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Regional Variation in Personality is Associated with Regional Variation in the Level and Shape of the Fertility Schedule across the United States

Daniel A. Briley[1,2], Joseph E. Potter[2,3], Peter J. Rentfrow[4], Samuel D. Gosling[1], Jeff Potter[5], and Elliot M. Tucker-Drob[1,2]

[1]Department of Psychology, University of Texas at Austin

[2]Population Research Center, University of Texas at Austin

[3]Department of Sociology, University of Texas at Austin

[4]Department of Psychology, University of Cambridge

[5]Atof Inc., Cambridge, MA.

Address correspondence to: Daniel A. Briley, Department of Psychology, University of Texas at Austin, 108 E. Dean Keeton Stop A8000, Austin, TX 78712-1043. Email: daniel.briley@utexas.edu. Phone: 512-471-1406

Abstract

Levels of fertility, as assessed by the period total fertility rate, vary substantially across regions in the United States. The shape of the age-specific fertility schedule also varies substantially with some states having peak fertility relatively early and others relatively late. Researchers from sociology and economics have been most concerned with these trends, positing that structural institutions or economic situations explain this heterogeneity. Personality psychology, however, has the potential to add substantial clarity to regional differences in fertility. Individuals differ in contextually and developmentally stable patterns of thoughts, feelings, and behaviors, and these personality differences are associated with individual-level fertility behavior. We evaluated whether variation between the personality traits of extraversion, agreeableness, conscientiousness, neuroticism, and openness to experience measured at the U.S. state-level were associated with the level, timing, and context of fertility across U.S. states. We found several associations between personality and fertility. Generally, states with higher levels of agreeableness and conscientiousness had more conventional patterns of fertility, and states with higher levels of neuroticism and openness had more non-conventional patterns of fertility. These associations were robust to controls for sociodemographics, voting behavior, and religiosity, each of which are known correlates of fertility. Personality represents an overlooked predictor that can be leveraged to explain the existence and persistence of fertility differentials.

Regional Variation in Personality is Associated with Regional Variation in the Level and Shape of the Fertility Schedule across the United States

Understanding regional variation in rates of fertility has long been a key question of demography. One prominent theoretical prediction was that regional differences would eventually fade away as demographic processes converge to a stable level (e.g., van de Kaa, 1987; Watkins, 1990; Westoff & Jones, 1979). However, this prediction largely failed to materialize (Billari & Kohler, 2004; Bishop 2009; Johnson-Hanks, Bachrach, Morgan, Kohler, 2011). For example, in the United States substantial variation remains across states from regions with very low and late fertility (e.g., Massachusetts) to areas with relatively high and early fertility (e.g., Utah). To account for persistent regional differences in fertility, explanations have largely centered on regional differences in political, economic, or religious characteristics (Lesthaeghe & Neidert, 2006; 2009). However, these explanations are limited to the extent that the individuals that generate the fertility schedule differ across regions.

Several converging lines of evidence indicate that personality (i.e., consistent patterns of behavior that vary across individuals) may be a complementary explanatory variable to political, religious, or economic influences. First, personality is a more enduring feature of an individual's psychology than values (Conley, 1984). Second, individual differences are measurable very early in development (Measelle et al., 2005), and these initial differences are highly predictive of adult personality (Caspi et al., 2003). Third, personality is predictive of known correlates of regional differences in fertility, such as political (Jost, Glaser, Kruglanski, & Sulloway, 2003) and religious (Saroglou, 2002) values. Fourth, time-ordered relations have been found between personality and the formation of political preferences (Sibley & Duckitt, 2010) and religious beliefs (Wink, Ciciolla, Dillon, & Tracy, 2007). Finally, personality is predictive of fertility

outcomes at the individual-level (e.g., Berg, Rotkirch, Väisänen, & Jokela, 2013; Hutteman, Bleidorn, Penke, & Denissen, 2013; Jokela, 2012; Jokela, Alvergne, Pollet, & Lummaa, 2011; Miller, 1992).

These pieces of information point to personality as an enduring individual differences variable that may play a role in persistent state-level variation in fertility, above and beyond the influence of political affiliation, religiosity, or economic constraints. Yet, regional differences in personality have not been explored as potential influences on fertility schedules. In the sections that follow, we provide an overview of a major demographic explanation for regional differences in fertility, a general overview of personality theory, a socioecological extension that postulates that regional concentrations of personality influence behavior, and finally, an empirical demonstration of the hypothesis that personality is associated with the level, timing, and context (i.e., patterns of marriage, divorce, cohabitation, and abortion) of fertility across the United States.

Demographic Transition Theory

The basic demographic processes of birth and death have dramatically changed in nearly every society around the world over the past two centuries. A little more than a hundred years ago, the prevailing demographic regime entailed high mortality and high fertility, meaning the average woman would give birth to several children in her lifetime (Coale & Watkins, 1986). The tremendous and rapid fall in both mortality and fertility currently observed in developed countries is termed the demographic transition (Notestein, 1945). Whereas most pre-transitional women would give birth to four or more children, the 2010 United States total fertility rate (i.e., the average number of times a woman would give birth if she experienced the age-specific fertility rates that prevail in the period) was only 1.9 (Martin et al., 2012). Explanations for the

demographic transition are extremely varied with some models working for specific countries or transitions but not for others (Kirk, 1996). The major theoretical explanations primarily center on changing aspects of social structure. For example, economic explanations emphasize the increasing cost of children or the increasing loss of opportunity cost to childbearing for women as the labor force becomes less gendered (Becker, 1981; Easterlin & Crimmins, 1985). Under this perspective, economic development is seen as the primary driver of fertility declines. Alternatively, sociological explanations argue that changing cultural values in regards to family, fertility, and work may act as better explanatory variables than material circumstances (Lesthaeghe, 1983). However, these two viewpoints are not necessarily contradictory. Ideas about desired family size or effective contraceptive methods may diffuse through society through means brought about by economic or scientific development, such as the widespread changes in public opinion following the discovery of hormonal birth control (Cleland & Wilson, 1987; Bongaarts & Watkins, 1996; Potter, Schmertmann, & Cavenaghi, 2002).

Lesthaeghe (2010) argued that life-course events, such as childbearing, were strongly ordered by pillars of social control following the first demographic transition. These pillars sent strong messages about the proper ordering of the life-course primarily through the institution of marriage (DeLamater, 1981). Thus, the nuclear family model was seen as an essential method to integrate into society at large and maintain cohesion of the group. During what is commonly referred to as the "sexual revolution" of the 1960's in the United States, the institution of marriage increasingly became less central to an individual's parenting decisions. Since that time, the United States has seen dramatic changes in the context of fertility decision making with increases in the age at first birth, the age at first marriage, cohabitation rates, and the percentage of total fertility that is attributable to non-marital fertility (Cherlin, 2010; Goodwin, McGill, &

Chandra, 2009; Mathews & Hamilton, 2009; Ventura, 2009). Life-course events have become less structured with increasing acceptance of cohabitation, childbearing outside the context of marriage, and childlessness. To account for the changing fertility landscape, a second demographic transition was identified by diverging demographic regimes concerning family formation, fertility goals, and secular changes in values (Lesthaeghe, 2010; Lesthaeghe & van de Kaa, 1986; van de Kaa, 1987). Following the second demographic transition, children were no longer seen as a normative life-course objective, but were instead seen as an optional choice if it aligned with one's desires. Social values tended toward tolerance, and individuals increasingly expressed deviant fertility related behaviors. Empirical support for this model has been found for fertility associations with country-level variation in conformity values (Lesthaeghe & Neels, 2002; Surkyn & Lesthaeghe, 2004) and variation in political and family values across the United States (Lesthaeghe & Neidert, 2006; 2009).

The theoretical framework for the second demographic transition, similar to the framework for the first demographic transition, rests entirely upon structural level changes in social pressures. What is unique about second demographic transition theory is that it allows the individual's unique preferences, desires, and fertility goals to be expressed. Discussing the differences in causes between the first and second transition, Lesthaeghe (2010) notes:

> All elements typical of conformity (obedience, order and neatness, thrift and hard work, traditional gender roles, religious faith) and those linked to social orientations (loyalty, solidarity, consideration for others) have gradually given way to expressive traits that stress personality (being interested in how and why, capability of thinking for oneself, self-presentation, independence, and autonomy). (p. 219)

Prior to the second demographic transition, social influences on having many children (pre-transitional) or having two or three children (first transition) strongly limited individual differences in fertility motivation or expression. However, in the post-second demographic transition world, it is possible that stable patterns of thoughts, feelings, and actions may be associated with ultimate fertility.

Personality Theory

Personality traits reflect comparative individual differences in cognition, emotion, and behavior that are relatively stable across time and context (John, Naumann, & Soto, 2008). The field of personality psychology has reached a consensus that the Big Five traits of extraversion, agreeableness, conscientiousness, neuroticism, and openness to experience provide a relatively comprehensive account of individual differences in personality traits (Digman, 1990). Extraversion refers to a tendency to be outgoing and socially dominant rather than timid. Agreeableness refers to the tendency to be warm and trusting of others rather than confrontational. Conscientiousness refers to the tendency to be organized and disciplined rather than accidental. Neuroticism refers to the tendency to be anxious and self-conscious rather than emotionally stable. Openness to experience refers to the tendency to be creative and intellectual rather than conventional.

Personality traits are thought to influence behavior both through biological differences between individuals that calibrate basic tendencies of behavior in response to the environment (McCrae & Costa, 2008) and through learned skills, habits, and preferences (Roberts, Wood, & Caspi, 2008). Personality traits are heritable (Bouchard & Loehlin, 2001), but these genetic influences depend on environmental context (Krueger, South, Johnson, & Iacono, 2008). Individual differences in personality are associated with an emerging map of neurological

substrates (DeYoung et al., 2010), but personality can change in response to life experiences (Jackson, Thoemmes, Jonkmann, Lüdtke, & Trautwein, 2012). In a cohort, mean-levels of personality change over time to reflect greater maturity (Roberts, Walton, & Viechtbauer, 2006). That is to say, people generally become more extraverted, agreeable, and conscientious and less neurotic with age. Roberts and colleagues (2007) provided the most persuasive and comprehensive evidence of the importance of personality. They conducted a meta-analysis of longitudinal studies of important life outcomes (i.e., mortality, divorce, and occupational success) that included indicators of personality, cognitive ability, and socioeconomic status. The unique prospective predictive power of personality tended to outweigh the influence of cognitive ability and socioeconomic status for each of the outcomes.

Importantly, sociological or economic explanations of behavior are not incompatible with personality explanations of behavior. A wealth of evidence indicates that person-effects and situation-effects are orthogonal and can both occur simultaneously (see Funder, 2001 for a comprehensive review). Although everyone is quieter in a library than in a bar, the loudest person in the bar is also likely to be the loudest person in the library. These two frames of reference, an environment-centered focus on institutional influences and a person-centered focus on individual differences, can act as complementary explanations of behavior.

The Socioecological Perspective

The socioecological perspective highlights the impact of the ecological environment on psychological development (Oishi & Graham, 2010). Applied to personality, there are a number of pathways for an individual's environment to alter or reinforce trait levels. For example, the prevalence of social norms, cultural influences, or environmental resources may accentuate or constrain personality expression. Alternatively, concentrations of certain personality profiles

may lead to the creation of social norms, cultural influences, or environmental resources. It is likely that these and other pathways of influence interact reciprocally through time. If ecological resources are differentially distributed geographically, then it could lead to persistent regional variation in personality. Rentfrow, Gosling, and Potter (2008) documented this pattern for the United States. They found considerable differences in state-level personality, and these differences were associated with state-level indicators, such as crime rates and health outcomes. Using a similar approach, Rentfrow, Jost, Gosling, and Potter (2009) found that state-level personality predicted presidential voting patterns. Obschonka, Schmitt-Rodermund, Silbereisen, Gosling, and Potter (2013) extended this approach to Germany and the United Kingdom and found that regional personality was associated with entrepreneurial activity. Rentfrow and colleagues (2013) demonstrated that regional clusters of personality within the United States were associated with political, religious, economic, sociological, and health outcomes. Finally, Bleidorn and colleagues (2013) examined personality maturation in 62 nations and found that personality maturity was associated with cross-cultural differences in the timing of adult social roles. These studies provide robust and provocative evidence for dynamic interactions between people as creators of their environment and environments as shapers of individual differences.

Personality as a Predictor of Fertility

Consistent with Lesthaeghe's (2010) claim that the second demographic transition facilitated personality influences on fertility behavior, several studies in modern societies have found that personality traits are associated with individual-level fertility. The most direct evidence for this effect comes from a study by Jokela (2012) that tracked the changing association between fertility and personality across successive birth cohorts in two large United States samples. He found that personality was a stronger predictor of the likelihood of having a

child for the cohort born in the 1960s than the 1920 cohort, and the personality effect size increased relatively monotonically across cohorts, particularly for the trait openness to experience. That is, it seemed individuals had greater freedom to pursue their own fertility interests following the second demographic transition than previously. Specifically, those high in openness were less likely to have children compared to their less open peers, but much more strongly for recent cohorts. A similar cohort trend has been found in Norway for men (Skirbekk & Blekesaune, 2013).

More generally, variation in personality has been associated with the level and timing of childbearing in a single, recent cohort (Jokela et al., 2011). Personality has been found to predict proximate determinants of fertility, such as motivation, expectations, and intentions (Hutteman et al., 2013). Additionally, Berg et al. (2013) found that personality predicted the likelihood of having a planned compared to a non-planned pregnancy. Women with high levels of agreeableness and low levels of openness to experience were more likely to have a planned pregnancy. Women with high extraversion and neuroticism and low conscientiousness were more likely to have a non-planned pregnancy. Finally, personality appears to interact with sociological or economic explanations of fertility differentials in that neuroticism and openness modulate the trade-off between high educational investment in a few offspring and low educational investment in many offspring (Jokela, Alvergne, Rotkirch, Rickard, & Lummaa, 2013).

These results, that personality predicts differences in childbearing, are consistent with the idea put forward by Lesthaeghe (2010) that individuals are increasingly pursuing their preferences and desires for fertility, at least in part, independent of social controls. Some evidence is less supportive of Lesthaeghe's (2010) framework for the timing and effect of the

second demographic transition. For example, personality has been found to be associated with fertility outcomes in pre-industrial, pre-transitional societies (Alvergne, Jokela, & Lummaa, 2010; Courtiol, Pettay, Jokela, Rotkirch, & Lummaa, 2012; Gurven, Rueden, Stieglitz, Kaplan, & Rodriguez, 2013). Further, social hierarchy and fertility outcomes have been found to be structured on the basis of individual differences in personality in natural observations of non-human animal populations (Aplin et al., 2013; Cote, Dreiss, & Clobert, 2008; Réale, Martin, Coltman, Poissant, & Festa-Bianchet, 2009; Seyfarth, Silk, & Cheney, 2012). Individual differences in general patterns of behavior apparently exert a ubiquitous influence on the manner in which social organisms manage the trajectory of life-course events and construct interpersonal relationships. Thus, it may be the case that, in the absence of absolute social control over fertility, personality exerts some influence over the manner that individuals transition to parenthood. As social controls wane, however, the influence of individual choice may be accentuated or magnified if fertility innovators are selected on the basis of personality traits.

Personality and Social Context

Despite person-effects on fertility, social context also clearly plays a large role in fertility outcomes in terms of social institutions, family policy, and fertility norms. Integrating this foundation with the socioecological perspective, we hypothesize that personality plays a role in fertility differences by reciprocally influencing fertility practices and fertility social context at the state-level. For example, certain state-level differences in personality traits might be associated with pro- or anti-natalist policies, the general fertility-relevant social climate, or regional labor market concentrations. Based on economic and sociological explanations of fertility, these factors likely influence observed fertility. The socioecological perspective argues that personality plays a role in shaping environmental circumstances and that personality development is, in turn,

influenced by environmental context. Therefore, personality directly and indirectly influences the fertility behavior of individuals in a region.

The social context of marriage and mating markets (e.g., Becker, 1991; Choo & Siow, 2006; Oppenheimer, 1988) also influence the expression of fertility. As fertility is essentially a dyadic process, the availability of suitable partners can limit or facilitate childbearing. Typically, this is measured in terms of the availability of males or females with certain levels of educational or occupational attainment. Integrating this approach with the socioecological perspective, state-level personality effects may differ by gender. Regional levels of male and female personality may have differential associations with fertility because of gendered divisions of labor and childrearing (MacDonald, 2000), the fertility desires of available partners (Thomson, 2002), the socialization of gender roles (Bussey & Bandura, 1999), or roles regarding the use or effectiveness of birth control methods (Gordon, 2002). For example, female conscientiousness may be especially important for fertility timing through mechanisms associated with access to effective birth control (e.g., Berg et al., 2013). Differential gender-specific personality effects may result from the interaction between personality and the gendered social context with the personality concentration of males and females acting as one social context.

Similarly, the personality trait levels of the younger (age < 30) and somewhat older (age ≥ 30) population may have differing associations with fertility. The older population typically has greater control over policy and institutions, but the younger population is responsible for the majority of actual births (Martin et al., 2012). Regional concentrations of personality may have relatively direct effects on fertility behavior concerning the level and timing of fertility. In this case, it may be more likely that the personality of the younger population would predict fertility as this segment of the population produces the most children. On the other hand, social

institutions or policies designed to control fertility may be constructed, in part, due the personality context of the older population. In situations where social policies exert a large influence on fertility, it may be more likely that the personality of the older population would predict fertility as these individuals largely enact policy. Additionally, the majority of fertility occurs to similarly aged individuals, and the personality concentration of suitable partners may influence fertility behavior. If there are differences in personality concentration by age, then omnibus aggregates would obscure potential personality effects.

Subgroup trait levels may also have relative, rather than absolute, associations with fertility. For example, fertility might be maximized when levels of male and female personality are relatively equal in a region as compared to regions that have stark differences in personality between males and females. As another example, a larger amount of social control over fertility might occur when there are high levels of conscientiousness in the older population relative to the younger population due to a desire to create a structured life-course trajectory. These are, of course, speculations as there are no previous empirical examples of this type of personality process at the regional-level.

Goals of the Current Project

A number of studies have found that personality is predictive of fertility outcomes at the individual-level, but we are aware of no study that has taken a socioecological perspective. Based on this perspective, we hypothesize that regional variation in the level, timing, and context of fertility across the United States is associated with state-level variation in personality. Substantial variation in fertility exists across the United States. For example, the total fertility rate in Rhode Island was 1.6 in 2010, but in Utah it was 2.4, representing almost a full one-child difference between states (Martin et al., 2012). Similarly, the average age at first birth in

Massachusetts was 27.7 years in 2006, and it was only 22.6 years in Mississippi (Mathews & Hamilton, 2009). The average age at first marriage in 2010 was 30.3 years in Massachusetts and 25.6 years in Utah (U.S. Census Bureau, 2010). What accounts for these differences in the level, timing, and context of fertility? We would argue that current explanations based on economic or ideational forces are limited to the extent that individuals actively create their environment to be in line with their preferences, desires, and predispositions (Conger & Donnellan, 2007; Scarr & McCartney, 1983; Schofield et al., 2011). Further, it is likely that early personality is predictive of later important life outcomes relevant for fertility (e.g., Roberts et al., 2007), giving some temporal and potentially causal precedence to personality at the individual-level.[1] We attempt to find evidence of this process in the aggregate by constructing state-level estimates of personality and the level, timing, and context of fertility.

Method

Data

Regional estimates of personality. We obtained regional estimates of personality from a very large scale, online study (Gosling, Vazire, Srivastava, & John, 2004). Self-reports on the Big Five Inventory (John et al., 2008) were obtained from 890,253 individuals in the United States. The responses were classified based on reported state of residence. Numerous measures have been taken to ensure the validity, representativeness, and reliability of the data. These procedures are described in several publications (Rentfrow et al., 2008; 2009; 2013). Repeat participants were removed from the sample by detecting entries from the same IP address

[1] The ecological fallacy entails inferring that individual-level processes will hold at the group-level. This is a fallacy because the group- and individual-levels are independent. We do not intend to make this strong assertion, but rather, that the individual-level evidence provides some support for the hypothesis that state-level variation in fertility is associated with state-level variation in personality. We return to this important caveat in the discussion.

submitted within a 60 minute period. The sample size for each state correlates very strongly with the population of each state (r = .98). The sample is also racially diverse. Correlations between the proportion of participants within a given state that identify as African American, Asian, Latino, White, and Other and the enumerated proportion of each racial/ethnic group by the census are all above .74. Correlations based on social class (working class, lower-middle class, middle class, upper-middle class, and upper class) are lower, but still sizable (all r's greater than .40). As the state-level estimates are aggregated over thousands of individuals, they are highly stable due to the principal of aggregation (Rushton, Brainerd, & Pressley, 1983). In fact, test-retest correlations at the state-level have been found to be nearly as high as the reliability of the measures (all r's greater than .70). Most importantly, the external validity of the aggregated indicators has been demonstrated for a number of important regional outcomes (see Rentfrow et al., 2008; 2009; 2013).

We applied the Big Five Inventory scoring technique described by John et al. (2008). This scoring technique has the desirable property of reducing the influence of response sets, such as acquiescence (i.e., yea-saying) and extreme responding (i.e., preferential use of polar response options). Additionally, we controlled for the individual-level influence of age, age^2, gender, and an age-×-gender interaction so that our analyses would not be confounded by demographic differences of the sample. From this individual-level data, we calculated state-level aggregates for the Big Five. However, as noted earlier, we also predicted that the influence of personality might differ by age or gender. To test this idea, we calculated state-level estimates of personality (controlling for acquiescence and extreme responding) separately by gender (male and female) and by age categories (< 30 years old and ≥ 30 years old). To test whether the relative concentration of gender- or age-based personality was associated with fertility, we calculated the

difference between male personality and female personality and the difference between the younger population personality and the older population personality. Thus, we calculated a total of 7 (data conditions) × 5 (Big Five) estimates of personality for each state.

Fertility schedules. We obtained 5-year age-specific fertility rates and period total fertility rates for each of the 50 states for the year 2010 (Martin et al., 2012). We transformed the 5-year age-specific fertility rates into 1-year age-specific fertility rates using the method designed by Schmertmann (2012). This method uses historical consistencies in fertility schedules to estimate the most likely 1-year age-specific fertility rates. From this, we fit Schmertmann's (2003) calibrated spline model to the fertility schedules to provide parameters that are intuitively meaningful. This model uses very few parameters to construct a continuous fertility function. We are focusing on four aspects of the fertility schedule. First, the total fertility rate represents the average number of children that would be born to a woman if she experienced the age-specific fertility rates that prevailed in the year 2010 through her lifetime. This reflects the overall level of fertility in a given state. Second, initiation reflects the earliest age at which fertility begins. Third, peak fertility refers to the age at which fertility is highest. Fourth, stopping refers to the force of individuals controlling maximum fertility, presumably after a desired family size has been reached. Following Schmertmann's (2003) recommendation, stopping is calculated as the difference between the age at which fertility would linearly fall to half from peak fertility to age 50 and the actual age at which fertility reaches half of the peak. Larger stopping values indicate a steeper decline in fertility following the peak and presumably more control of fertility. The initiation, peak, and stopping parameters describe differences in the shape of the fertility schedule.

Context of fertility. We included several contextual factors identified by Lesthaeghe (2010) as being central to the second demographic transition in addition to the level and timing of fertility. This includes the percentage of cohabiting households, proportion of the population never married, proportion of marriages that ended in divorce in the last year (in reference to the total married population), age at first birth, age at first marriage, abortion rate (i.e., number of abortions per 1,000 women aged 15-44), family planning expenditures per woman in need of contraceptives, non-marital fertility rate, and percent unintended pregnancies (Finer & Kost, 2011; Jones & Kooistra, 2008; Lofquist, Lugaila, O'Connell, & Feliz, 2012; Mathews & Hamilton, 2009; Sonfield & Gold, 2012; U.S. Census Bureau, 2010). Most indicators were obtained for the year 2010 and are based on census estimates or on the American Community Survey (U.S. Census Bureau, 2010). A more complete description of the specific data and timeframe of the indicators can be found in Table 1.

Sociodemographic and value controls. We controlled for state differences in median household income, percent African American population, percent Hispanic population, percent female population, percent of population that has obtained a college degree, and the percent of the population that lives in an urban area based on estimates from the 2010 census. Based on previous evidence that regional variation in fertility is associated with values (e.g., Lesthaeghe & Neidert, 2006; 2009), we additionally controlled for the percent that voted for Obama in the 2008 election (Federal Election Commission, 2009) and the percent that report that religion is very important to them in the Gallup (2010) State of the States poll.

Analytical Approach

Table 1 reports the mean, standard deviation, range, and source for each variable included in the study. As the current set of analyses is primarily exploratory, we evaluated correlations

between state-level estimates of personality and fertility while holding known confounds (i.e., sociodemographics) and correlates (i.e., values) constant. To accomplish this, we computed standardized residuals for each personality and fertility variable based on a multiple regression that used all of the sociodemographic and value variables as predictors. These residual variables were used for all analyses besides Table 1. Following this procedure, we calculated the correlation between the aggregate personality variables and the fertility outcomes. This provides a general impression of whether individual differences in personality are associated with fertility. Importantly, our sample size is limited by the population of possible states to sample, and we include the entire population of states. With only 50 observations (because there are 50 states) on which to base the analysis, power is limited. Therefore, we focus our analysis on a descriptive account of the pattern of results instead of relying exclusively on null hypothesis significance testing. Because the state-level estimates are based on aggregates of thousands of individuals, the mean estimates are very precise and typically produce robust associations (see Rosnow, Rosenthal, & Rubin, 2000, p. 449-551).

To probe whether personality factors differentially matter for fertility based on gender, we used personality aggregates derived from males and females separately. We used multiple regression to predict each fertility outcome by the estimates of male and female personality. This procedure provides an index of whether male or female personality matters more or in a different direction than personality at the general level. We performed a similar approach with the two age ranges of personality, again, including both variables in a single regression. These estimates of personality tended to be correlated across gender (average r = .72) and less so across age categories (average r = .59). This potentially introduces the problem of multicollinearity which tends to inflate standard errors and can sometimes obfuscate interpretation of the regression

parameters (see Cohen, Cohen, West, & Aiken, 2003, p. 419-422). To complement the standard regression analysis, we also performed a commonality analysis (Mood, 1969; Nimon, Lewis, Kane, & Haynes, 2008; Rowell, 1996). Commonality analysis partitions variance accounted for (R^2) among predictor variables into that which is unique to that predictor and that which is shared in common with the other predictors. This is accomplished by comparing the amount of variance accounted for in the outcome variable by all possible regression subsets. For our analysis based on subgroups, this entailed a comparison of three separate models predicting fertility. For example, the commonality analysis for gendered personality entailed estimating variance explained by male personality, by female personality, and by the multiple regression of male and female personality. This approach allows the overlapping variance to be identified and partitioned. Rather than treating multicollinearity as a problem to be fixed, this approach takes multicollinearity into account and provides reasonable estimates of an independent variable's effect at multiple levels.

Although our gender and age estimates of personality were moderately strongly correlated with each other, they were very strongly correlated with the estimates of personality based on the full sample. The average correlation between male and female estimates of personality and the full sample estimate was .89. For estimates based on age categories, the average correlation was .87. Therefore, we interpret common effects on fertility shared across the gender or age variables to be primarily indicative of the general association found with the full sample estimates of personality. The unique predictive power of the gender or age category variables, then, represents potential personality associations with fertility that are obscured when the full data estimates of personality are used.

To test for whether the influence of subgroup personality is relative to the personality of another subgroup, we calculated difference scores. For gendered personality, we calculated the difference between male and female personality with higher scores indicating that males tend to score higher on average in the region. For aged personality, we calculated the difference between the younger (< 30 years) and somewhat older (≥ 30 years) personality levels with higher scores indicating that the younger population tends to score higher on average in the region. We used these difference scores to correlate with the fertility outcomes.

Finally, the omnibus, aggregate regional personality estimates were moderately intercorrelated (average absolute value r = .67). As a sensitivity analysis, we evaluated whether associations between personality traits and fertility were due to unique or common effects using commonality analysis. To accomplish this, we evaluated all possible regression subsets for the five predictor variables. This entailed univariate associations with fertility, every pairwise combination of personality traits, and all additional levels of combination including a multiple regression with all five traits simultaneously predicting the outcome.

Results

Zero-Order Correlations between Personality and Fertility

Table 2 reports the association between the fertility outcomes and personality at the general-level of analysis. There was only weak evidence that state-level extraversion was associated with fertility. States with higher concentrations of extraverted individuals tended to have later peak fertility and greater stopping behavior, consistent with a pattern of conscious control over family timing and size. Extraversion was also associated lower unintended pregnancies. Other modest, but non-significant associations were found with a higher total fertility rate and lower cohabitation, divorce, and family planning expenditures. General state-

level agreeableness was associated with higher total fertility, less cohabitation, and less divorce, consistent with highly agreeable states reflecting comparatively more conventional family formation practices. Other modest, but nonsignificant associations were found with younger ages at first birth and lower rates of abortion. Conscientiousness was associated with a higher total fertility rate, greater stopping behavior, and a lower rate of cohabitation, abortion, and unintended pregnancies, again, consistent with a pattern of more traditional family formation. Conscientiousness also displayed non-trivial associations with later peak fertility and younger ages at first birth and marriage. Neuroticism was associated with a lower total fertility rate, later age at first birth and marriage, and a greater abortion rate, consistent with a delayed and less structured life-course trajectory. Openness was associated with a lower total fertility rate, later age at first birth and marriage, and greater rates of cohabitation and divorce, consistent with highly open states following a more delayed and non-traditional fertility regime.

Gendered Personality and Fertility

Table 3 reports the results of a gender based analysis for extraversion, agreeableness, conscientiousness, neuroticism, and openness to experience. We discuss the results for each trait individually.

Extraversion. The general-level association with peak fertility was largely driven by common variance shared by male and female extraversion. On the other hand, the general-level association with stopping behavior was driven in part by common variance, but the unique effect of female extraversion accounted for a larger proportion of variance. For the general association with unintended pregnancy, this pattern was reversed. Roughly equivalent proportions of variance were accounted for by the unique effect of male extraversion and the common effect. Other minor associations were primarily driven by common variance, but there was some

evidence of a male effect for divorce. An additional suppression effect emerged in the prediction of the non-marital fertility rate. Higher male extraversion was associated with lower non-marital fertility, and higher female extraversion was associated with higher non-marital fertility. The negative commonality effect can be interpreted as the amount the unique effects are increased by including the suppressor variable (see Nimon, 2010, p. 14-15). Common suppressor effects occur when the individual predictors act in opposite directions, but together provide more unique information than simply in isolation. Significant predictive power is gained by included both male and female indicators of extraversion.

Agreeableness. The general-level associations with the total fertility rate and prevalence of cohabitation were primarily driven by common effects, but the association with divorce differed by gender. Male agreeableness was associated with higher rates of divorce, and female agreeableness was associated with lower rates of divorce. The majority of variance explained was due to unique effects, but neither regression parameter was significant due to inflated standard errors. Similar to extraversion, gender differences in effects emerged for non-marital fertility in response to a suppressor effect. Male agreeableness tended to be associated with lower non-marital fertility, and female agreeableness tended to be associated with higher non-marital fertility.

Conscientiousness. Total fertility rate, which displayed a general-level association, was primarily associated with common variance, but there were also small unique effects for both male and female conscientiousness. Interestingly, it appears that the majority of the general-level associations with the fertility context (i.e., cohabitation, abortion, and unintended pregnancy) were driven by sizable common effects with additional unique male effects. This contrasts with

near zero standardized regression coefficients and no unique effects for female conscientiousness.

Neuroticism. The general-level association with the total fertility rate was primarily driven by common effects with a sizeable unique female effect as well. General-level associations with age at first birth and marriage were primarily associated with common effects, but these outcomes were additionally associated with sizeable unique male effects. The general-level association with the abortion rate was primarily associated with male neuroticism with essentially no common effect. Three suppression effects were observed for stopping behavior, family planning expenditures, and unintended pregnancy. Higher male neuroticism was associated with less stopping behavior and more family planning expenditures and unintended pregnancies. Female neuroticism displayed the opposite pattern. Female neuroticism was also significantly predictive of later peak fertility.

Openness. The general-level associations with the total fertility rate and cohabitation rate were driven relatively equally by common effects and unique female openness effects. The general-level divorce association displayed the opposite pattern with a relatively equal distribution of common effects and male openness effects. General-level associations with age at first birth and marriage displayed suppression effects in which male openness was associated with younger ages, and female openness was associated with later ages. Both were primarily driven by unique female openness effects. Suppression effects also led to novel male driven associations with peak fertility and percent never married. In both cases, higher male openness was associated with lower levels of these variables.

Relative Gendered Personality. Table 4 reports the correlations between relative measures of gendered personality (i.e., male personality minus female personality) and fertility.

We found few associations. In states with greater concentration of males with high extraversion and agreeableness relative to females, the non-marital fertility rate tended to be lower. States with high male neuroticism relative to female neuroticism tended to have less stopping behavior, more family planning expenditures, and more unintended pregnancies. Finally, states with higher male openness relative to female openness tended to have earlier peak fertility, younger age a first birth and marriage, and a smaller never married population.

Aged Personality and Fertility

Table 5 reports the results of an age based analysis for extraversion, agreeableness, conscientiousness, neuroticism, and openness to experience. We discuss the results for each trait individually.

Extraversion. This analysis indicated that young extraversion (< 30 years) was primarily associated with fertility. The general-level associations with peak fertility, stopping behavior, and percent unintended pregnancy had similar signs for age < 30 years extraversion, and the effect was primarily driven by unique effects of this age category. For each outcome, some suppression was observed, but particularly so for unintended pregnancy. Additional, small suppression effects were observed for abortion rate, family planning expenditures, and non-marital fertility with younger extraversion predicting lower levels of these variables. On the whole, common effects were rather small, and unique effects (plus suppression) tended to explain the majority of the variance in fertility outcomes.

Agreeableness. Sizeable common effects were observed for total fertility rate, age at first birth, and percent cohabit. The remaining effects were primarily due to unique effects with small evidence of suppression. Levels of agreeableness in the age ≥ 30 population tended to predict more unique variance in the outcomes. Higher levels of age ≥ 30 agreeableness were associated

with a higher total fertility rate and lower age at first birth, age at first marriage, percent never married, abortion rate, non-marital fertility rate, and unintended pregnancy. The association between agreeableness and conventional patterns of fertility was primarily due to levels of age ≥ 30 agreeableness.

Conscientiousness. Age < 30 conscientiousness tended reflect the general-level associations to a stronger degree than the age ≥ 30 conscientiousness, which had few associations with fertility. Higher age < 30 conscientiousness was associated with conventional fertility practices such as a higher total fertility rate and lower age at first birth, percent cohabit, abortion rate, non-marital fertility rate, and unintended pregnancy. Age < 30 conscientiousness was also associated with later peak fertility and more stopping behavior. Age ≥ 30 conscientiousness predicted less stopping behavior and a smaller never married population. The majority of the effects were unique with only one modest suppression effect for stopping behavior. Common variance across aged conscientiousness explained variance in the total fertility rate and percent cohabitation.

Neuroticism. The general-level associations with total fertility, age at first birth and marriage, and abortion were primarily associated with age < 30 neuroticism. Age < 30 neuroticism also predicted less stopping behavior and higher levels of never married individuals, non-marital fertility, and unintended pregnancies. The effects for stopping behavior, non-marital fertility, and unintended pregnancy were driven by moderate suppression effects. Age ≥ 30 neuroticism tended to only predict fertility outcomes in the presence of a suppression effect. Sizable common effects were found for total fertility rate, age at first birth, and age at first marriage.

Openness. The general-level associations with total fertility, age at first birth and marriage, and cohabitation were primarily driven by common effects or unique effects of age ≥ 30 openness. Age ≥ 30 openness also predicted later peak fertility, greater never married population, more family planning expenditures, and high non-marital fertility in the context of suppression effects. Age < 30 openness predicted higher rates of divorce primarily due to a unique effect.

Relative Aged Personality. Table 6 reports the correlations between relative measures of aged personality (i.e., age < 30 personality minus age ≥ 30 personality) and fertility. Compared to the relative gender analysis, more significant correlations were found. In instances where the younger population had higher levels of extraversion than the older population, peak fertility occurred later, stopping behavior was larger, and there was less unintended pregnancy. For agreeableness, higher relative levels for the younger population were associated with increased never married population and age at first marriage and less divorce. Higher relative young conscientiousness was associated with greater stopping behavior and less unintended pregnancy. Higher relative young neuroticism was associated with earlier peak fertility, less stopping behavior, and greater family planning expenditures, non-marital fertility, and unintended pregnancy. The relative distribution of openness had associations with most of the fertility outcomes indicating that this construct, partially reflecting individual differences in the acceptance of non-traditional lifestyles, may be particularly sensitive to age structure. Higher relative young openness was associated with earlier peak fertility, younger age at first birth and marriage, less cohabitation, a smaller never married population, and lower family planning expenditures and non-marital fertility.

Sensitivity Analysis: Trait Covariation?

The primary analytical approach found two general patterns of association. Agreeableness and conscientiousness predicted more conventional fertility practices, and neuroticism and openness predicted more non-traditional fertility practices. As a sensitivity analysis, we tested whether these patterns were unique or common across the Big Five traits using multiple regression and commonality analysis. Table 7 reports the standardized parameter estimates from regressing the fertility outcomes on the Big Five simultaneously. As expected with multicollinearity, several relatively large parameter estimates ($\beta > .40$) do not meet traditional levels of statistical significance due to inflated standard errors. However, as we were primarily interested in whether different traits predicted unique variance in the outcomes, we do not interpret these coefficients strongly.

Table 8 reports the results of the commonality analysis in terms of unique variance accounted for by each Big Five trait (i.e., variance not shared with other traits) and common variance shared across all combinations of the Big Five (i.e., the sum of variance common to every combination of traits from pairwise combinations to variance common to all five traits). For total fertility rate and abortion rate, the majority of variance explained in the outcome by personality was due to common variance, with relatively small additional unique effects. However, the primary trend is for unique effects. For the initiation, peak, stopping, age at first birth, cohabitation, divorce, age at first marriage, and unintended pregnancy outcomes, the common effect only accounted for 16% of the total variance accounted for on average. For percent never married and non-marital fertility rate, an aggregate suppression effect was found for the common effect. This analysis indicates that the majority of the domain-specific personality results are not due to common variance shared with other traits. On the other hand, the results for total fertility rate seem to be driven by a general factor reflecting conventional

compared to non-traditional fertility practices. Across all outcomes, common effects tended to be driven by variance that was common to all five traits or to all traits except extraversion, rather than by other specific combinations (i.e., the common variance between conscientiousness and agreeableness).

Discussion

The current project tracks state-level associations between personality and the level, timing, and context of fertility. We find patterns of associations that are largely consistent with the framework described by the second demographic transition (Lesthaeghe, 2010). States marked with higher concentrations of agreeable and conscientious individuals tend to reflect more traditional and conventional fertility behaviors. These states tend to have higher levels of fertility with earlier major life-course events (i.e., first birth and marriage) and lower rates of new family types or controls on fertility (i.e., never married, cohabitation, and abortion). States marked with higher concentrations of neuroticism and openness tend to reflect the opposite pattern. These states tend to have lower, later, and more unusual fertility practices. The pattern of results for extraversion is less clear with some associations indicative of delay (e.g., positive correlation with peak fertility) and others indicative of traditional family formation (e.g., age < 30 negative association with abortion and non-marital fertility). For some outcomes (e.g., total fertility rate and abortion rate), variance that is common among the personality factors accounts for more variance in the outcome than the unique effects. More commonly, however, we find that the personality effects are largely independent. The results indicate that fertility regimes are associated with personality, above and beyond factors typically used in major theoretical explanations, such as political, religious, or economic characteristics. In fact, the association between personality and total fertility was surprisingly strong. Across the Big Five, the multiple *r*

between personality and the total fertility rate was .62 (see Table 8). This correlation translates to a Cohen's *d* of 1.60, a large effect size (Cohen, 1988). If the people that actively produce the fertility regime and the environmental circumstances found within states differ, then it is unlikely that demographic processes will converge to a common fertility schedule.

Our results indicate that these general patterns of association are differentially driven by gender or age effects. In fact, we found contrasting gender or age parameters for several outcomes that did not generally demonstrate an association with personality. This pattern indicates the importance of personality concentrations at different demographic levels. As fertility processes primarily entail the dynamics across these categories (i.e., typically males and females are necessary for pregnancy, and most of fertility occurs to members within similar age categories), this makes intuitive sense. Similar to marriage markets based on individual differences in earnings or education (e.g., Becker, 1991; Choo & Siow, 2006; Oppenheimer, 1988), marriage markets may be sensitive to the concentration of individual differences in personality (see Hutteman et al., 2013). Somewhat surprisingly, male personality tended to have more significant and larger effect sizes associated with the fertility context than female personality, particularly for conscientiousness. The analysis based on personality in reference to specific age categories indicated that the personality of the younger population was associated with fertility outcomes to a larger extent than the older population for extraversion, conscientiousness, and neuroticism. On the other hand, concentrations of conscientiousness and openness within the older population tended to have stronger associations with fertility.

Possible Mechanisms Linking State-Level Personality and Fertility

A number of pathways might cause regional clustering of personality and fertility, all of which probably play some role. Personality is partially heritable (Bouchard & Loehlin, 2001),

and therefore regional concentrations of personality might emerge from differential patterns of migration (i.e., founder effects) that persist across generations. Likely the most intuitive pathway for region-level personality to influence region-level fertility is through the accumulation of individual-level effects. For example, individual-level openness is associated with lower individual-level fertility (Jokela, 2012; Skirbekk & Blekesaune, 2013), a finding consistent with the present results representing the accumulation of individual-level effects. Highly open states might have lower fertility due to the aggregated behavior of the individuals. In turn, these regions may begin to place lower value on fertility or family formation, leading to fewer social norms, practices, or institutions designed to regulate fertility and more divergent family formation behaviors (i.e., cohabitation and later marriage). However, these individual-level studies also find that conscientiousness is associated with *lower* fertility, particularly for females. We find the opposite results at the region-level; conscientiousness tends to predict higher total fertility rates. Of course, there is no logical dependency between the individual- and regional-levels of analysis, and the ecological fallacy entails assuming that results at one level apply to the other.

An alternative, region-level explanation is that individual differences in personality exert some influence over the types of institutions or policies that are present within a region. States differ in terms of the social climate of fertility beliefs (Grammich, DaVanzo, & Stewart, 2004), abortion legislation (Harper, Henderson, & Darney, 2005; Upadhyay, Weitz, Jones, Barar, & Foster, 2013), and other predictors of fertility, such as religiosity and poverty (Glass & Levchak, *in press*; Santelli & Melnikas, 2010). Individuals tend to create these institutions and social contexts partially on the basis of individual differences in personality (Rentfrow et al., 2009; Scarr & McCartney, 1983). These societal institutions may exert top-down influences on the

ability of individuals to behaviorally express fertility outcomes that are in line with personal preferences.

Finally, fertility differentials may influence personality trait concentrations. Jokela, Kivimäki, Elovainio, and Keltikangas-Järvinen (2009) found that, in addition to baseline personality predicting fertility, the experience of parenthood actually resulted in changes in personality. Individuals within a region may show personality clustering because of their own fertility behavior or due to region-level fertility outcomes. The social context of having a child or of living in a region that emphasizes or minimizes childbearing may change trait levels, and therefore create a link between fertility and regional personality. Each of the mechanisms above likely operates simultaneously and dynamically with the other mechanisms to create a two-way dependency between regional personality and fertility.

Implications for Demographic Theory

A major goal of demographic theory is to characterize persistent regional differences in fertility and the determinants of these trends. Based on the current results, integrating regional personality can aid in this goal. Regions that contain higher concentrations of agreeable and conscientious individuals tend to have more conventional patterns of fertility (i.e., high total fertility, less cohabitation, divorce, abortion, and unintended pregnancy), and regions that contain higher concentrations of neurotic and open individuals tend to have more nonconventional patterns of fertility (i.e., lower total fertility, later age at first birth and marriage, more cohabitation, divorce, and abortion). For most outcomes, these associations appear to be largely unique to the specific traits. We also found that subgroup personality of regions is systematically linked with fertility. In states with higher male openness relative to female openness, peak fertility occurs earlier, average age at first birth and marriage occur at younger ages, and there is

a smaller never married population. These associations indicate that a greater prevalence of male openness compared to female openness predicts more conventional patterns of fertility. We found a largely similar pattern when evaluating age-based openness at the state-level. In states with higher openness among the younger population (age < 30 years) compared to the older population (age ≥ 30 years), peak fertility occurs earlier, average age at first birth and marriage occur at younger ages, and there is lower cohabitation, never married individuals, family planning expenditures, and non-marital fertility. Interestingly, these associations indicative of conventional patterns of fertility are essentially the opposite of those observed at the general-level. Personality may be differentially expressed by subgroups for a number of reasons including differences in patterns of migration, social norms for gender or age-based roles, normative trends in personality development, and institutional control over personality expression.

The current results are consistent with at least two broad demographic perspectives. Second demographic transition theory (Lesthaeghe, 2010; Lesthaeghe & van de Kaa, 1986; van de Kaa, 1987) argues that the decline of pillars of social control facilitated the expression of individual fertility preferences. Whereas personality effects on fertility would have previously been minimized due to strong social norms for marriage and "properly timed" childbearing, the second demographic transition marks an increasing emphasis on values of individuality and self-actualization. In such a tolerant social climate, individuals are free to pursue or avoid fertility in ways that align with personal preferences, desires, or motivations. Inherent in the notion of a second demographic *transition* is that fertility practices are potentially moving towards a new universal norm, and states that have more conventional patterns of fertility will eventually adopt lower, later, and less structured fertility (Lesthaeghe & Neidert, 2006; 2009).

An alternative perspective is that individuals cluster within regions with other similar individuals (Bishop, 2009). This has the effect of sorting different ideological frameworks into specific geographic regions. If social pressures are tolerant of different life-course decisions, then it may be the case that a new universally followed fertility regime will fail to manifest. Instead, several pathways to parenthood will emerge and persist through time. The current results imply that the extent to which different geographic regions adopt different forms of fertility behavior is associated with the personality of the individuals in the region. If fertility patterns continue to be sorted on the basis of personality (and the associated preferences, motivations, and desires), then it may be more likely regional differences in fertility will continue.

Strengths and Limitations

The current study used an extremely large, geographically coded sample with information about psychological characteristics that were linked with regional aspects of the level, timing, and context of fertility. Each of these components of the study are unique strengths. The large sample size enabled highly precise regional personality estimates at several levels of analysis, including subgroup analysis by gender and age. This is the first study to test the association between regional concentrations of personality traits and fertility outcomes. Fertility is a relatively understudied area in psychology, with more attention given to close relationships and parenting practices. This study adds to an emerging literature (Berg et al., 2013; Gurven et al., 2013; Hutteman et al., 2013; Jokela, 2012; Jokela et al., 2009; 2011; 2013; Skirbekk, & Blekesaune, 2013) that personality is associated with fertility at both the individual and regional levels.

More future research will be necessary to delineate the processes which link personality and fertility both within and across levels of analysis. We speculated about several likely

pathways for the link between personality and fertility to emerge, but the current project was not well-suited to track these processes. Longitudinal data with fertility data at both the individual and regional levels would be useful for identifying the directionality of effects between personality and fertility or between individual and regional processes. Although the factor structure of the Big Five Inventory is well-validated at the individual-level (John et al, 2008), little is known about this structure at the region-level. By aggregating region-level estimates of personality based on individual scores, we assumed that the structure of personality is the same across levels. This simplifying assumption proved useful and yielded consistent patterns of results, but a more complete examination of the multi-level factor structure of personality is warranted. Finally, we limited our analyses to relatively large regions within the United States, and it remains to be seen whether these results can generalize to other regions around the world or for more narrow (e.g., counties) or larger regions (e.g., nations).

Conclusion

Despite the relative ubiquity of fertility and family formation, individuals differentially move through these important life transitions as a function of personality. Fertility behavior is complex with input effects from the individual, social, and institutional context. Much emphasis in previous research has been placed on the social and institutional influences, but we argue that more attention needs to be paid to person-oriented influences and the interaction of personality with social context. People within regions differ in terms consistent patterns of cognition, emotion, and behavior due to a combination of genetic influences, environmental circumstances, and the interaction of the two over development. These differences matter for understanding fertility at the individual- and regional-levels. Theoretical frameworks that model human behavior solely in terms sociological or economic forces are limited to the extent that individuals

possess unique characteristics, preferences, and motivations. Integrating broad contextual factors within a comprehensive taxonomy of individual differences has the potential to better inform demography, sociology, psychology, and public policy debates concerning the highly controversial topic of fertility.

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Table 1. Descriptive statistics of study variables

Variable	Mean (SD)	Range	Year	Source
Personality				
Extraversion	0.00 (0.04)	-0.13-0.08	1999-2005	Rentfrow et al. (2008)
Agreeableness	0.00 (0.06)	-0.15-0.11	1999-2005	Rentfrow et al. (2008)
Conscientiousness	0.00 (0.05)	-0.11-0.09	1999-2005	Rentfrow et al. (2008)
Neuroticism	0.00 (0.05)	-0.08-0.14	1999-2005	Rentfrow et al. (2008)
Openness to experience	-0.02 (0.06)	-0.17-0.09	1999-2005	Rentfrow et al. (2008)
Fertility Schedule				
Total fertility rate	1.95 (0.17)	1.63-2.45	2010	Martin et al. (2012)
Initiation	10.51 (1.68)	6.06-13.34	2010	Martin et al. (2012)
Peak	26.83 (2.49)	22.72-32.16	2010	Martin et al. (2012)
Stopping	3.87 (0.82)	1.28-5.16	2010	Martin et al. (2012)
Fertility Context				
Age at first birth	24.84 (1.18)	22.6-27.7	2006	Mathews & Hamilton (2009)
Percent cohabit	6.88 (1.09)	4.6-9.3	2010	Lofquist et al. (2012)
Percent never married	30.70 (2.82)	24.80-37.53	2010	ACS
Percent divorce	1.46 (0.22)	1.00-2.92	2010	ACS
Age at first marriage	27.31 (1.12)	24.45-29.75	2010	ACS
Abortion rate	15.62 (8.35)	0.90-40.00	2008	Jones & Kooistra (2008)
Family planning expenditures	107.46 (43.31)	31-245	2010	Sonfield & Gold (2012)
Non-marital fertility rate	35.55 (6.22)	15.8-51.2	2010	ACS
Percent unintended pregnancy	51.56 (5.44)	38-65	2006	Finer & Kost (2011)
Sociodemographic and Value Controls				
Median income (in $1,000)	49.76 (7.98)	36.85-68.85	2010	Census
Percent African American	10.34 (9.46)	0.4-37.0	2010	Census
Percent Hispanic	10.61 (9.88)	1.2-46.3	2010	Census
Percent female	50.66 (0.74)	47.9-51.7	2010	Census
Percent with a B.A.	27.16 (4.72)	17.3-38.3	2010	Census
Percent urban	73.58 (14.42)	38.66-94.95	2010	Census
Vote for Obama	50.51 (9.40)	32.54-71.85	2008	FEC (2009)
Percent very religious	39.62 (8.60)	23.80-56.60	2010	Gallup (2010)

Note. SD = Standard Deviation. B.A. = Bachelor's degree. ACS = American Community Survey. FEC = Federal Election Commission.

Table 2. Zero-order correlations between personality and fertility outcomes

	E	A	C	N	O
Fertility Schedule					
Total fertility rate	.24	**.51**	**.42**	**-.49**	**-.53**
Initiation	-.17	.07	-.05	-.22	-.04
Peak	**.37**	.07	.27	.12	-.08
Stopping	**.36**	.09	**.36**	.03	-.22
Fertility Context					
Age at first birth	-.06	-.27	-.28	**.40**	**.36**
Percent cohabit	-.27	**-.43**	**-.43**	.24	**.49**
Percent never married	.00	.11	-.11	.18	.02
Percent divorce	-.26	**-.28**	-.19	.09	**.30**
Age at first marriage	-.16	-.15	-.26	**.34**	**.28**
Abortion rate	.20	-.26	**-.34**	**.28**	.19
Family planning expenditures	-.26	.07	-.18	-.07	.14
Non-marital fertility rate	-.10	-.08	-.20	.06	.07
Percent unintended pregnancy	**-.37**	-.11	**-.44**	.13	.18

Note. E = Extraversion. A = Agreeableness. C = Conscientiousness. N = Neuroticism. O = Openness to experience. Parameters printed in bold are significant at $p < .05$.

Table 3. Associations between male and female personality and fertility outcomes

Type of Parameter	β's		Unique R^2		Common R^2
Level of Aggregation	Male	Female	Male	Female	Male & Female
Panel A: Extraversion					
Fertility Schedule					
Total fertility rate	.24	.01	.02	.00	.04
Initiation	-.16	-.07	.01	.00	.03
Peak	.24	.23	.02	.02	.15
Stopping	-.15	**.56**	.01	.13	07
Fertility Context					
Age at first birth	.24	-.25	.02	.02	-.02
Percent cohabit	-.16	-.12	.01	.01	.05
Percent never married	-.05	.09	.00	.00	.00
Percent divorce	-.36	.01	.05	.00	.07
Age at first marriage	.08	-.20	.00	.02	.00
Abortion rate	-.29	.08	.03	.00	.02
Family planning expenditures	-.15	-.14	.01	.01	.06
Non-marital fertility rate	**-.53**	**.41**	.12	.07	-.07
Percent unintended pregnancy	**-.44**	.04	.08	.00	.09
Panel B: Agreeableness					
Fertility Schedule					
Total fertility rate	.34	.20	.03	.01	.23
Initiation	.00	.11	.00	.00	.01
Peak	.22	-.20	.01	.01	-.01
Stopping	.07	-.03	.00	.00	.00
Fertility Context					
Age at first birth	-.04	-.26	.00	.02	.07
Percent cohabit	-.22	-.23	.01	.01	.15
Percent never married	-.25	.26	.03	.04	-.03
Percent divorce	.25	-.48	.02	.06	.01
Age at first marriage	-.37	.17	.04	.01	.01
Abortion rate	-.21	-.07	.01	.00	.06
Family planning expenditures	-.19	.29	.01	.02	-.01
Non-marital fertility rate	**-.81**	**.69**	.18	.13	-.13
Percent unintended pregnancy	-.29	.18	.02	.01	.00
Panel C: Conscientiousness					
Fertility Schedule					
Total fertility rate	.30	.18	.06	.02	.11
Initiation	.11	.03	.01	.00	.01
Peak	.07	-.09	.00	.01	.00
Stopping	.22	-.03	.03	.00	.01
Fertility Context					
Age at first birth	-.24	-.20	.04	.02	.09
Percent cohabit	**-.36**	-.09	.08	.01	.10
Percent never married	-.15	-.18	.01	.02	.05
Percent divorce	.24	-.18	.04	.02	-.02

Age at first marriage	-.31	-.11	.06	.01	.08
Abortion rate	**-.37**	-.04	.09	.00	.07
Family planning expenditures	-.27	.15	.05	.01	-.01
Non-marital fertility rate	-.31	.07	.06	.00	.01
Percent unintended pregnancy	**-.38**	-.09	.09	.00	.10
Panel D: Neuroticism					
Fertility Schedule					
Total fertility rate	-.15	**-.35**	.01	.07	.13
Initiation	.01	-.26	.00	.04	.02
Peak	-.22	**.35**	.03	.07	-.03
Stopping	**-.51**	**.50**	.15	.15	-.12
Fertility Context					
Age at first birth	**.34**	.12	.07	.01	.11
Percent cohabit	.20	.04	.02	.00	.03
Percent never married	.18	.06	.02	.00	.03
Percent divorce	-.07	.13	.00	.01	.00
Age at first marriage	**.36**	.05	.08	.00	.07
Abortion rate	**.44**	-.11	.12	.01	.02
Family planning expenditures	**.34**	**-.39**	.07	.09	-.06
Non-marital fertility rate	.13	-.06	.01	.00	.00
Percent unintended pregnancy	**.64**	**-.44**	.24	.12	-.11
Panel E: Openness					
Fertility Schedule					
Total fertility rate	-.01	**-.53**	.00	.14	.14
Initiation	.25	-.23	.03	.03	-.02
Peak	**-.47**	.27	.11	.04	-.03
Stopping	-.14	-.14	.01	.01	.05
Fertility Context					
Age at first birth	**-.39**	**.69**	.08	.24	-.07
Percent cohabit	-.06	**.55**	.00	.16	.11
Percent never married	**-.42**	.35	.09	.06	-.06
Percent divorce	**.41**	-.01	.08	.00	.07
Age at first marriage	-.29	**.52**	.04	.14	-.04
Abortion rate	-.05	.23	.00	.03	.01
Family planning expenditures	-.02	.18	.00	.02	.01
Non-marital fertility rate	-.29	.34	.04	.06	-.04
Percent unintended pregnancy	-.02	.21	.00	.02	.02

Note. The second and third columns report standardized regression coefficients (β) from a multiple regression. Parameters printed in bold are significant at $p < .05$. The unique R^2 refers to the proportion of variance accounted for in the outcome by male or female extraversion net of the common effect. The common R^2 reports the proportion of variance in the outcome accounted for by the shared variance of the predictors. We do not report significance levels for R^2 values because we are primarily interested in the distribution of unique male, unique female, and common variance explained rather than whether the R^2 is different from zero. Negative R^2 values indicate a suppressor effect (see Methods section).

Table 4. Correlations between relative gender personality and fertility outcomes

	ΔE	ΔA	ΔC	ΔN	ΔO
Fertility Schedule					
Total fertility rate	.08	.04	.05	.08	.20
Initiation	-.03	-.03	.04	.12	.18
Peak	.01	.11	.07	-.24	**-.29**
Stopping	-.24	.03	.11	**-.43**	.00
Fertility Context					
Age at first birth	.16	.06	-.02	.09	**-.42**
Percent cohabit	-.01	.00	-.12	.07	-.24
Percent never married	-.05	-.19	.01	.05	**-.30**
Percent divorce	-.13	.20	.18	-.08	.16
Age at first marriage	.10	-.15	-.09	.13	**-.31**
Abortion rate	-.13	-.04	-.15	.23	-.11
Family planning expenditures	.00	-.13	-.18	**.31**	-.08
Non-marital fertility rate	**-.32**	**-.41**	-.16	.08	-.24
Percent unintended pregnancy	-.16	-.12	-.13	**.46**	-.09

Note. E = Extraversion. A = Agreeableness. C = Conscientiousness. N = Neuroticism. O = Openness to experience. Relative gender personality was calculated as male personality - female personality. Parameters printed in bold are significant at $p < .05$.

Table 5. Associations between age-specific personality and fertility outcomes

Type of Parameter	β's		Unique R^2		Common R^2
Level of Aggregation	< 30	≥ 30	< 30	≥ 30	< 30 & ≥ 30
Panel A: Extraversion					
Fertility Schedule					
Total fertility rate	.06	.24	.00	.03	.05
Initiation	-.31	.18	.06	.02	-.02
Peak	**.64**	**-.33**	.23	.06	-.06
Stopping	**.70**	**-.42**	.29	.10	-.10
Fertility Context					
Age at first birth	-.06	-.01	.00	.00	.00
Percent cohabit	-.33	.06	.06	.00	.02
Percent never married	-.01	.00	.00	.00	.00
Percent divorce	-.07	-.25	.00	.03	.05
Age at first marriage	-.23	.07	.03	.00	.00
Abortion rate	**-.40**	.23	.09	.03	-.03
Family planning expenditures	**-.43**	.20	.11	.02	-.02
Non-marital fertility rate	**-.35**	.30	.07	.05	-.05
Percent unintended pregnancy	**-.94**	**.66**	.43	.21	-.21
Panel B: Agreeableness					
Fertility Schedule					
Total fertility rate	.29	**.31**	.05	.06	.19
Initiation	-.16	.33	.02	.07	-.01
Peak	.14	-.12	.01	.01	-.01
Stopping	-.06	.19	.00	.02	.00
Fertility Context					
Age at first birth	.00	**-.38**	.00	.09	.06
Percent cohabit	-.29	-.26	.04	.03	.13
Percent never married	**.39**	**-.40**	.09	.09	-.07
Percent divorce	**-.45**	.24	.12	.03	-.03
Age at first marriage	.23	**-.54**	.03	.17	-.02
Abortion rate	-.02	**-.33**	.00	.07	.05
Family planning expenditures	.13	-.07	.01	.00	.00
Non-marital fertility rate	.22	**-.42**	.03	.11	-.03
Percent unintended pregnancy	.16	**-.36**	.01	.08	-.01
Panel C: Conscientiousness					
Fertility Schedule					
Total fertility rate	**.41**	.05	.13	.00	.07
Initiation	-.09	.08	.01	.00	.00
Peak	**.36**	-.17	.10	.02	-.02
Stopping	**.55**	**-.29**	.23	.06	-.06
Fertility Context					
Age at first birth	**-.34**	.05	.09	.00	.01
Percent cohabit	**-.45**	-.01	.15	.00	.05
Percent never married	.06	**-.33**	.00	.07	.01

Percent divorce	-.17	.00	.02	.00	.01
Age at first marriage	-.27	-.04	.05	.00	.03
Abortion rate	**-.39**	.05	.11	.00	.02
Family planning expenditures	-.15	-.05	.02	.00	.01
Non-marital fertility rate	**-.32**	.15	.08	.02	-.02
Percent unintended pregnancy	**-.62**	.17	.23	.02	.00
Panel D: Neuroticism					
Fertility Schedule					
Total fertility rate	**-.52**	-.10	.10	.01	.12
Initiation	.00	-.28	.00	.05	.03
Peak	-.30	**.52**	.04	.13	-.04
Stopping	**-.39**	**.51**	.09	.15	-.08
Fertility Context					
Age at first birth	**.42**	-.01	.11	.00	.06
Percent cohabit	.30	-.06	.05	.00	.01
Percent never married	**.39**	-.23	.09	.03	-.03
Percent divorce	-.04	.16	.00	.01	.00
Age at first marriage	**.40**	-.06	.10	.00	.04
Abortion rate	**.43**	-.17	.11	.02	-.01
Family planning expenditures	.29	**-.43**	.05	.11	-.05
Non-marital fertility rate	**.40**	**-.39**	.09	.09	-.07
Percent unintended pregnancy	**.61**	**-.56**	.22	.19	-.16
Panel E: Openness					
Fertility Schedule					
Total fertility rate	-.13	**-.49**	.01	.12	.22
Initiation	.04	-.10	.00	.00	.00
Peak	**-.40**	**.37**	.08	.07	-.06
Stopping	-.16	-.09	.01	.00	.04
Fertility Context					
Age at first birth	-.20	**.68**	.02	.23	.05
Percent cohabit	-.09	**.74**	.00	.23	.15
Percent never married	**-.52**	**.64**	.14	.21	-.13
Percent divorce	**.50**	-.23	.13	.03	-.01
Age at first marriage	-.26	**.65**	.03	.21	.01
Abortion rate	-.11	.35	.01	.06	.01
Family planning expenditures	-.28	**.50**	.04	.13	-.04
Non-marital fertility rate	-.32	**.46**	.05	.11	-.05
Percent unintended pregnancy	.02	.20	.00	.02	.02

Note. The second and third columns report standardized regression coefficients (β) from a multiple regression. Parameters printed in bold are significant at $p < .05$. The unique R^2 refers to the proportion of variance accounted for in the outcome by male or female extraversion net of the common effect. The common R^2 reports the proportion of variance in the outcome accounted for by the shared variance of the predictors. We do not report significance levels for R^2 values because we are primarily interested in the distribution of unique male, unique female, and common variance explained rather than whether the R^2 is different from zero. Negative R^2 values indicate a suppressor effect (see Methods section).

Table 6. Correlations between relative age-specific personality and fertility outcomes

	ΔE	ΔA	ΔC	ΔN	ΔO
Fertility Schedule					
Total fertility rate	-.08	-.01	.18	-.14	.14
Initiation	-.20	-.21	-.08	.12	.05
Peak	**.40**	.11	.26	**-.32**	**-.30**
Stopping	**.47**	-.11	**.42**	**-.38**	-.03
Fertility Context					
Age at first birth	-.02	.16	-.20	.19	**-.34**
Percent cohabit	-.17	-.01	-.22	.15	**-.29**
Percent never married	-.01	**.34**	.18	.26	**-.45**
Percent divorce	.07	**-.30**	-.09	-.08	.28
Age at first marriage	-.13	**.33**	-.11	.20	**-.35**
Abortion rate	-.26	.14	-.22	.26	-.18
Family planning expenditures	-.26	.09	-.05	**.31**	**-.30**
Non-marital fertility rate	-.27	.28	-.23	**.34**	**-.30**
Percent unintended pregnancy	**-.61**	.22	**-.36**	**.50**	-.07

Note. E = Extraversion. A = Agreeableness. C = Conscientiousness. N = Neuroticism. O = Openness to experience. Relative age-specific personality was calculated as age < 30 personality - age ≥ 30 personality. Parameters printed in bold are significant at $p < .05$.

Table 7. Multiple regression of state-level fertility on state-level fertility

			β		
Fertility Schedule	E	A	C	N	O
Total fertility rate	**-.37**	.14	.10	-.23	**-.49**
Initiation	-.33	-.10	-.32	**-.58**	-.22
Peak	.40	.13	**.62**	**.73**	.29
Stopping	.13	-.16	**.82**	**.62**	-.03
Fertility Context					
Age at first birth	**.50**	.26	-.16	**.45**	**.52**
Percent cohabit	.36	-.26	**-.54**	**-.38**	**.40**
Percent never married	.17	**.71**	-.29	**.51**	.15
Percent divorce	-.18	-.36	.11	-.28	.16
Age at first marriage	.16	**.45**	-.12	**.47**	.35
Abortion rate	.11	-.03	-.40	.04	-.05
Family planning expenditures	-.24	.41	-.42	-.27	.14
Non-marital fertility rate	.14	.02	-.52	-.21	-.06
Percent unintended pregnancy	-.10	.30	**-.90**	-.31	-.12

Note. E = Extraversion. A = Agreeableness. C = Conscientiousness. N = Neuroticism. O = Openness to experience. Standardized coefficients are reported. Parameters printed in bold are significant at $p < .05$.

Table 8. Commonality analysis for multiple regression of state-level fertility on state-level personality

Outcome	Unique					All Common Combinations		
Fertility Schedule	E R^2	A R^2	C R^2	N R^2	O R^2	Common R^2	% R^2 Common	Total R^2
Total fertility rate	.05	.01	.00	.02	.10	.21	53.85	.39
Initiation	.04	.00	.02	.11	.02	.01	5.00	.20
Peak	.06	.01	.09	.18	.03	.01	2.63	.38
Stopping	.01	.01	.15	.13	.00	.05	14.29	.35
Fertility Context								
Age at first birth	.09	.02	.01	.07	.11	.01	3.23	.31
Percent cohabit	.05	.02	.07	.05	.07	.09	25.71	.35
Percent never married	.01	.15	.02	.09	.01	-.08	-40.00	.20
Percent divorce	.01	.04	.00	.03	.01	.06	40.00	.15
Age at first marriage	.01	.06	.00	.08	.05	.00	0.00	.20
Abortion rate	.00	.00	.04	.00	.00	.08	66.67	.12
Family planning expenditures	.02	.05	.04	.03	.01	.06	28.57	.21
Non-marital fertility rate	.01	.00	.06	.02	.00	-.02	-28.57	.07
Percent unintended pregnancy	.00	.03	.18	.03	.01	.09	26.47	.34

Note. E = Extraversion. A = Agreeableness. C = Conscientiousness. N = Neuroticism. O = Openness to experience. The unique R^2 refers to the proportion of variance accounted for in the outcome by the individual personality traits net of the common effect. The common R^2 reports the proportion of variance in the outcome accounted for by the total shared variance of every possible combination of traits. We do not report significance levels for R^2 values because we are primarily interested in the distribution of unique and common variance explained rather than whether the R^2 is different from zero. Negative R^2 values indicate a suppressor effect (see Methods section).