Rutigliano et al., 2023). We also controlled for year of observation, marking the year when single women were expressly allowed to access MAR treatments (2007). Lastly, we controlled for place of birth—the Belgian regions (Flanders, Brussels Capital, Wallonia) and abroad—to capture structural and cultural factors that may have impacted single-childbearing.

Analytic Strategy

We first described the profile of women who had a first child while single and inspected their socioeconomic characteristics according to their age at childbirth. We then estimated single women's relative risks of having a first child versus remaining childless through piecewise constant exponential hazards models with censored intervals. We opted for piecewise models because of the non-proportionality of childbearing risks across women's ages. Setting different baseline hazards by age groups accounts for the age-related decline in fertility. We

grouped ages into four categories: young (25 to 29), middle (30 to 34), later (35 to 39), and latest (40+) ages, based on existing age norms and childbearing trends in Europe.

We estimated the main effects of education and income on the likelihood of having a child for periods when women were single, fitting models with and without control variables (Model 1 to Model 5). We then modelled interactions between age and education (Model 6), as well as age and income (Model 7), to see how the impact of SES on single-childbearing varies throughout women's life course. Lastly, we conducted further analyses on women who were still single and childless at age 35 onwards (165,700 women), as we anticipated changes in the relationship between SES and single-childbearing in later ages and wished to investigate this further. Focusing on the 35+ age group is relevant to broader discussions on fertility postponement, as rapidly declining fecundity heightens these women's risk of permanent childlessness. We fitted models estimating the main effects of SES on single-childbearing at later ages, including a model that interacted education and income (Model 8). This interaction aimed to disentangle the influence of financial resources from that of culture and values as reflected by education. We emphasized results for the 35+ age group in this paper, but also included education-income interaction models for younger age groups in the online supporting materials.

The baseline instantaneous annual risks of having a child while single informed our interpretation of effect sizes. Considering the small annual baseline risks (2% to 3%), which is notably smaller for women aged 40 and above (0.6%), we classified the effect sizes of SES as such: a change in risk up to 20% was considered a weak effect, 21% to 50% as moderate, and 51% and up as strong. Although these thresholds were ultimately based on the authors' subjective judgment, explicitly mentioning them provides a clearer framework for interpreting results. Doing so aligns with the principle of "Informed Benchmarking of Estimates" (Bernardi

et al., 2016), which calls for contextualizing estimates and clearly stating effect strengths to avoid overstating statistically significant but weak associations.

Several robustness checks were performed. We conducted analyses on samples that excluded foreign-born women, to check if incomplete information on their partnership history, birth history, education, and income affected the associations we found. For the 35+ subsample, we ran a model that excluded women with long-term illness as identified by the 2001 census (Directorate-general Statistics – Statistics Belgium, 2021a), since their singlehood and possible childlessness at later ages may have been driven more by health issues than SES. For the 35+ subsample, we also estimated the risks of having a child while single, competing with having a child while partnered. This allowed us to confirm whether the associations we found remained robust when including periods in partnership rather than censoring them, thus reducing the impact of selection into remaining single at later ages.

RESULTS

Descriptive Results

Table 1A describes the characteristics of single women in our sample. In the overall sample and the 35+ subsample, one in three women were highly educated with either a short- or a long-tertiary diploma. Meanwhile, 44% of single women below 35 had tertiary education. A larger proportion of women in the 35+ subsample had low education (14%) compared to the full sample (9%) and the <35 subsample (8%). Some 40% of single women were born in Flanders, while more than a quarter were born abroad. Almost sixty percent of foreign-born women ($n = 158,637$) had European origins—nearly one in four were born in neighboring countries (France, Germany, Luxembourg, the Netherlands, United Kingdom), while 34% were born in other European countries (data not shown).

TABLE 1A. Characteristics of Single Women: Belgium, 2005-2015.

Variables	Proportion (%)		
	All Women	<35	35+
Education			
Low	9.22	7.50	14.45
Medium	28.91	29.76	27.67
Short-Tertiary	23.78	24.36	23.89
Long-Tertiary	17.60	19.67	11.65
Unknown	20.49	18.71	22.35
Birthplace			
Flanders	39.93	40.41	40.13
Wallonia	22.15	22.79	21.35
Brussels	10.91	11.43	9.82
Abroad	27.01	25.37	28.70
Cohort			
<70s	14.57	0.00	51.63
70s	32.17	34.71	48.37
80s	53.27	65.29	0.00
Total N	587,390	479,261	165,700

Source. Belgian population registers (2005-2015), tax declarations (2005-2015), census (2011).

Note. The sample sizes for the <35 and 35+ groups do not add up to the total number of women, as some women appear in both subsamples.

We estimated a total of 43,810 first births to single women from January 2005 to January 2015, representing 10.62% of first births to all women in the sample (N = 412,345 women). These estimates are similar to data from birth records: for the same period, 10.54% of first births to women aged 25 to 48 were to women who were not in a union (45,459 out of 431,474 births) (Directorate-general Statistics – Statistics Belgium, 2021c).

Table 1B describes the profile of women who had a first child while single (“single mothers”). Nearly half of these women (45%) were in the youngest age group during childbirth, while one in five women were at later ages (35+). Single women had their first child at around 31 years old, whether they were Belgian-born (30.7) or foreign-born (31.4). Among single mothers born abroad (n = 11,701), 43% had European origins and 26% were born in Sub-Saharan Africa (data not shown). Socioeconomic characteristics of single mothers vary by age.

Larger proportions of younger single mothers had lower SES, while high SES was more prevalent among those in later ages.

TABLE 1B. Characteristics of Women Who Had a 1st Child While Single: Belgium, 2005-2015

Variables	Proportion (%)					Total N
	25-29	30-34	35-39	40+	All	
Age during childbirth						
25 to 29					45.46	19,914
30 to 34					32.29	14,148
35 to 39					17.35	7,599
40+					4.91	2,149
Education						
Low	16.61	11.05	10.49	11.26	13.49	5,910
Medium	41.29	29.54	24.45	20.43	33.55	14,700
Short-Tertiary	21.36	27.08	28.99	29.60	24.93	10,923
Long-Tertiary	8.62	16.21	19.17	20.61	13.49	5,910
Unknown	12.12	16.12	16.90	18.10	14.53	6,367
Income pre-birth						
Low	39.77	27.33	22.32	21.13	31.81	13,936
Moderate	34.80	31.28	27.25	22.80	31.77	13,917
Comfortable	13.41	24.10	26.36	24.20	19.64	8,604
Prosperous	1.00	5.48	11.59	16.57	5.05	2,213
Unknown	11.02	11.80	12.48	15.31	11.73	5,140
Birthplace						
Flanders	30.11	33.55	35.57	31.50	32.24	14,123
Wallonia	34.15	26.73	22.73	19.78	29.07	12,734
Brussels	11.72	12.16	11.87	13.77	11.99	5,252
Abroad	24.02	27.56	29.33	34.95	26.71	11,701
Period of childbirth						
<2008	30.05	28.44	26.85	24.06	28.68	12,565
2008-2010	30.49	29.71	30.39	30.01	30.19	13,228
2011+	39.46	41.86	42.77	45.93	41.13	18,017
Total N	19,914	14,148	7,599	2,149	43,810	43,810

Source. Belgian population registers (2005-2015), tax declarations (2005-2015), census (2011).

More than half single mothers aged 25 to 29 (58%) had below-tertiary education, and 40% had low income. Among single mothers aged 35+, half had short- or long-tertiary education, and around 40% had comfortable to prosperous income. Further, 17% of single mothers aged 40 and above had very high (prosperous) income, compared to 1% to 6% among single mothers aged 25 to 34. Among the youngest single mothers, 34% were born in Wallonia. Yet in the 30 to 39 age groups, women born in Flanders form the plurality of single mothers (34% to 36%). One in three single mothers aged 40 and above were born abroad. Almost 76%

of single mothers aged 40+ had a child after the legal recognition of MAR access for single women (2007).

Multivariate Results

Full Sample (All Ages)

We analyzed the association between SES and the likelihood of having a first child while single versus remaining childless in models estimated on 587,390 single women (43,810 single mothers). The multivariate results in Table 2 show a negative overall association between single-childbearing and the two SES measures. We observed a small to moderate education effect in Model 1. Having low compared to medium education level modestly increased the risk of having a first child while single. Having short-tertiary education led to a weak reduction in risk, while long-tertiary education moderately lowered the risk of single-childbearing by 34% to 38% (95% CI). Model 2 displays the moderate impact of income on the risks of having a first child while single. Compared to the reference, having low income led to an increase in the risk of single-childbearing. Meanwhile, women with comfortable to prosperous income were 34% to 40% (95% CI) less likely to have a first child while single compared to moderate earners.

Regarding the control variables, living close to at least one parent reduced the risks of having a first child while single, and single-childbearing appeared more common before 2008. Foreign-born women were twice as likely to have a first child while single compared to women born in Flanders. Some of these foreign-born “single mothers” might have had partners who lived abroad. Considering the effect strength of being foreign-born, we conducted analyses excluding foreign-born women to see if their inclusion biased the results, and observed SES patterns that were consistent with the main models (graphical comparison of estimates: Figure S1, online supporting materials). Despite a noticeably smaller point estimate for low education

in the models without foreign-born women, effect sizes for education and income remained small to moderate, as in Models 1 and 2. The same SES patterns emerged in models without controls (Table S2) and the combined income-education model (Table S3). These results are elaborated in the online supporting materials.

TABLE 2. Having a First Child While Single from Ages 25 to 48, Associations with Education and Income

Variables	M1. Education + Controls			M2. Income + Controls		
	Hazard Ratio	SE	95% CI	Hazard Ratio	SE	95% CI
Education (ref. Medium Ed.)						
Low Education	1.12***	.02	1.08 – 1.15			
Short-Tertiary Education	0.81***	.01	0.79 – 0.83			
Long-Tertiary Education	0.64***	.01	0.62 – 0.66			
Unknown Education	0.65***	.01	0.63 – 0.67			
Income (ref. Moderate Inc.)						
Low Income				1.25***	.02	1.22 – 1.28
Comfortable Income				0.63***	.01	0.62 – 0.65
Prosperous Income				0.63***	.01	0.60 – 0.66
Unknown Income				0.66***	.01	0.64 – 0.68
Proximity (ref. No parent)						
Close to 1 parent	0.82***	.01	0.80 – 0.85	0.82***	.01	0.80 – 0.85
Close to 2 parents	0.86***	.01	0.84 – 0.88	0.84***	.01	0.82 – 0.86
Unknown	0.70***	.01	0.67 – 0.72	0.67***	.01	0.65 – 0.70
Period of observation (ref. <2008)						
2008 to 2010	0.53***	.01	0.52 – 0.55	0.53***	.01	0.52 – 0.54
2011 to 2015	0.42***	.00	0.41 – 0.43	0.41***	.00	0.40 – 0.42
Birthplace (ref. Flanders)						
Wallonia	1.62***	.02	1.58 – 1.66	1.53***	.02	1.50 – 1.57
Brussels	1.39***	.02	1.35 – 1.44	1.31***	.02	1.27 – 1.35
Abroad	2.14***	.04	2.07 – 2.21	1.92***	.03	1.86 – 1.98
Constant		0.003			0.003	
Log likelihood		-141195.76			-140291.71	
Persons		587,390			587,390	
Person-months at risk		23,389,112			23,389,112	
Had 1 st child while single		43,810			43,810	
Piecewise baseline hazard						
	Months			Scaled to Years		
25 to 29	0.0019 (0.0019 – 0.0020)			0.023 (0.023 – 0.024)		
30 to 34	0.0024 (0.0024 – 0.0025)			0.029 (0.029 – 0.030)		
35 to 39	0.0022 (0.0022 – 0.0023)			0.027 (0.027 – 0.028)		
40+	0.0005 (0.0005 – 0.0005)			0.006 (0.006 – 0.007)		

Source. Belgian population registers (2005-2015), tax declarations (2005-2015), census (2011).
Note. * $p < .05$; ** $p < .01$; *** $p < .001$. Baseline hazard values are reported in both unscaled (monthly) and scaled (yearly) formats.

We interacted our SES variables with women's age to investigate age-based SES differentials shown in the descriptive analysis. Figure 2 (Table S4, online supporting materials) illustrates how the relationship between education and having a first child while single reversed from negative in younger ages to positive at later ages. For the youngest age group (25 to 29), we observed a striking reduction in the relative risks of having a first child while single with increasing education. Being low-educated and young doubled the risk of single childbearing (HR 95% CI: 1.92 – 2.11), compared to being medium educated and aged 30 to 34 (reference category). Highly educated young women had substantially lower risks of single-childbearing (HR 95% CI: 0.30 – 0.34) compared to the reference group.

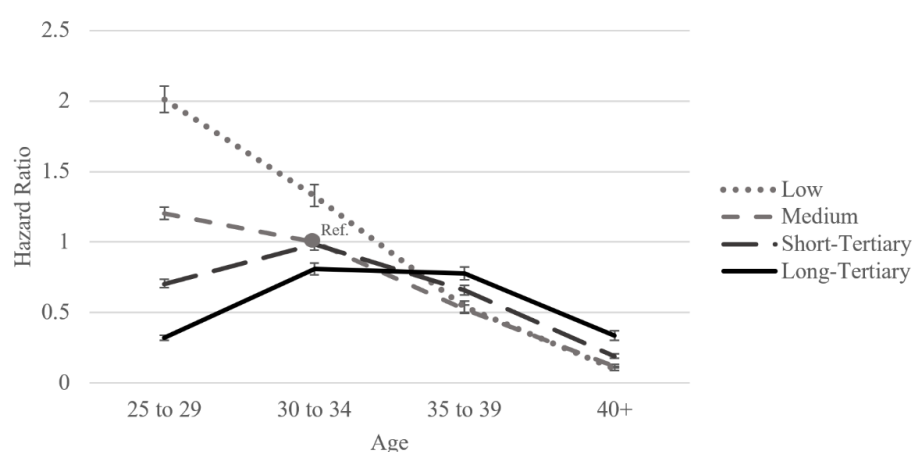


FIGURE 2. RELATIVE RISKS OF HAVING A FIRST CHILD WHILE SINGLE FROM AGES 25 TO 48, AGE # EDUCATION INTERACTION

Source. Belgian population registers (2005-2015), tax declarations (2005-2015), census (2011)
Note. Controls are place of birth, period, and proximity to parents (omitted from figure).

Regardless of education level, the risks of having a first child decreased for women aged 35 and onwards (Figure 2). Yet among women who were childless up to this point, those with long-tertiary education became the most likely to have a child while single, while low- and medium-educated women were most prone to remaining childless.

We also interacted age with income (Figure 3, Table S4 of online supporting materials) and observed a consistent negative association between income and single-childbearing that

was stronger at younger ages. Risk differences by income were smaller compared to those by education.

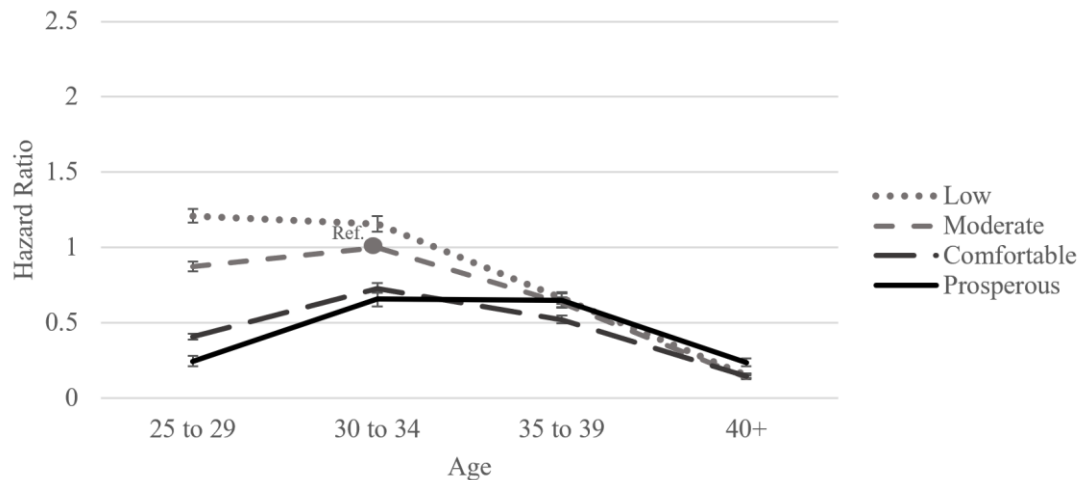


FIGURE 3. RELATIVE RISKS OF HAVING A FIRST CHILD WHILE SINGLE FROM AGES 25 TO 48, AGE # INCOME INTERACTION

Source. Belgian population registers (2005-2015), tax declarations (2005-2015), census (2011)
Note. Controls are place of birth, period, and proximity to parents (omitted from figure).

As in education, in the youngest age group, the relative risks of single-childbearing decreased with increasing income (Figure 3). We observed a strong reduction in risk associated with having comfortable to prosperous income at ages 25 to 29, compared to the reference group (age 30 to 34, moderate income). For women still childless at ages 30 to 34, low to moderate income remained linked to a relatively higher risk of having a first child while single. Differences were primarily between the low-moderate and the comfortable-prosperous income groups.

In the 35 to 39 age group, patterns begin to differ. Overlapping confidence intervals suggest that women with low, moderate, and prosperous incomes had similar risks of having a child while single (Figure 3). Meanwhile, those with comfortable income had the lowest risk of single-childbearing, compared to women of the same age in other income groups. Among still-childless women aged 40+, the highest-earners were most likely to become mothers while

single, although risk differences were small. We found the same overall direction of effects when we ran the interaction models on a sample without foreign-born women, with some differences in estimates (graphical comparison of estimates: Figure S2, online supporting materials). The education effect, especially in younger ages, remained strong.

35+ Subsample (Later Ages)

As anticipated, the relationship between SES and starting motherhood while single shifted around age 35. Women who postpone childbearing until these later ages face a heightened possibility of never bearing children. With this implication in mind, we conducted further analyses on later-aged women (165,700 women, 9,541 single mothers) to disentangle the relationships between education, income, and the likelihood that they have a first child while single, than remain at risk of permanent childlessness. Relatively wider confidence bands in models based on the 35+ subsample call for more caution in interpretation. Model estimates are detailed in Table S5 of the online supporting materials.

For later-aged single women, there was a moderate to strong positive association between education and single-childbearing (Table S5). Women with short- and especially long-tertiary education had higher risks of single-childbearing compared to the reference group. Long-tertiary education increased the risks of being a single mother at later ages by 39% to 81% (95% CI), relative to having medium education. On the other hand, the association between income and single-childbearing remained negative (Table S5), contrary to what we expected. Women with low to moderate income were the most at risk of having a child while single at later ages. Meanwhile, high-earning women (comfortable and prosperous income) faced weak to moderate reductions in the risks of single-childbearing, compared to their lower-earning counterparts.

The associations between the control variables and single-childbearing remained in the same direction as the previous models, except for proximity to parents. Later-aged women who did not reside near any parent had similar single-childbearing risks as those who lived in the same municipality as both parents. Contrary to what we anticipated, more recent time periods decreased the likelihood of becoming a first-time mother while single at later ages. The recognition of single women's access to MAR in 2007 may have had limited impact, considering that Belgian fertility clinics have long treated single patients and because of the option to seek treatment abroad. This may also reflect a reduction in unintended pregnancies and improved access to abortion.

We subsequently interacted education with income, as we sought to disentangle the effects of these two SES variables and hypothesized that income requirements for becoming a parent vary according to education. The interaction plot in Figure 4 (Table S5, online supporting materials) shows that the positive association between education and single-childbearing at later ages persisted across all income levels. Women with long-tertiary education, followed by short-tertiary educated women, consistently had the highest risks of being a single mother compared to single women with less education.

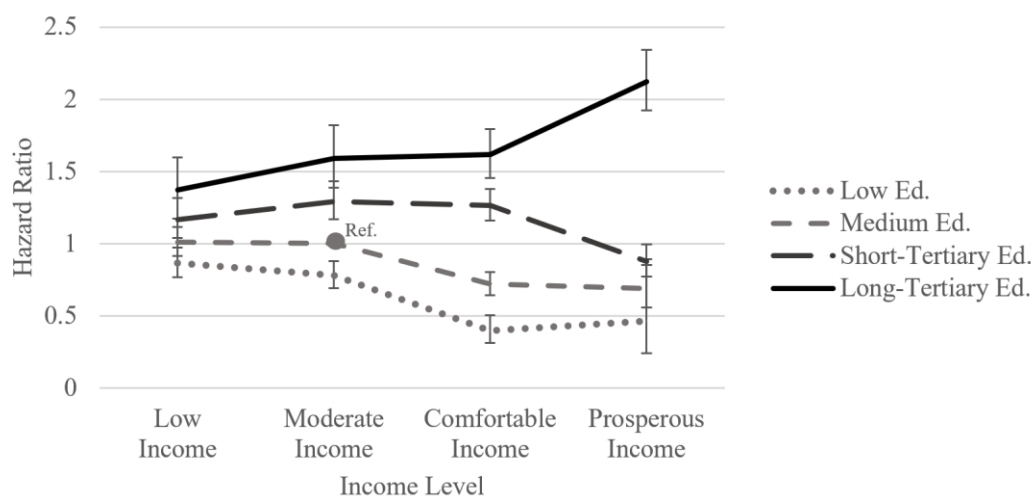


FIGURE 4. RELATIVE RISKS OF HAVING A FIRST CHILD WHILE SINGLE FROM AGE 35+, EDUCATION # INCOME INTERACTION

Source. Belgian population registers (2005-2015), tax declarations (2005-2015), census (2011)

Note. Controls are place of birth, period, and proximity to parents (omitted from figure).

For women with prosperous income, long-tertiary education strongly amplified the relative risks of single-childbearing. Even without focusing on non-intuitive combinations (e.g., low education and prosperous income), we observed a moderate to strong education effect. For instance, among women with moderate income, long-tertiary education increased the risk of single-childbearing by around 39% to 82% (95% CI) compared to medium education.

The risks of single-childbearing decreased as income reached comfortable and prosperous levels for later-aged single women with low and medium education (Figure 4). For those with short-tertiary education, having prosperous income eventually reduced the likelihood of single-childbearing. Yet for long-tertiary educated women, prosperous income doubled the risks of single-childbearing (HR 95% CI: 1.92 – 2.34) compared to the reference group (medium education, moderate income).

Running the interaction model on a sample without foreign-born women affirmed these associations and even increased the positive effect of long-tertiary education on being a first-time mother while single at later ages (graphical comparison of estimates: Figure S3, online supporting materials). As robustness checks, we conducted analyses on a sample that excludes women with long-term illnesses (Table S6) and performed a competing risks regression (first child while single competing with first child while partnered, Table S7). The robustness checks are detailed in the online supporting materials. These checks reaffirmed that education is positively associated with single-childbearing at later ages, and that prosperous income increased single-childbearing risks only for the most educated women. The competing risks model (Table S7, online supporting materials) showed some differences with the main interaction model. In particular, short-tertiary educated women had higher risks of single-

childbearing compared to less educated women from all income groups in the model which did censor out periods in a partnership.

Education-income interaction models were also produced for younger age groups (Figure S4, online supporting materials), further illustrating how the SES-single-childbearing relationship changed in later ages. It is only in the 35+ model that we observed a full reversal in the education-single childbearing relationship and an increase in the risks of single-childbearing with increasing income for long-tertiary educated women. We do not discuss results for other age groups in the text to maintain the focus on the later-aged women facing possible permanent childlessness.

DISCUSSION AND CONCLUSION

Summary of Findings

This study investigated the role of SES in the likelihood of having a first child versus remaining childless throughout single women's life course. Our results show that the relationship between SES and single-childbearing changed with increasing age. High SES decreased the likelihood of having a child while single at younger ages (<35), but increased it at later ages (35+). The correlation between SES and single-childbearing started to shift around age 35 onward—the ages at which women's fecundity begins to significantly decline. At these later ages, the relationship between education and single-childbearing turned positive as hypothesized (H1). However, the effects of education and income did not always go in the same direction. At later ages, increasing income amplified the risk of single-childbearing, but only for long-tertiary educated women. We thus find partial support for H2A (↑ income, ↑ single-childbearing at later ages) and H2B (strong increase among highly educated). The observed differences among highly educated groups demonstrate the added value of distinguishing them whenever possible, as access to higher education expands.

Study Implications

At younger ages, the negative relationship between SES and having a first child while single likely reflects SES differences in fertility postponement. Highly educated women may anticipate greater (career and financial) gains from their qualifications and may thus postpone childbearing until they reach more stable circumstances. On the other hand, young women might be more accepting of single motherhood as a path to self-fulfillment if other socioeconomic opportunities seem out of reach (see: Value of Children theory, Friedman et al., 1994; studies on teen pregnancy in the US: Kearney & Levine, 2012, 2014). The same mechanism has been suggested to explain why socially disadvantaged individuals may desire a child within relatively unstable cohabitations despite an ideal for childbearing within marriage (Perelli-Harris et al., 2010). Less-educated women with low income might also perceive that they have already reached their earning potential, thus finding few reasons to delay childbearing. Further, this negative relationship likely reflects disparities in preventing or terminating unwanted pregnancies (also suggested by Koops et al., 2021). In Belgium, low-educated women may have limited access to comprehensive sexuality education, and those with low income face barriers to accessing abortion services abroad after the 12-week limit is surpassed. Abortion remains morally stigmatized in the country, and some practitioners still refuse to perform it.

The shift to a positive education gradient at later ages was likely driven by highly educated single women becoming first-time mothers alone. Highly-educated women may be turning to single-childbearing to avoid permanent childlessness amid fecundity decline. Being compelled to be a mother alone may stem from difficulties in finding a partner in later ages, given the smaller pool of potential companions (Rapp, 2018) and men's general preference for younger women, which may strengthen as men age (e.g., Alterovitz & Mendelsohn, 2011). Partnership may also be forgone if it is perceived as something that does not align with one's

lifestyle. This is reflected in a multi-country study (Bellani et al., 2017) that found a peak in lifelong singlehood, especially for highly-educated women, in contexts where gender egalitarianism has not been achieved despite a decline in traditional values. This occurs, for instance, when domestic labor remains heavily gendered despite women's widespread labor market participation.

This positive relationship between education and single-childbearing persisted even at lower income levels. Single-childbearing at later ages thus appears to be a function of high education, enabled by opportunities and resources that extend beyond income. Highly educated women with low income may be confident enough to welcome a child if they are optimistic that their qualifications will lead to better earning opportunities. They may also have more flexible work schedules and sufficient leave benefits that enable an easier balance between employment and starting a family. Further, they would have a network of high-SES family and friends that may provide them with support in raising their child. As observed by other authors, having a strong network was a crucial consideration for women who decided to have a child alone (Jadva et al., 2009; Van Gasse & Mortelmans, 2020). Lastly, higher education is associated with having liberal values and greater resistance to social norms (Liefbroer & Billari, 2010), thus enabling these women to pioneer new family forms, including solo motherhood. On the other hand, highly educated women may have also had a child within living-apart-together relationships—a relatively new relationship form found to be more common among individuals with higher education (Liefbroer et al., 2015; Régnier-Loilier & Vignoli, 2014).

The results for later-aged women bear a concerning implication: less educated single women face greater risks of permanent childlessness. This aligns with findings in Nordic countries, where childlessness was found to presently be more prevalent among lower-educated

women (Jalovaara et al., 2019). Such outcomes suggest that parenthood is increasingly becoming a privilege that many are unable to experience.

As our models were estimated on single women who were childless until the age examined, it is worth reflecting on the barriers to family-formation faced by women from various educational backgrounds, and why highly educated women are more likely to pursue alternative paths to motherhood than their less educated peers. First, although literature often attributes fertility postponement to highly educated women, it is important to recognize that less educated women also face challenges in finding partners and, consequently, in entering parenthood. Low education may be viewed by others as a reflection of lower cultural interests or cognitive abilities, thus decreasing desirability (Kalmijn, 2013). Less educated individuals also have more limited access to social and leisure activities that may be avenues for meeting potential partners to have a child with (de Graaf & Kalmijn, 2003). Moreover, it would be amiss to assume that less-educated women do not worry about the economic impacts of motherhood. The tradeoffs may even be more dire for less educated women, who are increasingly marginalized as access to higher education expands for others (e.g., as explained by Jalovaara et al., 2019). A temporary break in the labor market due to pregnancy and childrearing may have irreparable negative consequences on earnings and future employment, especially if one's qualifications do not lead to many open doors. Career progression may also be slower for women with lower education.

We found a consistently negative general association between income and single-childbearing. Abundant financial resources may not be perceived as a necessity in a welfare state that provides family allowances and support for single parents. Moreover, low to moderate income may reflect informal, part-time, or flexible employment that allows the combination of work and family formation.

The income effect at later ages varied according to educational attainment. Higher income increased the likelihood of having a first child while single only for women with long-tertiary education. The same pattern was not seen among those with short-tertiary education. Perhaps the latter are more likely to enter partnerships or may be less independent than those with long-tertiary education. It is also possible that university education and long periods of study attract primarily those from upper- and upper-middle-class backgrounds with distinct behaviors.

Our results resonate with studies on solo mothers who are both highly educated and financially stable (Golombok, 2015; Golombok et al., 2016; Jadvá et al., 2009; Mannis, 1999; Volgsten & Schmidt, 2021). While higher education may come with values that lead women to consider single-childbearing, high income may enable the realization of this desire. High income allows access to MAR—the most common way for women to conceive without a partner (Golombok, 2015; Van Gasse & Mortelmans, 2020). Despite generous state subsidies for MAR, the costs of donor sperm and co-payments may still be too expensive for some. Multiple MAR cycles may be necessary due to MAR's modest success rates, but health insurance coverage is subject to age and cycle limitations. Fertility clinics (and adoption services) may also favor women with stable financial resources when screening prospective solo mothers (e.g., Hertogs et al., 2021). Additionally, prosperous income may facilitate access to alternative fertility treatments abroad and costly social egg freezing. For women who chose to keep an unintended pregnancy or end a relationship while pregnant, higher income may have offered a greater sense of security for raising children independently.

Our reflections highlight how socioeconomic disparities impact family-formation opportunities throughout women's life course. Although structural changes are necessary, governments may begin tackling family-formation barriers by ensuring their citizens have livable wages alongside a stable balance between work and family life. This would necessitate

improving leave benefits, allowing for adaptable working hours, and expanding access to publicly-funded daycare, among other issues. To-be-parents and current parents must be able to adjust work arrangements to accommodate domestic needs, without fearing negative economic consequences.

Through this discussion, we attempted to show various narratives surrounding fertility decisions, largely framing childbearing as an outcome of rational choice. However, it is important to recognize that (single-) childbearing, like many life events, may be the result of circumstances beyond conscious control. Moreover, we remain mindful that women's experiences cannot be categorized into clear-cut boxes.

Limitations and Directions for Future Research

This study relied on register data, which may not always reflect reality. For example, a recently cohabiting couple may report their change in residence only after the birth of their child. Also, we could only observe children ever-registered in Belgium. We are unable to identify individuals who are in committed relationships but do not share a household, a group that constitutes around 10% of adults in Europe (Liefbroer et al., 2015). We are also unable to determine whether women became single mothers or remained childless voluntarily, and we are unable to account for medical infertility. Regarding our SES variables, we took education from the 2011 census due to data limitations, and we lack information on occupations to contextualize income.

Future research may address these limitations through surveys or qualitative interviews that inquire about single women's detailed partnership status, their evolving fertility intentions, reasons for remaining single or childless, views on having a child alone, and fertility outcomes. Future studies may nuance partnership status by adding a third "living-apart-together" category, on top of "single" and "partnered." As a further step, researchers may investigate

whether single mothers cohabit with a partner after childbirth, revealing the prevalence of a family-formation path that begins with childbearing before partnership. Future work may also further examine the relationship between education, income, and single-childbearing among younger adults (<35). Quantitative researchers may attempt to estimate the prevalence of solo motherhood by using large datasets that record conception methods (e.g., data from hospitals, birth records) and focusing on single women who conceived via MAR. Demand for solo motherhood via MAR may also be studied through data from fertility clinics. Finally, future work on solo mothers may also investigate whether they experience negative economic impacts linked to single motherhood despite their high SES.

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SUPPORTING MATERIALS

NOTE S1. COHABITING COUPLES AND IDENTIFYING THE DURATION OF RELATIONSHIPS

In the dataset, it was not possible to identify unmarried couples sharing a household with other unrelated individuals. Women in these couples may thus be wrongly identified as single. A correction from single to partnered could only be made if a woman gave birth and identified a co-parent who resides within the shared household. This correction yielded very marginal changes to the proportions of births born to single women.

A union is assumed to be formed on month that two people join one another in the same household. This may happen if they move together to a new address, or if one person moves in with another who was previously living alone. On the flipside, the union is assumed to be dissolved on the month that one or both parties move out of their shared residence. For some couples, a change in partnership status may be detected between two years without us being able to identify the months of union formation or dissolution. This may happen, for example, when a roommate moves out of a three-person shared flat, leaving the two remaining roommates who will thus be identified as a cohabiting couple. For these instances, partnership change is assumed to have taken place on the 7th month of the previous year. We also tried to distribute the unknown partnership changes randomly throughout the previous year and yielded similar estimates for births to single women.

TABLE S1. Income Categories According to Annual Net Taxable Personal Income (EUR)

	Until 2007	2008 onwards
Low	0 to <10,000	0 to <15,000
Moderate (incl. min wage)	10,000 to <20,000	15,000 to <25,000
Comfortable	20,000 to <35,000	25,000 to <40,000
Prosperous	35,000 and above	40,000 and above

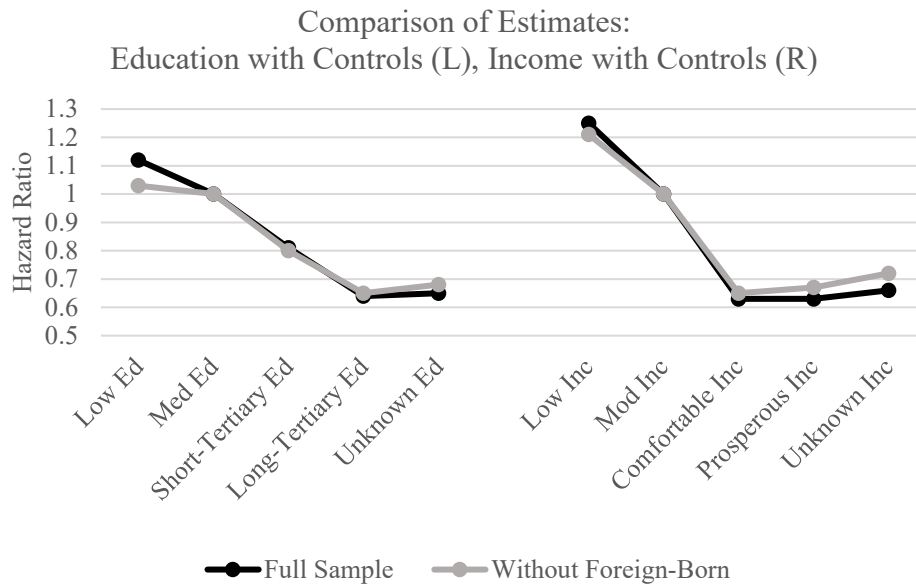


FIGURE S1. COMPARING ESTIMATES IN TABLE 2 (M1 & M2) WITH ESTIMATES FROM MODELS EXCLUDING FOREIGN-BORN WOMEN

Source. Belgian population registers (2005-2015), tax declarations (2005-2015), census (2011)
Note. Models without the foreign-born population were estimated on a sample of 428,753 individuals (32,109 first births to single women). Controls are place of birth, period, and proximity to parents (omitted from figure).

TABLE S2. Having a First Child While Single from Ages 25 to 49, Education- and Income-Only Models

Variables	M3. Education Only		M4. Income Only	
	Hazards Ratio	95% CI	Hazard Ratio	95% CI
Education (ref. Medium Ed.)				
Low Education	1.19***	1.16 – 1.23		
Short-Tertiary Education	0.84***	0.82 – 0.86		
Long-Tertiary Education	0.65***	0.63 – 0.67		
Unknown Education	0.77***	0.74 – 0.79		
Income (ref. Moderate Inc.)				
Low Income			1.25***	1.22 – 1.28
Comfortable Income			0.62***	0.60 – 0.64
Prosperous Income			0.62***	0.60 – 0.65
Unknown Income			0.67***	0.65 – 0.69
Model Information				
Constant	0.002		0.002	
Log likelihood	-145227.59		-144153.83	
Persons	587,390		587,390	
Person-months at risk	23,386,112		23,386,112	
Events (1 st child while single)	43,810		43,810	

Source. Belgian population registers (2005-2015), tax declarations (2005-2015), census (2011).
Note. * $p < .05$; ** $p < .01$; *** $p < .001$.

TABLE S3. Having a First Child While Single from Ages 25 to 49, Combined Education and Income Model, with Controls

Variables	M5. Education, Income + Controls	
	Hazard Ratio	95% CI
Education (ref. Medium Ed.)		
Low Education	1.08***	1.05 – 1.12
Short-Tertiary Education	0.92***	0.90 – 0.95
Long-Tertiary Education	0.74***	0.72 – 0.76
Unknown Education	0.77***	0.75 – 0.80
Income (ref. Moderate Inc.)		
Low Income	1.24***	1.21 – 1.27
Comfortable Income	0.67***	0.65 – 0.69
Prosperous Income	0.71***	0.68 – 0.74
Unknown Income	0.71***	0.68 – 0.74
Proximity (ref. Living close to no parent)		
Close to 1 parent	0.80***	0.78 – 0.83
Close to 2 parents	0.84***	0.82 – 0.86
Unknown	0.70***	0.67 – 0.72
Period of observation (ref. <2008)		
2008 to 2010	0.53***	0.52 – 0.54
2011 to 2015	0.41***	0.40 – 0.42
Birthplace (ref. Flanders, BE)		
Wallonia, BE	1.52***	1.49 – 1.56
Brussels, BE	1.33***	1.29 – 1.37
Abroad	1.99***	1.93 – 2.06
Model Information		
Constant		0.004
Log likelihood		-139985.44
Persons		587,390
Person-months at risk		23,386,112
Events (1 st child while single)		43,810

Source. Belgian population registers (2005-2015), tax declarations (2005-2015), census (2011).

Note. *p < .05; **p < .01; ***p < .001.

TABLE S4. Having a First Child While Single from Ages 25 to 49, Age and SES Interaction

Variables	M6. Age # Education		M7. Age # Income	
	Hazard Ratio	95% CI	Hazard Ratio	95% CI
Age # Education				
(ref. 30 to 34 # Medium Education)				
25 to 29 # Low Education	2.01***	1.92 – 2.11		
25 to 29 # Medium Education	1.20***	1.16 – 1.25		
25 to 29 # Short-Tertiary Education	0.70***	0.67 – 0.73		
25 to 29 # Long-Tertiary Education	0.32***	0.30 – 0.34		
25 to 29 # Unknown Education	0.60***	0.56 – 0.63		
30 to 34 # Low Education	1.33***	1.25 – 1.41		
30 to 34 # Short-Tertiary Education	0.98	0.94 – 1.03		
30 to 34 # Long-Tertiary Education	0.81***	0.77 – 0.85		
30 to 34 # Unknown Education	0.62***	0.58 – 0.65		

TABLE S4. Having a First Child While Single from Ages 25 to 49, Age and SES Interaction (Ctd.)

Variables	M6. Age # Education		M7. Age # Income	
	Hazard Ratio	95% CI	Hazard Ratio	95% CI
35 to 39 # Low Education	0.54***	0.50 – 0.58		
35 to 39 # Medium Education	0.52***	0.50 – 0.55		
35 to 39 # Short-Tertiary Education	0.66***	0.62 – 0.69		
35 to 39 # Long-Tertiary Education	0.78***	0.73 – 0.82		
35 to 39 # Unknown Education	0.52***	0.49 – 0.56		
40+ # Low Education	0.10***	0.09 – 0.12		
40+ # Medium Education	0.12***	0.11 – 0.13		
40+ # Short-Tertiary Education	0.19***	0.18 – 0.21		
40+ # Long-Tertiary Education	0.34***	0.31 – 0.37		
40+ # Unknown Education	0.14***	0.13 – 0.16		
Age # Income				
(ref. 30 to 34 # Moderate Income)				
25 to 29 # Low Income			1.21***	1.16 – 1.25
25 to 29 # Moderate Income			0.87***	0.84 – 0.91
25 to 29 # Comfortable Income			0.40***	0.39 – 0.42
25 to 29 # Prosperous Income			0.24***	0.21 – 0.28
25 to 29 # Unknown Income			0.63***	0.60 – 0.66
30 to 34 # Low Income			1.15***	1.11 – 1.21
30 to 34 # Comfortable Income			0.73***	0.70 – 0.76
30 to 34 # Prosperous Income			0.66***	0.61 – 0.71
30 to 34 # Unknown Income			0.55***	0.51 – 0.58
35 to 39 # Low Income			0.66***	0.63 – 0.70
35 to 39 # Moderate Income			0.63***	0.60 – 0.67
35 to 39 # Comfortable Income			0.52***	0.49 – 0.55
35 to 39 # Prosperous Income			0.65***	0.60 – 0.70
35 to 39 # Unknown Income			0.38***	0.36 – 0.41
40+ # Low Income			0.15***	0.13 – 0.16
40+ # Moderate Income			0.14***	0.12 – 0.15
40+ # Comfortable Income			0.14***	0.13 – 0.16
40+ # Prosperous Income			0.24***	0.21 – 0.26
40+ # Unknown Income			0.14***	0.13 – 0.16
Model Information				
Constant	0.004		0.004	
Log likelihood	-134252.12		-135194.36	
Persons	587,390		587,390	
Person-months at risk	23,386,112		23,386,112	
Events (having a child while single)	43,810		43,810	

Source. Belgian population registers (2005-2015), tax declarations (2005-2015), census (2011).

Note. Controls are place of birth, period, and proximity to parents (omitted from the table).

*p < .05; **p < .01; ***p < .001.

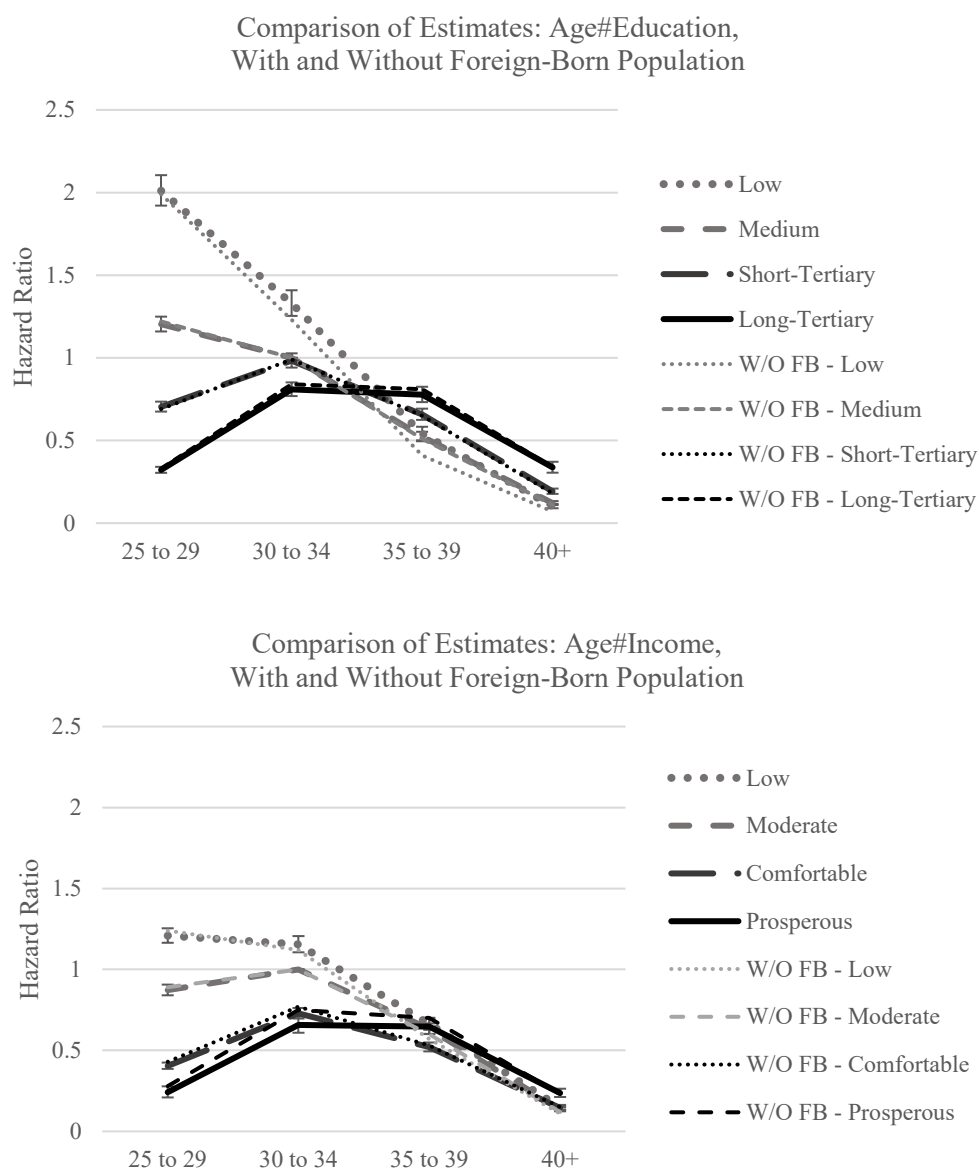


FIGURE S2. COMPARING ESTIMATES IN TABLE S4 (M6 & M7) WITH ESTIMATES FROM MODELS EXCLUDING FOREIGN-BORN WOMEN

Source. Belgian population registers (2005-2015), tax declarations (2005-2015), census (2011)
Note. W/O FB = without foreign-born. Models without the foreign-born population were estimated on a sample of 428,753 individuals (32,109 first births to single women). Controls are place of birth, period, and proximity to parents (omitted from figure).

TABLE S5. Having a First Child While Single from Age 35+, Main Effects of and Interactions Between Education and Income

Variables	M8. Ed. ## Inc.	
	Hazard Ratio	95% CI
Education (ref. Medium Education)		
Low Education	0.78***	0.69 – 0.88
Short-Tertiary Education	1.29***	1.17 – 1.43
Long-Tertiary Education	1.59***	1.39 – 1.81
Unknown Education	1.08	0.94 – 1.24
Income (ref. Moderate Income)		
Low Income	1.01	0.91 – 1.12
Comfortable Income	0.72***	0.64 – 0.80
Prosperous Income	0.69***	0.55 – 0.85
Unknown Income	0.92	0.75 – 1.13
Education # Income (ref. Medium Ed. # Moderate Inc.)		
Low Ed. # Low Inc.	1.10	0.93 – 1.30
Low Ed. # Comfortable Inc.	0.71*	0.54 – 0.93
Low Ed. # Prosperous Inc.	0.86	0.43 – 1.73
Low Ed. # Unknown Inc.	1.00	0.75 – 1.33
Short-Tertiary Ed. # Low Inc.	0.89	0.76 – 1.05
Short-Tertiary Ed. # Comfortable Inc.	1.36***	1.18 – 1.58
Short-Tertiary Ed. # Prosperous Inc.	0.98	0.77 – 1.27
Short-Tertiary Ed. # Unknown Inc.	1.29	0.99 – 1.68
Long-Tertiary Ed. # Low Inc.	0.85	0.69 – 1.05
Long-Tertiary Ed. # Comfortable Inc.	1.41***	1.18 – 1.69
Long-Tertiary Ed. # Prosperous Inc.	1.94***	1.50 – 2.50
Long-Tertiary Ed. # Unknown Inc.	1.32	0.99 – 1.78
Unknown Ed. # Low Inc.	1.10	0.92 – 1.31
Unknown Ed. # Comfortable Inc.	1.14	0.90 – 1.45
Unknown Ed. # Prosperous Inc.	1.45*	1.05 – 2.00
Unknown Ed. # Unknown Inc.	0.69**	0.54 – 0.88
Proximity (ref. Living close to no parent)		
Close to 1 parent	0.67***	0.63 – 0.71
Close to 2 parents	1.05	0.99 – 1.12
Unknown	0.66	0.62 – 0.71
Period of observation (ref. <2008)		
2008 to 2010	0.52***	0.49 – 0.55
2011 to 2015	0.42***	0.40 – 0.44
Birthplace (ref. Flanders, BE)		
Wallonia, BE	1.24***	1.17 – 1.31
Brussels, BE	1.41***	1.31 – 1.50
Abroad	2.38***	2.23 – 2.54
Model Information		
Constant	0.002	
Log likelihood	-40271.512	
Persons	165,700	
Person-months at risk	7,235,744	
Events (having a child while single)	9,539	

Source. Belgian population registers (2005-2015), tax declarations (2005-2015), census (2011).

Note. Abbreviations: Ed., Education; Inc., Income. Controls are place of birth, period, and proximity to parents (omitted from the table). *p < .05; **p < .01; ***p < .001.

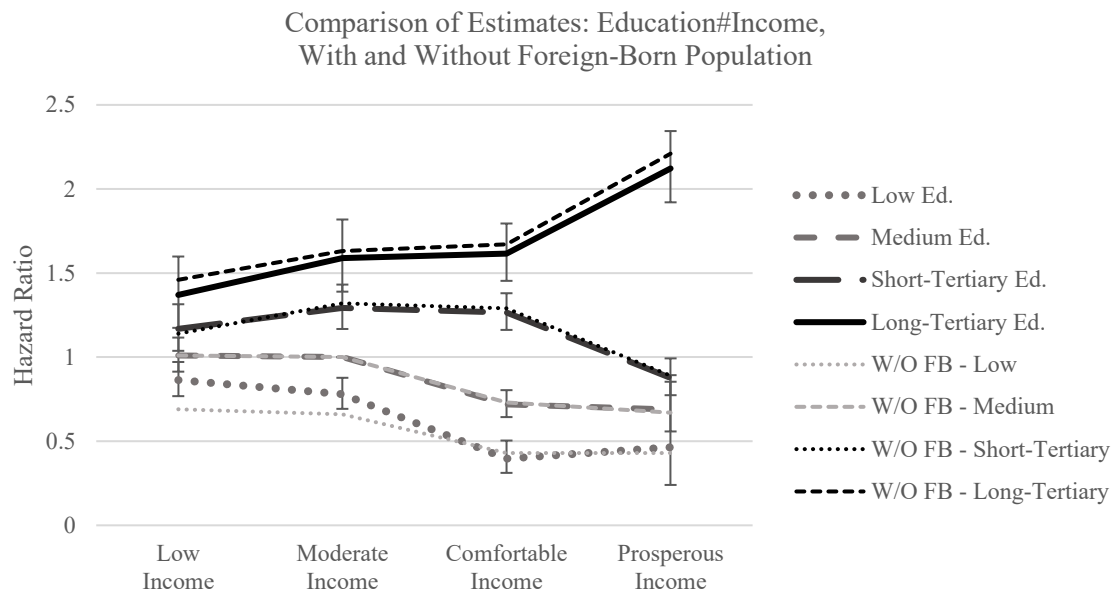


FIGURE S3. COMPARING ESTIMATES IN TABLE S5 (M8) WITH ESTIMATES FROM MODELS EXCLUDING FOREIGN-BORN WOMEN

Source. Belgian population registers (2005-2015), tax declarations (2005-2015), census (2011)
Note. W/O FB = without foreign-born. Models without the foreign-born population were estimated on a sample of 118,150 individuals (6,587 first births to single women). Controls are place of birth, period, and proximity to parents (omitted from figure).

NOTE S2. EXCLUDING WOMEN WITH LONG-TERM ILLNESSES (35+)

Women may have remained single and childless at age 35 onwards due to medical reasons. As a robustness check, we analyzed a sample that excluded women who reported having a long-term illness in the 2001 census (144,193 women, 8,750 single mothers). The main effects and interaction models in this sample (Table A6) yielded the same patterns shown in Table A5. Most significantly, long-tertiary education increased the risks of having a child while single at all income categories, and increasing income increased the risks of single-childbearing for long-tertiary educated women only.

TABLE S6. Robustness Check: Having a First Child While Single from Age 35+, Excluding Women with Long-Term Illnesses

Variables	M9. Ed. & Inc., No Long-term Ill		M10. Ed. # Inc., No Long-term Ill	
	HR	95% CI	HR	95% CI
Education (ref. Medium Ed.)				
Low Ed.	0.90*	0.83 – 0.98		
Short-Tertiary Ed.	1.37***	1.29 – 1.46		
Long-Tertiary Ed.	2.04***	1.91 – 2.18		
Unknown Ed.	1.04	0.96 – 1.13		
Income (ref. Moderate Inc.)				
Low Inc.	1.07*	1.00 – 1.13		
Comfortable Inc.	0.83***	0.78 – 0.88		
Prosperous Inc.	0.87***	0.81 – 0.94		
Unknown Inc.	0.84***	0.77 – 0.91		
Ed. # Inc. (ref. Medium Ed. # Moderate Inc.)				
Low Ed. # Low Inc.			1.04	0.92 – 1.18
Low Ed. # Moderate Inc.			0.85**	0.75 – 0.96
Low Ed. # Comfortable Inc.			0.41***	0.32 – 0.53
Low Ed. # Prosperous Inc.			0.44*	0.22 – 0.88
Low Ed. # Unknown Inc.			1.13	0.92 – 1.39
Medium Ed. # Low Inc.			1.12*	1.01 – 1.25
Medium Ed. # Comfortable Inc.			0.69***	0.62 – 0.78
Medium Ed. # Prosperous Inc.			0.68**	0.54 – 0.85
Medium Ed. # Unknown Inc.			1.07	0.86 – 1.33
Short-Tertiary Ed. # Low Inc.			1.24**	1.09 – 1.40
Short-Tertiary Ed. # Moderate Inc.			1.35***	1.21 – 1.50
Short-Tertiary Ed. # Comfortable Inc.			1.23***	1.12 – 1.35
Short-Tertiary Ed. # Prosperous Inc.			0.86*	0.75 – 0.98
Short-Tertiary Ed. # Unknown Inc.			1.61***	1.35 – 1.91
Long-Tertiary Ed. # Low Inc.			1.46***	1.25 – 1.72
Long-Tertiary Ed. # Moderate Inc.			1.68***	1.46 – 1.93
Long-Tertiary Ed. # Comfortable Inc.			1.62***	1.45 – 1.81
Long-Tertiary Ed. # Prosperous Inc.			2.12***	1.91 – 2.36
Long-Tertiary Ed. # Unknown Inc.			1.97***	1.61 – 2.40
Unknown Ed. # Low Inc.			1.28***	1.13 – 1.45
Unknown Ed. # Moderate Inc.			1.17*	1.01 – 1.35
Unknown Ed. # Comfortable Inc.			0.91	0.95 – 1.11
Unknown Ed. # Prosperous Inc.			1.11	0.89 – 1.40
Unknown Ed. # Unknown Inc.			0.73***	0.65 – 0.82
Model Information				
Constant	0.002		0.002	
Log likelihood	-36615.683		-36492.373	
Persons	144,193		144,193	
Person-months at risk	6,200,208		6,200,208	
Events (having a child while single)	8,750		8,750	

Source. Belgian population registers (2005-2015), tax declarations (2005-2015), census (2011).

Note. Abbreviations: Ed., Education; Inc., Income. Controls are place of birth, period, and proximity to parents (omitted from the table). * $p < .05$; ** $p < .01$; *** $p < .001$.

NOTE S3. COMPETING RISKS REGRESSION (35+)

We modelled the risk of having a child while single for all childless women aged 35+, competing with having a child while partnered (294,244 women, 9,541 single mothers). Overall, we found similar but slightly different patterns as the models in the main text. We found a linear positive relationship between education and single motherhood at later ages. The main income effects show however that women with moderate and prosperous income had the highest relative risks of single-childbearing, compared to women in other income groups (Table A7). As in the main models, those with the highest education had the highest relative risks of single-childbearing across all income groups. Further, prosperous income increased the likelihood of later-age single motherhood, only for long-tertiary educated women.

TABLE S7. Robustness Check: Having a First Child While Single from Age 35+, Child While Single versus Child While Partnered

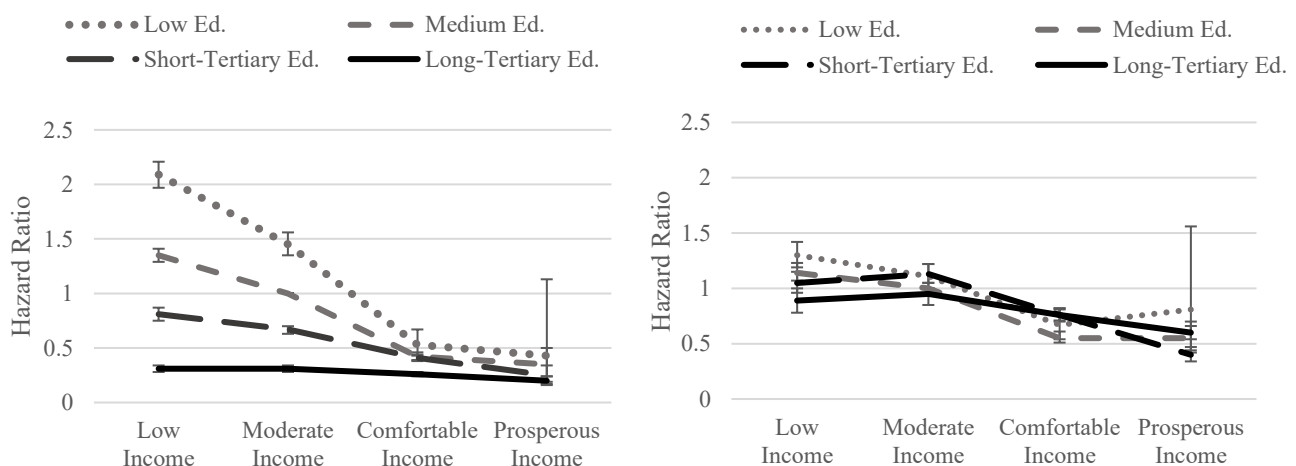
Variables	M11. Ed. & Inc., Competing Risks		M12. Ed. # Inc., Competing Risks	
	SHR	95% CI	SHR	95% CI
Ed. (ref. Medium Ed.)				
Low Ed.	1.02	0.95 – 1.10		
Short-Tertiary Ed.	1.39***	1.31 – 1.47		
Long-Tertiary Ed.	1.85***	1.73 – 1.98		
Unknown Ed.	0.98	0.90 – 1.06		
Inc. (ref. Moderate Inc.)				
Low Inc.	0.91**	0.86 – 0.97		
Comfortable Inc.	0.83***	0.78 – 0.88		
Prosperous Inc.	0.96	0.89 – 1.03		
Unknown Inc.	1.16***	1.08 – 1.26		
Ed. # Inc. (ref. Med Ed. # Mod Inc.)				
Low Ed. # Low Inc.			1.00	0.89 – 1.12
Low Ed. # Moderate Inc.			1.08	0.96 – 1.21
Low Ed. # Comfortable Inc.			0.57***	0.45 – 0.73
Low Ed. # Prosperous Inc.			0.76	0.39 – 1.44
Low Ed. # Unknown Inc.			1.20	1.00 – 1.45
Medium Ed. # Low Inc.			1.02	0.92 – 1.13
Medium Ed. # Comfortable Inc.			0.75***	0.68 – 0.84
Medium Ed. # Prosperous Inc.			0.94	0.76 – 1.17
Medium Ed. # Unknown Inc.			1.24*	1.01 – 1.51
Short-Tertiary Ed. # Low Inc.			1.19**	1.05 – 1.34
Short-Tertiary Ed. # Moderate Inc.			1.35***	1.22 – 1.49
Short-Tertiary Ed. # Comfortable Inc.			1.27***	1.16 – 1.38
Short-Tertiary Ed. # Prosperous Inc.			1.17*	1.03 – 1.32
Short Tertiary Ed. # Unknown Inc.			1.89***	1.60 – 2.23

TABLE S7. Robustness Check: Having a First Child While Single from Age 35+, Child While Single versus Child While Partnered (Ctd.)

Variables	M11. Ed. & Inc., Competing Risks		M12. Ed. # Inc., Competing Risks	
	SHR	95% CI	SHR	95% CI
Long-Tertiary Ed. # Low Inc.			1.54***	1.32 – 1.80
Long-Tertiary Ed. # Moderate Inc.			1.75***	1.53 – 2.01
Long-Tertiary Ed. # Comfortable Inc.			1.53***	1.38 – 1.70
Long-Tertiary Ed. # Prosperous Inc.			1.95***	1.77 – 2.15
Long-Tertiary Ed. # Unknown Inc.			2.15***	1.77 – 2.59
Unknown Ed. # Low Inc.			0.83**	0.73 – 0.95
Unknown Ed. # Moderate Inc.			1.19*	1.04 – 1.37
Unknown Ed. # Comfortable Inc.			0.86	0.71 – 1.05
Unknown Ed. # Prosperous Inc.			1.02	0.81 – 1.28
Unknown Ed. # Unknown Inc.			1.12*	1.00 – 1.25
Model Information				
Log pseudo-likelihood	-110832.3		-110795.75	
Persons	294,196		294,196	
Person-months at risk	14,411,313		14,411,313	
Events (having a child while single)	9,539		9,539	
Competing events (child while partnered)	40,694		40,694	

Source. Belgian population registers (2005-2015), tax declarations (2005-2015), census (2011).

Note. Abbreviations: Ed., Education; Inc., Income. Controls are place of birth, period, and proximity to parents (omitted from the table). * $p < .05$; ** $p < .01$; *** $p < .001$.

**FIGURE S4.** INTERACTIONS BETWEEN EDUCATION AND INCOME FOR THE 25 TO 29 AGE GROUP (L) AND THE 30 TO 34 AGE GROUP (R)

Source. Belgian population registers (2005-2015), tax declarations (2005-2015), census (2011)

Note. The model for the 25 to 29 age group was estimated on a sample of 406,457 individuals (20,209 first births to single women), while that for the 30 to 34 age group was estimated on 421,064 individuals (14,062 first births to single women). Controls are place of birth, period, and proximity to parents (omitted from figure).