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Psychological Traits and Family Outcomes*

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Abstract. This paper uses data from the German Socio-economic Panel Survey to examine the relationship between a set of personal traits (including personality, risk aversion, trust, locus of control, and reciprocity) and demographic and family outcomes. An individual's propensities to marry and to divorce are strongly related to personality, but completed fertility is not. The factors that predict marriage are different for men and women, and these differences suggest a specialized provision of emotional services by women and material support by men. Divorce is strongly related to openness to experience (a desire for change and variety) for both men and women. These results should be regarded as preliminary and exploratory, but suggest some new directions for the economic theory of the family.

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Psychological Traits and Family Outcomes

Introduction

Economists are beginning to explore psychological dimensions of human capital and the determinants of individual success, including personality, motivational factors, and preferences. Bowles, Gintis and Osborne (2001) review the literature on the labor market returns to personality, and emphasize that “incentive-enhancing preferences” are one of the advantages, along with quality schooling and cognitive ability, that successful parents may be able to pass on to their children. Although many recent studies have incorporated psychological variables into analyses of labor market outcomes, their impact on social and demographic behaviors remain largely unstudied by economists. This paper provides a preliminary examination of the empirical relationship between personality and family outcomes for a large representative sample of German men and women.

The formation and dissolution of marital and cohabiting relationships have important implications for individual wellbeing and for society. Economic factors such as market wages have been shown to influence decisions such as age at marriage and the number of children born, but they leave a great deal of individual variation unexplained. Psychologists and sociologists have examined the relationship between psychological traits and family outcomes such as marital satisfaction and fertility, but almost all of these analyses are based on small samples. The recent availability of psychological variables in large representative surveys such as the German Socio-economic Panel and the British Household Panel Study present new possibilities for economists and other social scientists to study their association with a wide range of lifetime experiences, and to consider the implications of these relationships for the economics of family behavior.

This paper uses data from the German Socio-economic Panel (SOEP), which contains a wide array of psychological and preference indicators (most gathered in recent waves of the survey), and relates these to simple lifecycle demographic outcomes for cohorts up to age 59 in 2005. Measured personality and other psychological traits are interpreted as indicators of preferences and capabilities that shape the returns to marriage, demand for children, and the ability of partners to solve problems and make long-term commitments. Factor analysis is used to reduce dimensionality of this set of variables and to help develop an intuitive understanding of the relationship between individual traits and family behavior. Three factors provide a useful

summary of the ten original traits with factor loadings that are remarkably similar for men and women. Both these factors and the individual traits have interesting and substantive impacts on family experiences of individuals, and these patterns differ substantially by gender.

Economic models of marriage and divorce postulate that decisions to form and dissolve intimate unions are driven by the expected and realized surplus to marriage, compared with single life. These returns to marriage and cohabitation are derived from a combination of production complementarities (returns to specialization and exchange) that are enhanced by the mating of individuals with different capabilities (Becker, 1981) and consumption complementarities (joint public goods consumption) that are greatest if individuals with similar preferences are matched (Lam, 1988; Stevenson and Wolfers, 2007). The empirical relationship between personality traits and demographic outcomes may be informative, both about the relative significance of these gains and the economic interpretation of personality.

As noted by Borghans et al. (2008), personality traits seem, intuitively, to be related to both preferences (conscientious people place a high value on order, and extraverts prefer social interaction to solitude) and opportunities (conscientious people are self-disciplined; introverts perform poorly in sales jobs). We find evidence both of common factors in the sorting of men and women into marriage and divorce (openness to experience and conscientiousness), which suggests that they are preference indicators, and of distinct sources of marital surplus for men and women (extraversion for women and antagonism for men) that may reflect gender specialization in marital production. These results suggest that, for both men and women, personality traits affect marital surplus and that contributions to this surplus are to some extent gender specialized, with men providing monetary and women emotional contributions. Personality traits are not, however, strongly predictive of completed fertility.

Economics and personality

What determines the market earnings of an individual agent? This is one of the central empirical questions in microeconomics, and the mainstream literature follows the basic approach of Mincer (1974). The wage rate depends on an individual's formal education and work experience, which reflect stocks of general and job-specific human capital that increase skills and productivity on the job. Improved data has permitted the inclusion of cognitive ability in wage and earnings regressions as well. Beginning with Bowles and Gintis (1976), economists have recognized that other worker attributes are also important—that, as Heckman, Stixrud, and Urzua (2006) note: “personality, persistence, motivation, and charm matter for success in life.”¹

James Heckman and his collaborators have worked to incorporate noncognitive attributes, including personality traits, into the economic analysis of individual achievement. Heckman, Stixrud, and Urzua (2006) show that noncognitive “skills” are important determinants of labor market success. They estimate a model with one cognitive and one noncognitive latent factor to explain wages, schooling, and risky behavior by youth in the National Longitudinal Survey of Youth, 1979, using the Rotter locus of control scale and the Rosenberg Self-Esteem scale as indicators of noncognitive skills. In an ambitious paper, Borghans, Duckworth, Heckman, and ter Weel (2008) discuss “the relevance of personality to economics and the relevance of economics to personality psychology.” They survey the evidence on the predictive power of personality traits for economically-relevant outcomes, discuss the stability of personality traits over contexts and the lifecycle, and provide some analytic frameworks for linking personality psychology and economics. They argue that both cognitive ability and personality traits impose constraints on agent choice behavior, and that they are related in complex ways to conventional economic preference parameters.

Personality inventories and other measures designed and validated by psychologists are increasingly available, usually in the form of brief self-reported questionnaires, on large representative surveys such as the British Household Panel Survey and the German Socio-

¹ For example, Weiss (1988) found that the return to high school graduation among a set of production workers was attributable to a reduced propensity to quit or be absent, rather than greater skill. Duncan and Dunifon (1998) show that a set of motivational and social factors measured for young men in the PSID are as important as completed schooling in explaining labor market success 15 to 25 years later. Kuhn and Weinberger (2005) document a positive relationship between leadership skills in high school and adult wages for men.

economic Panel (SOEP). The SOEP 2005 survey includes a version of the widely-used “Big Five” personality inventory. The Big Five factors are Openness to Experience, Conscientiousness, Extraversion, Agreeableness, and Neuroticism, and they are defined as follows by Hogan and Hogan (2007):

Openness vs. closedness to experience: The degree to which a person needs intellectual stimulation, change and variety.

Conscientiousness vs. lack of direction: The degree to which a person is willing to comply with conventional rules and norms.

Agreeableness vs. antagonism: The degree to which a person needs pleasant and harmonious relations with others.

Extraversion vs. introversion: The degree to which a person needs attention and social interaction.

Neuroticism vs. emotional stability: The degree to which a person experiences the world as threatening and beyond his or her control.

The measures of personality developed by psychologists are not theoretically based, but are descriptive of stable differences in individual dispositions. There are many alternative taxonomies, but the Big Five are broadly accepted as a consistent and reliable categorization of attributes that people find “important and useful in daily interactions” (Goldberg, 1981). In an evolutionary context, the five-factor model may identify individual variations on dimensions that are significant to human social acceptance and status—social dominance (extraversion), negativity and instability (neuroticism), cooperation (agreeableness), trust and commitment (conscientiousness), and openness to change and learning (openness to experience) (McAdams and Pals, 2006).

Each personality trait incorporates a variety of detailed traits that tend to be correlated, and “the Big 5 are fairly independent dimensions that can be measured with convergent and discriminant validity” (John and Srivasta, 1999). There is a long history, as with most psychological measures, of testing for internal validity, but external validity assessments that examine their ability to predict life outcomes tend to be limited, and focused on small samples. In general, studies of adolescents find that low agreeableness and conscientiousness are

associated with juvenile delinquency. Conscientiousness, and particularly the sub-traits self-control and perseverance, is a good predictor of general job performance and success in school.²

A recent literature in economics has examined the relationship between personality indicators and labor market outcomes on large representative surveys. Mueller and Plug (2006) find that antagonism and emotional stability increase men's earnings, while conscientiousness and openness increase women's. Heineck and Anger (2008) examine the effects of cognitive abilities and personality traits (including positive and negative reciprocity and locus of control) on earnings in Germany and find that, though the effects of personality on men's and women's earnings are not uniform, both experience a wage penalty for an external locus of control. Using Dutch data, Nyhus and Pons (2005) find that emotional stability is positively related to the wages of men and women, while agreeableness is associated with lower wages for women. The returns to personality factors vary both by tenure and by educational group.

One issue in treating personality as a determinant of labor market success concerns the stability of personality traits over the adult lifecycle and their responsiveness to experience. There is considerable evidence of some systematic changes with age—conscientiousness increases and extraversion decreases with age, for example. The rank-ordering of individuals is quite stable over time, but there is some instability, especially in early adulthood (Roberts and DelVecchio, 2000). It is not clear at this point, however, to what extent personality changes are due to maturation, or are a response to changing circumstances. A longitudinal study of young adults (Magnus et al., 1993) found that personality was predictive of future life events, but that life events had no influence on personality measures. Caspi and Herbener (1990) argue that individuals choose situations compatible with their dispositions, such as assortative mating, and therefore maintain considerable personality stability over a lifetime.

It is difficult to incorporate many of the standard psycho-social constructs, including personality, into an economic model of constrained choice. Borghans et al. (2008) argue that personality traits, as well as cognitive ability, may impose constraints on individual choices and, in turn, “conventional economic preference parameters can be interpreted as consequences of these constraints” (p. 997). As an example, they note that high rates of time preference may be caused by an individual's inability to delay gratification, or by an inability to imagine the future.

² See the review in Borghans et al. (2008), p. 44.

Empirically, however, traits such as conscientiousness and self-esteem have been shown to be important determinants of economic behaviors and outcomes, and to have strong intergenerational correlations. The role of parents and educational institutions in fostering personality and motivational traits that enhance individual welfare is now an important component of research on the intergenerational transmission of inequality, and we can expect the relationship between personality, preferences, and economic behavior to be part of the increasing dialogue between economists and psychologists.

Marriage, Divorce, and Fertility

Union formation, union dissolution, and childbearing are strongly linked to the lifetime wellbeing. The interpersonal transactions that determine family structure and family functioning will be shaped by the personalities and preferences of the individuals involved, and this dependence may be increasing over time as community constraints weaken in modern societies. The erosion of social norms concerning traditional family arrangements can be expected to increase the marginal impact of individual characteristics such as personality on family behavior (Tavares, 2008). The same argument suggests that the factors driving family structure and demographic behavior should vary across institutional and economic environments. In a social environment in which marriage is not universal, family roles are more transitory, and gender roles are less distinct, analysis of the determinants of an individual's family status becomes more significant and salient for policy (Lundberg, 2005).

Marriage. Economists consider marriage (or other forms of stable, intimate partnership) to be a voluntary arrangement between individuals who expect to enjoy private gains from the establishment of a joint household. Since individuals will decide to marry depending on a comparison of their expected utility in two states—married and single—the decision depends both on the magnitude of the expected marital surplus and on the partners' ability to make a credible commitment regarding the division of the surplus. The gains from marriage arise from joint production and consumption in the household, and have several distinct sources. These include the returns to specialization and exchange within the household, risk pooling, joint consumption of household public goods, including children, and the direct utility of time together. A focus on production complementarities leads to the standard prediction that there should be negative assortative mating based on market wages, so that the hard-driving careerist

marries the happy homemaker. This would also apply to other individual capabilities relevant to household production—there will be potential gains if a cook marries a gardener. As the relative significance of household (rather than market) production has declined with the increasing labor force participation of women, complementarities in consumption have become more important sources of the gains to marriage (Lam, 1988; Stevenson and Wolfers, 2007). This implies that positive assortative mating on traits related to preferences for household consumption—a shared interest in children or in loud parties, for example—would be increasingly important.

These dual forces in the determination of marital surplus suggest that the role of psychological traits in marital decisions may be informative as to whether they should be interpreted as indicators of preferences or constraints. If a personality trait has a similar impact on marital surplus, and therefore on the probability of marriage for both men and women, then it is probably related to consumption returns, or preferences. If gender-based specialization is an important source of marital surplus, however, we would expect different capabilities to promote the marriages of men and women and therefore, if some psychological traits are primarily capability-related, different trait effects.

Following Lam (1988), let us assume that two prospective partners each have preferences over a household public good, Q , and a private good, x_i , that can be represented in the form:

$$U_i(Q, x_i) = A(Q)x_iB_i(Q)$$

In this specification, utility is transferable between the partners via a reallocation of the private good, and the efficient allocation of the public good is independent of the distribution of resources within the household (Bergstrom and Cornes, 1983). Suppose that when single, each individual has identical preferences, but that single households do not produce any of the public good, and $A(0)=1$. This implies that total marital surplus will be

$$S = U_1 + U_2 - C = A(Q)(x_1 + x_2) + B_1(Q) + B_2(Q) - C ,$$

where C is the value of total private goods consumption of both partners when single. Let each partner have a fixed income, and let Q be purchased in the market. The chosen value of Q will be the one that maximizes joint utility subject to a pooled household budget constraint.

Lam shows, in a similar model in which the gains from marriage depend only on a household public good and potential spouses vary only in wealth, that there will be positive

assortative mating on wealth. In this case, there are returns from spouses having similar demands for the public good. Similarly, there will be returns from spouses having similar tastes B for public goods consumption, and we expect to see that individuals with stronger preferences for marital public goods are more likely to marry. Suppose that a personality trait z_0 influences preferences so that $B_i(Q; z_{0i})$ and that $\frac{\partial B}{\partial z_0} > 0$ for any $Q = \bar{Q}$. In this case, marital surplus will be increasing in z_0 for both men and women, given the characteristics of their partner, because this trait increases the value of the marital public good.

On the other hand, suppose that the marital public good is produced in the household with two spousal inputs, γ_1 and γ_2 and purchased inputs, G , so that $Q = F(\gamma_1, \gamma_2, G)$. Lam shows that, in a model where the spousal inputs are time and each partner can work in the market at a fixed wage, a combination of the public good demand effect and household specialization implies that assortative mating on wage rates may be either positive or negative. If instead the spousal inputs to the public good are functions of personality traits, $\gamma_1(z_1)$ and $\gamma_2(z_2)$, and there is complete gender specialization so that wives contribute to input one and husbands contribute to input 2, then potential marital surplus and the probability of marriage will depend upon different traits for men and women.

In this one-period model, the production and consumption benefits of marriage are directly related to coresidence and joint parenthood, and need not require legal marriage. However, a full realization of the gains to specialization and to childrearing relies on a long-term commitment (Lundberg, 2008). For this reason, characteristics that enhance an individual's ability to make credible intertemporal commitments (such as conscientiousness or trustworthiness) may lead to a higher probability of marriage. Given the general nature of long-term cohabitation, we might also expect individuals who are more risk averse, less extraverted, and less open to new experiences to find the stability and intimacy of marriage relatively more attractive.

There is substantial empirical evidence that potential gains to specialization affect the propensity to marry, though there is strong positive assortative mating on a variety of individual characteristics, including education, wages, religion, and ethnicity. For example, Raymo, Goyette, and Thornton (2003) show that potential earnings increase the likelihood of marriage for men, but not women. At present, there is very little evidence based on large samples about

the relationship between personality and preferences measures and the probability of marriage. Two exceptions are Spivey (2007) and Schmidt (2008) who show that risk aversion is positively related to transitions to marriage in the NLSY and PSID. This result is consistent with a search framework in which individuals with higher levels of risk aversion will set a lower reservation level for spousal quality, and with marriage as a risk-pooling arrangement. An extensive literature in psychology examines the impact of personality on marital processes, such as marital satisfaction, but not on the probability of marriage.

Divorce. The essence of the economic theory of divorce is stated in the classic paper by Becker, Landes and Michael (1977)—a couple divorces when they have “less favorable outcomes from their marriage than they expected when marrying” (p. 1142). A newly-married couple will be uncertain about each other’s true nature and the characteristics of their future children, about their future earnings prospects and health conditions. As information about the quality of their match and the value of their alternatives arrives, surprises can lead to a dissipation of the marital surplus and divorce.³

If legal restrictions or social norms make divorce costly, then marital dissolution will only occur if marital surplus becomes sufficiently negative to make it worthwhile to pay these costs. Individual commitment to marriage can also be thought of as a source of (psychic) divorce costs. Finally, when surprises arrive that leave marital surplus positive but change the value of marital alternatives for one partner, some renegotiation is required to maintain the marriage. Peters (1986) shows that, if the marital surplus cannot be reallocated (due, for example, to asymmetric information) then ‘inefficient’ divorces may occur.

In general, then, we would expect divorce to be more likely when marital surplus and divorce costs (or commitment) are low, when the cost of renegotiating the marital contract is high, and when alternative relationships are more readily available. In terms of individual traits, this suggests that individuals who are more impulsive and desirous of variety (openness), more

³ Weiss and Willis (1997) find that negative shocks to men’s earnings (but not women’s earnings) increase divorce probabilities. Charles and Stephens (2004) show that the information content of an earnings shock may be more important than the shock itself. They find that the divorce hazard rises after a spouse’s job displacement but not after a disabling health shock, and that job loss only increases divorce if it is due to a layoff, not a plant closing. The availability of alternatives is also important: McKinnish (2004) shows that workplace contact between men and women appears to increase divorce.

extraverted, less conscientious and less risk-averse may be more likely to divorce. Neuroticism may inhibit negotiation and make an individual more divorce-prone.

There is some support for these hypotheses in small sample studies. In a sample of 431 male physicians, McCranie and Kahan (1986) found that socially non-conforming, impulsive, risk-taking, stimulus-seeking men were more likely to have multiple divorces. In terms of the psychological characteristics discussed above, this would lead us to expect that low conscientiousness, high openness to experience, and low risk-aversion are associated with a high probability of divorce. Lowell and Conley (1987) follow a panel of couples from 1930 to 1980 and show that marital instability is related to neuroticism and to the husband's poor impulse control. Kinnunen et al. (2000) find, in a small longitudinal sample, that marital instability at age 36 is predicted by personality characteristics measured at age 27, including low agreeableness in women and extraversion and low conscientiousness in men.

Fertility. Economic models of fertility postulate that the demand for children is a function of their expected benefits and costs. Costs include the opportunity costs of the parent's (usually, the mother's) time and the level of government subsidization of childrearing costs. Benefits, in a broad sense, will include the child's expected contribution to family resources and the value of conformance with society's fertility norms. The number of children born should be negatively correlated with the probability of divorce, both because most childbearing occurs within marriage, and because anticipated divorce reduces marital fertility.

Jokela et al. (2009) review a small literature in psychology on personality and childbearing and examine the two-way relationship between personality and parenthood using a large longitudinal survey (N=1,839) of young Finns. They find that emotionality (related to neuroticism) and sociability (related to extraversion) are associated with the probability of having children for both men and women, and that having children increased levels of emotionality, particularly in participants with high baseline emotionality, over the nine years of the study. Tavares (2008) examines the relationship between Big Five personality traits and age at first birth for women in the British Household Panel Survey. She argues that the results reflect individual women's underlying preferences and motivations for childbearing—agreeableness,

extraversion, and neuroticism accelerate childbearing, while conscientiousness and openness delay it.⁴

Data and Factor Analysis

This study uses data from the German Socio-economic Panel Study (SOEP), a representative longitudinal survey of households and individuals in Germany. The initial wave of the survey was conducted in 1984, and consisted of 12,000 randomly-selected respondents in West Germany in 1984. In 1990, following re-unification, a sample from East Germany was added, followed by a sample of immigrants in 1994. Several additional samples have been added in subsequent years, and sample weights are used in all analyses.

Our sample is derived from the Scientific Use File of SOEP, and consists of 10,703 household heads, spouses, and partners aged 18 to 59 in 2005. The SOEP conducts a separate interview with each member of a household over age 17, so that all information is self-reported. Table 1 presents means and standard deviations for key variables.

The key dependent variables consist of a set of life-cycle family outcomes for age appropriate samples: Ever-married by age 25, ever-married by age 35, whether the first marriage ended in divorce by the end of the sample period, and the number of children ever born by age 30 and by age 40 for women. The main independent variables are the Big Five personality traits—openness to experience, agreeableness, extraversion, neuroticism, and conscientiousness—and five other psychological and preference measures—locus of control, positive and negative reciprocity, willingness to trust others, and risk aversion. The personality variables are age-adjusted to eliminate standard age trajectories in some measures, since they are measured in 2005 for all cohorts in the sample. Additional control variables include the final level of education achieved, German ethnicity, and age cohort.

A number of large population surveys now include a variety of other measures of individual traits, including standard psychological measures such as locus of control and preference indicators. In some cases, experimental methods as well as survey instruments have been used to develop alternative measures of economic preferences. In 2005, Mexican Family

⁴ Plotnick (1992) also finds that self-esteem and, to a lesser extent, locus of control, affect premarital childbearing.

Life Survey (Eckel et al, 2008) administered a set of incentivized tasks to measure risk aversion, altruism, trust, and reciprocity that could be linked to survey measures and to observed behavior. The German SOEP has been innovative in developing psychological measures that can be implemented in a large survey, and in recent years has collected information on **risk aversion** (2004), **locus of control** (2005) (essentially, the extent to which an individual believes that what happens to him is under his control, rather than due to external forces), **willingness to trust others** (2003), **positive reciprocity** (2005), and **negative reciprocity** (2005). The questions that these, and the Big Five personality traits, are based on are presented in Table 2.

The validity of some of the SOEP survey-based instruments has been examined by linking individual responses to reported behavior in particular domains or to behavior in incentivized experiments. Dohmen et al. (2005) show that the SOEP risk aversion measure predicts risk-taking behavior in investment, career choice, smoking, and other domains.⁵ Fehr et al. (2003) show that responses to the trust questions predict trust game behavior in a field experiment.

One issue in the interpretation of these models concerns possible endogeneity of personality and other traits with respect to an individual's family history. The determinants and stability of personality traits has received a great deal of attention from psychologists. As noted above, rank-orderings of personality appear to be quite stable over adult life and longitudinal research on relatively small samples has suggested that personality is not affected by major life events.⁶ Direct analysis of reverse causality will have to wait until the SOEP personality inventory is repeated in future waves, but one comparison of personality profiles in subpopulations of the SOEP is encouraging. If we compare the original West German sample with the East German sample added in 1990, the means of most personality traits are not significantly different, though these population have been subject to very different social and economic environments since childhood.⁷

⁵ Risk aversion plays a very specific role in models of economic behavior, and the SOEP measure has been used to empirically test the hypothesized role of risk aversion in the determination of reservation wages (Pannenberg, 2007) and trade union membership (Goerke and Pannenberg, 2008).

⁶ The life events included in the study by Magnus et al. (1993) included marriage and divorce/separation, but their analysis of causality between personality and experiences aggregated a large number of positive and negative events.

⁷ The East German sample is significantly more conscientious than the West German sample ($p=0.01$) and more neurotic ($p=0.05$).

Table 1: Sample Means and Standard Deviations

	Women			Men		
	Obs.	Mean	Std. Dev.	Obs.	Mean	Std. Dev.
Married by Age 25	5436	0.59	0.49	4827	0.41	0.49
Married by Age 35	4173	0.87	0.33	3848	0.81	0.39
Divorced (1 st marriage)	4475	0.21	0.41	3765	0.19	0.39
Children by Age 30	4740	1.30	1.04			
Children by Age 40	3033	1.82	1.15			
Years of Education	5580	12.18	2.52	4852	12.37	2.65
Age in 2005	5739	41.13	10.01	4964	42.35	9.48
Some religion reported	5739	0.80	0.40	4964	0.77	0.41
German ethnicity	5739	0.91	0.29	4964	0.91	0.28
“Big 5” Personality Traits						
Openness to Experience	5678	-0.02	3.57	4907	0.05	3.42
Conscientiousness	5694	0.05	2.55	4912	0.06	2.67
Agreeableness	5691	0.03	2.78	4922	0.02	2.93
Extraversion	5706	0.01	3.39	4923	0.07	3.03
Neuroticism	5705	0.05	3.59	4917	0.01	3.52
Trusting	5385	-0.01	1.58	4630	-0.00	1.66
Risk Aversion	5504	-0.01	2.21	4748	-0.05	2.16
Internal Locus of Control	5562	0.01	7.03	4845	0.23	7.24
Positive Reciprocity	5701	0.01	2.70	4932	0.06	2.62
Negative Reciprocity	5678	-0.02	4.24	4928	-0.03	4.40
Principal factors						
Factor 1: “Nice”	4984	0.00	0.81	4319	0.00	0.85
Factor 2: “Lively”	4984	0.00	0.77	4319	0.00	0.74
Factor 3: “Stable”	4984	0.00	0.69	4319	0.00	0.74

Table 2: Personality traits and preferences, SOEP questions

Big Five: I see myself as someone who ... (7-point scale from ‘applies to me perfectly’ to ‘does not apply to me at all’)

is original, comes up with new ideas	Openness to Experience
values artistic experiences	Openness to Experience
has an active imagination	Openness to Experience
does a thorough job	Conscientiousness
does things effectively and efficiently	Conscientiousness
tends to be lazy (<i>reversed</i>)	Conscientiousness
is communicative, talkative	Extraversion
is outgoing, sociable	Extraversion
is reserved (<i>reversed</i>)	Extraversion
is sometimes somewhat rude to others (<i>reversed</i>)	Agreeableness
has a forgiving nature	Agreeableness
is considerate and kind to others	Agreeableness
worries a lot	Neuroticism
gets nervous easily	Neuroticism
is relaxed, handles stress well (<i>reversed</i>)	Neuroticism

Internal Locus of control (7-point scale from totally agree to totally disagree)

- How my life goes depends on me
- If a person is socially or politically active, he/she can have an effect on social conditions
- One has to work hard in order to succeed
- If I run up against difficulties in life, I often doubt my own abilities (*reversed*)
- Compared to other people, I have not achieved what I deserve (*reversed*)
- What a person achieves in life is above all a question of fate or luck (*reversed*)
- I frequently have the experience that other people have a controlling influence over my life (*reversed*)
- The opportunities that I have in life are determined by the social conditions (*reversed*)
- Inborn abilities are more important than any efforts one can make (*reversed*)

Reciprocity (7-point scale from ‘applies to me perfectly’ to ‘does not apply to me at all’)

Positive reciprocity

- If someone does me a favor, I am prepared to return it
- I go out of my way to help somebody who has been kind to me
- I am ready to undergo personal costs to help somebody who helped me

Negative reciprocity

- If I suffer a serious wrong, I will take revenge as soon as possible, no matter what the cost
- If somebody puts me in a difficult position, I will do the same to him/her
- If somebody offends me, I will offend him/her back

Trust (4 point scale from totally agree to totally disagree)

- On the whole one can trust people
- Nowadays one can’t rely on anyone (*reversed*)
- If one is dealing with strangers, it is better to be careful before one can trust them (*reversed*)

Risk aversion (10-point scale)

- Are you generally a person who is fully prepared to take risks, or do you avoid taking risks?

Factor Analysis and Assortative Mating

Regressing several family outcomes on ten indicators of personality traits, preferences, and other non-cognitive individual characteristics, many of them strongly correlated, produces a complex set of associations. To reduce the dimensionality of the problem, I use principal factor analysis separately for men and women to estimate a three-factor model from the matrix of psychological traits that provides independent variables for an alternative specification. Based on a preliminary analysis, three latent factors provide a useful representation of the larger set of correlated variables, and the factors are rotated using the orthogonal varimax procedure to simplify interpretation. The factors that emerge from this analysis (reported in Table 3a and 3b) have intuitively plausible interpretations and factor loadings that are very similar for the male and female samples.

Factor 1 is dominated by a strong positive loading on agreeableness, with a positive association with conscientiousness and positive reciprocity and a negative loading on negative reciprocity. This factor would seem to describe what could be called conventional “niceness”—the characteristic of someone who places a high value on pleasant social relations and compliance with rules and norms. Factor 2 has large positive loadings on extraversion and openness to experience, and loadings close to 0.3 on conscientiousness, positive reciprocity, and (negatively) on risk aversion. An individual with a high value for Factor 2 has a strong desire for variety, stimulation, and attention and is willing to take risks, but is not undisciplined or negative. I have termed this factor “liveliness”, but the label seems inadequate. Factor 3 captures emotional stability (rather than neuroticism), an internal locus of control, and a willingness to trust others, plus a low level of negative reciprocity. This combination of traits, which I term “stability”, describes a person who is calm and in control, both in their own sphere and in their relations with others.

These factors also permit a parsimonious description of the degree of similarity in psychological traits between husbands and wives in the SOEP sample, as shown in Table 3c. There is a strong positive correlation for each of the three factors, and the magnitudes of the correlations are similar for married women over and under age 45. This would seem to indicate strong assortative mating on psychological traits.

Table 3a: Rotated factor loadings for non-cognitive traits–Men

Variable	Factor 1 “Nice”	Factor 2 “Lively”	Factor 3 “Stable”
Openness to Experience	0.1404	0.5538	0.0586
Conscientiousness	0.3327	0.2879	0.1537
Extraversion	0.0700	0.5329	0.1775
Agreeableness	0.8356	0.0797	0.0830
Neuroticism	-0.1989	-0.1024	-0.4457
Trusting	0.0480	-0.0132	0.2534
Risk Aversion	0.1069	-0.3064	-0.1519
Internal Locus of Control	0.1382	0.1114	0.6582
Positive Reciprocity	0.1602	0.3957	0.0003
Negative Reciprocity	-0.4148	0.1037	-0.2976

Table 3b: Rotated factor loadings for non-cognitive traits–Women

Variable	Factor 1 “Nice”	Factor 2 “Lively”	Factor 3 “Stable”
Openness to Experience	0.0690	0.5544	0.0382
Conscientiousness	0.4243	0.3124	-0.0072
Extraversion	0.0487	0.6152	0.1844
Agreeableness	0.7567	0.0420	0.0676
Neuroticism	-0.1044	-0.1565	-0.4767
Trusting	0.0021	0.0135	0.2925
Risk Aversion	0.1355	-0.3101	-0.1431
Internal Locus of Control	0.1770	0.2053	0.5099
Positive Reciprocity	0.2295	0.3082	-0.1437
Negative Reciprocity	-0.4387	0.0651	-0.3076

Note: Factor loadings greater than |0.25| highlighted for emphasis.

Table 3c. Correlation between factors of married women (fx) and their spouses (sfx)

	f1	f2	f3	sf1	sf2	sf3
f1	1.0000					
f2	0.0440	1.0000				
f3	0.1243	0.1323	1.0000			
sf1	0.2705	0.0818	0.0950	1.0000		
sf2	0.1059	0.2050	-0.0188	0.0765	1.0000	
sf3	0.1218	0.1151	0.3742	0.1367	0.1291	1.0000

Results

Marriage. Table 4 reports the coefficients from a probit model of marriage by age 35 for men and women in the sample who were 35 or older in 2005. Included in the model are the ten personality and preference traits (columns 1 and 3) or the three factors from the factor analysis described in the previous section (columns 2 and 4). Also included in all models are years of education, a dummy for German ethnicity, and a dummy for the reporting of some religious affiliation. Probit models for marriage by age 25 yielded similar results for women (with some exceptions) but no significant psychological trait effects for men.

The effects of individual traits on the marriage probabilities of men and women are quite distinct. For both, conscientiousness increases the probability of marriage and openness decreases it, indicating that a willingness to commit to a conventional long-term arrangement is an important factor in the marriage decisions of both sexes. In terms of the earlier discussion, the consistency of these effects for men and women suggest that they are reflective of joint consumption preferences. However, there is also evidence of specialized production in marriage—the effects of other traits on marriage are very different for men and women. Women’s propensity to marry by age 35 is positively related to extraversion, neuroticism, and positive reciprocity. Agreeableness is also significant and positive in many female marriage models, and here has a p-value of 0.12. For men, on the other hand, agreeableness and positive reciprocity have negative effects on marriage,⁸ and men with an internal locus of control are more likely to marry. Men who marry by age 35 thus have a trait profile that is related to earnings power rather than interpersonal connection, compared to unmarried men. Combined with the selection of nurturing, sociable, and emotional women into marriage, these results are suggestive of continued specialization in the generation of marital surplus in Germany, with women making emotional and social contributions and men, material ones. The alternative factor specification reinforces this story, with “nice” women and “stable” men more likely to marry by age 35.

Divorce. In Table 5, the hazard ratios for a Cox proportional hazard model of time to divorce for first marriages are reported. Most notable is the very strong positive effect of openness to experience on the divorce probabilities of both men and women. A one standard

⁸ These coefficients, as well as those on neuroticism, are significantly different for men and women.

deviation increase in openness increases the divorce hazard by 12 percent for women and by 20 percent for men. The finding that openness, which is associated with a desire for variety and change, is a significant detriment to a stable marital arrangement suggests a re-interpretation of the “surprise” model of divorce.⁹ That individuals have a taste for variety is a commonplace assumption, and the demand for variety in other spheres has been shown to be associated with income and education.¹⁰ In intimate partnerships, a taste for variety may be destabilizing.

An unwillingness to trust others also increases the divorce propensity of men and women, though this trait did not affect marriage.¹¹ Women who are risk-loving and have an external locus of control, and men who are extraverted and less conscientious (and therefore perhaps both willing and able to pursue alternatives), are more likely to have experienced an end to their first marriage. The factor model provides an alternative view of these patterns—“lively” men and women, and “unstable” women are more likely to experience a divorce from their first marriage.

Number of children. Table 6 shows the determinants of the number of children born to women by age 30 and by age 40. Poisson regression is used for this count model—the number of children ranges from 0 to 10. The individual traits that predict early childbearing for women are very similar to those that predict marriage (particularly early marriage)—agreeableness, extraversion, neuroticism, and low openness to experience. This is not surprising, since fertility outside cohabiting partnerships is low in Germany. “Nice” and “unstable” (or emotional) women marry and bear children early, but lifetime fertility (for which children by age 40 is a reasonable proxy) has only one significant predictor—a small (negative) effect of negative reciprocity. Though the set of ten psychological and preference variables are jointly significant at $p=0.01$, individual traits do not have the systematic effects on completed fertility that they do on other demographic outcomes. Estimating the number of children at age 30 using only the smaller sample of the “age 40” analysis yields results very similar to the age 30 equation on the full sample, so that the different outcome clearly reflects different determinants of early vs. completed fertility.

⁹ If the sample is split by education level ($<12, \Rightarrow 12$), the impact of openness on the probability of marriage by age 35 is much stronger for the high-education group, and is a significant determinant of divorce only among the low-education group.

¹⁰ Behrman and Deolalikar (1989); Gronau and Hamermesh (2008).

¹¹ This is one result that might raise concerns about reverse causality.

Table 4: The Probability of Marriage by Age 35
Probit Model

	Women		Men	
	1	2	3	4
Years of Education	-0.070** (0.018)	-0.076** (0.018)	-0.038** (0.016)	-0.054** (0.016)
“Big 5” Personality Traits				
Openness to Experience	-0.035** (0.013)		-0.023* (0.014)	
Conscientiousness	0.039** (0.019)		0.061** (0.017)	
Extraversion	0.039** (0.018)		0.012 (0.013)	
Agreeableness	0.027 (0.018)		-0.028* (0.015)	
Neuroticism	0.028* (0.009)		-0.001 (0.013)	
Trusting	-0.001 (0.030)		-0.017 (0.027)	
Risk Aversion	0.025 (0.020)		-0.005 (0.020)	
Internal Locus of Control	0.006 (0.007)		0.011* (0.006)	
Positive Reciprocity	0.030* (0.017)		-0.031* (0.017)	
Negative Reciprocity	0.003 (0.011)		0.003 (0.010)	
Principal factors				
Factor 1: “Nice”		0.181** (0.053)		-0.063 (0.046)
Factor 2: “Lively”		0.080 (0.065)		-0.014 (0.054)
Factor 3: “Stable”		-0.089 (0.068)		0.143** (0.054)
Observations	3504	3504	3287	3287
Log likelihood	-1380.69	-1405.12	-1765.54	-1790.44

Note: Numbers in () are robust standard errors. Model also includes age in 2005, German ethnicity, and dummy for reported religious affiliation. *= $p < 0.1$, **= $p < 0.05$.

Table 5: Divorce Hazard Ratios for First Marriages
Cox proportional hazard model

	Women			Men
	1	2	3	4
Years of Education	1.015 (0.024)	0.994 (0.023)	0.953** (0.023)	0.941** (0.024)
“Big 5” Personality Traits				
Openness to Experience	1.035** (0.017)		1.056** (0.019)	
Conscientiousness	1.034 (0.025)		0.953* (0.023)	
Extraversion	1.016 (0.018)		1.036* (0.021)	
Agreeableness	1.000 (0.021)		1.012 (0.027)	
Neuroticism	1.008 (0.015)		0.983 (0.017)	
Trusting	0.896** (0.033)		0.882** (0.033)	
Risk Aversion	0.924** (0.023)		0.965 (0.029)	
Internal Locus of Control	0.980** (0.008)		0.996 (0.008)	
Positive Reciprocity	0.976 (0.020)		0.997 (0.022)	
Negative Reciprocity	1.010 (0.013)		1.017 (0.016)	
Principal factors				
Factor 1: “Nice”		0.938 (0.066)		0.960 (0.067)
Factor 2: “Lively”		1.299** (0.094)		1.373** (0.106)
Factor 3: “Stable”		0.779** (0.060)		0.902 (0.072)
Observations	3955	3955	3356	3356
Log likelihood	-7807.29	-7808.96	-5663.43	-5688.26

Note: Numbers in () are robust standard errors. Model also includes age at first marriage, year of marriage, German ethnicity, and dummy for reported religious affiliation. *= $p < 0.1$, **= $p < 0.05$.

Table 6: Number of Children Ever Born: Women
Poisson Regression

	By Age 30		By Age 40	
	1	2	3	4
Years of Education	-0.108** (0.010)	-0.110** (0.010)	-0.050** (0.015)	-0.050** (0.009)
“Big 5” Personality Traits				
Openness to Experience	-0.015* (0.006)		-0.005 (0.006)	
Conscientiousness	0.013 (0.009)		-0.006 (0.009)	
Extraversion	0.014** (0.006)		0.011 (0.007)	
Agreeableness	0.018** (0.008)		0.004 (0.009)	
Neuroticism	0.016** (0.005)		0.009 (0.005)	
Trusting	-0.007 (0.012)		-0.009 (0.013)	
Risk Aversion	-0.012 (0.009)		0.006 (0.009)	
Internal Locus of Control	-0.003 (0.003)		0.001 (0.003)	
Positive Reciprocity	0.009 (0.008)		0.011 (0.008)	
Negative Reciprocity	-0.002 (0.005)		-0.009* (0.005)	
Principal factors				
Factor 1: “Nice”		0.083** (0.025)		0.042 (0.030)
Factor 2: “Lively”		0.026 (0.024)		0.011 (0.025)
Factor 3: “Stable”		-0.080** (0.027)		-0.017 (0.028)
Observations	4150	4150	2679	2679
Wald χ^2	319.02	289.20	112.23	92.52

Note: Numbers in () are robust standard errors. Models also include age in 2005, German ethnicity, and dummy for reported religious affiliation. *= $p < 0.1$, **= $p < 0.05$.

Conclusions

Evidence from the German Socio-economic Panel Survey shows that several dimensions of personality and other psychological attributes are strongly associated with the propensity of men and women to marry and to divorce, but not with women's completed fertility. The pattern of results is consistent with the view that variation in marital surplus, rather than in ability to commit or solve problems, is the principal determinant of marriage and divorce behavior in Germany. Some psychological traits have similar effects on the probability of marriage and divorce for men and women, which is consistent with a model in which marital surplus depends on the joint consumption of public goods, while other, gender-distinct effects reflect specialized production.

Openness to experience, which reflects a desire for variety and change as well as imagination and creativity, is strongly related to both long-term singlehood and to divorce for both men and women. There is little indication that divorce is driven by individual traits that might indicate difficulties in problem-solving or negotiation, such as disagreeableness, neuroticism, or negative reciprocity. Instead, a factor with high loadings on openness and extraversion ("Lively") has a substantial positive effect on the divorce hazard. This may indicate that low surplus from long-term marriage, due to a taste for variety or a propensity for boredom, causes divorce rather than an inability to respond effectively to shocks.

The determinants of marriage for men and women include some common features (low levels of openness and high conscientiousness) and some distinct differences that suggest marital surplus is related to nurturance by women ("nice") and to men's stability and earnings. This pattern is consistent with the relatively conservative social environment in Germany, and with the persistence of traditional gender roles. Early childbearing by women is related to factors that predict early marriage, but psychological variables are not important determinants of childbearing by age 40.

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