

ORIGINAL ARTICLE

Open Access



The prospective power of personality for childbearing: a longitudinal study based on data from Germany

Steffen Peters^{1,2*}

*Correspondence:
peters@demogr.mpg.de

¹ Max Planck Institute
for Demographic Research,
Rostock, Germany

² Stockholm University,
Stockholm, Sweden

Abstract

The link between personality and fertility is relatively underexplored. Moreover, there are only a few studies focusing on the prospective association between personality and childbearing. However, none of these studies considered the Five-Factor Model (FFM), which is the most widely accepted measurement of personality. The present study fills this gap by examining the prospective association between the FFM and the hazard ratio of the first and the second childbirth in Germany. Analyses are based on recent data (2005–2017) from the Socio-economic Panel Study. Cox proportional hazard models are applied. Findings demonstrate that personality traits are associated with fertility. Extraversion is positively linked with the first childbirth, but is negatively associated with the second childbirth. These findings are mainly driven by males. Agreeableness is positively linked with the first childbirth across the total sample. Again, this correlation is mainly based on the findings for men, among whom a positive association between agreeableness and the second childbirth is also found. Among women, personality does not seem to be linked with the first childbirth. However, the risk of having a second child is found to be negatively associated with conscientiousness. My study adds to the current understanding of the personality–fertility association by exploring the impact of personality trait scores from the FFM on subsequent fertility behavior. However, further research is needed on the association between personality and childbearing; on the mechanisms through which personality affects fertility; and on how these links differ across cultures, among higher parities, and for births after re-partnering.

Keywords: Fertility, Personality, Five-factor model, Hazard ratio

Introduction

The theory of the second demographic transition (SDT) argues that individualization and self-realization contribute to fertility behavior (van de Kaa, 1987). Individuals may gain more control over their reproductive outcomes through the use of contraceptives, abortion and sterilization (van de Kaa, 1987). Therefore, individual characteristics such as personality may play a more important role in fertility today than in the past. Personality is linked with fertility intentions (Miller, 1992, 2011a, 2011b), and may affect fertility via the expected consequences of and attitudes toward childbearing (Ajzen & Klobas,

2013). For instance, higher self-esteem tends to reduce negative expectations of parenthood, whereas shyness reinforces them (Hutteman et al., 2013). These expectations may, in turn, predict intentions that determine fertility outcomes (Miller, 2011a, 2011b).

Furthermore, personality may affect fertility via opportunities. Available resources appear to play an important role in childbearing behavior. For instance, personality may be associated with vocational choice, as was suggested by Holland (1958). Indeed, previous studies have examined this relationship (Ackerman & Beier, 2003; Costa et al., 1984; Garcia-Sedeño et al., 2009), and have found that people's vocational choices may affect their fertility opportunities by, for example, enabling them to earn a higher income, and thus to have the financial resources needed to support a child. A recent study based on German data has shown that personality is linked with life trajectories, including family formation processes (union formation, fertility) and opportunities (education, employment) (Mencarini et al., 2022).

Previous research has explored the association between personality and childbearing to some extent. For instance, Markus Jokela and colleagues have found that fertility is positively connected with extraversion (Alvergne et al., 2010; Jokela, 2012; Jokela et al., 2011) and with sociability (Jokela et al., 2009). These correlations may differ by sex; e.g., while a strong positive association between extraversion and fertility has been found among males, weaker effects have been observed among females (Allen, 2019; Skirbekk & Blekesaune, 2014). However, due to data limitations, previous researchers focused on single facets of personality only, or they measured personality at relatively high ages (i.e., at a mean age of around 35 or higher), and thus at ages when the majority of people have already had their children (Avison & Furnham, 2015; Skirbekk & Blekesaune, 2014; Tavares, 2016).

Previous studies have suggested that personality may change after childbearing (Bleidorn et al., 2018; Jokela et al., 2009). Therefore, it is important to collect personality information on individuals before they have their children, and to apply prospective approaches in order to avoid reverse causality. The FFM has been shown to be the most reliable and robust approach to measuring personality (Goldberg, 1993; McCrae & Costa, 1987; McCrae & John, 1992). Because the FFM now plays a dominant role in personality research (Ashton & Lee, 2005), it is generally preferred by scholars when examining personality and childbearing. Some studies have used the FFM for examining fertility outcomes, but have considered cross-sectional data only (Alvergne et al., 2010; Avison & Furnham, 2015). Other analyses have used longitudinal data, but have applied the FFM at relatively high ages (Jokela et al., 2011; Skirbekk & Blekesaune, 2014; Tavares, 2016). Previous studies that explored the personality–fertility link based on prospective designs did not use the FFM as a personality measurement, but instead investigated only single personality facets, such as self-esteem (Hutteman et al., 2013), sociability (Jokela et al., 2009), or leadership (Jokela & Keltikangas-Järvinen, 2009). My study contributes to the existing research on personality and fertility outcomes. To my knowledge, this is the first study to examine the prospective association between personality traits as measured by the Five-Factor Model (FFM) and fertility.

In addition to performing gender-specific analyses, I distinguish between birth parities in my study. The transition from childlessness to parenthood is usually associated with major changes in the daily lives of individuals. The transition to the second child may be

different, given that individuals who have a first child already have parenthood experience, and their daily routines are unlikely to change dramatically following the birth of a second child. Thus, the association between personality and fertility may differ by birth parity, as well as by gender. For instance, as extraverted individuals are, by definition, sociable, they may have higher chances of meeting a potential partner, which may, in turn, improve their chances of entering parenthood. However, because having a child greatly restricts the social life of parents, extraverted people who become parents may experience a new phase of life that no longer suits their personal preferences. For parents, social activities with friends tend to be limited, and their available time tends to be spent on childcare. This social isolation can induce dissatisfaction among extraverted individuals in particular, which may, in turn, lead them to refrain from having another child. Another reason why it is important to distinguish between first and higher-order births is related to infidelity, which has been positively linked with extraversion (Orzeck & Lung, 2005). For example, because partnership stability tends to be lower among extraverted individuals, they may be less likely to have a second child.

In order to examine the extent to which personality determines the first and the second childbirth among both men and women, I run Cox proportional hazard (Cox PH) models using longitudinal data from Germany for the 2005–2017 period. Although the focus of my study is on individuals' childbearing chances over the life course, I also examine the association between individuals' personality facets and the number of children they have at age 40 or older.

Theoretical background

The second demographic transition

The SDT considers individualization—i.e., the desire for self-fulfillment, freedom, and self-realization—as one important explanatory factor in demographic behavior (Lesthaeghe, 2014; van de Kaa, 1987). In combination with higher rates of female participation in higher education and in the labor market, individualization may produce higher opportunity costs for childbearing (van de Kaa, 1987), particularly among women. The SDT also considers contraceptives and abortion as factors that contribute to reduced fertility in many European societies (van de Kaa, 1987). Couples may have greater control over their fertility, which can, in turn, result in fertility postponement, fewer unplanned births, and higher rates of voluntary childlessness (Lesthaeghe, 2014; van de Kaa, 1987). The SDT has been criticized. For example, some scholars have argued that the SDT is valid for certain cultures only (e.g., Northwestern Europe, the U.S., Canada, and Australia) (Lesthaeghe, 2014, 2020), or that it is based on cross-sectional data only (Zaidi & Morgan, 2017). Nevertheless, the SDT has served as an influential theoretical foundation for understanding empirical changes in family formation processes (childbearing, partnering, marriage) in high-income countries in recent decades.

The SDT serves as a theoretical foundation of my study, even though in the German context it refers to birth cohorts who are not well represented in my analytical sample (1940s/1950s). When Lesthaeghe and van de Kaa published their work in the 1980s, they considered West Germany to already be at an advanced stage of the transition (e.g., van de Kaa, 1987). East Germany was at an earlier stage of the SDT, but was showing some signs of progressing to a later stage (e.g., abortion was legalized much earlier in East than

in West Germany) (van de Kaa, 1987). Therefore, the aim of my study is not to examine the transition itself or potential changes in the personality–fertility link in the German context, but to emphasize the relevance of personality for childbearing behavior in contemporary Germany.

Nevertheless, the SDT provides an appropriate framework for my study, since it suggests that very low fertility levels will persist in Western European countries due to a number of structural (e.g., female labor market participation and female educational levels) and ideational factors, such as the drive for self-realization or emancipation (Lesthaeghe, 2020). However, in Germany in the recent past, considerable increases in fertility have occurred (BiB, 2022). The individualization process deserves more attention in demography, particularly with respect to fertility. Self-realization in fertility may influence whether people have children earlier or later in life; whether they have more or fewer children; and whether they have children at all. Personality may shape these fertility decisions. Individuals could view having a child as a restriction of their freedom, or as an important life goal (Langdridge et al., 2005). Moreover, some people may believe that their personality traits render them less suitable for parenting (Park, 2005). Thus, personality may play an essential role in fertility decisions.

Fertility in Germany has been below replacement level for several decades. In both East and West Germany, the total fertility rate (TFR) declined sharply from approximately 2.5 in the mid-1960s to about 1.5 in the mid-1970s (BiB, 2022). In West Germany, with some minor fluctuations, the TFR remained relatively stable at between 1.3 and 1.5 until the early 2010s (BiB, 2022). Fertility levels in East Germany increased in the mid-1970s, and remained higher than West German levels until German reunification in 1990. In 1994, the TFR in East Germany dropped to an all-time low of 0.83 (BiB, 2022). However, in the recent past, the fertility levels in East and West Germany have converged, reaching between 1.5 and 1.6 (BiB, 2022). These developments raise the question of what factors contribute to fertility in Germany, and who is having a first or a second child. My study examines the extent to which personality is linked with childbearing using data from Germany as one example of a Western European country with below-replacement fertility.

The concept of personality

Personality has been defined as the collection of thoughts, feelings, and behaviors that form individuals' distinctive characters (Uher, 2017). These facets accompany people through various situations in their lives. One of the fundamental decisions that people make over their life course is whether—and, if so, when—to have a child. Personality is linked with relationship satisfaction; e.g., agreeableness is positively associated and neuroticism is negatively associated with this outcome (Orth, 2013). Relationship satisfaction has, in turn, been positively linked with fertility (e.g., Riederer et al., 2019). Thus, personality factors may shape fertility via partnership satisfaction.

In a recent longitudinal study based on data from the German Socio-economic Panel Study (SOEP), Mencarini and colleagues (2022) have shown that personality facets are linked with life trajectories related to family formation and work life. The authors argued that because employment trajectories, relationship status, and childbearing are closely intertwined, they should be considered together, rather than separately (Mencarini et al.,

2022). However, this approach had several limitations. First, the authors examined life trajectories instead of specific life events (childbearing, education, marriage). Therefore, their analyses did not distinguish the specific effects of personality on fertility. Thus, caution is advised when applying their findings to fertility, since many other factors might have contributed to the outcomes they examined (e.g., educational attainment, union formation). For instance, the authors found a negative association between agreeableness and one life trajectory (short education, full-time job, late or no family formation), but a positive association between agreeableness and another life trajectory (no work, very early formation of large family) among women (Mencarini et al., 2022). Whether these differences could be attributed to employment, family formation, or both was unclear. In my study, I focus specifically on the personality–fertility link in order to disentangle this effect from other relevant life events, such as education or union formation.

Another limitation of the analyses by Mencarini and colleagues is that they measured personality at advanced stages of the life trajectory. Their study was based on data from the German Socio-economic Panel Study, which did not collect personality information before 2005. As the authors used data from 1984 onward, the associations they found between personality and life trajectories were not prospective. However, previous research has suggested that personality may change based on certain life events (e.g., the transition from school to university or employment) (Bleidorn et al., 2018). Therefore, personality scores from 2005 or later may be the result of life events that happened before the personality measurement occurred. Nevertheless, the work by Mencarini and colleagues is a benchmark for my study, since it emphasized not only that family formation processes and SES indicators are closely correlated, but also that the effects of personality differ between men and women (Mencarini et al., 2022).

The Five-Factor Model and gender

In psychological research, one personality model has been widely accepted as the most robust and reliable: namely, the Big Five Inventory (BFI), from which the Five-Factor Model (FFM) has been developed (Ashton & Lee, 2005). A helpful overview of the history of the BFI can be found in Goldberg (1993). The five factors measured by the FFM are agreeableness, conscientiousness, extraversion, neuroticism, and openness to experience (McCrae & Costa, 1987).

Previous research has shown that women tend to score higher than men on all these factors. For instance, analyses conducted on a sample of U.S. students showed that women have higher scores than their male counterparts on agreeableness, conscientiousness, and openness in particular (Kwon & Song, 2011). However, a systematic review of literature on personality differences among students mainly from North America and Europe reported that while females were consistently found to have higher neuroticism scores than males, the findings regarding openness were inconsistent across the analyzed studies (Vedel, 2016). In general, however, gender differences in personality tend to be rather small and dependent on the cultural context (Schmitt et al., 2017). With respect to personality development over time, the findings of previous research have been mixed. While an analysis of a U.S. sample found no gender differences in personality trait changes over a 50-year period (Damian et al., 2019), other studies reported gender differences in personality trait trajectories in younger samples in the Netherlands

(Borghuis et al., 2017) and Italy (Vecchione et al., 2012). It was, for instance, shown that emotional stability increases slightly for males but less so for females (Vecchione et al., 2012); and that conscientiousness increases linearly among young women, but follows a U-shaped pattern among men (Borghuis et al., 2017).

Women and men differ not only in terms of the level and the development of their personality traits, but also with respect to the impact of their personality traits on their fertility outcomes. For instance, a number of studies have shown that extraversion is positively linked with childbearing, particularly among men (Jokela et al., 2011; Skirbekk & Blekesaune, 2014). Other traits, such as agreeableness (positive association), appear to be particularly relevant for fertility among women (Jokela et al., 2011).

In light of the gender differences found by previous research, it is essential to differentiate between men and women when examining the association between personality and fertility. Therefore, my analyses are run for males and females separately.

Agreeableness

Agreeableness is the tendency to be forgiving, sympathetic, friendly, and warm. People report that agreeableness facets like kindness and considerateness are among the personality characteristics they most desire in potential partners (Buss & Barnes, 1986; Li et al., 2002). Furthermore, agreeableness is related to lower conflict levels with individuals of the opposite sex at younger ages (Asendorpf & Wilpers, 1998). Thus, young people who are agreeable are more likely to enter a romantic relationship that may lead to parenthood. There is also evidence that agreeableness is positively associated with partnership quality (Holland & Roisman, 2008) and relationship satisfaction (Orth, 2013), both of which may increase the chances of having children. Furthermore, it has been shown that agreeableness is positively linked with planned pregnancies among women, and is negatively associated with unplanned pregnancies among men (Berg et al., 2013). In line with these findings, other studies have reported that nurturance (being sympathetic and helpful) and affiliation (enjoying spending time with other people, being willing to make friends)—both of which are correlated with agreeableness (Costa Jr. et al. 1991)—are positively associated with the motivation to have a child (Miller, 1992). A recent study using SOEP data has demonstrated that among women, agreeableness is positively linked with life trajectories that include early union formation and having a larger number of children (two or more) (Mencarini et al., 2022). Research results on associations between agreeableness and life sequences among males have been less clear (Mencarini et al., 2022).

Empirical evidence on the agreeableness–fertility link suggests that women with higher scores on agreeableness give birth to more children (Jokela et al., 2011), and are less likely to be childless (Tavares, 2016); whereas these associations have not been found among men (Jokela, 2012; Jokela et al., 2011). However, there is evidence that higher scores on agreeableness are associated with having children earlier in the life course among men, but not among women (Jokela et al., 2011). The impact of agreeableness on childbearing appears to weaken at higher birth parities among women, but this decline seems to be rather small (Jokela et al., 2011). Therefore, I expect to find a positive association between agreeableness and fertility among women for both the first and the

second childbirth, whereas my expectations regarding the link between agreeableness and fertility among males are less clear.

Conscientiousness

Conscientious individuals are relatively well-organized, thorough, reliable, and hard-working. These facets may affect contraceptive use. Indeed, studies have found that a higher level of conscientiousness is related to a lower risk of having an unplanned pregnancy, at least among women; while conscientious males have higher chances of having a planned pregnancy (Berg et al., 2013). With regard to potential work–family conflicts, some studies have suggested that conscientiousness has a negative impact on career outcomes (Boudreau et al., 2001; Bozionelos, 2004; Gelissen & de Graaf, 2006; Roberts & Bogg, 2004). In line with these findings, a recent study found that German teenagers with higher conscientiousness scores are more likely to follow the vocational rather than the educational track after completing upper secondary education (Usslepp et al., 2020). This suggests both women and men in Germany with higher conscientiousness scores tend to have life trajectories characterized by higher employment stability levels but lower educational levels (Mencarini et al., 2022). Thus, these women and men may have sufficient income early in life to support a partner and/or a child.

However, the conflict between career and fertility may vary between women and men, and can be particularly challenging for women. Previous research has shown that women who consider their career to be important are less likely to have children (Shreffler & Johnson, 2013), and that delayed childbearing is linked with greater income benefits for women than for men (Miller, 2011a, 2011b). The work–family trade-off may be reduced by welfare regulations and the sharing of childcare responsibilities between the partners (Brodmann et al., 2007). However, positive associations between career outcomes and fertility have been consistently found for males (Andersson & Scott, 2007; Hopcroft, 2006; Kolk & Barclay, 2021). Furthermore, conscientious individuals tend to report higher levels of relationship quality (Holland & Roisman, 2008) and happiness (Orth, 2013), and to have lower risks of infidelity (Orzeck & Lung, 2005). Thus, conscientiousness indicators may be positively linked with fertility (Roberts & Bogg, 2004). On the other hand, conscientious individuals tend to define their career goals clearly (Judge & Ilies, 2002), and to feel more satisfied with their job (Sutin et al., 2009). Thus, conflicts between work and family could cause more career-oriented women to have lower fertility, or to postpone having children (Blossfeld & Huinink, 1991; Gustafsson, 2001; Skirbekk, 2008; Van Bavel, 2010). There is, however, evidence that the negative gradient between SES indicators and fertility has attenuated in the more recent past among women in Scandinavian countries (Jalovaara et al., 2019; Kravdal & Rindfuss, 2008).

Previous research provides stronger evidence for a negative correlation between conscientiousness and fertility. Conscientious individuals, and particularly females, tend to have fewer children (Jokela et al., 2011; Skirbekk & Blekesaune, 2014). In line with this finding, it has been shown that conscientious women have a lower likelihood of having a first and a second child, but that conscientious men do not (Jokela et al., 2011). Therefore, I expect to find a negative association between conscientiousness and fertility (parity 1 and 2) among women, but not among men.

Extraversion

Extraversion is defined as being sociable, talkative, active, and dominant. This trait is positively linked with the motivation to work in the public sector (van Witteloostuijn et al., 2017). Thus, previous findings have detected a positive association between extraversion and transitioning from the private to the public sector (Maczulskij & Viinikainen, 2021). Since compensation is usually lower in the public than in the private sector (Bourantas & Papalexandris, 1999), extraverts may be less likely than introverts who work in the private sector to have sufficient financial resources to support a family. However, as public sector employment provides greater job stability and more support for balancing work and family, working in the public sector and fertility outcomes may be positively associated (Adsera, 2004, 2011; Conti & Sette, 2013). For the German context, it has been shown that young people who are extraverted are less likely to start higher education (compared to starting an apprenticeship) within one year of completing secondary education (Usslepp et al., 2020). Given that young extraverts tend to follow the occupational track early in their life course, they are likely to have an independent income, which may, in turn, influence their childbearing decisions. Therefore, men with higher extraversion scores are more likely to have life trajectories characterized by lower education and full-time work (Mencarini et al., 2022). Previous research has also found that extraverted people tend to work in specific occupations (Costa et al., 1984). For instance, a study conducted in Germany found that extraversion is positively linked with entry into self-employment, which is, on average, associated with higher income risks, but also more financial wealth (Caliendo et al., 2014). Therefore, self-employed individuals may have more resources to support a family, and could, in turn, have higher fertility. Indeed, self-employment has been found to be positively linked with fertility (Florida et al., 2021). However, as was suggested above, the association between career and fertility differs between women and men.

Furthermore, extraverted people may have higher fertility because they tend to have larger social networks and closer relationships than their introverted counterparts (Neyer & Asendorpf, 2001; Schmitt & Shackelford, 2008). Thus, extraverts have higher chances of forming a romantic relationship that may lead to parenthood. Indeed, men in Germany are more likely to follow life paths characterized by early union formation if they have higher extraversion scores (Mencarini et al., 2022). Additionally, it has been shown that extraversion is positively associated with the number of sex partners over time (Allen & Desille, 2017; Miller et al., 2004; Nettle, 2005, 2006; Schmitt, 2004). Having more sex partners over the life course may increase the chances of having planned or unplanned pregnancies. Indeed, previous findings have suggested that extraversion is positively related to a higher risk of having an unplanned pregnancy among both men and women (Berg et al., 2013). Furthermore, being an extravert is linked to a lower age at first marriage (Jokela et al., 2011), and marriage promotes childbearing (Laplante & Fostik, 2015). However, reverse causality may affect this association, given that couples may decide to get married after getting pregnant so that the childbirth occurs within marriage. More extraverted individuals also report higher levels of relationship quality (Holland & Roisman, 2008; Orth, 2013), which could increase their partnership stability, and their fertility.

Previous research has shown that among the personality traits measured by the FFM, extraversion is most closely associated with sexual and fertility behavior (Allen, 2019). High scores on this personality trait have been linked to a higher probability of entering parenthood (Jokela et al., 2011), earlier childbearing (Jokela et al., 2011; Tavares, 2016), and lower rates of childlessness (Avison & Furnham, 2015) for both sexes. However, previous research has also found that extraversion is more closely associated with reproductive behavior among males than among females (Allen, 2019; Jokela et al., 2011; Skirbekk & Blekesaune, 2014). Additionally, the effects of extraversion appear to be particularly strong for the first childbirth, but to be weaker for the second childbirth (Jokela et al., 2011). Consequently, I expect to find a positive correlation between extraversion and fertility for both genders and parities, and to observe particularly distinct patterns for men and for the first childbirth.

Neuroticism

Neurotic people tend to be nervous, emotionally unstable, insecure, and moody. Higher scores on neuroticism have been negatively linked with relationship quality (Donnellan et al., 2004) and satisfaction (Fisher & McNulty, 2008; Karney & Bradbury, 1997; Malouff et al., 2010; McNulty, 2008). Thus, people with high levels of neuroticism may have more unstable partnerships, and, therefore, lower fertility. Furthermore, as neurotic people may see parenthood as an additional burden (Lillard & Waite, 1993), they could have lower fertility intentions. Conversely, neurotic individuals may choose to have children to improve their own (life) stability in the future (Friedman et al., 1994; Johns et al., 2011). Moreover, the risk of having an unplanned pregnancy may be higher among women with lower emotional stability (Berg et al., 2013). In line with this observation, it has been shown that life trajectories characterized by early family formation are positively linked with neuroticism scores among women in Germany (Mencarini et al., 2022). There is also evidence that young Germans with higher neuroticism scores are less likely to enter higher education, and are more likely to follow a vocational path after completing upper secondary education (Usslepp et al., 2020). This may imply that individuals with higher neuroticism scores are more likely to have sufficient financial resources to have a child early in the life course. In light of the arguments presented above, it appears to be difficult to predict fertility outcomes based on neuroticism levels.

Fertility researchers have found negative correlations between neuroticism and the probability of having children for both sexes (Jokela, 2012). In line with these findings, it has been shown that more neurotic women have fewer children over the life course (Jokela et al., 2011). However, it has also been reported that females with higher neuroticism scores tend to enter parenthood earlier in the life course (Jokela et al., 2011; Tavares, 2016). For both women and men, the association between neuroticism and childbearing behavior do not seem to change drastically by birth parity (Jokela et al., 2011). Given that previous studies have found a positive, a negative, or even no association between neuroticism and fertility, I am, at this point, unable to formulate any specific hypothesis for my analyses regarding this relationship for either women or men. However, I do not expect to find any large differences in the effects of neuroticism on the first and the second childbirth.

Openness to new experiences

People who are open to experiences tend to be creative, imaginative, curious, and broad-minded. These facets are beneficial for certain occupations, such as author or journalist (Costa et al., 1984). However, people with such occupations may be less likely to have children, since having childcare responsibilities can restrict the creativity and the freedom needed to be a journalist or an author. In Germany, openness is also positively associated with entry into self-employment (Caliendo et al., 2014). As was shown above, self-employment tends to generate greater financial wealth, which may, in turn, lead to higher fertility. There is, indeed, evidence that self-employment is positively linked with fertility (Florida et al., 2021). However, for self-employed people with high levels of openness, their decision to enter self-employment may be based on their creativity or imagination, both of which would be restricted by having a newborn, given that childcare plays a dominant role in the lives of parents. Openness is also associated with higher education and cognitive functioning (Wainwright et al., 2008). Negative correlations between both factors and fertility outcomes have been found in the past (Hopcroft, 2006; Retherford & Sewell, 1989; Skirbekk, 2008). However, previous findings suggested that the detected associations tend to depend on the cultural context, and are usually stronger among women (Sobotka et al., 2017); although weakening educational gradients for fertility among females have been observed (Jalovaara et al., 2019; Kravdal & Rindfuss, 2008). There is also evidence that a higher openness score is associated with a lower risk of an early sex debut and a lower number of unprotected sex acts (Miller et al., 2004), both of which may be linked to later (or no) childbearing. Other studies have found that openness is negatively correlated with traditional attitudes (Costa et al., 1984; McCrae, 1996; Van Hiel & Mervielde, 2004), and that these attitudes are positively linked with higher fertility (Holton et al., 2009; Kaufman, 2000; Puur et al., 2008). Another mechanism through which openness may be associated with fertility is union formation. Jokela and colleagues (2011) found that openness tends to reduce the probability of marrying, and to delay the first marriage. Negative associations between openness scores and early union formation have been found for both men and women in Germany (Mencarini et al., 2022). Late partnership formation may reduce fertility at younger ages. It has also been shown that a higher openness score is associated with a lower risk of early childbearing (Miller et al., 2004) and a higher risk of unfaithfulness (Orzeck & Lung, 2005).

The results of previous studies are in line with these observations. Having a higher openness score has been found to delay the first childbirth, particularly among women (Jokela et al., 2011; Miller et al., 2004; Tavares, 2016); to decrease the probability of having children for both sexes (Jokela, 2012; Jokela et al., 2011); and to reduce the number of children born to both sexes (Jokela et al., 2011), or only to males (Skirbekk & Blekesaune, 2014). Among women, having a higher openness score tends to be more negatively associated with the first than with the second childbirth (Jokela et al., 2011). Therefore, in this study, I expect to find a negative association between openness and fertility among both men and women for both the first and the second childbirth. However, I also expect to observe that among women, this association is particularly strong for the first childbirth.

This brief overview of previous research could lead the reader to conclude that the correlation between the FFM and fertility is well understood. However, these previous studies have fundamental weaknesses, which have been described above. Previous research has shown that the associations between personality traits and fertility differ by parity and by gender. Therefore, I have conducted analyses of these associations separately by birth parity (first and second childbirth) and by gender.

Previous research has examined the personality–fertility link using fertility timing as the outcome. However, some studies have also reported that personality traits are associated with completed fertility; i.e., with the total number of children each individual has (Jokela et al., 2011; Skirbekk & Blekesaune, 2014). Therefore, in additional analyses, I consider this fertility outcome as well. However, offspring count is not the focus of my study, since the prospective association between personality and completed fertility cannot be explored based on the data that I use.

Data and methods

SOEP data

My analyses are based on data from the German Socio-Economic Panel Study (SOEP), which is the largest multidisciplinary follow-up survey in Germany in terms of the number of participants. The SOEP is conducted by the German Institute for Economic Research, and has provided information about German households and their members since 1984. Each year, approximately 30,000 individuals from around 14,000 households participate in this study (Britzke & Schupp 2018). In an effort to achieve greater representativeness, a number of subsamples and refreshments have been implemented over time. For instance, East Germans have been included from 1990 onward to ensure that the country's total population after German reunification is represented (Goebel et al., 2019). More details about the subsamples of the SOEP and their sizes can be found in Siegers, Belcheva, and Silbermann (2019). The SOEP provides data on a range of topics, including household composition, employment, educational history, and health and subjective indicators (e.g., personal attitudes or self-reported personality traits) (Goebel et al., 2019).

Study design

This study examines the link between personality traits and the transition to the first and the second childbirth. The SOEP provides information about childbirths and birth parity on a monthly basis. Therefore, I can examine first and second childbirths separately. While analyses of higher birth orders were also conducted, the confidence intervals were relatively large due to the very low number of such events over time. Therefore, two study samples were obtained. Using the first sample, I examine the transition from being childless to (potentially) having a first child. The underlying time scale of this analysis is age. The exposure time starts at the study entry, i.e., at the age at first observation (average: 28.42 years); and the study exit occurs at the age at first childbirth, i.e., at the age at last observation (average: 32.04 years). The sample consists of individuals who had not entered parenthood before the first collection of personality information. Therefore, all respondents at risk must have been childless in 2005 (first wave including personality items), although they could have entered the study at a later point in time; e.g., in 2009,

when the SOEP collected personality information for the second time. These individuals were followed until their first childbirth or the end of the study (2017 or drop-out), whichever came first. The second sample consists of individuals who could transition to a second childbirth. The underlying time scale of these analyses is not age, but time since the first childbirth. However, the models are stratified according to the age at first childbirth using the following categories: <21, 21–23, 24–26, 27–29, 30–32, 33–35, and >35. The respondents are considered at risk of having a second child nine months after the first childbirth at the earliest, and are included in the sample only if their personality information is available. This sample includes all respondents who had a first child before 2005, or who had their first child during the study period and were followed thereafter. Individuals in the second sample were followed until their second childbirth or the end of the study. Both samples were right-censored for two reasons. First, age 50 is assumed to mark the end of fecundability for women, based on an international comparison of the mean ages at menopause (Thomas et al., 2001). While men are not subject to this biological restriction, having a child after age 50 was very rare among men in this sample. Therefore, observations for both females and males over 50 years of age were excluded. Furthermore, the data were right-censored, since not all participants gave birth to a first or a second child by the end of the study period. The Cox Proportional Hazards (Cox PH) model I applied addressed the problems of right-censoring and left-truncation, which occurred when individuals had a first or a second childbirth before the onset of the study, and were therefore excluded from the analyses.

Personality-related information has been made available every four years since 2005. Since personality serves as a predictor in this study, the childbirths had to be observed after the personality information had been collected. Therefore, first childbirths before 2005 were not considered in the analysis on the age at first childbirth. Similarly, the individuals at risk of having a second childbirth were included in the analysis only if their personality information was available. While their personality values could change when new information was collected, it was assumed that these values remained constant during the period between the two observations. This approach is in line with previous literature showing that personality remains relatively stable over short time intervals (Ardelt, 2000; Hopwood & Bleidorn, 2018; Lucas & Donnellan, 2011).

Personality measure

The FFM is represented by 15 items in the SOEP data. The adjectives *rude (reversed)*, *forgiving*, and *kind* reflect the trait “Agreeableness” (A); whereas *thorough*, *lazy (reversed)*, and *efficient* reflect the characteristic “Conscientiousness” (C). *Talkative*, *sociable*, and *reserved (reversed)* are linked to “Extraversion” (E); while *worrying*, *nervous*, and *relaxed (reversed)* are associated with “Neuroticism” (N). The assessment of “Openness to new experiences” (O) is based on the adjectives *original*, *valuing*, and *imaginative*. Factor analyses with principal factors for my sample suggest that the single facets belong to the personality traits as listed. These analyses revealed reasonable values of rotated factor loadings with oblique promax rotation (A: 0.35–0.58; C: 0.47–0.68; E: 0.60–0.67; N: 0.54–0.63; O: 0.42–0.55). Uniqueness of the items ranges from 0.56 to 0.83. The original version of the FFM covers more than these 15 items. However, previous research has

shown that this short version can still be considered representative of the FFM (Boyce et al., 2016; Donnellan & Lucas, 2008).

The personality factors were measured as self-reports. Participants could answer the item “I am somebody who is...” by using a Likert scale ranging from one (not applicable at all) to seven (completely applicable). Missing values were excluded from these analyses. Thus, the study samples only contained observations with information on all three trait-specific items for each personality factor. In this case, the scores of these facets were summed up, and the mean was calculated for the respective individual and year. The mean values could range from one (trait does not suit the respondent at all) to seven (trait fits completely). Eventually, all of the personality trait variables were standardized (mean = 0, standard deviation = 1) for both genders separately.

Several tests were applied in order to assess the appropriateness of the measure. Cronbach’s Alpha was used to measure the internal consistency of personality traits over time. Given that the Alpha depends on the number of tested items (Sijtsma, 2009; Tavakol & Dennick, 2011), and that the SOEP only contains three items per trait, the relatively low values of some of the facets were reasonable (A: 0.49; C: 0.61; E: 0.73; N: 0.64; O: 0.60). Additionally, the Intraclass Correlation Coefficients were calculated in order to check the reliability of the personality measures over time. The results indicate that the coefficients were above 0.5 (A: 0.53; C: 0.55; E: 0.66; N: 0.59; O: 0.60), which can be interpreted as a moderate level of consistency (Koo & Li, 2016).

Control variables

My analyses controlled for several sociodemographic characteristics. Gender (“female” or “male”) was included as a time-independent covariate, and as a stratification factor based on inconsistent findings from previous research. Observations with missing values on gender or on any other covariate were excluded [42.43%; mostly based on missing values on income (20.22%) and on maternal (14.67%) and paternal education (17.48%)]. Previous research has shown that personality can change, particularly at younger ages (Hopwood & Bleidorn, 2018; Specht et al., 2011). Among most people, a process of maturation—i.e., increasing conscientiousness and agreeableness, as well as decreasing neuroticism—can be observed with age (Borghuis et al., 2017). However, the extent to which these (changing) personality trait levels affect fertility can also vary depending on the calendar time and the birth cohort. As the second demographic transition theory suggests, members of younger birth cohorts live in a social environment that allows them to realize their individual fertility preferences, whereas members of older birth cohorts grew up in a different social context in which social control played a greater role. Furthermore, after German reunification in 1990, Germans faced new political conditions, which may have affected many of their daily routines, work situations, and other processes. Therefore, birth year was included as a covariate in order to control for potential birth cohort effects. Models that included interaction terms between each personality factor and year of birth were also run.

Additionally, potential mediators were included in the models, and the findings are shown with and without these factors. Numerous studies have reported a link between education and fertility. Highly educated individuals tend to have lower fertility (Sobotka et al., 2017) and to postpone childbirths (Monstad et al., 2008). Furthermore, education

appears to be associated with personality (Meyer et al., 2019; Sutin et al., 2017). Previous research has demonstrated the prospective association between personality and educational attainment, and has shown that this association is stronger than the reverse relationship. Therefore, education—measured in years (centered around 13 years of education) and enrollment status—serves as a mediator for the link between personality and fertility (Sutin et al., 2017).

A similar picture can be drawn for the association between personality and civil (relationship) status. While personality can predict relationship status, partnerships do not change personality much (Neyer & Asendorpf, 2001). However, the connection between divorce and personality is unclear (Bleidorn et al., 2018). Regarding fertility, the role of partnership status is well understood (Balbo et al., 2013): i.e., fertility is higher for married than for cohabiting couples (Baizán et al., 2003; Brien et al., 1999; Spéder & Kapitány, 2009). Consequently, civil status (“single”, “cohabiting”, “married”, “divorced/widowed”) is included as another mediator in these analyses. Both individuals without a partner and individuals with a partner outside of the household are included in the “single” category.

Income serves as another potential mediator in my analyses. Income has strong negative associations with fertility (Bar et al., 2018; Córdoba & Ripoll, 2016). However, there is evidence indicating that in recent decades, fertility has increased among higher income groups. This means that this correlation might have flattened instead of following a linear trend (Bar et al., 2018). Consequently, income (standardized logarithm of individual gross income in the previous year) was included in the study as a time-varying covariate. Income was adjusted for inflation using information from the German Federal Statistical Office. Further analyses showed that using household income instead of individual income did not lead to different patterns.

Recent research has pointed to the potential influence of family background on fertility. Thus, ignoring family background can bias the results (Kramarz et al., 2019). Family background includes parental education (Chen, 2016). For this reason, the highest maternal and paternal school degree (“no degree”, “secondary school degree”, “intermediate school degree”, “technical or upper secondary school degree”, and “other degree”) were included in the analysis. The impact of further family-related information (parental religiosity, number of own siblings) was checked, but was not reported due to relatively high statistical uncertainty, and because the personality trait coefficients did not change much.

At the starting point of this study (2005), the fertility rates in the former East Germany were relatively low compared to those in the former West Germany (BiB, 2022). Since 2005, the fertility levels in some states of the former East Germany have exceeded those in several states of the former West Germany. Over the past few years, the fertility levels of the two regions have converged (BiB, 2022). Consequently, region was included in the present analysis, even though the personality traits of East and West Germans do not seem to differ (Schimmack et al., 2008).

Statistical methods

Based on the nature of my research question—i.e., how personality is linked with fertility risks over time—and the longitudinal data that the SOEP provides, I ran

event-history analyses. This type of models is appropriate for studying time to events (here: childbirth). I applied Cox proportional (PH) models due to their key assumption of proportionality. According to this assumption, the hazard rates (chances of having a child) of different subgroups are proportional to each other over time; e.g., when individuals with different extraversion scores are compared to each other. Equation (1) represents this model:

$$\begin{aligned}
 h(t|X_1, \dots, X_p) = & h_0(t) * \exp(\beta_0 + \beta_1 \text{Agree}_{it} + \beta_2 \text{Conscient}_{it} \\
 & + \beta_3 \text{Extra}_{it} + \beta_4 \text{Neuro}_{it} + \beta_5 \text{Open}_{it} + \beta_6 \text{Gender}_i \\
 & + \beta_7 \text{BirthYear}_i + \beta_8 \text{YearsEdu}_{it} + \beta_9 \text{EnrolStat}_{it} \\
 & + \beta_{10} \text{CivilStat}_{it} + \beta_{11} \log \text{Income}_{it} + \beta_{12} \text{EduMom}_i \\
 & + \beta_{13} \text{EduDad}_i + \beta_{14} \text{Region}_{it}).
 \end{aligned} \tag{1}$$

The expression $h(t|X_1, \dots, X_p)$ represents the hazard rate depending on the time point t and the vectors of the considered covariates X_1, \dots, X_p of each individual i . Certain independent variables are allowed to vary over time (personality factors, education indicators, civil status, income, and region of residence), and these factors obtain the index t . The hazard rate is the product of the baseline hazard $h_0(t)$, which can take any shape, and the exponentiated sum of covariate terms. The intercept is β_0 and $\beta_1 \dots \beta_{14}$ are the estimated coefficients of the covariates. The underlying time scale of this model is age in months (until the first childbirth), and time in months starting nine months after the first childbirth (until the second childbirth), respectively. Individuals were followed until they experienced the event or dropped out of the study, or until the end of the study in 2017.

A number of statistical tools were used to ensure that the estimates were as precise as possible. The analyses adjusted for cluster effects coming from households using robust standard errors. Goodness-of-fit checks using Cox–Snell residuals indicate that the Cox model fits the data relatively well, as can be seen from the corresponding graph in the appendix (Fig. 7). Furthermore, proportionality—as a key assumption of Cox PH models—was tested for personality traits using Schoenfeld residuals, and no evidence for violation of this assumption was found (results available upon request). Statistical analyses were run separately for both genders. Analyses regarding second childbirths were stratified by age at first childbirth (< 21, 21–23, 24–26, 27–29, 30–32, 33–35, > 35).

To examine whether personality was correlated with the number of children at age 40, 45, or 50 and older, Poisson regression models were run. I used the same information on personality as was described above. Since this setting focused on completed fertility, no time-varying variables were used. Thus, the observations were from 2005 at the earliest (the first wave with personality information), and individuals were included in the analyses if they were age 40 (45 and 50, respectively) or older at the time of the latest survey collection. The Poisson regression models were conducted for the total sample and separated by gender. They are based on the following equation:

$$\begin{aligned}
 \log(E[Y|X_1, \dots, X_p]) = & \beta_0 + \beta_1 \text{Agree}_i + \beta_2 \text{Conscient}_i + \beta_3 \text{Extra}_i \\
 & + \beta_4 \text{Neuro}_i + \beta_5 \text{Open}_i + \beta_6 \text{Gender}_i \\
 & + \beta_7 \text{BirthYear}_i + \beta_8 \text{YearsEdu}_i + \beta_9 \text{EnrolStat}_i \quad (2) \\
 & + \beta_{10} \text{CivilStat}_i + \beta_{11} \log \text{Income}_i + \beta_{12} \text{EduMom}_i \\
 & + \beta_{13} \text{EduDad}_i + \beta_{14} \text{Region}_i.
 \end{aligned}$$

The logarithmized outcome $E[Y]$ (here: expected number of children by age 40 and higher) depends on a set of independent variables X_1, \dots, X_p . Apart from the outcome, all of the variables and indications are equivalent to the ones used above in Eq. (1), with the difference being that they are not allowed to vary over time. Instead, personality was taken from first observation in order to examine the prospective association between personality and fertility. All the other covariates and the offspring counts were measured at age 40 or higher. This may mean that characteristics like income could be affected by earlier childbearing. However, additional analyses found similar estimates when time-varying factors such as income or education from the first observation were considered.

Results

Descriptive results

The first sample contained individuals who were childless when their personality information was first collected (2005, 2009, or 2013). These participants either remained childless over time or gave birth to a first child between 2005 and 2017. Information was available for 5,758 participants, and there were 28,100 observations in total. The respondents were born between 1956 and 1995 (more information about the birth cohorts and ages of the respondents in sample 1 is provided in Fig. 8). On average, these respondents were 28.42 years old when they entered the study, and were 32.67 years old when they had their first child (if they had a first child). However, the sample was restricted to those individuals who were childless when they entered the study. Therefore, this sample includes relatively high proportions of singles (62.49%) and of people who were enrolled in educational programs (36.28%). During the considered time period, 1065 first childbirths were observed. Table 1 shows the mean values (before standardization of personality traits) and the frequencies of all included characteristics for the total sample, and stratified by gender. On a scale from one to seven, the mean values for agreeableness (5.34), conscientiousness (5.61), and extraversion (4.96) may be considered relatively high. By contrast, the mean values for openness (4.65) and particularly for neuroticism (3.75) appear to be relatively low. Women had higher mean values for all personality traits. These differences were tested by z-tests, and were shown to be statistically valid for all five factors. The largest differences in mean values by gender were observed for neuroticism (females: 4.08 vs. males: 3.48), while the smallest differences were found for conscientiousness (females: 5.69 vs. males: 5.54).

Sample 2 was restricted to participants who had at least one child and for whom personality information was available. This sample consisted of 2740 individuals and 11,508 observations. The participants were born between 1956 and 1995, and they had an average age of 35.30 when they entered the study. Further information on the ages and the birth cohorts of the participants in sample 2 is shown in Fig. 9. These individuals had their second child at an average age of 34.80 years (if they had a second child). Being

Table 1 Descriptive statistics (Sample 1)

| Sample 1 Age at first childbirth | | | | | | | | |
|---|-------------|------------------|------------|------------|----------------|------------------|--------------|------------------|
| Individuals: | | | | | | | | 5758 |
| Observations: | | | | | | | | 28,100 |
| Events: | | | | | | | | 1065 |
| Baseline characteristics | | | | | Females | | Males | |
| Variable | Mean | Std. Dev. | Min | Max | Mean | Std. Dev. | Mean | Std. Dev. |
| Agreeableness | 5.34 | 0.95 | 1 | 7 | 5.47 | 0.92 | 5.23 | 0.96 |
| Conscientiousness | 5.61 | 0.98 | 1 | 7 | 5.69 | 0.94 | 5.54 | 1.01 |
| Extraversion | 4.96 | 1.17 | 1 | 7 | 5.11 | 1.15 | 4.82 | 1.18 |
| Neuroticism | 3.75 | 1.22 | 1 | 7 | 4.08 | 1.20 | 3.48 | 1.17 |
| Openness | 4.65 | 1.16 | 1 | 7 | 4.78 | 1.17 | 4.55 | 1.13 |
| Years of education | 12.63 | 2.59 | 7 | 18 | 12.87 | 2.57 | 12.43 | 2.59 |
| Birth year | | | 1956 | 1995 | | | | |
| Income (log) | 9.21 | 1.35 | 3.91 | 13.05 | 9.06 | 1.37 | 9.33 | 1.32 |
| | | N | % | N | % | N | % | |
| Gender | | | | | | | | |
| Female | | 2656 | 46.13 | – | – | – | – | – |
| Male | | 3102 | 53.87 | – | – | – | – | – |
| Enrolment status | | | | | | | | |
| Not enrolled | | 3669 | 63.72 | 1593 | 59.98 | 2076 | 66.92 | |
| Enrolled | | 2089 | 36.28 | 1063 | 40.02 | 1026 | 33.08 | |
| Civil status | | | | | | | | |
| Single | | 3598 | 62.49 | 1572 | 59.19 | 2026 | 65.31 | |
| Cohabited | | 1199 | 20.82 | 621 | 23.38 | 578 | 18.63 | |
| Married | | 854 | 14.83 | 420 | 15.81 | 434 | 13.99 | |
| Divorced/widowed | | 107 | 1.86 | 43 | 1.62 | 64 | 2.06 | |
| Maternal education | | | | | | | | |
| No degree | | 172 | 2.99 | 79 | 2.97 | 93 | 3.00 | |
| Secondary degree | | 2207 | 38.33 | 965 | 36.33 | 1242 | 40.04 | |
| Intermediate degree | | 2095 | 36.38 | 993 | 37.39 | 1102 | 35.53 | |
| Upper secondary degree | | 974 | 16.92 | 476 | 17.92 | 498 | 16.05 | |
| Other | | 310 | 5.38 | 143 | 5.38 | 167 | 5.38 | |
| Paternal education | | | | | | | | |
| No degree | | 155 | 2.69 | 81 | 3.05 | 74 | 2.39 | |
| Secondary degree | | 2404 | 41.75 | 1060 | 39.91 | 1344 | 43.33 | |
| Intermediate degree | | 1508 | 26.19 | 712 | 26.81 | 796 | 25.66 | |
| Upper secondary degree | | 1372 | 23.83 | 673 | 25.34 | 699 | 22.53 | |
| Other | | 319 | 5.54 | 130 | 4.89 | 189 | 6.09 | |
| Region | | | | | | | | |
| West | | 4625 | 80.32 | 2187 | 82.34 | 2438 | 78.59 | |
| East | | 1133 | 19.68 | 469 | 17.66 | 664 | 21.41 | |

married was the most common family status (67.92%) in this sample, and the vast majority of these individuals were not participating in an educational program when the study started (2005 or later) (94.78%). A total of 716 s childbirths were recorded among the individuals in sample 2. Compared to the participants in sample 1, the participants in

Table 2 Descriptive statistics (Sample 2)

| Sample 2—age at second childbirth | | | | | | | | |
|--|-------------|------------------|------------|------------|----------------|------------------|--------------|------------------|
| Individuals: | | | | | | | | 2740 |
| Observations: | | | | | | | | 11,508 |
| Events: | | | | | | | | 716 |
| Baseline characteristics | | | | | Females | | Males | |
| Variable | Mean | Std. Dev. | Min | Max | Mean | Std. Dev. | Mean | Std. Dev. |
| Agreeableness | 5.40 | 0.94 | 1 | 7 | 5.50 | 0.92 | 5.26 | 0.94 |
| Conscientiousness | 5.89 | 0.89 | 2 | 7 | 5.94 | 0.87 | 5.82 | 0.91 |
| Extraversion | 4.98 | 1.12 | 1.33 | 7 | 5.07 | 1.11 | 4.87 | 1.12 |
| Neuroticism | 3.83 | 1.22 | 1 | 7 | 4.08 | 1.20 | 3.51 | 1.16 |
| Openness | 4.57 | 1.16 | 1 | 7 | 4.69 | 1.20 | 4.43 | 1.09 |
| Years of education | 13.07 | 2.73 | 7 | 18 | 13.14 | 2.69 | 12.99 | 2.78 |
| Birth Year | | | 1956 | 1995 | | | | |
| Income (log) | 9.77 | 1.13 | 3.69 | 13.14 | 9.37 | 1.15 | 10.29 | 0.87 |
| | | N | % | | N | % | N | % |
| Gender | | | | | | | | |
| Female | | 1532 | 55.91 | – | – | – | – | – |
| Male | | 1208 | 44.09 | – | – | – | – | – |
| Enrolment status | | | | | | | | |
| Not enrolled | | 2597 | 94.78 | 1452 | 94.78 | 1145 | 94.78 | |
| Enrolled | | 143 | 5.22 | 80 | 5.22 | 63 | 5.22 | |
| Civil status | | | | | | | | |
| Single | | 207 | 7.55 | 162 | 10.57 | 45 | 3.73 | |
| Cohabited | | 590 | 21.53 | 341 | 22.26 | 249 | 20.61 | |
| Married | | 1861 | 67.92 | 963 | 62.86 | 898 | 74.34 | |
| Divorced/widowed | | 82 | 2.99 | 66 | 4.31 | 16 | 1.32 | |
| Maternal education | | | | | | | | |
| No degree | | 104 | 3.80 | 49 | 3.20 | 55 | 4.55 | |
| Secondary degree | | 1385 | 50.55 | 752 | 49.09 | 633 | 52.40 | |
| Intermediate degree | | 817 | 29.82 | 478 | 31.20 | 339 | 28.06 | |
| Upper secondary degree | | 316 | 11.53 | 189 | 12.34 | 127 | 10.51 | |
| Other | | 118 | 4.31 | 64 | 4.18 | 54 | 4.47 | |
| Paternal education | | | | | | | | |
| No degree | | 87 | 3.18 | 44 | 2.87 | 43 | 3.56 | |
| Secondary degree | | 1385 | 50.55 | 760 | 49.61 | 625 | 51.74 | |
| Intermediate degree | | 686 | 25.04 | 405 | 26.44 | 281 | 23.26 | |
| Upper secondary degree | | 457 | 16.68 | 262 | 17.10 | 195 | 16.14 | |
| Other | | 125 | 4.56 | 61 | 3.98 | 64 | 5.30 | |
| Region | | | | | | | | |
| West | | 2020 | 73.72 | 1115 | 72.78 | 905 | 74.92 | |
| East | | 720 | 26.28 | 417 | 27.22 | 303 | 25.08 | |

sample 2 had slightly higher personality scores (except on openness). In particular, they had higher levels of conscientiousness (sample 1: 5.61 vs. sample 2: 5.89). Further details on sample 2 are provided in Table 2.

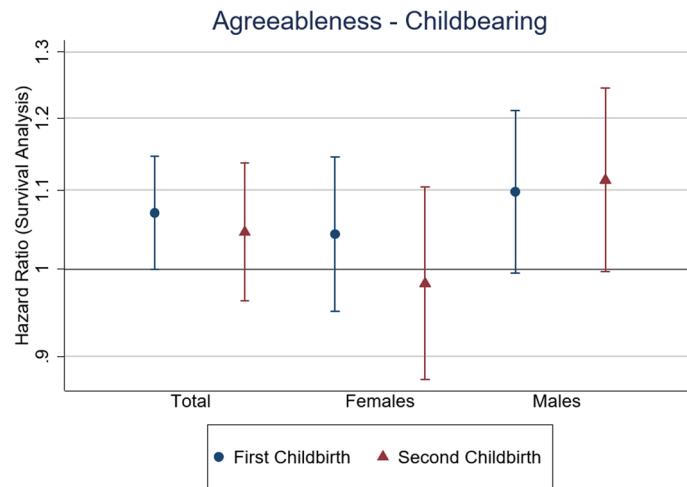


Fig. 1 Hazard ratios agreeableness—childbearing. Controlled for gender (total sample), birth year, education (years and enrolment status), civil status, income, region, parental education

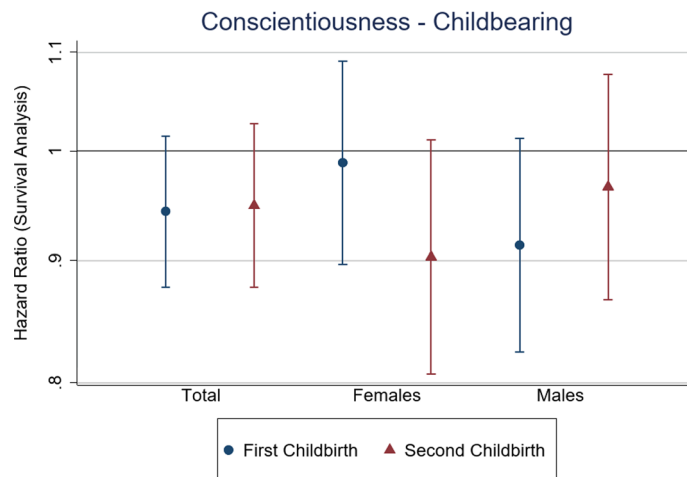


Fig. 2 Hazard ratios conscientiousness—childbearing. Controlled for gender (total sample), birth year, education (years and enrolment status), civil status, income, region, parental education

Survival models

In the following, results from Cox PH Survival Models are presented for each trait measured by the FFM separately. Each graph displays point estimates of hazard ratios (HR) and the corresponding 95% confidence intervals. Ratios above one indicate a higher risk of childbearing at any point on the age/time scale among the individuals with higher scores on the respective standardized personality scale (e.g., one standard deviation higher). Point estimates below one suggest lower chances of childbearing with higher standardized scores. Each graph contains information about the total sample, and about females and males after controlling for all of the covariates listed above. Results are shown for the first and the second childbirth.

The y-scale is logarithmic for visualization purposes, and its range can vary according to trait-specific results. Estimated coefficients of all considered covariates for the total sample and for women and men separately are listed in Tables 3 and 4 in the Appendix.

Agreeableness

Figure 1 depicts the point-estimated HR regarding the association between agreeableness and childbearing for the total sample, as well as for women and men separately. Within the total sample, agreeableness tends to be associated with increased childbearing risks. The HR is 1.07 ($p=0.052$) for first childbirths and is 1.05 ($p=0.291$) for second childbirths. The findings are mainly based on the results among males, for whom an estimate of 1.10 ($p=0.062$) is calculated for the first childbirth (second childbirth: 1.11 and $p=0.057$). For women, the association between agreeableness and the first or the second childbirth is less clear (HR: 1.04 and 0.98).

Conscientiousness

Results on conscientiousness are presented in Fig. 2. A negative correlation between conscientiousness and the first childbirth can be detected for males only, which indicates that men with high scores for this trait have lower hazard ratios for the first childbirth (HR: 0.91, $p=0.084$). However, the standard errors are relatively large. For the second childbirth, conscientiousness is negatively linked with fertility among women (HR: 0.90; $p=0.077$). Thus, females with high conscientiousness scores have a lower risk of having a second child.

Extraversion

Figure 3 displays the findings regarding the association between extraversion and fertility. Within the entire sample, a positive, albeit statistically uncertain, estimate

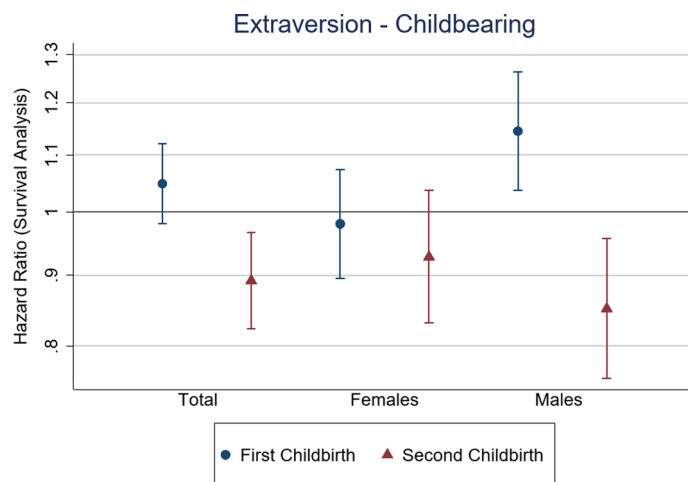


Fig. 3 Hazard ratios extraversion—childbearing. Controlled for gender (total sample), birth year, education (years and enrolment status), civil status, income, region, parental education

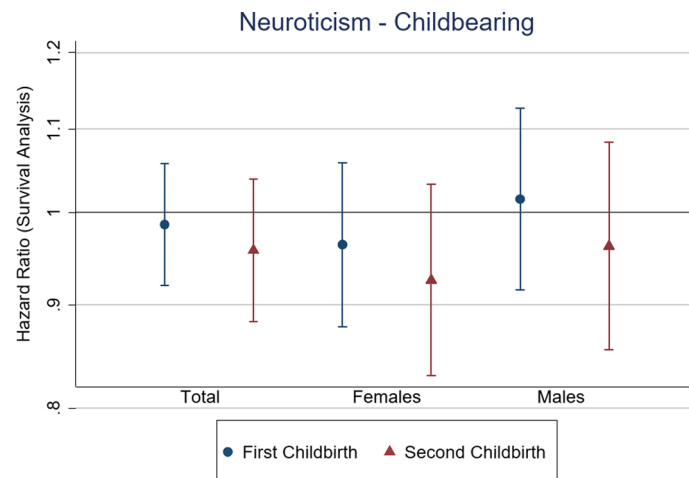


Fig. 4 Hazard ratios neuroticism—childbearing. Controlled for gender (total sample), birth year, education (years and enrolment status), civil status, income, region, parental education

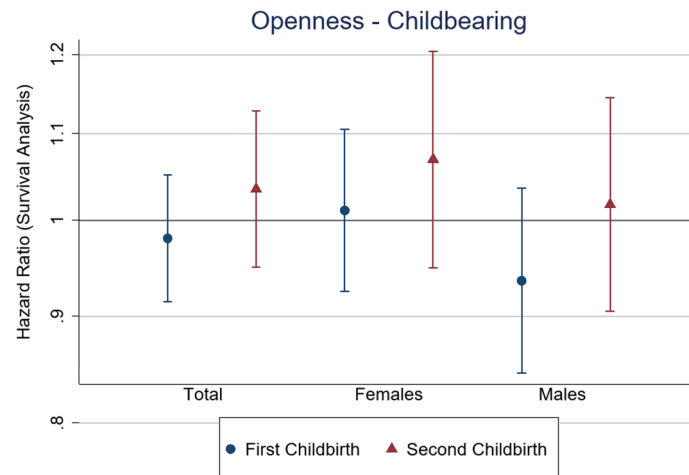


Fig. 5 Hazard ratios openness—childbearing. Controlled for gender (total sample), birth year, education (years and enrolment status), civil status, income, region, parental education

(HR: 1.05) regarding the first childbirth can be detected. However, with respect to the second childbirth, a negative link can be observed across the total sample (HR: 0.89, $p = 0.006$). Therefore, it appears that higher extraversion scores are associated with a lower risk of having a second child. These correlations are mainly based on the findings among males, for whom a strong positive association between extraversion and the first childbirth (HR: 1.14, $p = 0.007$), but a negative link between extraversion and the second childbirth, is found (HR: 0.85, $p = 0.007$). Contrary to my expectations, no correlations between extraversion and childbearing are observed among women.

Neuroticism

The correlations between neuroticism and childbearing identified in my study are presented in Fig. 4. The findings suggest that neuroticism does not play a large role in

childbearing. This factor is not found to be linked with the first or the second childbirth in any of the (sub-)samples.

Openness to new experiences

Figure 5 shows that openness is not correlated with the first childbirth. The results of additional analyses show that a possible negative association (HR: 0.90, $p=0.001$) vanishes when civil status is included in the model. If a negative link exists at all, it is for males (HR: 0.94). However, the confidence intervals are relatively large. For the second childbirth, a positive relationship can be observed across all samples, and particularly among women (HR: 1.07). Again, however, the level of uncertainty is relatively high.

In addition to running the models for which the estimates are presented above, I tested whether these coefficients changed across birth cohorts by running models that included interaction terms between each personality factor and year of birth. Results are shown in the appendix (Figs. 10, 11, 12, 13, 14). However, no clear patterns emerged. Thus, these models found no large changes in the association between personality and fertility across birth cohorts.

Mediators

Additional checks were performed to examine the effects of mediators (family status, education, income). The models without these variables did not differ greatly in their personality trait coefficients, as can be seen in the appendix (Figs. 15, 16, 17, 18). In most of the models, the inclusion of potential mediators did not affect the personality coefficients very much. The only exception to this pattern was for openness. The models that excluded mediators found negative associations between this factor and the first childbirth for the total sample (HR: 0.90; $p=0.001$), and for females (HR: 0.91; $p=0.039$) and males (HR: 0.86; $p=0.004$). However, mediators, and civil status in particular, could explain much of this correlation. The corresponding hazard ratios are presented in Fig. 6.

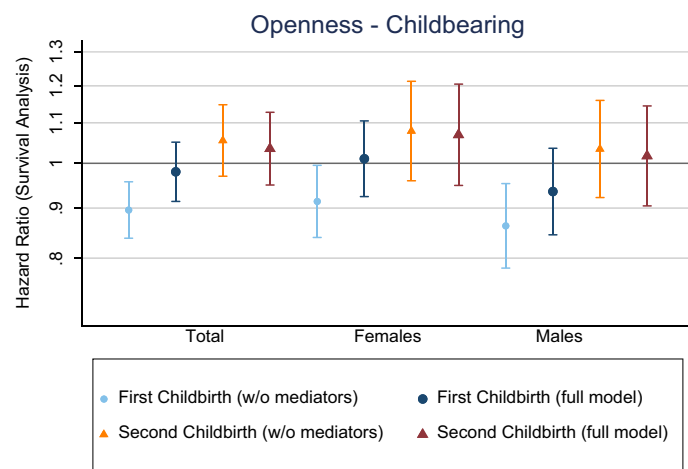


Fig. 6 Hazard ratios openness—childbearing (mediation analyses). Controlled for gender (total sample), birth year, region, parental education; full models also control for education (years and enrolment status), civil status, income

Number of children

Furthermore, Poisson regression models were conducted to analyze the correlation between personality factors and the number of children. This perspective complements the present study, which only focused on fertility risks over time. However, an analysis of the number of children cannot be understood as having a prospective design, because the follow-up data needed to conduct such an analysis are still not sufficient. Therefore, the number of children born to each individual at the end of her or his fertility history—i.e., at ages 40, 45, and 50 and older—is used (Table 5 in Appendix). The results indicate that agreeableness and extraversion are positively related to the number of children, whereas conscientiousness and openness are linked with having fewer children. The findings for women are of particular interest, as associations between fertility and agreeableness (positive), conscientiousness (negative), and extraversion (positive) are found among women. This implies that personality is correlated with fertility among women—which is a finding that did not emerge from the prospective analyses on entry into parenthood of the present study. Why personality is linked with the number of children among women, but not with the risks of having a first child, is a question that remains open. This finding could be explained by the point in time when the information on personality was collected (before childbirth vs. at the end of fertility history), since having and raising children can affect personality, which can, in turn, influence the risk of having a second child and the total number of children born.

Discussion

This study examined the association between personality traits as measured by the FFM and childbearing in Germany over a 12-year follow-up period. In general, the results showed that the impact of personality on fertility was rather small. Across the total sample, the findings for agreeableness indicated that (by one standard deviation) more agreeable individuals had a higher risk of having a first child (HR: 1.07). Conscientiousness (HR: 0.94) and neuroticism (HR: 0.99) were not found to be associated with childbearing. Openness was shown to be associated with a lower risk of having a first child (HR: 0.89), but this relationship vanished when potential mediators were included in the model. The most striking correlations between fertility and personality were observed for extraversion. This trait tended to be positively associated with the first childbirth (HR: 1.05), but negatively associated with the second childbirth (HR: 0.90).

The estimates did not vary across birth cohorts, as additional analyses have shown (see Figs. 10, 11, 12, 13, 14). This result may, at first glance, appear to contradict the SDT. However, considering that the vast majority of the birth cohorts in my analytical sample had reached adult ages when the SDT was well advanced, my empirical findings do not necessarily contradict this theoretical framework. In order to examine the validity of the SDT for the personality–fertility link in Germany, data from cohorts who reached adulthood before, during, and after the SDT are required. As the GSOEP has not collected personality information before 2005, the cohorts who could be included in my study were born between 1956 and 1995. Moreover, full cohort fertility accompanied by personality information could not be observed for any of these cohorts (because the 2005–2017 observation period spanned only 12 years). Therefore, the SDT may help to explain the relevance of personality for childbearing observed in my analyses, but not

the changing personality gradient for fertility over cohorts. Furthermore, the relatively stable effects of personality on fertility observed across birth cohorts are in line with the findings from previous research on divorce (Boertien & Mortelmans, 2018). The authors found small to non-significant changes in the effects of personality on divorce in Germany and in other high-income contexts (Boertien & Mortelmans, 2018). These stable patterns over cohorts may indicate that the effects of personality on family-related outcomes (fertility, divorce) did not change much across cohorts, as is suggested by the SDT.

The results were mainly driven by males, although conscientiousness was found to be negatively associated with the second childbirth among women. These gender-specific findings are partly in line with those of previous research. I expected to observe strong positive associations between extraversion and childbearing among males based on findings from previous studies (Allen, 2019; Jokela et al., 2011). For instance, a study conducted in Germany found that while extraversion is positively linked with life trajectories characterized by early childbearing among males, the patterns among women are less clear (Mencarini et al., 2022). These gender differences might be attributed to the positive correlation observed between extraversion and the number of sexual partners among men, but not among women (Allen & Desille, 2017). Furthermore, agreeableness was found to be positively associated with the first childbirth across the total sample, even after controlling for sociodemographic covariates. Once more, this finding was mainly driven by males, although previous research has found a positive association between agreeableness and fertility among German women (Mencarini et al., 2022). However, these previous findings were based on an analysis of life trajectories that took fertility, union formation, education, and employment into account, and that did not examine each of these events separately (Mencarini et al., 2022). Therefore, the positive associations between agreeableness and certain life trajectories observed among women may also be based on other events, such as union formation. Additionally, my findings indicated that conscientiousness was negatively linked with the first childbirth (males only) and with the second childbirth (females only). Again, these results are partly in line with the findings of previous studies that reported correlations between agreeableness (positive) and fertility, as well as between conscientiousness (negative) and fertility (Allen, 2019). Thus, it appears that in Germany, fertility is mainly shaped by male personality, and much less by female personality. This could be based on the mating preferences of men and women. Women may choose a long-term partner more carefully than men do (Buss, 1994, 2006), which may be related to their personal characteristics as well. Indeed, evidence from previous research indicates that women value indicators of agreeableness (kindness, considerateness) in a partner, whereas males do not value these characteristics to the same extent (Buss & Barnes, 1986). This may explain why agreeableness plays an important role in male fertility, but not in female fertility. A similar argument may be applied to the correlation between fertility and extraversion, which also appears to vary by gender.

The different results for the first childbirth and for the second childbirth might be explained by the differences between these transitions. Parenthood typically requires investment in children (money, time). There are different motives for parental investment such as personal growth (Gauthier & de Jong, 2021), which may be interconnected

with personality. For instance, conscientious individuals may be more likely to invest in their child, and this affects the transition to a first or a second child. The transition from being childless to being a parent may be characterized by larger adjustments in daily life than the transition to having a second child. As was argued earlier, extraverted individuals tend to have larger social networks that provide more opportunities for family formation (earlier partnering, a higher risk of entry into parenthood). However, parenthood may not be compatible with engaging in social network activities, since parents are forced to prioritize childcare over socializing (high parental investment). Therefore, extraverted individuals may refrain from having a second child.

Over the study period of the present analyses (2005–2017), the total fertility rate in Germany increased from 1.36 to 1.57 (Human Fertility Database 2020). In general, fertility increased more among older people than it decreased among younger people (Human Fertility Database 2020). One possible explanation for this pattern is that the number of immigrants, who usually have higher fertility levels than the indigenous population, increased over this period (Schmid & Kohls, 2010). However, changes in personality traits across generations may have contributed to these trends as well. Indeed, Jean M. Twenge, in collaboration with others, observed for the U.S. context that several personality facets changed over time across generations of college students and children, including anxiety/neuroticism (Twenge, 2000), self-esteem (Twenge & Campbell, 2001), and narcissism (Twenge et al., 2008). In particular, extraversion levels were shown to increase over time across generations of students in the U.S. (Twenge, 2001). These changes in personality factors were only observed among U.S. college students during the last decades of the twentieth century. However, it is reasonable to assume that similar developments have taken place in other societies as well, including in Germany, although empirical evidence on this topic is missing. Personality changes on the population level are shaped by the societal context, as Twenge suggested in her studies. However, these changes can also affect fertility levels in the long run. If, for instance, people are encouraged to be more sociable and talkative—i.e., more extraverted—this could improve their chances of meeting a potential partner for a romantic relationship, which may, in turn, increase their fertility.

This study has certain limitations. For instance, the associations between personality and higher birth orders were not presented because statistical uncertainty became too large. However, previous research has suggested that the associations between fertility and personality traits may differ by parity (Jokela & Keltikangas-Järvinen, 2009). Moreover, this study did not distinguish between planned and unplanned pregnancies, even though personality traits can affect planned and unplanned pregnancies differently, as Berg and colleagues (2013) have shown. Furthermore, I used the FFM as a personality indicator, even though other personality factors might also be considered, such as honesty-humility (Ashton & Lee, 2005) or the willingness to take risks (Caliendo et al., 2014). The latter trait was controlled for in additional analyses, but no associations between this facet and fertility emerged, and the personality trait coefficients did not change much either. Moreover, the findings regarding agreeableness should be considered with caution, as the internal consistency of this factor was comparatively low (Cronbach's Alpha: 0.49).

This study also has several strengths. First, my study showed that the personality factors measured by the FFM may affect the first and the second childbirth differently, while other previous studies focused only on entry into parenthood. Previous research that distinguished between the first, the second, and the third childbirth did not consider factors from the FFM. Moreover, while several previous studies were based on cross-sectional data, my study examined the prospective association between personality traits (including potential personality changes) and childbearing using longitudinal data. This represents an important contribution, since the previous research on this relationship either collected information on personality at one time point and fertility at some later time point, or it was based on personality measures taken at the end of people's fertility histories. These analyses might have referred to the effects of fertility on personality, but not the other way around. By contrast, this study used longitudinal survey data in which the personality information was collected before (possible) childbearing. The present study illustrated that using the prospective approach can generate unexpected results, such as no associations among females. Furthermore, connections between personality and fertility have not previously been explored for the German context, except in one study by Hutteman and colleagues (2013), who used a smaller dataset (Panel Analysis of Intimate Relationships and Family Dynamics) and other personality measures (self-esteem, shyness, and aggressiveness).

In general, the findings of the present study contribute to the existing literature by focusing on the prospective association between personality factors from the FFM and fertility outcomes within the German context. When the results of my analyses are compared to those of previous studies, certain inconsistencies in the correlations found between personality and fertility can be detected. The findings tend to differ between countries and study designs. Thus, more research is required to disentangle the prospective impact of personality on childbearing. Longitudinal designs that consider personality changes over time will provide deeper insight into the causal effects of personality on fertility. In addition, to obtain a better understanding of fertility motivations, more attention should be paid to a wider range of personality traits and personality types. Furthermore, having access to population-based data would allow researchers to explore the link between personality and higher birth orders.

Appendix

Cox–Snell (CS) residuals are plotted versus the estimated cumulative hazard function, as presented in the figure below. If the Cox PH model fits the data well, we would expect the cumulative hazard line to follow a linear trend with a slope of one; i.e., the estimations would follow the straight reference line (based on CS residuals) that is shown in the graph. Some variation, in particular at the right end of the tail, is expected for analytical reasons (e.g., most of the events have already happened). As we can see, the Cox PH model fits the data relatively well.

See Figs. 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18 and Tables 3, 4, 5.

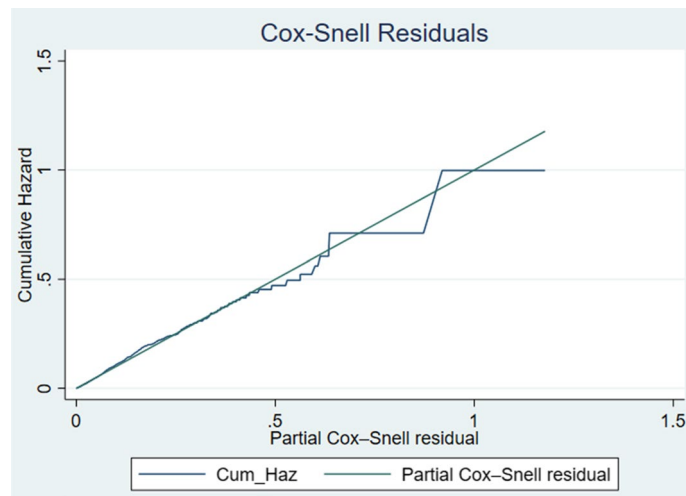


Fig. 7 Cox-Snell residuals

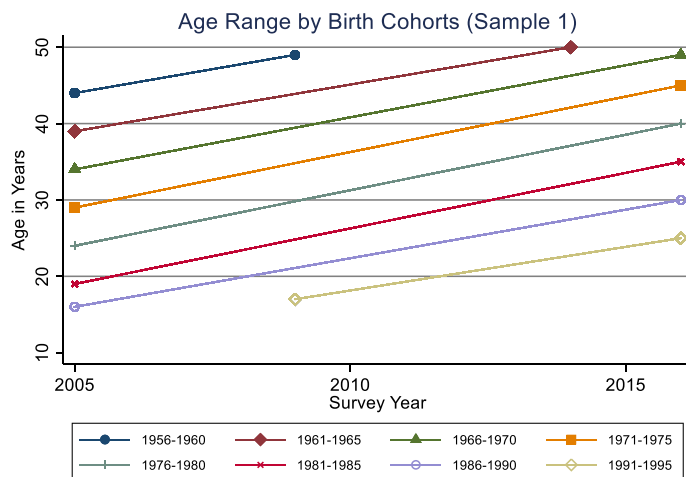


Fig. 8 Age and Birth Cohorts Sample 1

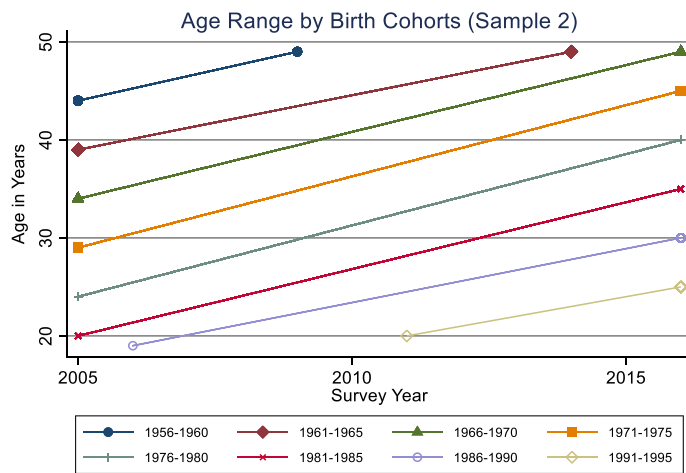


Fig. 9 Age and Birth Cohorts Sample 2

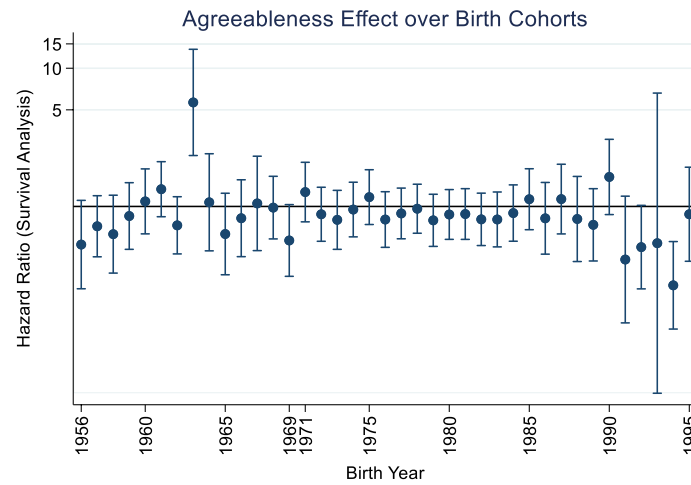


Fig. 10 Hazard ratios from Cox PH models on first childbearing including an interaction between agreeableness and birth cohort. Estimates are shown here on a log-scale for visualization purposes only; models control for the other personality factors, gender, education in years, enrolment status, income, civil status, maternal education, paternal education, and region; reference category (birth year 1970 shown as horizontal line when hazard ratio = 1)

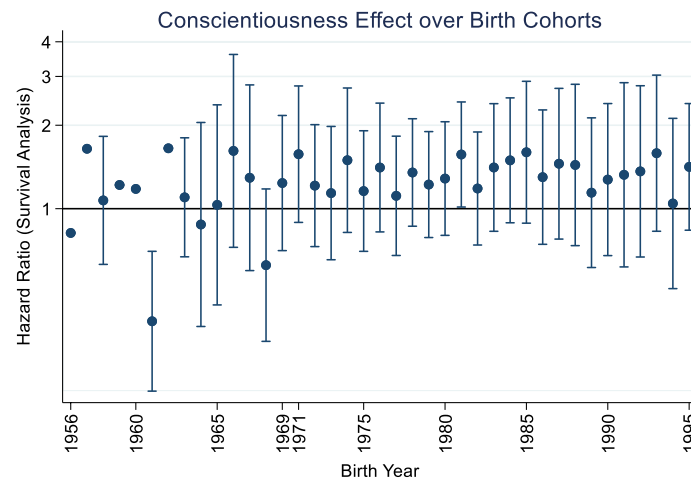


Fig. 11 Hazard ratios from Cox PH models on first childbearing including an interaction between conscientiousness and birth cohort. Estimates are shown here on a log-scale for visualization purposes only; models control for the other personality factors, gender, education in years, enrolment status, income, civil status, maternal education, paternal education, and region; reference category (birth year 1970 shown as horizontal line when hazard ratio = 1)

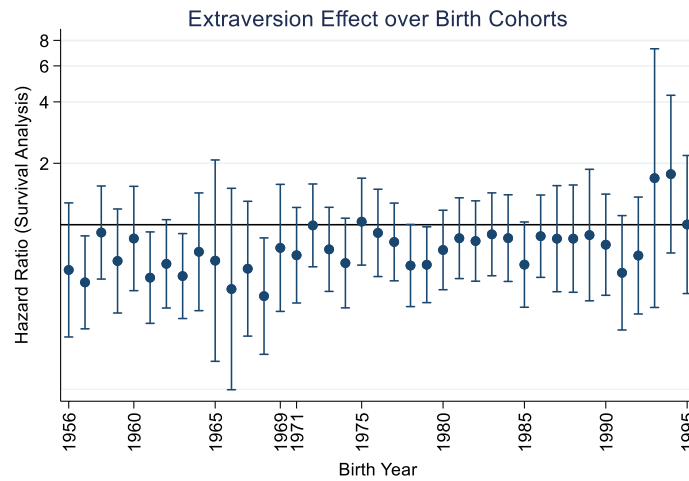


Fig. 12 Hazard ratios from Cox PH models on first childbearing including an interaction between extraversion and birth cohort. Estimates are shown here on a log-scale for visualization purposes only; models control for the other personality factors, gender, education in years, enrolment status, income, civil status, maternal education, paternal education, and region; reference category (birth year 1970 shown as horizontal line when hazard ratio = 1)

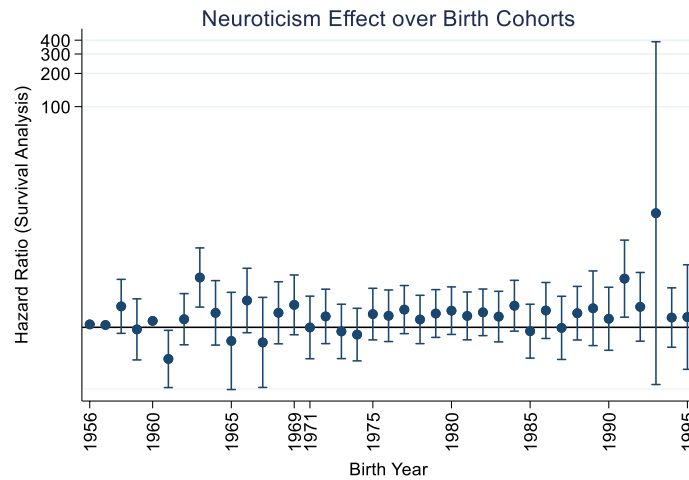


Fig. 13 Hazard ratios from Cox PH models on first childbearing including an interaction between neuroticism and birth cohort. Estimates are shown here on a log-scale for visualization purposes only; models control for the other personality factors, gender, education in years, enrolment status, income, civil status, maternal education, paternal education, and region; reference category (birth year 1970 shown as horizontal line when hazard ratio = 1)

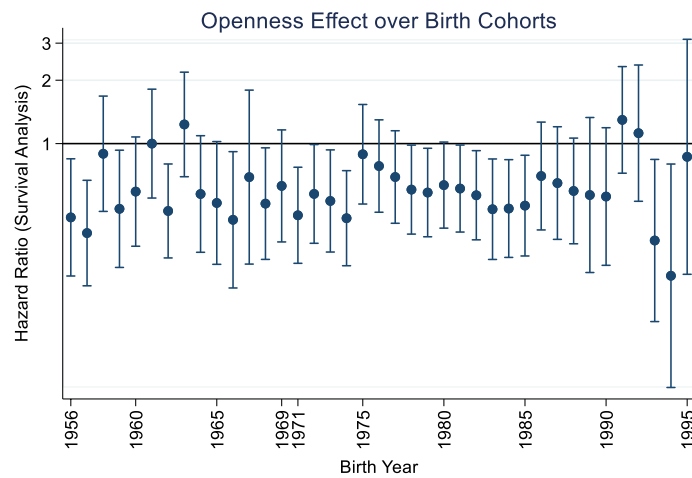


Fig. 14 Hazard ratios from Cox PH models on first childbearing including an interaction between openness and birth cohort. Estimates are shown here on a log-scale for visualization purposes only; models control for the other personality factors, gender, education in years, enrolment status, income, civil status, maternal education, paternal education, and region; reference category (birth year 1970 shown as horizontal line when hazard ratio = 1)

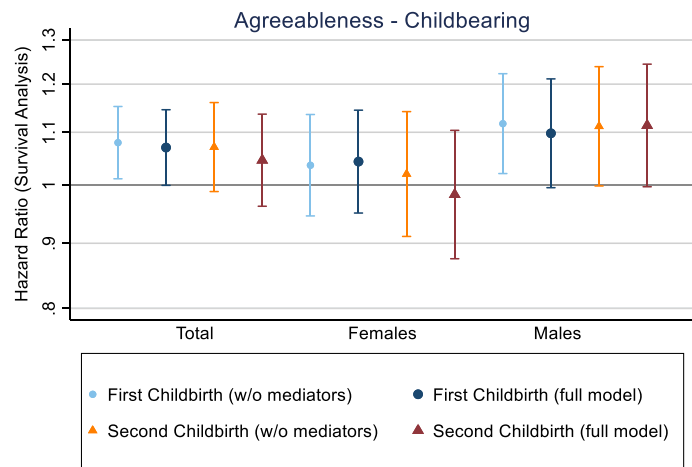


Fig. 15 Hazard ratios agreeableness—childbearing (mediation analyses). Models w/o mediators controlled for gender (total sample), birth year, region, parental education; full models also controlled for civil status, income, education (years and enrolment status)

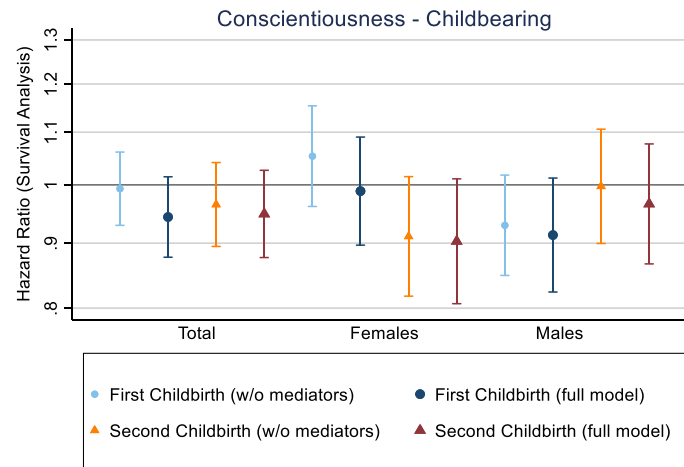


Fig. 16 Hazard ratios conscientiousness—childbearing (mediation analyses). Models w/o mediators controlled for gender (total sample), birth year, region, parental education; full models also controlled for civil status, income, education (years and enrolment status)

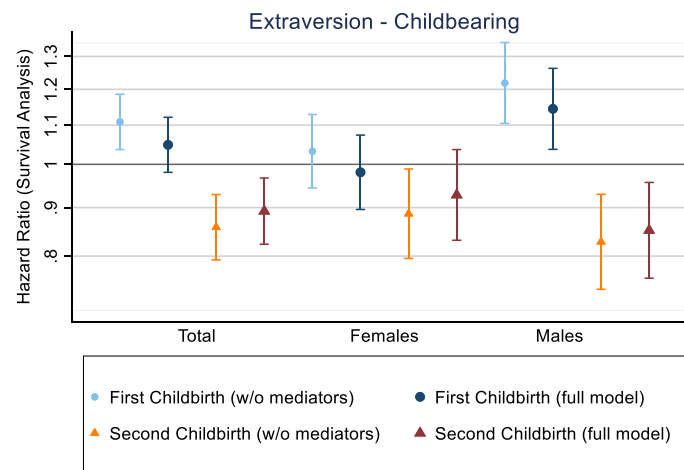


Fig. 17 Hazard ratios extraversion—childbearing (mediation analyses). Models w/o mediators controlled for gender (total sample), birth year, region, parental education; full models also controlled for civil status, income, education (years and enrolment status)

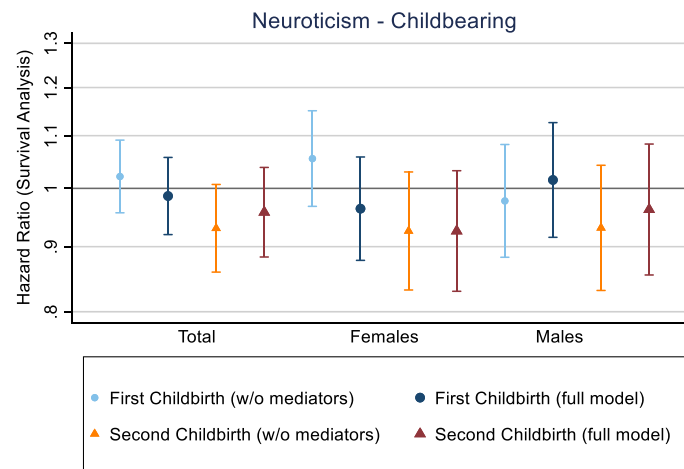


Fig. 18 Hazard ratios neuroticism—childbearing (mediation analyses). Models w/o mediators controlled for gender (total sample), birth year, region, parental education; full models also controlled for civil status, income, education (years and enrolment status)

Table 3 Hazard ratios of childbearing (first childbirth)

| | Total | Females | Males |
|---------------------------------------|-------------------------|-------------------------|-------------------------|
| Agreeableness | 1.07 (1.00; 1.15) | 1.04 (0.95; 1.14) | 1.10 (0.99; 1.21) |
| Conscientiousness | 0.94 (0.88; 1.01) | 0.99 (0.90; 1.09) | 0.91 (0.82; 1.01) |
| Extraversion | 1.05 (0.98; 1.12) | 0.98 (0.90; 1.07) | 1.14 (1.04; 1.26) |
| Neuroticism | 0.99 (0.92; 1.06) | 0.96 (0.88; 1.06) | 1.02 (0.92; 1.13) |
| Openness | 0.98 (0.91; 1.05) | 1.01 (0.92; 1.10) | 0.94 (0.84; 1.04) |
| Gender (ref.: Females) | | | |
| Males | 0.88 (0.78; 0.99) | – | – |
| Years of education | 1.00 (0.98; 1.03) | 0.98 (0.95; 1.02) | 1.01 (0.97; 1.05) |
| Enrolment status (ref.: Not enrolled) | | | |
| Enrolled | 0.70 (0.56; 0.86) | 0.53 (0.40; 0.70) | 0.96 (0.71; 1.31) |
| Birth year | 1.04 (1.02; 1.06) | 1.04 (1.02; 1.07) | 1.04 (1.01; 1.06) |
| Civil status (ref.: Single) | | | |
| Cohabited | 7.87 (6.02; 10.27) | 5.53 (4.04; 7.57) | 12.51 (7.83; 19.99) |
| Married | 25.70 (19.69; 33.54) | 16.23 (11.94; 22.07) | 45.58 (28.53; 72.81) |
| Divorced/widowed | 3.00 (1.17; 7.67) | 2.53 (0.74; 8.64) | 3.72 (0.86; 16.13) |
| Income (log) | 1.19 (1.07; 1.33) | 1.07 (0.94; 1.22) | 1.34 (1.15; 1.56) |

Table 3 (continued)

| | Total | Females | Males |
|---|----------------------|----------------------|----------------------|
| Maternal education (ref.: Secondary Degree) | | | |
| No degree | 0.87 (0.54; 1.39) | 0.94 (0.52; 1.71) | 0.98 (0.49; 1.94) |
| Intermediate degree | 1.05 (0.89; 1.25) | 1.02 (0.80; 1.29) | 1.14 (0.89; 1.46) |
| Upper secondary degree | 1.11 (0.88; 1.40) | 1.10 (0.81; 1.49) | 1.19 (0.84; 1.68) |
| Other | 1.54 (0.98; 2.42) | 1.06 (0.56; 2.04) | 2.43 (1.40; 4.21) |
| Paternal education (ref.: Secondary Degree) | | | |
| No degree | 1.75 (1.04; 2.96) | 2.54 (1.34; 4.82) | 1.13 (0.58; 2.24) |
| Intermediate degree | 1.13 (0.94; 1.35) | 1.15 (0.90; 1.46) | 1.11 (0.86; 1.44) |
| Upper secondary degree | 1.11 (0.92; 1.34) | 1.28 (0.98; 1.66) | 0.92 (0.68; 1.24) |
| Other | 0.95 (0.60; 1.50) | 1.08 (0.57; 2.05) | 0.79 (0.42; 1.49) |
| Region (ref.: West) | | | |
| East | 1.53 (1.25; 1.86) | 1.61 (1.28; 2.03) | 1.44 (1.11; 1.86) |
| <i>N</i> | 28,100 | 12,904 | 15,196 |

Table 4 Hazard ratios of childbearing (second childbirth)

| | Total | Females | Males |
|---------------------------------------|----------------------|----------------------|----------------------|
| Agreeableness | 1.05 (0.96; 1.14) | 0.98 (0.88; 1.10) | 1.11 (1.00; 1.24) |
| Conscientiousness | 0.95 (0.88; 1.03) | 0.90 (0.81; 1.01) | 0.97 (0.87; 1.08) |
| Extraversion | 0.89 (0.82; 0.97) | 0.93 (0.83; 1.04) | 0.85 (0.76; 0.96) |
| Neuroticism | 0.96 (0.88; 1.04) | 0.93 (0.83; 1.03) | 0.96 (0.86; 1.08) |
| Openness | 1.04 (0.95; 1.13) | 1.07 (0.95; 1.20) | 1.02 (0.90; 1.14) |
| Gender (ref.: Females) | | | |
| Males | 1.27 (1.09; 1.47) | – | – |
| Years of education | 1.09 (1.05; 1.12) | 1.12 (1.07; 1.17) | 1.05 (1.00; 1.10) |
| Enrolment status (ref.: Not Enrolled) | | | |
| Enrolled | 0.89 (0.63; 1.25) | 0.75 (0.46; 1.20) | 1.05 (0.65; 1.69) |
| Birth year | 1.07 (1.04; 1.10) | 1.08 (1.05; 1.11) | 1.07 (1.04; 1.10) |

Table 4 (continued)

| | Total | Females | Males |
|---|-----------------------|-----------------------|-----------------------|
| Civil status (ref.: Single) | | | |
| Cohabited | 5.25 (2.71; 10.17) | 6.96 (3.21; 15.13) | 3.71 (1.15; 11.94) |
| Married | 7.31 (3.88; 13.76) | 8.16 (3.88; 17.16) | 6.00 (1.90; 18.92) |
| Divorced/widowed | 2.06 (0.67; 6.32) | 2.18 (0.52; 9.04) | 2.90 (0.46; 18.27) |
| Income (log) | 1.06 (0.97; 1.15) | 0.95 (0.86; 1.06) | 1.26 (1.05; 1.50) |
| Maternal education (ref.: Secondary Degree) | | | |
| No degree | 1.37 (0.93; 2.03) | 0.91 (0.43; 1.92) | 1.61 (1.02; 2.52) |
| Intermediate degree | 1.08 (0.88; 1.34) | 0.98 (0.74; 1.31) | 1.25 (0.94; 1.67) |
| Upper secondary degree | 1.14 (0.86; 1.51) | 0.95 (0.66; 1.37) | 1.35 (0.90; 2.02) |
| Other | 1.21 (0.72; 2.02) | 1.35 (0.59; 3.13) | 1.13 (0.59; 2.18) |
| Paternal education (ref.: Secondary Degree) | | | |
| No degree | 0.89 (0.55; 1.43) | 1.05 (0.48; 2.31) | 0.87 (0.51; 1.49) |
| Intermediate degree | 1.06 (0.86; 1.32) | 0.96 (0.71; 1.28) | 1.21 (0.89; 1.63) |
| Upper secondary degree | 1.00 (0.78; 1.29) | 1.06 (0.76; 1.46) | 0.99 (0.69; 1.44) |
| Other | 1.15 (0.68; 1.92) | 1.02 (0.42; 2.45) | 1.16 (0.63; 2.12) |
| Region (ref.: West) | | | |
| East | 0.72 (0.57; 0.91) | 0.83 (0.64; 1.08) | 0.64 (0.48; 0.85) |
| <i>N</i> | 11,508 | 6570 | 4938 |

Table 5 Poisson regression models

| | Total | Females | Males |
|-------------------|----------------------------|------------------------------|----------------------------|
| <i>Age 40+</i> | | | |
| Agreeableness | 0.03 (0.02; 0.04) | 0.03 (0.02; 0.05) | 0.02 (0.01; 0.04) |
| Conscientiousness | − 0.01 (− 0.02; < 0.01) | − 0.02 (− 0.03; > − 0.01) | < 0.01 (> − 0.01; 0.02) |
| Extraversion | 0.01 (< 0.01; 0.03) | 0.02 (< 0.01; 0.03) | 0.02 (> − 0.01; 0.03) |
| Neuroticism | − 0.01 (− 0.02; < 0.01) | − 0.01 (− 0.02; 0.01) | − 0.01 (− 0.02; 0.01) |
| Openness | − 0.01 (− 0.02; < 0.01) | > − 0.01 (− 0.02; 0.01) | − 0.01 (− 0.03; < 0.01) |
| <i>N</i> | 16,713 | 8306 | 8407 |

Table 5 (continued)

| | Total | Females | Males |
|-------------------|----------------------------|----------------------------|--------------------------|
| <i>Age 45+</i> | | | |
| Agreeableness | 0.03 (0.01; 0.04) | 0.03 (0.01; 0.04) | 0.02 (< 0.01; 0.04) |
| Conscientiousness | - 0.01 (- 0.02; 0.01) | - 0.02 (- 0.03; < 0.01) | < 0.01 (- 0.02; 0.02) |
| Extraversion | 0.01 (< 0.01; 0.03) | 0.01 (> - 0.01; 0.03) | 0.02 (> - 0.01; 0.04) |
| Neuroticism | - 0.01 (- 0.02; < 0.01) | - 0.01 (- 0.02; < 0.01) | - 0.01 (- 0.02; 0.01) |
| Openness | - 0.01 (-0.02; < 0.01) | - 0.01 (- 0.02; 0.01) | - 0.01 (- 0.03; 0.01) |
| <i>N</i> | 13,736 | 6732 | 7004 |
| <i>Age 50+</i> | | | |
| Agreeableness | 0.03 (0.01; 0.04) | 0.03 (0.01; 0.05) | 0.02 (< 0.01; 0.04) |
| Conscientiousness | 0.01 (- 0.01; 0.02) | - 0.01 (- 0.03; 0.01) | 0.02 (- 0.01; 0.04) |
| Extraversion | 0.01 (> - 0.01; 0.03) | 0.01 (- 0.01; 0.03) | 0.01 (- 0.01; 0.04) |
| Neuroticism | - 0.01 (- 0.02; < 0.01) | - 0.01 (- 0.02; 0.01) | - 0.01 (- 0.03; 0.01) |
| Openness | - 0.01 (- 0.02; 0.01) | - 0.01 (- 0.02; 0.01) | - 0.01 (- 0.03; 0.01) |
| <i>N</i> | 10,285 | 4947 | 5338 |

All models controlled for gender (total samples only), birth year, region, parental education, civil status, income, education (years and enrolment status)

Abbreviations

| | |
|----------|-------------------------------------|
| FFM | Five-factor model |
| SDT | Second demographic transition |
| (Cox) PH | (Cox) proportional hazard(s) |
| (G)SOEP | (German) socio-economic panel study |
| BFI | Big five inventory |
| A | Agreeableness |
| C | Conscientiousness |
| E | Extraversion |
| N | Neuroticism |
| O | Openness to new experiences |
| HR | Hazard ratio(s) |

Acknowledgements

I would like to thank all reviewers and colleagues for helpful suggestions in order to improve the quality of this paper. Special thanks go to my supervisors Mikko Myrskylä, and, in particular, Kieron Barclay for supporting me along the path to publication. I am also grateful for any kind of support provided by the Max Planck Institute for Demographic Research, its research school for population, health and data science (IMPRS-PHDS), and Stockholm University.

Author contributions

Sole author, 100% contribution. The author read and approved the final manuscript.

Funding

Open Access funding enabled and organized by Projekt DEAL. This research has been funded by the Strategic Research Council (SRC), FLUX consortium, decision numbers: 345130 and 345131.

Availability of data and materials

The data that support the findings of this study are available from DIW Berlin but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. The Stata code is, however, available from the author upon reasonable request, which can be run over the data for reproducing purposes.

Declarations

Competing interests

The author declares that there are no competing interests.

Received: 1 September 2022 Accepted: 30 December 2022

Published online: 16 February 2023

References

- Ackerman, P. L., & Beier, M. E. (2003). Intelligence, personality, and interests in the career choice process. *Journal of Career Assessment*, 11(2), 205–218. <https://doi.org/10.1177/1069072703011002006>
- Adsera, A. (2004). Changing fertility rates in developed countries. The impact of labor market institutions. *Journal of Population Economics*. <https://doi.org/10.1007/s00148-003-0166-x>
- Adsera, A. (2011). Where are the babies? Labor market conditions and fertility in Europe. *European Journal of Population / Revue Européenne De Démographie*, 27(1), 1–32. <https://doi.org/10.1007/s10680-010-9222-x>
- Ajzen, I., & Klobas, J. (2013). Fertility intentions: An approach based on the theory of planned behavior. *Demographic Research*, 29, 203–232. <https://doi.org/10.4054/DemRes.2013.29.8>
- Allen, M. S. (2019). The role of personality in sexual and reproductive health. *Current Directions in Psychological Science*, 28(6), 581–586. <https://doi.org/10.1177/0963721419862293>
- Allen, M. S., & Desille, A. E. (2017). Personality and sexuality in older adults. *Psychology and Health*, 32(7), 843–859.
- Alvergne, A., Jokela, M., & Lummaa, V. (2010). Personality and reproductive success in a high-fertility human population. *Proceedings of the National Academy of Sciences*, 107(26), 11745–11750. <https://doi.org/10.1073/pnas.1001752107>
- Andersson, G., & Scott, K. (2007). Childbearing dynamics of couples in a universalistic welfare state: The role of labor-market status, country of origin, and gender. *Demographic Research*, 17, 897–938. <https://doi.org/10.4054/DemRes.2007.17.30>
- Ardelt, M. (2000). Still stable after all these years? Personality stability theory revisited. *Social Psychology Quarterly*, 63(4), 392. <https://doi.org/10.2307/2695848>
- Asendorpf, J. B., & Wilpers, S. (1998). Personality effects on social relationships. *Journal of Personality and Social Psychology*, 74(6), 1531–1544. <https://doi.org/10.1037/0022-3514.74.6.1531>
- Ashton, M. C., & Lee, K. (2005). Honesty-humility, the big five, and the five-factor model. *Journal of Personality*, 73(5), 1321–1354. <https://doi.org/10.1111/j.1467-6494.2005.00351.x>
- Avison, M., & Furnham, A. (2015). Personality and voluntary childlessness. *Journal of Population Research*, 32(1), 45–67. <https://doi.org/10.1007/s12546-014-9140-6>
- Baizán, P., Aassve, A., & Billari, F. C. (2003). The interrelations between cohabitation, marriage and first birth in Germany and Sweden. *Population and Environment*, 25(6), 531–561. <https://doi.org/10.1023/B:POEN.0000039064.65655.3b>
- Balbo, N., Billari, F. C., & Mills, M. (2013). Fertility in advanced societies: A review of research: La fécondité dans les sociétés avancées: Un examen des recherches. *European Journal of Population / Revue Européenne De Démographie*, 29(1), 1–38. <https://doi.org/10.1007/s10680-012-9277-y>
- Bar, M., Hazan, M., Leukhina, O., Weiss, D., & Zoabi, H. (2018). Why did rich families increase their fertility? Inequality and marketization of child care. *Journal of Economic Growth*, 23(4), 427–463. <https://doi.org/10.1007/s10887-018-9160-8>
- Berg, V., Rotkirch, A., Väisänen, H., & Jokela, M. (2013). Personality is differentially associated with planned and non-planned pregnancies. *Journal of Research in Personality*, 47(4), 296–305. <https://doi.org/10.1016/j.jrp.2013.01.010>
- BiB. (2022). *Zusammengefasste Geburtenziffer in Deutschland (1871–2019)*. <https://www.bib.bund.de/DE/Fakten/Fakt/F09-Zusammengefasste-Geburtenziffer-West-Ost-ab-1945.html;jsessionid=A92750373EBB0E485EB3EE655BBF9C9F.intranet241?nn=1218208>
- Bleidorn, W., Hopwood, C. J., & Lucas, R. E. (2018). Life events and personality trait change: Life events and trait change. *Journal of Personality*, 86(1), 83–96. <https://doi.org/10.1111/jopy.12286>
- Blossfeld, H.-P., & Huinink, J. (1991). Human capital investments or norms of role transition? How women's schooling and career affect the process of family formation. *American Journal of Sociology*, 97(1), 143–168.
- Boertien, D., & Mortelmans, D. (2018). Does the relationship between personality and divorce change over time? A cross-country comparison of marriage cohorts. *Acta Sociologica*, 61(3), 300–316. <https://doi.org/10.1177/0001699317709048>
- Borghuis, J., Denissen, J. J. A., Oberski, D., Sijsma, K., Meeus, W. H. J., Branje, S., Koot, H. M., & Bleidorn, W. (2017). Big five personality stability, change, and codevelopment across adolescence and early adulthood. *Journal of Personality and Social Psychology*, 113(4), 641–657.
- Boudreau, J. W., Boswell, W. R., & Judge, T. A. (2001). Effects of personality on executive career success in the United States and Europe. *Journal of Vocational Behavior*, 58(1), 53–81. <https://doi.org/10.1006/jvbe.2000.1755>
- Bourantas, D., & Papalexandris, N. (1999). Personality traits discriminating between employees in public- and in private-sector organizations. *The International Journal of Human Resource Management*, 10(5), 858–869. <https://doi.org/10.1080/095851999340198>
- Boyce, C. J., Wood, A. M., & Ferguson, E. (2016). For better or for worse: The moderating effects of personality on the marriage-life satisfaction link. *Personality and Individual Differences*, 97, 61–66. <https://doi.org/10.1016/j.paid.2016.03.005>
- Bozionelos, N. (2004). The relationship between disposition and career success: A British study. *Journal of Occupational and Organizational Psychology*, 77(3), 403–420. <https://doi.org/10.1348/0963179041752682>
- Brien, M. J., Lillard, L. A., & Waite, L. J. (1999). Interrelated family-building behaviors: Cohabitation, marriage, and nonmarital conception. *Demography*, 36(4), 535. <https://doi.org/10.2307/2648089>

- Britzke, J., & Schupp, J. (Eds.). (2018). *SOEP Wave Report 2017*. 2017. <http://hdl.handle.net/10419/191296>
- Brodmann, S., Esping-Andersen, G., & Guell, M. (2007). When fertility is bargained: Second births in Denmark and Spain. *European Sociological Review*, 23(5), 599–613. <https://doi.org/10.1093/esr/jcm025>
- Buss, D. M. (1994). The Strategies of Human Mating. *American Scientist*, 82(3), 238–249.
- Buss, D. M. (2006). Strategies of Human Mating. *Psychological Topics*, 15(2), 239–260.
- Buss, D. M., & Barnes, M. (1986). Preferences in human mate selection. *Journal of Personality and Social Psychology*, 50(3), 559–570.
- Caliendo, M., Fossen, F., & Kritikos, A. S. (2014). Personality characteristics and the decisions to become and stay self-employed. *Small Business Economics*, 42(4), 787–814. <https://doi.org/10.1007/s11187-013-9514-8>
- Chen, I.-C. (2016). Parental education and fertility: An empirical investigation based on evidence from Taiwan. *Journal of Family and Economic Issues*, 37(2), 272–284. <https://doi.org/10.1007/s10834-015-9448-1>
- Conti, M., & Sette, E. (2013). Type of employer and fertility of working women: Does working in the public sector or in a large private firm matter? *Cambridge Journal of Economics*, 37(6), 1303–1333.
- Córdoba, J. C., & Ripoll, M. (2016). Intergenerational transfers and the fertility-income relationship. *The Economic Journal*, 126(593), 949–977. <https://doi.org/10.1111/ecej.12197>
- Costa, P. T., Jr., McCrae, R. R., & Dye, D. A. (1991). Facet scales for agreeableness and conscientiousness: A revision of the NEO personality inventory. *Personality and Individual Differences*, 12(9), 887–898.
- Costa, P. T., McCrae, R. R., & Holland, J. L. (1984). Personality and vocational interests in an adult sample. *Journal of Applied Psychology*, 69(3), 390–400.
- Damian, R. I., Spengler, M., Sutu, A., & Roberts, B. W. (2019). Sixteen going on sixty-six: A longitudinal study of personality stability and change across 50 years. *Journal of Personality and Social Psychology*, 117(3), 674–695.
- Donnellan, M. B., Conger, R. D., & Bryant, C. M. (2004). The Big Five and enduring marriages. *Journal of Research in Personality*, 38(5), 481–504. <https://doi.org/10.1016/j.jrjp.2004.01.001>
- Donnellan, M. B., & Lucas, R. E. (2008). Age differences in the Big Five across the life span: Evidence from two national samples. *Psychology and Aging*, 23(3), 558–566. <https://doi.org/10.1037/a0012897>
- Fisher, T. D., & McNulty, J. K. (2008). Neuroticism and marital satisfaction: The mediating role played by the sexual relationship. *Journal of Family Psychology*, 22(1), 112–122. <https://doi.org/10.1037/0893-3200.22.1.112>
- Florida, R., Mellander, C., & King, K. (2021). Housing costs, self-employment, and fertility. *Population Space and Place*, 27(3), e2413. <https://doi.org/10.1002/psp.2413>
- Friedman, D., Hechter, M., & Kanazawa, S. (1994). A theory of the value of children. *Demography*, 31(3), 375–401.
- García-Sedeño, M., Navarro, J. I., & Menacho, I. (2009). Relationship between personality traits and vocational choice. *Psychological Reports*, 105(2), 633–642. <https://doi.org/10.2466/PRO.105.2.633-642>
- Gauthier, A. H., & de Jong, P. W. (2021). Costly children: The motivations for parental investment in children in a low fertility context. *Genus*, 77(1), 6. <https://doi.org/10.1186/s41118-020-00111-5>
- Gelissen, J., & de Graaf, P. M. (2006). Personality, social background, and occupational career success. *Social Science Research*, 35(3), 702–726. <https://doi.org/10.1016/j.ssresearch.2005.06.005>
- Germeijs, V., & Verschuere, K. (2011). Indecisiveness and Big Five personality factors: Relationship and specificity. *Personality and Individual Differences*, 50(7), 1023–1028. <https://doi.org/10.1016/j.paid.2011.01.017>
- Goebel, J., Grabka, M. M., Liebig, S., Kroh, M., Richter, D., Schröder, C., & Schupp, J. (2019). The German Socio-Economic Panel (SOEP). *Jahrbücher Für Nationalökonomie Und Statistik*, 239(2), 345–360. <https://doi.org/10.1515/jbnst-2018-0022>
- Goldberg, L. R. (1993). The structure of phenotypic personality traits. *American Psychologist*, 48(1), 26–34.
- Gustafsson, S. (2001). Optimal age at motherhood. Theoretical and empirical considerations on postponement of maternity in Europe. *Journal of Population Economics*, 14, 225–247.
- Holland, A. S., & Roisman, G. I. (2008). Big Five personality traits and relationship quality: Self-reported, observational, and physiological evidence. *Journal of Social and Personal Relationships*, 25(5), 811–829. <https://doi.org/10.1177/0265407508096697>
- Holland, J. L. (1958). A personality inventory employing occupational titles. *Journal of Applied Psychology*, 42(5), 336–342. <https://doi.org/10.1037/h0047330>
- Holton, S., Fisher, J., & Rowe, H. (2009). Attitudes toward women and motherhood: Their role in Australian Women's Child-bearing Behaviour. *Sex Roles*, 61(9–10), 677–687. <https://doi.org/10.1007/s11199-009-9659-8>
- Hopcroft, R. L. (2006). Sex, status, and reproductive success in the contemporary United States. *Evolution and Human Behavior*, 27(2), 104–120. <https://doi.org/10.1016/j.evolhumbehav.2005.07.004>
- Hopwood, C. J., & Bleidorn, W. (2018). Stability and change in personality and personality disorders. *Current Opinion in Psychology*, 21, 6–10. <https://doi.org/10.1016/j.copsyc.2017.08.034>
- Hutteman, R., Bleidorn, W., Penke, L., & Denissen, J. J. A. (2013). It Takes two: A longitudinal dyadic study on predictors of fertility outcomes: Dyadic predictors of fertility outcomes. *Journal of Personality*, 81(5), 487–498. <https://doi.org/10.1111/jopy.12006>
- Jalovaara, M., Neyer, G., Andersson, G., Dahlberg, J., Dommermuth, L., Fallesen, P., & Lappegård, T. (2019). Education, gender, and cohort fertility in the Nordic Countries. *European Journal of Population*, 35(3), 563–586. <https://doi.org/10.1007/s10680-018-9492-2>
- Johns, S. E., Dickins, T. E., & Clegg, H. T. (2011). Teenage pregnancy and motherhood: How might evolutionary theory inform policy? *Journal of Evolutionary Psychology*, 9(1), 3–19. <https://doi.org/10.1556/JEP.9.2011.37.1>
- Jokela, M. (2012). Birth-cohort effects in the association between personality and fertility. *Psychological Science*, 23(8), 835–841. <https://doi.org/10.1177/0956797612439067>
- Jokela, M., Alvergne, A., Pollet, T. V., & Lummaa, V. (2011). Reproductive behavior and personality traits of the Five Factor Model. *European Journal of Personality*, 25(6), 487–500. <https://doi.org/10.1002/per.822>
- Jokela, M., & Keltikangas-Järvinen, L. (2009). Adolescent leadership and adulthood fertility: Revisiting the "Central Theoretical Problem of Human Sociobiology." *Journal of Personality*, 77(1), 213–230. <https://doi.org/10.1111/j.1467-6494.2008.00543.x>

- Jokela, M., Kivimäki, M., Elovainio, M., & Keltikangas-Järvinen, L. (2009). Personality and having children: A two-way relationship. *Journal of Personality and Social Psychology*, 96(1), 218–230. <https://doi.org/10.1037/a0014058>
- Judge, T. A., & Ilies, R. (2002). Relationship of personality to performance motivation: A meta-analytic review. *Journal of Applied Psychology*, 87(4), 797–807. <https://doi.org/10.1037/0021-9010.87.4.797>
- Karney, B. R., & Bradbury, T. N. (1997). Neuroticism, marital interaction, and the trajectory of marital satisfaction. *Journal of Personality and Social Psychology*, 72(5), 1075–1092.
- Kaufman, G. (2000). Do gender role attitudes matter? Family formation and dissolution among traditional and egalitarian men and women. *Journal of Family Issues*, 21(1), 128–144.
- Kolk, M., & Barclay, K. (2021). Do income and marriage mediate the relationship between cognitive ability and fertility? Data from Swedish taxation and conscriptions registers for men born 1951–1967. *Intelligence*, 84, 1–11. <https://doi.org/10.1016/j.intell.2020.101514>
- Koo, T. K., & Li, M. Y. (2016). A guideline of selecting and reporting intraclass correlation coefficients for reliability research. *Journal of Chiropractic Medicine*, 15(2), 155–163. <https://doi.org/10.1016/j.jcm.2016.02.012>
- Kramarz, F., Skans, O. N., & Rosenqvist, O. (2019). *Skills, education and fertility* [Working Paper].
- Kravdal, Ø., & Rindfuss, R. R. (2008). Changing relationships between education and fertility: A study of women and men born 1940 to 1964. *American Sociological Review*, 73(5), 854–873. <https://doi.org/10.1177/000312240807300508>
- Kwon, N., & Song, H. (2011). Personality traits, gender, and information competency among college students. *Malaysian Journal of Library and Information Science*, 16(1), 87–107.
- Langdrige, D., Sheeran, P., & Connolly, K. (2005). Understanding the reasons for parenthood. *Journal of Reproductive and Infant Psychology*, 23(2), 121–133. <https://doi.org/10.1080/02646830500129438>
- Laplante, B., & Fostik, A. L. (2015). Two period measures for comparing the fertility of marriage and cohabitation. *Demographic Research*, 32, 421–442. <https://doi.org/10.4054/DemRes.2015.32.14>
- Lesthaeghe, R. (2014). The second demographic transition: A concise overview of its development. *Proceedings of the National Academy of Sciences*, 111(51), 18112–18115.
- Lesthaeghe, R. (2020). The second demographic transition, 1986–2020: Sub-replacement fertility and rising cohabitation—A global update. *Genus*, 76(10), 1–38.
- Li, N. P., Bailey, J. M., Kenrick, D. T., & Linssenmeier, J. A. W. (2002). The necessities and luxuries of mate preferences: Testing the tradeoffs. *Journal of Personality and Social Psychology*, 82(6), 947–955. <https://doi.org/10.1037/0022-3514.82.6.947>
- Lillard, L. A., & Waite, L. J. (1993). A joint model of marital childbearing and marital disruption. *Demography*, 30(4), 653. <https://doi.org/10.2307/2061812>
- Lucas, R. E., & Donnellan, M. B. (2011). Personality development across the life span: Longitudinal analyses with a national sample from Germany. *Journal of Personality and Social Psychology*, 101(4), 847–861. <https://doi.org/10.1037/a0024298>
- Maczulskij, T., & Viinikainen, J. (2021). Personality and public sector employment. *SSRN Electronic Journal*, 14118, 1–30. <https://doi.org/10.2139/ssrn.3789385>
- Malouff, J. M., Thorsteinsson, E. B., Schutte, N. S., Bhullar, N., & Rooke, S. E. (2010). The Five-Factor Model of personality and relationship satisfaction of intimate partners: A meta-analysis. *Journal of Research in Personality*, 44(1), 124–127. <https://doi.org/10.1016/j.jrp.2009.09.004>
- McCrae, R. R. (1996). Social consequences of experiential openness. *Psychological Bulletin*, 120(3), 323–337.
- McCrae, R. R., & Costa, P. T. (1987). Validation of the five-factor model of personality across instruments and observers. *Journal of Personality and Social Psychology*, 52(1), 81–90.
- McCrae, R. R., & John, O. P. (1992). An introduction to the five-factor model and its applications. *Journal of Personality*, 60(2), 175–215. <https://doi.org/10.1111/j.1467-6494.1992.tb00970.x>
- McNulty, J. K. (2008). Neuroticism and interpersonal negativity: The independent contributions of perceptions and behaviors. *Personality and Social Psychology Bulletin*, 34(11), 1439–1450. <https://doi.org/10.1177/0146167208322558>
- Mencarini, L., Piccarreta, R., & Le Moglie, M. (2022). Life-course perspective on personality traits and fertility with sequence analysis. *Journal of the Royal Statistical Society: Series A (statistics in Society)*, 185(3), 1344–1369. <https://doi.org/10.1111/rssa.12832>
- Meyer, J., Fleckenstein, J., Retelsdorf, J., & Köller, O. (2019). The relationship of personality traits and different measures of domain-specific achievement in upper secondary education. *Learning and Individual Differences*, 69, 45–59. <https://doi.org/10.1016/j.lindif.2018.11.005>
- Miller, A. R. (2011a). The effects of motherhood timing on career path. *Journal of Population Economics*, 24(3), 1071–1100. <https://doi.org/10.1007/s00148-009-0296-x>
- Miller, J. D., Lynam, D., Zimmerman, R. S., Logan, T. K., Leukefeld, C., & Clayton, R. (2004). The utility of the Five Factor Model in understanding risky sexual behavior. *Personality and Individual Differences*, 36(7), 1611–1626. <https://doi.org/10.1016/j.paid.2003.06.009>
- Miller, W. B. (1992). Personality traits and developmental experiences as antecedents of childbearing motivation. *Demography*, 29(2), 265–285. <https://doi.org/10.2307/2061731>
- Miller, W. B. (2011b). Differences between fertility desires and intentions: Implications for theory, research and policy. *Vienna Yearbook of Population Research*, 9, 75–98.
- Monstad, K., Propper, C., & Salvanes, K. G. (2008). Education and fertility: Evidence from a natural experiment*. *Scandinavian Journal of Economics*, 110(4), 827–852. <https://doi.org/10.1111/j.1467-9442.2008.00563.x>
- Nettle, D. (2005). An evolutionary approach to the extraversion continuum. *Evolution and Human Behavior*, 26(4), 363–373. <https://doi.org/10.1016/j.evolhumbehav.2004.12.004>
- Nettle, D. (2006). The evolution of personality variation in humans and other animals. *American Psychologist*, 61(6), 622–631. <https://doi.org/10.1037/0003-066X.61.6.622>
- Neyer, F. J., & Asendorpf, J. B. (2001). Personality–relationship transaction in young adulthood. *Journal of Personality and Social Psychology*, 81(6), 1190–1204. <https://doi.org/10.1037/0022-3514.81.6.1190>

- Orth, U. (2013). How large are actor and partner effects of personality on relationship satisfaction? The importance of controlling for shared method variance. *Personality and Social Psychology Bulletin*, 39(10), 1359–1372.
- Orzeck, T., & Lung, E. (2005). Big-five personality differences of cheaters and non-cheaters. *Current Psychology*, 24(4), 274–286. <https://doi.org/10.1007/s12144-005-1028-3>
- Park, K. (2005). Choosing childlessness: Weber's typology of action and motives of the voluntarily childless*. *Sociological Inquiry*, 75(3), 372–402. <https://doi.org/10.1111/j.1475-682X.2005.00127.x>
- Puur, A., Oláh, L. S., Tazi-Preve, M. I., & Dorbritz, J. (2008). Men's childbearing desires and views of the male role in Europe at the dawn of the 21st century. *Demographic Research*, 19, 1883–1912. <https://doi.org/10.4054/DemRes.2008.19.56>
- Retherford, R. D., & Sewell, W. H. (1989). How intelligence affects fertility. *Intelligence*, 13(2), 169–185. [https://doi.org/10.1016/0160-2896\(89\)90015-9](https://doi.org/10.1016/0160-2896(89)90015-9)
- Riederer, B., Buber-Ennsner, I., & Brzozowska, Z. (2019). Fertility intentions and their realization in couples: How the division of household chores matters. *Journal of Family Issues*, 40(13), 1860–1882. <https://doi.org/10.1177/0192513X19848794>
- Roberts, B. W., & Bogg, T. (2004). A longitudinal study of the relationships between conscientiousness and the social-environmental factors and substance-use behaviors that influence health. *Journal of Personality*, 72(2), 325–354. <https://doi.org/10.1111/j.0022-3506.2004.00264.x>
- Schimmack, U., Schupp, J., & Wagner, G. G. (2008). The influence of environment and personality on the affective and cognitive component of subjective well-being. *Social Indicators Research*, 89(1), 41–60. <https://doi.org/10.1007/s11205-007-9230-3>
- Schmid, S., & Kohls, M. (2010). Fertility of Female Immigrants in Germany. In T. Salzmann, B. Edmonston, & J. Raymer (Eds.), *Demographic aspects of migration* (pp. 179–207). VS Verlag für Sozialwissenschaften. https://doi.org/10.1007/978-3-531-92563-9_7
- Schmitt, D. P. (2004). The Big Five related to risky sexual behaviour across 10 world regions: Differential personality associations of sexual promiscuity and relationship infidelity. *European Journal of Personality*, 18(4), 301–319. <https://doi.org/10.1002/per.520>
- Schmitt, D. P., Long, A. E., McPhearson, A., O'Brien, K., Rimmert, B., & Shah, S. H. (2017). Personality and gender differences in global perspective: Gender and Personality. *International Journal of Psychology*, 52, 45–56. <https://doi.org/10.1002/ijop.12265>
- Schmitt, D. P., & Shackelford, T. K. (2008). Big five traits related to short-term mating: From personality to promiscuity across 46 nations. *Evolutionary Psychology*, 6(2), 147470490800600. <https://doi.org/10.1177/147470490800600204>
- Shreffler, K. M., & Johnson, D. R. (2013). Fertility intentions, career considerations and subsequent births: The moderating effects of women's work hours. *Journal of Family and Economic Issues*, 34(3), 285–295. <https://doi.org/10.1007/s10834-012-9331-2>
- Siegers, R., Belcheva, V., & Silbermann, T. (2019). SOEP-Core v34—Documentation of Sample Sizes and Panel Attrition in the German Socio-Economic Panel (SOEP) (1984 until 2017). *SOEP Survey Papers 606, Series C*.
- Sijtsma, K. (2009). On the Use, the Misuse, and the Very Limited Usefulness of Cronbach's Alpha. *Psychometrika*, 74(1), 107–120. <https://doi.org/10.1007/s11336-008-9101-0>
- Skirbekk, V. (2008). Fertility trends by social status. *Demographic Research*, 18, 145–180. <https://doi.org/10.4054/DemRes.2008.18.5>
- Skirbekk, V., & Blekesaune, M. (2014). Personality Traits Increasingly Important for Male Fertility: Evidence from Norway: Personality traits and male fertility. *European Journal of Personality*, 28, 521–529. <https://doi.org/10.1002/per.1936>
- Sobotka, T., Beaujouan, É., & Van Bavel, J. (2017). Introduction: Education and fertility in low-fertility settings. *Vienna Yearbook of Population Research*, 15, 1–16. <https://doi.org/10.1553/populationyearbook2017s001>
- Specht, J., Egloff, B., & Schmukle, S. C. (2011). Stability and change of personality across the life course: The impact of age and major life events on mean-level and rank-order stability of the Big Five. *Journal of Personality and Social Psychology*, 101(4), 862–882. <https://doi.org/10.1037/a0024950>
- Spéder, Z., & Kapitány, B. (2009). How are Time-Dependent Childbearing Intentions Realized? Realization, Postponement, Abandonment, Bringing Forward: Les intentions de fécondité sont-elles réalisées dans le délai prévu ? Réalisation, report, abandon, avancement. *European Journal of Population / Revue Européenne De Démographie*, 25(4), 503–523. <https://doi.org/10.1007/s10680-009-9189-7>
- Sutin, A. R., Costa, P. T., Miech, R., & Eaton, W. W. (2009). Personality and career success: Concurrent and longitudinal relations. *European Journal of Personality*, 23(2), 71–84. <https://doi.org/10.1002/per.704>
- Sutin, A. R., Luchetti, M., Stephan, Y., Robins, R. W., & Terracciano, A. (2017). Parental educational attainment and adult offspring personality: An intergenerational life span approach to the origin of adult personality traits. *Journal of Personality and Social Psychology*, 113(1), 144–166. <https://doi.org/10.1037/pspp0000137>
- Tavakol, M., & Dennick, R. (2011). Making sense of Cronbach's alpha. *International Journal of Medical Education*, 2, 53–55. <https://doi.org/10.5116/ijme.4dfb.8dfd>
- Tavares, L. P. (2016). Who Delays Childbearing? The associations between time to first birth, personality traits and education. *European Journal of Population*, 32(4), 575–597. <https://doi.org/10.1007/s10680-016-9393-1>
- Thomas, F., Renaud, F., Benefice, E., de Meeus, T., & Guegan, J.-F. (2001). International variability of ages at menarche and menopause: Patterns and main determinants. *Human Biology*, 73(2), 271–290. <https://doi.org/10.1353/hub.2001.0029>
- Twenge, J. M. (2000). The Age of Anxiety? Birth cohort change in anxiety and neuroticism, 1952–1993. *Journal of Personality and Social Psychology*, 79(6), 1007–1021.
- Twenge, J. M. (2001). Birth cohort changes in extraversion: A cross-temporal meta-analysis, 1966–1993. *Personality and Individual Differences*, 30(5), 735–748.
- Twenge, J. M., & Campbell, W. K. (2001). Age and birth cohort differences in self-esteem: A cross-temporal meta-analysis. *Personality and Social Psychology Review*, 5(4), 321–344. https://doi.org/10.1207/S15327957PSPR0504_3
- Twenge, J. M., Konrath, S., Foster, J. D., Keith Campbell, W., & Bushman, B. J. (2008). Egos inflating over time: A cross-temporal meta-analysis of the narcissistic personality inventory. *Journal of Personality*, 76(4), 875–902. <https://doi.org/10.1111/j.1467-6494.2008.00507.x>

- Uher, J. (2017). Open peer commentary and authors' response: Comments. *European Journal of Personality*, 31(5), 529–595. <https://doi.org/10.1002/per.2128>
- Usslepp, N., Hübner, N., Stoll, G., Spengler, M., Trautwein, U., & Nagengast, B. (2020). RIASEC interests and the Big Five personality traits matter for life success—But do they already matter for educational track choices? *Journal of Personality*, 88(5), 1007–1024. <https://doi.org/10.1111/jopy.12547>
- Van Bavel, J. (2010). Choice of study discipline and the postponement of motherhood in Europe: The impact of expected earnings, gender composition, and family attitudes. *Demography*, 47(2), 439–458. <https://doi.org/10.1353/dem.0.0108>
- van de Kaa, D. J. (1987). Europe's second demographic transition. *Population Bulletin*, 42(1), 3–55.
- Van Hiel, A., & Mervielde, I. (2004). Openness to experience and boundaries in the mind: Relationships with cultural and economic conservative beliefs. *Journal of Personality*, 72(4), 659–686. <https://doi.org/10.1111/j.0022-3506.2004.00276.x>
- van Witteloostuijn, A., Esteve, M., & Boyne, G. (2017). Public sector motivation *ad fonts*: Personality traits as antecedents of the motivation to serve the public interest. *Journal of Public Administration Research and Theory*, 27(1), 20–35. <https://doi.org/10.1093/jopart/muw027>
- Vecchione, M., Alessandri, G., Barbaranelli, C., & Caprara, G. (2012). Gender differences in the Big Five personality development: A longitudinal investigation from late adolescence to emerging adulthood. *Personality and Individual Differences*, 53(6), 740–746. <https://doi.org/10.1016/j.paid.2012.05.033>
- Vedel, A. (2016). Big Five personality group differences across academic majors: A systematic review. *Personality and Individual Differences*, 92, 1–10. <https://doi.org/10.1016/j.paid.2015.12.011>
- Wainwright, M. A., Wright, M. J., Luciano, M., Geffen, G. M., & Martin, N. G. (2008). Genetic covariation among facets of openness to experience and general cognitive ability. *Twin Research and Human Genetics*, 11(3), 275–286. <https://doi.org/10.1375/twin.11.3.275>
- Zaidi, B., & Morgan, S. P. (2017). The Second Demographic Transition Theory: A Review and Appraisal. *Annual Review of Sociology*, 43, 473–492.

Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Submit your manuscript to a SpringerOpen[®] journal and benefit from:

- ▶ Convenient online submission
- ▶ Rigorous peer review
- ▶ Open access: articles freely available online
- ▶ High visibility within the field
- ▶ Retaining the copyright to your article

Submit your next manuscript at ▶ [springeropen.com](https://www.springeropen.com)
