Relationship between personality traits and childbearing in an African context: Evidence from Ghana

Ibrahim Mohammed
[1]Department of Banking and Finance,
University of Professional Studies, Accra Ghana
ibrahim.mohammed@upsamail.edu.gh
ibrahim.mohammed@connect.polyu.hk

Wassiuw Abdul Rahaman*
Department of Economics
University of Ghana
wabdulrahaman@ug.edu.gh
wassiuw@yahoo.co.uk

Edward Nketiah-Amponsah
Department of Economics
University of Ghana
enamponsah@ug.edu.gh

* Corresponding Author

Abstract

This paper provides empirical evidence on the association between personality and childbearing in an African context using the dimensions of the Big Five factor model - extraversion, conscientiousness, neuroticism, openness to experience and agreeableness. Applying the negative binomial and zero-inflated negative binomial regression models to data obtained from the World Bank's survey on Skills toward Employment and Productivity (STEP) for Ghana, we found that after controlling for age, education, spouse and employment status, three of the personality traits, namely conscientiousness, openness to experience and agreeableness, have significant associations with number of children. Openness to experience is negatively associated with number of children in both males and females. However, conscientiousness and agreeableness are negatively and positively associated with number of children respectively but only in the male sample. Extraversion and stability were not significantly associated with number of children even when the models were estimated without the control variables.

Keywords: childbearing. reproductive fitness. number of children. Big-five factor model. Curiosity. Novelty.

Introduction

For several decades now, personality psychologists and psycho-social economists have been interested in how individual differences in emotion, cognition and behaviour are related to several social behaviours (Argyle and Little, 1972). For example, personality differences have been examined in relation to mate selection and marital satisfaction (Botwin et al.,1997; Lewak et al., 1985), marital infidelity (Shackelford et al., 2008) and divorce (Eysenck, 1980). In the field of applied economics, there is also a growing interest in how personality is related to economic choices and outcomes (Feguson et al., 2011). For instance, personality has been implicated in schooling decisions, occupational choices, labour force participation, unemployment duration, employability and earnings (Almlund et al., 2011; Uysal and Pohlmeier, 2011). In the marriage market, personality has also been considered to play an important role in intrahousehold bargaining of time use and partners' labour supply (Flinn et al., 2018; Dupuy and Galichon, 2014).

Consistent with the growing interest in how personality is related to social behaviour and economic choices and outcomes, there is evolving evidence that childbearing and fertility may also be related to personality. The argument advanced in support of this view is that in modern societies, where reliable contraceptives are available to support family planning, childbearing is no longer entirely left to chance (Rantakallio and Myhrman, 1990; Potts, 1997; Miller, 1992); rather, it can be influenced by individuals' choice, preferences and dispositions, such as personality traits (Jokela et al., 2011). Indeed, Taylor et al. (2007) have posited that with the increasing availability of reliable birth control, sex and reproduction can be disconnected. In some societies, the primary purpose of marriage is no longer considered to be procreation and child upbringing. In the US, for example, the term childfree was first coined in 1972 by the US-based National Organization of Non-parents to imply freedom and choice.

According to Avison and Furnham (2015), fertility statistics gathered over the past five decades have indicated that: people are having fewer children; they are having children later; and an increasing number of people are not having children at all. Jokela (2012) has also pointed out that in most developing countries, fertility rates have been declining over the past several decades. Consequently, theories of fertility behaviour are now emphasizing the role of social influences and individual preferences on individuals' decisions to have children (Newson et al., 2005). In this regard, personality traits which refer to stable individual characteristics and differences have been associated with various aspects of fertility behaviour including number of children. For example, in a large U.S. sample, higher extraversion was associated with having a larger number of children (Jokela et al., 2011). So far, the emerging empirical evidence on this association between personality and number of children is focused on the western world (Alvergne et al., 2010; Eaves et al., 1990; Tavares, 2010) with limited empirical evidence from African countries. This lacuna notwithstanding, the existing evidence is inconclusive; it provides contrasting findings based on measures of personality employed and the socio-demographic contexts (Eaves et al., 1990; Mealey and Segal, 1993; Roberts and Beeg, 2004).

Given the contrasting findings from the western world and the cultural differences between the west and Africa (LeVine, 1973), it is not known whether the established relationships in previous studies hold for an African country like Ghana where, per the culture, procreation seems to be the main aim of marriage, with attendant social pressure on married couples to give birth. In this paper, we aim to contribute to the dearth of literature on this issue in Ghana by determining the associations between the Big Five factor personality traits (namely extraversion, agreeableness, conscientiousness, stability and openness) and number of children. The Big-Five personality traits are considered in this study because they have received wider application in the literature and also found

to be robust across different cultures and samples (Barrick and Mount, 1991). They have also been found to be relatively stable after biological maturation or early adulthood and shown to have substantial heritability, unlike other personality measures (Cobb-Clark and Schurer, 2012; John and Srivastava, 1999; Loehlin et al., 1998).

Literature Review

Conceptual definition of personality and its linkages with childbearing

Existing literature on fertility suggests that besides socio-demographic and economic factors, fertility can be linked to personality which has been defined as patterns of thought, feelings, and actions or behaviours that are relatively stable and enduring characteristics of human beings (Borghans et al., 2008; Costa and McCrae, 1990). One of the earliest studies in this area is Eaves et al. (1990). Using Australian data, Eaves et al. (1990) found some associations between personality traits and completed fertility among women. Investigating childbearing motivations among 362 married men and 354 married women, Miller (1992) finds that personality traits predict motivation for childbearing differently by gender. Other studies have confirmed these differences and the association between personality traits and the number of children (Dijkstra and Barelds, 2009; Jokela et al., 2011). In Jokela et al.'s (2011) study, these associations were found to be independent of marital status.

In an earlier study, Schoen et al. (1997) traced the mechanisms by which personality could be linked to childbearing. The authors argued that childbearing is motivated, in part, by social relations or sociability (an aspect of personality), such that people who value social relations are more likely to have children than those with low sociability since the former group prefers to be with other people. Corroborating Schoen et al.'s (1997) argument, existing studies have found personality traits related to sociability to be positively associated with increased mating behaviour (e.g., Nettle, 2005) and involvement in romantic relationships (e.g., Asendorpf and Wilpers, 1998; Neyer and Voigt, 2004) which can promote childbearing. Another line of argument buttressing the link between personality and childbearing is related to parenthood. That is, being a parent of young children has been associated with increased psychological distress (McLanahan and Adams, 1987). Therefore, individuals with high emotionality may be less likely to have children of their own because they may perceive parenthood as more stressful compared to those with low emotionality. Also, personality traits related to emotionality have been found to be associated with low marital satisfaction and difficulties in romantic relationships (e.g., Caughlin et al., 2000; Lehnart and Neyer, 2006), and these difficulties are likely to decrease childbearing intentions.

The Five Factor Model of Personality and Childbearing

In psychology, there are different taxonomies of personality. However, the Big-Five factor model (Digman, 1990; McCrae and Costa, 1999; John and Srivastava, 1999) has emerged as the most widely-used comprehensive categorization and robust taxonomy (Mueller and Plug, 2006). Goldberg (1993) has argued that the Big-Five factor model has an advantage over other taxonomies of personality traits because it provides a unifying, hierarchical taxonomy for traits, which enables the study of both broad and narrow personality influences (Marshall et al., 1994; Smith and Williams, 1992). In view of the aforementioned reasons, this study adopts the Big Five factor model. The model posits that personality traits can be categorized into five dimensions consisting of extraversion, conscientiousness, neuroticism, openness to experience and agreeableness, with corresponding opposite dimensions as introversion, unconscientiousness, emotional stability, closedness to experience and antagonism respectively.

Extraversion has been referred to as the level of comfortability in relating with others. It embodies characteristics such as active, assertive, talkative, outgoing, social, gregarious, energetic, surgent and ambitious (Barrick and Mount, 1991; Goldberg, 1990). Conscientiousness is defined to encapsulate the degree of reliability of an individual. It represents different sub traits such as organized, dependable, responsible, conforming, orderly, diligent, vigilant, attentive, cautious, logical, risk averse, systematic, thorough, comprehensive, reliable, determined and focused (Digman, 1990; Barrick and Mount, 1991). Neuroticism, on the other hand, refers to a low level of emotional stability. It is characterized by being prone to worry, fear, anxiety, depression and impulsiveness. Openness to experience is the extent of an individual's imagination or fascination. Personality characteristics that fall under this trait include curiosity, novelty, cultivated, aesthetic, sensitivity, independent minded, intellectual, and creative (Barrick and Mount, 1991; Goldberg, 1990; Digman, 1990). Lastly, agreeableness is defined as the degree to which an individual differs from others. This trait represents personality characteristics such as cooperative, soft-hearted, tolerant, forgiving, altruism, emotionally supportive, courteous, good natured, flexible, and self-sacrifice (Barrick and Mount, 1991; Digman, 1990). Each of the above traits may relate to childbearing differently. Thus, in subsequent sections, we provide a selective review of how each of the five traits – extraversion, neuroticism, agreeableness, conscientiousness, and openness to experience – may be associated with childbearing.

Extraversion and Childbearing

Defined as the level of comfortability in relating with others, people who are extraverts "tend to be socially oriented (outgoing and gregarious), but also are surgent (dominant and ambitious) and active (adventuresome and assertive)" (Judge et al., 1999 p.624).

In social settings, people high in extraversion are more likely to make friends and to fall in love than people low in extraversion (Neyer and Asendorpf, 2001). Generally, extraverts tend to like people and to seek excitement and stimulation while introverts (the opposite of extroverts) tend to prefer to spend more time alone (Costa and McCrae, 1992). As an antecedent to social behaviour, research has shown that extraversion is positively associated with higher mating motivation (Schmitt and Shackelford, 2008), greater success in finding sex partners and spouses (Nettle, 2005), higher probability of earlier parenthood, greater likelihood of non-planned pregnancy, and higher number of children (Berg et al., 2013; Jokela et al., 2011; Tavares, 2008; Skirbekk and Blekesaune, 2014). The related trait of sociability (Buss and Plomin, 1984) has also been shown to increase the probability of having children (Jokela et al., 2009). On the contrary, Caspi et al. (1988) and Kerr et al. (1996) have indicated that shyness (the inverse of extraversion), particularly in men, appears to delay the transition to marriage and consequently parenthood.

Conscientiousness and Childbearing

Conscientiousness is a trait defining people who are organized, diligent, cautious, dependable, goal-oriented, achievement-seeking, perseverant and disciplined (Digman, 1990; Barrick and Mount, 1991). Given these qualities, conscientiousness has mostly been found to be negatively related to the number of children. The reasons offered by some scholars (e.g., Berg et al., 2013; Jokela et al., 2011; Skirbekk and Blekesaune, 2014) are that the achievement motivation may lead career-oriented people, especially women, to delay childbearing or remain without children while the tendency to plan and act cautiously may lead to effective use of contraception, lower likelihood of unplanned pregnancy and fewer children. However, where achievement-seeking is defined to include number of children, women who place high value on family size as opposed to career achievement (Elder and MacInnis, 1983) have reported positive association between conscientiousness and number of children (Dijkstra and Barelds, 2009; Roberts and Bogg, 2004). This means that achievement-seeking could have a positive or negative relationship with the number of children depending on the underlying goal set for achievement and the potential conflict it creates between family and career.

Neuroticism and Childbearing

Neuroticism refers to the tendency to experience negative emotions such as anxiety, anger, stress and depression. According to Costa and McCrae (1992), high neuroticism corresponds with negative emotionality or emotional instability, being prone to worry, fear, anxiety, depression and impulsiveness. Since higher neurotic individuals may find childbearing (or the prospects of it) and parenting stressful, they may have fewer children

or avoid giving birth altogether. In social or marital relationships, neuroticism has been associated with difficulties and negativity in marital interactions (Rogge et al., 2006), leading to lower relationship quality (Karney and Bradbury, 1997; McNulty, 2008). Thus, high neuroticism has been associated mainly with lower number of children for both men and women, although it has been associated positively with early childbirth and the likelihood of unplanned pregnancy (Berg et al., 2013; Tavares, 2008). In other studies, neuroticism has also been associated with childbearing intention and decisional ambivalence in adolescents and young adults (Pinquart et al., 2008) which may lead to postponement of parenthood as well as to having fewer children (Jokela et al., 2009). Reis et al. (2011) demonstrated that higher neuroticism is associated with lower likelihood of becoming a parent by the age of 38.

Openness to Experience and Childbearing

Jokela et al. (2011) has defined openness to experience as the flexibility of social attitudes and worldviews and the cognitive and aesthetic sensitivity to internal and external stimuli. According to Avis and Furnham (2015), people high in openness demonstrate intellectual curiosity, enjoy variety and are inclined to be more creative or open-minded, and less traditional. Thus, such people are likely to be associated with lower probability of parenthood and having fewer children because they are more likely to postpone or forgo marriage in defiance of traditions (Lundberg, 2012) or to delay having children in acceptance of non-traditional lifestyles (Tavares, 2008; Jokela, 2012). Jokela et al. (2011) adduced two reasons for the association between openness to experience and childbearing. First, high openness to experience is known to correlate with cognitive ability and educational achievement (Wainwright et al., 2008). These attributes, especially when found in women, can lead them to postpone childbearing, thereby lowering the number of children (Hopcroft, 2006; Retherford and Sewell, 1989; Skirbekk, 2008). Second, the value orientation of people high in openness towards traditions and family may contribute to a negative association between openness and childbearing. Generally, high openness to experience is correlated with non-traditional attitudes and values (McCrae, 1996; Van Hiel and Mervielde, 2004), and people with non-traditional family values are less likely to have children than those with more traditional perceptions of family life (Holton et al., 2009; Kaufman, 2000).

Agreeableness and Childbearing

The degree to which an individual differs from others defines his agreeableness. Basically, individuals who possess high agreeableness are characterized as trusting, forgiving, caring, altruistic, and gullible. They represent people who are cooperative, soft-hearted, tolerant, forgiving, altruistic, emotionally supportive, courteous, good natured, flexible,

selfless and have good interpersonal relationships (Barrick and Mount, 1991; Digman, 1990). Given these attributes, it is expected that high agreeableness will correlate with a higher childbearing propensity. The reason is that individuals with high agreeableness tend to have less decisional ambivalence toward childbearing (Pinquart et al., 2008). Besides, the attributes of agreeable people such as forgiving, courteous, cooperative and emotionally supportive are among the most desired qualities people seek in potential spouses (Buss and Barnes, 1986; Li et al., 2002), which might contribute to a positive association between agreeableness and childbearing (Jokela et al., 2011).

Empirical Literature

Available empirical evidence suggests there is a relationship between personality and childbearing. However, the association depends on the measures of personality used and the socio-demographic contexts (Eaves et al., 1990; Mealey and Segal, 1993; Roberts and Beeg, 2004). In a cross-sectional study of 1,101 postmenopausal females drawn from the Australian twin registry, Eaves et al. (1990) found that neither extraversion nor neuroticism showed significant linear or quadratic association with reproductive success proxied by the number of biological children. However, they observed a significant non-linear interaction effect between the two dimensions on number of children, such that high neuroticism in introverts (low extraversion) and low neuroticism in extroverts (high extraversion) favoured women with high number of children. Using life history analysis and data from the Minnesota Study of Twins Reared Apart, Mealey and Segal (1993) found no association between retrospectively reported childhood personality and adulthood fertility in a sample of 164 individuals comprising 82 pairs of twins raised apart. Nettle (2005) also reported no associations between having children and extraversion.

Focusing on the four scales of the California Psychological Inventory (i.e. responsibility, socialization, self-control, and achievement via conformance) that dwells on the social responsibility facet of conscientiousness (Deniston and Ramanaiah, 1993; Roberts, 1997), Roberts and Bogg (2004) tested the relation of social responsibility to social-environmental factors such as marital stability, number of children and divorce using data from the Mills Longitudinal study of women over a 30-year period from age 21 to age 52. The study finds that social responsibility (a facet of conscientiousness) was positively associated with having more children by age 43, spending more time in marriage from age 21 to age 43, and not experiencing divorce from age 21 to age 43. In agreement with Roberts and Bogg (2004), Jokela et al. (2009) found that personality traits related to status seeking, just like social responsibility and need for achievement, increase the number of children in men and women.

In two different studies conducted in Germany, Dijkstra and Barelds (2009) found that extraversion, conscientiousness and agreeableness were positively correlated with number of children among women, while Reis et al. (2011) reported that high-childhood neuroticism was negatively related to the likelihood of becoming a parent in both women and men. In another study involving a large sample of Finnish young adults, Jokela et al. (2010) investigated associations between temperament traits and childbearing. The findings revealed that high-novelty seeking, low-harm avoidance, high-reward dependence, and low persistence all independently increased the probability of having children. In a previous study, Jokela et al. (2009) assessed whether 3 personality traits—sociability, emotionality, and activity—predicted the probability of having children. They found that high emotionality decreased the probability of having children while high sociability increased the probability of having children.

Examining the associations between the Five factor model personality traits and various outcomes of reproductive behaviour using a sample of 15,729 women and men from the Wisconsin Longitudinal Study (WLS) and Midlife Development in the United States (MIDUS) survey, Jokela et al. (2011) reported that high extraversion, high openness to experience, and low neuroticism are associated with higher number of children for both males and females, while for females only, high agreeableness and low conscientiousness correlated with higher number of children. In a follow-up study, Jokela (2012) argued that the relationship between fertility and personality might change across cohorts. Testing this hypothesis, the author finds that "Openness", for both genders, and "Conscientiousness", only for women, are particularly related to lower fertility among later-born cohorts in the US. In a Norwegian study, Skirbekk and Blekesaune (2014) conclude that the personality–fertility relationship is different for more recently born cohorts who have experienced adult life in a different historical context. The main results of their study showed that conscientiousness is associated with lower fertility for women, extraversion is associated with higher fertility for men, whereas openness and neuroticism in men are associated with having fewer children. Furthermore, their results showed that neuroticism is negatively associated with fertility only for more recently born male cohorts.

In relatively more recent studies, Ferrari and Guerrero (2017) assessed the relationship of the personality of married Catholic clergy fathers to the number and gender of children. They reported that the personality dimensions that predicted clergy dad's family size (i.e., number of children) are emotional stability and conscientiousness (accounting for social desirability). Higher emotional stability and conscientiousness by clergy dads predicted fewer children in their family size. Using the twin subsample from the Midlife Development in the United States study and the Twins UK study to explain what accounts for completed fertility, Briley et al. (2017) found that in both datasets,

early fertility timing, high agreeableness, and low conscientiousness were associated with greater completed fertility through genetic pathways. Results from the regression analyses of Međedovića et al. (2018) also show that whereas the number of children was associated with lower scores on honesty and openness and higher scores on emotionality, agreeableness was positively associated with number of children but only in males.

To sum up, the empirical evidence on the relationship between personality traits and childbearing (or fertility and reproductive success) is heterogeneous and inconclusive (Međedovića et al., 2018). So far, extraversion has emerged as the most important personality trait for fertility in men but appears relatively unimportant for fertility in women (Allen, 2019). According to Međedovića et al. (2018), the obtained results on the positive association between extraversion and reproductive success appear to also be relatively congruent (Bailey et al., 2013; Gurven et al., 2014) while results on negative association between openness and number of children are somewhat consistent (Jokela et al., 2011). With respect to neuroticism and conscientiousness, empirical findings of both positive and negative associations between neuroticism (Alvergne et al., 2010; Jokela et al. 2011), conscientiousness (Alvergne et al., 2010; Dijkstra and Barelds, 2009) and reproductive success abound. However, the effect of agreeableness on fertility still remains scarce, albeit Jokela et al. (2011) have found a positive association. While the studies on personality traits-reproductive success relationship are growing in the western world, empirical evidence from an African country is still lacking. To fill this void and broaden the empirical evidence on this subject, this study is set to determine whether the personality traits defined by the Big Five factor model are associated with number of children, and if so, examine how they are associated with number of children for male and female using data from Ghana.

Methodology

Model Specification

In this study, the dependent variable is the numwber of children at the time of the survey. This means that it takes only nonnegative integer values and varies from zero to several or many children. Given the nature of the dependent variable, using continuous functional forms such as Ordinary Least Squares without controlling for the censoring in the dependent variable will yield inefficient, inconsistent and biased estimates (Long, 1997). To overcome this limitation, count data models are appropriate because they explicitly recognize the "count" nature of the dependent variable.

From the literature, two count data models are commonly used - the Poisson regression models (PRM) and the Negative binomial regression models (NBRM) (Hilbe, 2011). While the two models are applied under different conditions or assumptions, the

NBRM is generally considered to be an extension of the PRM. For the PRM to be more appropriate, the conditional mean and variance of the Poisson distribution should be equal or similar (a condition or assumption known as the equi-dispersion assumption). When this assumption is violated (i.e., the variance of the distribution exceeds the mean (i.e., over-dispersion), the estimates from the PRM will be consistent, but inefficient (Greene, 2008). That is, the standard errors in the Poisson regression model will be biased downward, resulting in spuriously large z-values and spuriously small p-values) (Long and Freese, 2001; Cameron and Trivedi, 1986).

To address the problems with PRM when there is over-dispersion in data, the negative binomial model is used. The NBRM addresses the problem by adding to the PRM "a parameter that allows the conditional variance (of the count outcome) to exceed the conditional mean" (Long, 1997, p.230). Given the following structural equation for PRM (i.e., equation 1), the NBRM is obtained as equation (2) by introducing a latent heterogeneity in the conditional mean of the Poisson model (Greene, 2008) as follows.

$$E(y_i \mid X_i)=\mu_i=\exp(a_i+X_i' \beta) \quad (1)$$

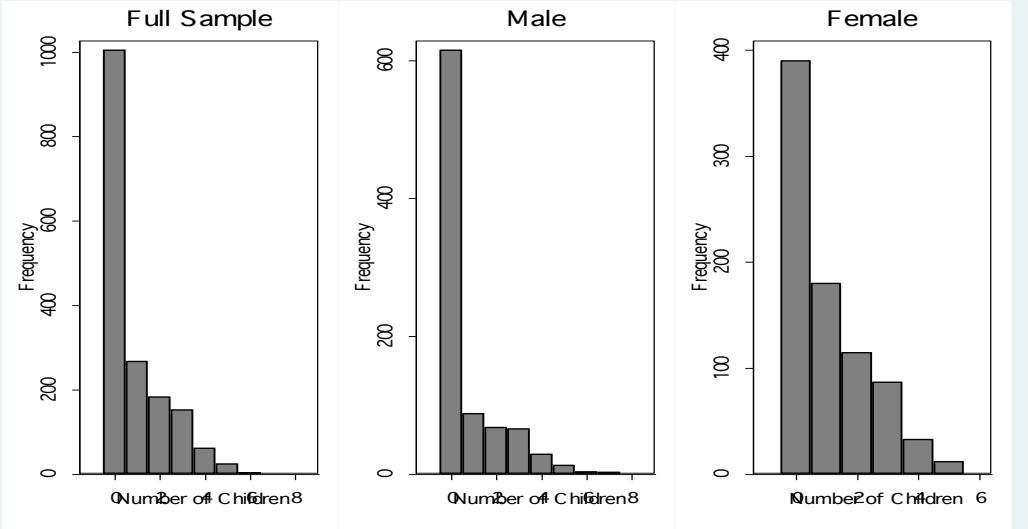
$$E(y\_{i} \mid X_i, \varepsilon_i)=\mu_i h_i=exp(a_i+X_i'\beta+\varepsilon_i) \quad (2)$$

with assumed to have a one parameter gamma distribution.

where X_i is the vector of covariates and is the set of parameters to be estimated. The descriptions of the variables are given in Table 1.

In practice, numerous empirical studies tend to use the NBRM as opposed to the PRM because the dependent variable is usually not equally dispersed. To establish if the PRM or NBRM is appropriate for this study, the distribution of the count dependent variable is presented in Figure 1. This indicates the presence of over-dispersion in the data; hence, NBRM will be more appropriate to use in this study. A formal test of over-dispersion in the data confirming the appropriateness of the NBRM over PRM is provided in Table 3.

Figure 1: Distribution of Number of Children Born



Another noticeable feature about the distribution of number of children presented in Figure 1 is that there are many zeros in the count dependent variable. As with other scenarios of zero-inflated count data (e.g., fish catch, number of publications by scientists), Poston and McKibben (2003) argue that the preponderance of zeros in fertility data may apply to people of childbearing ages of 15-49 who might have tried to produce children but were not successful or others who have not tried or those who have voluntarily opted against having children. To address this issue in this paper, the zero-inflated negative binomial is used in addition to the NBRM. Long and Freese (2001, p.250) have indicated that Zero-inflated models respond to the problem of excess zeros "by changing the mean structure to allow zeros to be generated by two distinct processes" (Long and Freese, 2001, p. 250). The first process which generates individuals in the Always-0 Group (Group A) which has an outcome of 0 with a probability of 1, and the second which generates individuals in the Not Always-0 Group (Group ~A) which might have a zero count, but there is a nonzero probability that the count is positive (Long and Freese, 2001). Following the recommendations of Long and Freese (2001) and the application of these recommendations in a fertility paper by Poston and McKibben (2003), the estimation of zero-inflated regression models involves three steps: 1) predicting membership in the two latent groups, Group A and Group ~A; 2) estimating the number of counts for persons in Group ~A; and 3) computing "the observed probabilities as a mixture of the probabilities for the two groups" (Long and Freese, 2001, p. 251). For further details on zero-inflated models, refer to Long and Freese (2001. p. 251-252) and Cameron and Trivedi (1998, p. 125-127, 211-215).

Data and Definition of Variables

The source of data for this study is the World Bank's survey on Skills toward Employment and Productivity (STEP) for Ghana. The survey data were collected from urban areas in all the regions of Ghana focusing on the working age population. Following a two-stage sampling process, households were randomly selected in the first stage, after which individuals in the households were selected in the second stage using simple random technique. For the purpose of this study, the variables listed in Table 1 were selected from the survey.

The main variables of interests, personality traits, were measured based on the Big-Five factor model using a four-point scale (where 1 is almost never, 2 is some of the time, 3 is most of the time and 4 is almost always). Sample questions for each trait are: Are you outgoing and sociable, for example, do you make friends very easily? (*extraversion*); When doing a task, are you very careful? (*conscientiousness*); Are you very interested in learning new things? (*openness*); Are you relaxed during stressful situations? (*stability*); and Do you forgive other people easily? (*agreeableness*). The questions relating to each of the personality traits were then aggregated and converted into a composite index after reverse scoring the appropriate responses.

In addition to the personality trait variables, age, education, spouse and labour market status were selected as control variables. The definition and measurement of all the variables used in the analysis are provided in Table 1 together with their summary statistics. Table 2 also shows the correlation matrix for the variables, indicating that some of the personality traits significantly correlate but not highly.

Table 1: Variables Definitions, Measurement and Summary Statistics

Variable	Definition	Measurement	Mean (Std. Dev)
Dependent variable			
Childbearing	Number of Children born	Count of children ever born	2.173 (1.225)
Control variables			
Age	How old respondent is in completed years	Age in completed years	32.419 (11.59)
Education	Educational status	1 if educated, 0 otherwise	0.989 (0.102)
Spouse	Marital status	Value is 1 if respondent has spouse, 0 otherwise	0.420 (0.494)
Labour market status	Labour market status of respondent (whether employed, unemployed or inactive)	1 if respondent is employed, 0 otherwise	0.726 (0.446)
		1 if respondent is unemployed, 0 otherwise	0.065 (0.247)
		1 if respondent is inactive, 0 otherwise	0.209 (0.407)
Independent variables			
Extraversion	How does respondent see himself or herself (talkative; prefer to keep quiet or keep opinion; outgoing, sociable and makes friends).	Average responses to the questions after reverse coding (responses range from 1 “almost never to 4 “almost always”)	2.529 (0.605)

Conscientiousness	How does respondent see himself or herself (careful when doing task; prefers relaxation more than hard work; works well and quickly).	Average responses to the questions after reverse coding (responses range from 1 "almost never to 4 "almost always")	3.232 (0.569)
Openness	How does respondent see himself or herself (comes up with ideas other people haven't thought of before; interested in learning new things; enjoy beautiful things, like nature, art and music).	Average responses to the questions after reverse coding (responses range from 1 "almost never to 4 "almost always")	3.079 (0.588)
Stability	How does respondent see himself or herself (relaxed during stressful situations; tends to worry; gets nervous easily).	Average responses to the questions after reverse coding (responses range from 1 "almost never to 4 "almost always")	2.727 (0.567)
Agreeableness	How does respondent see himself or herself (forgives other people easily; very polite to other people; prefer to keep quiet or keep opinion; outgoing, sociable a generous to other people with your time or money).	Average responses to the questions after reverse coding (responses range from 1 "almost never to 4 "almost always")	3.045 (0.648)
Sample size			1,704

Table 2: Kendall Tau-b correlation

	1	2	3	4	5	6	7	8	9	10
1. Number of Children	1									
2. Age	0.387*	1								
3. Education	-0.040	-0.035	1							
4. Has spouse	0.592*	0.422*	-0.063	1						
5. Labour Market status	-0.22*	-0.350*	0.015	-0.269*	1					
6. Extraversion	-0.025	-0.032	0.022	-0.036	0.013	1				
7. Conscientiousness	-0.022	0.028	0.029	0.018	-0.046	0.036	1			
8. Openness	-0.111*	-0.061*	0.024	-0.070*	0.028	0.089*	0.242*	1		
9. Stability	0.007	0.063*	0.007	0.045	-0.032	0.003	0.072*	0.027	1	
10. Agreeableness	-0.036	-0.010	0.019	-0.036	0.053	0.094*	0.229*	0.249*	0.029	1

As shown in Table 1, the average scores for the Big-five personality traits range from 2.552 for extraversion to 3.211 for conscientiousness. The average scores for openness, stability and agreeableness are 3.094, 2.692 and 3.036 respectively. Significant but low correlations are observed between some of these variables, thereby posing no multicollinearity problem.

Results

Since the bivariate analysis showed that some of the personality traits significantly correlate with number of children (e.g., openness), we proceeded to conduct a multivariate analysis to provide more accurate estimates of the associations. In this wise, number of children was regressed on the personality traits (extraversion, conscientiousness, openness, stability and agreeableness) with age, education, spouse and labour market status as control variables. Three regression models using the full sample, male sample and female sample were estimated using two alternative models, negative binomial model and zero-inflated negative binomial. The sub-sample analyses for male and female are done to reveal gender differences in the associations between personality traits and childbearing. Table 3 displays the results of the negative binomial and zero-inflated negative binomial regressions, each presented according to the three models.

Table 3: Negative Binomial and Zero Inflated Negative Binomial regression output

Variable **Full sample** **Male** **Female**	**Negative Binomial**			**Zero Inflated Negative Binomial**		
	Full sample	Male	Female			
Controls						
Age	0.432***	0.324	0.397***	0.316***	0.217*	0.220***
	(0.093)	(0.224)	(0.092)	(0.071)	(0.116)	(0.082)
Education (1 if educated, 0 otherwise)	-1.069***	-1.754**	-0.735***	-0.408**	-0.259	-0.265
	(0.266)	(0.856)	(0.224)	(0.166)	(0.213)	(0.226)
Spouse (1 if has spouse, 0 otherwise)	1.725***	2.739***	1.217***	0.756***	1.164***	0.630***
	(0.097)	(0.234)	(0.098)	(0.088)	(0.183)	(0.095)
Labour market status (base-employed)						
Unemployed	-0.567***	-0.665*	-0.560***	-0.438***	-0.423	-0.478***
	(0.152)	(0.387)	(0.166)	(0.140)	(0.351)	(0.158)
Inactive	-0.373***	-0.900*	-0.371***	-0.144	0.126	-0.174*
	(0.108)	(0.515)	(0.100)	(0.097)	(0.783)	(0.090)
Personality traits						
Extraversion	0.045	0.015	0.075	0.062	-0.041	0.023
	(0.053)	(0.099)	(0.059)	(0.047)	(0.077)	(0.055)
Conscientiousness	-0.205***	-0.293***	-0.087	-0.072	-0.104	0.008
	(0.055)	(0.100)	(0.061)	(0.048)	(0.080)	(0.059)
Openness	-0.315***	-0.217**	-0.323***	-0.178***	-0.148*	-0.190***
	(0.051)	(0.096)	(0.058)	(0.048)	(0.085)	(0.056)
Stability	-0.079	0.047	-0.060	-0.053	-0.028	-0.047
	(0.055)	(0.102)	(0.062)	(0.049)	(0.080)	(0.059)
Agreeableness	0.094*	0.213**	0.007	0.050	0.154**	-0.020
	(0.050)	(0.086)	(0.059)	(0.046)	(0.066)	(0.057)
Test for Over-dispersion						
Chi-squared	55.68	69.58	40.87			
P-value	(0.000)	(0.000)	(0.000)			
Sample size	1,704	887	817	1,704	887	817

Notes: Standard errors in parentheses;
* p<0.10, ** p<0.05 *** p<0.01"

From the results in Table 3, it is noticeable that all the control variables are statistically significant, meaning that we can go ahead to interpret their coefficients. However, before proceeding to interpret the individual coefficients, it is worth noting that the significance of the variables was largely consistent across the two regression models, especially for the full sample. For the male and female sub-samples, the significant variables also bear consistent signs between the two models.

As would be expected, age has a positive association with number of children. This means that as individuals grow, the chance of having more children also increases. Education has a negative coefficient; implying that being educated is associated with a lower probability of having more children. This is consistent with the prediction from the literature which indicates that education can cause a delay in childbearing and for that matter number of children given birth to. The coefficient of spouse is positive, indicating that individuals who have spouses are positively associated with higher number of children compared to those who do not have spouses. This goes to underscore the role of spousal relationship in childbearing. Finally, the coefficients of labour market status variables are negative, showing that individuals who are unemployed or inactive in the labour market are negatively associated with higher number of children when compared to individuals who are employed.

From the coefficients of the personality traits, the results indicate that three of the personality traits variables (i.e., conscientiousness, openness and agreeableness) are significantly associated with the number of children with some notable gender differences. Of the three, the most consistent variable in all the models is openness to experience which demonstrates a negative association with number of children, signifying that people who are more open are less likely to have more children. Conscientiousness and agreeableness which have significant negative and positive associations with number of children respectively are only significant for the full sample and male sample but not the female sample.

Discussion

The Big Five factor model of personality traits, comprising extraversion, conscientiousness, openness, stability and agreeableness, has received wider application in social sciences due to its comprehensive nature and robustness across cultures and samples. In previous research, and for the purpose of this study, it has been linked to a variety of reproductive success or fitness measures including number of children born and found to have some associations in the western world. However, we notice that the model is yet to be applied to determine its association with number of children born in an African country context, which presented a research gap that we sought to fill. Thus, the coefficients of the personality traits presented in Table 3 contribute to filling this gap and adding to the

emerging empirical evidence on personality-childbearing relationships.

The results reveal that three of the Big Five personality traits are associated with the number of children. These traits are conscientiousness, openness and agreeableness. The coefficients of these variables are largely consistent with a priori expectations but demonstrate some agreement and departure with prior empirical literature. For example, whereas most literature shows that extraversion is the most consistent trait with positive association to number of children (Dijkstra and Barelds, 2009; Joekela et al., 2011), this study did not find the positive association between extraversion and number of children to be significant, which is nonetheless consistent with Eaves et al (1990) who found that neither extraversion nor neuroticism had significant linear or quadratic association with the number of biological children born to Australian female twins. Nettle (2005) also reported no associations between having children and extraversion. On the contrary, agreeableness which has appeared in some studies to be insignificant (e.g., Allen, 2019) turned out to have a positive association with the number of children, and this is in agreement with the findings of Međedovića et al. (2018) and Joekela et al. (2011).

As the most consistent personality traits with a significant association with number of children in all the models, openness to experience has a significant negative association with the probability of having a higher number of children. This means that people who are high in openness to experience are less likely to have more children. This finding is in line with previous studies (e.g., Berg et al., 2014; Jokela et al., 2011) which found that openness to experience is correlated negatively with number of children. From the literature, we know that people high in openness demonstrate intellectual curiosity, enjoy variety and are inclined to be more creative or open-minded, and less traditional (Avison and Furnham, 2015). Such people are likely to be associated with a lower probability of having more children because they are most likely to postpone or forgo marriage in pursuit of experience or intellectuality. Other scholars have argued that people who are high in openness tend to reject traditional social norms (Lundberg, 2012; Lee et al., 2010; Van Hiel and Mervielde, 2004; McCrae, 1996) and, as a consequence, delay procreation or limit the number of children or childbirth altogether as an expression of their acceptance of non-traditional life styles (Tavares, 2008; Jokela, 2012). The gender-based results show that this trait is significant for both females and males.

In conformity with previous studies (e.g., Berg et al., 2013; Jokela et al., 2011; Skirbekk and Blekesaune, 2014), the results showed that conscientiousness is negatively associated with number of children and this is particularly so for the male sample only. From the literature, it has been suggested that given the attributes of conscientiousness as individuals who are organized, diligent, cautious, dependable, goal-oriented, achievement-seeking, perseverant and disciplined (Digman, 1990; Barrick and Mount, 1991), conscientiousness can either have positive or negative association with number of

children depending on the underlying goals set for achievement (i.e., family vs. career). Where goal-achievement is set in terms of career, conscientiousness may lead career-oriented people, especially women, to delay childbearing or remain without children, while the tendency to plan and act cautiously may lead to effective use of contraception, lower likelihood of unplanned pregnancy and fewer children. What is a bit surprising about this finding is that conscientiousness is not significant in the female sample. However, this may be explained by the fact that in the Ghanaian society, the social pressure to give birth is always on more females than males; therefore, no matter how conscientious females are, they may still yield to societal pressures, notwithstanding their ability to plan and act cautiously.

Conclusion

In this study, the associations between the five dimensions of personality traits defined by the Five factor model (i.e. extraversion, conscientiousness, stability, openness to experience and agreeableness) and number of children have been assessed using the negative binomial and zero-inflated negative binomial models which are appropriate regression estimates when the dependent variable is measured as a count data with variance of the distribution exceeding the mean (i.e. over-dispersion) and excess zeros. After controlling for age, education, spouse and labour market status, the estimates from these models showed that three of the personality traits, namely conscientiousness, openness to experience and agreeableness, have significant associations with number of children. The estimates were presented according to gender, comparing differences in the correlates with regard to number of children by males and females. This evidence showed that whereas openness to experience is negatively associated with number of children in both males and females, conscientiousness and agreeableness were negatively and positively associated with number of children but only in the male sample.

With these findings, this study concludes that some of the personality traits of the five-factor model are associated with number of children in the Ghanaian context, thus adding to the empirical evidence from the western world on this subject. As a single-country cross sectional study, this study has some inherent limitations that create opportunities for further research. First, it does not allow us to infer causality between personality traits and number of children given the nature of the data, although the established associations are still very useful knowledge. Second, it limits the ecological generalizability of the findings, notwithstanding the fact that it adds the perspective of an African country to the rather skewed evidence from the western world. As longitudinal data become available for many African countries, it will be useful for future studies to re-examine these associations to provide fresh causal evidence.

Declarations

Conflict of interest- The authors declare no potential conflicts of interest with respect to the research, authorship or publication of this article.

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