Cupid and Psyche: Cognition and the Choice of the Partner

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Abstract

The paper provides the first empirical evidence on the importance of cognition - numeric ability - in the choice of the partner. Using the British Household Panel Study Understanding Society, I estimate a structural model of marriage sorting on a representative sample of British couples. Results show that partners with similar numeric ability are attracted to each other. Cognition and physical characteristics are the most important attributes in marriage sorting. Personality traits and risk propensity are also relevant to various extents. Heterogeneous preferences across gender are found and results are robust to an alternative specification. Implications of mutual attractiveness in cognition for marriage dynamics are discussed.

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"*You are like nobody since I love you*", P. Neruda

"*Love is always also an amazing intellectual adventure*", F. Alberoni

"*Rare are the people who use their head, few those who use their hearth, and unique those who use both*", R. Levi Montalcini

"*Drink this Psyche and be immortal! Nor shall Cupid ever break away from the knot in which he is tied, but these nuptials shall be perpetual*", Apuleius

1 Introduction

Marriage may influence happiness, wealth and welfare of the two partners and their offsprings, therefore, understanding what drives marriage sorting is crucial.

The literature has often considered education, income, and more recently noncognitive skills to explain marriage matching. I here assess the impact of numeric ability, as measure of cognitive skills. Individuals make use of their numeric ability on a daily basis: these skills relate to and are among the determinants of various lifetime outcomes involving personal growth, professional achievements, and decision making broadly defined. Thus, if the assumption that the choice of the life partner grounds also on mutual attractiveness in cognition holds, then this outcome could have consequences for dynamic patterns of marriage as well. To the best of my knowledge, no prior study has investigated the impact of cognition in marriage matching.

Numeric ability is considered across disciplines a good measure for *crystallized intelligence*. According to the theory developed in psychology (e.g., Horn and Cattell, 1966; Horn, 1985; Cattell, 1987), *crystallized intelligence* is one of the dimensions, together with *fluid intelligence*, that constitute the two main components of individual primary abilities. *Fluid intelligence* is comprehensive of the factors that can be defined as biological, such as genetically inherited intelligence and physical injuries/events that may alter intelligence, and abstract thinking; instead, *crystallized intelligence* is comprehensive of the factors acquired with experience that may influence intelligence, such as for instance education and learning across the life span. Thus, crystallized intelligence is related to individual education, but it is inclusive of acculturated knowledge from daily life experience, then it is dynamically evolving over time, and, in sharp contrast to other cognitive skills (e.g., memory), it is increasing over adulthood.

I estimate a static model of marriage sorting as in Dupuy and Galichon (2014) where I let sorting be based on multiple attributes, among which numeric ability. I conduct the analysis using the years 2009-2011 of the British Household Panel Study - Understanding Society (BHPSUS hereafter) data set. The BHPSUS is a survey representative of the British population that is particularly suitable to study marriage matching because it provides information about both physical and behavioral characteristics of individuals and their partners. Given the availability of similar national surveys, these features make the paper suitable to be used for cross-country comparison.

The results are as follows. First, *physical* and *mental attraction* are the major drivers of marriage sorting: candidate partners with similar crystallized intelligence are mutually attracted to each other, this characteristic is second only to height, and it is followed by body mass index (henceforth BMI). Second, risk propensity and the 'Big 5' personality traits are also relevant to marriage sorting and support the existing literature, according to which some of these traits are more relevant than others to explain individual behavior: risk, conscientiousness, openness to experience and neuroticism are more relevant than extraversion and agreeableness. Third, attributes have both a direct and indirect -through their interactions- influence on matching. Fourth, the findings suggest the presence of heterogeneous preferences between husbands and wives in the choice of the partner. Finally, the results are robust to the inclusion of education among the attributes.

The paper is structured as follows. Section 2 motivates the study. Section 3 describes the data and the empirical methodology. Section 4 reports the results and the alternative specification. Finally, section 5 presents a discussion and concluding remarks.

2 Intelligence of Individuals and Couples

Numeric ability has already been used by researchers across disciplines to analyze individual behavior and its consequences. Existing studies (see for instance McArdle et al., 2002; Peters et al., 2006; Banks and Oldfield, 2007; Smith, McArdle and Willis, 2010; Benjamin, Brown and Shapiro, 2013; Zaval et al., 2015; Chen et al., 2019) have found that individuals with high numeric ability perform well in a series of tasks and situations, among which discounting, financial literacy, wealth accumulation, savings and investment, and taking care of their physical health; also, the advantage of these individuals with respect to those with lower numeric ability is considerable and can lead to significantly better achievements. Individuals scoring high in crystallized intelligence are generally more reflexive, more patient, and wiser than the others. They are more likely to think efficiently, to view problems from different perspectives, they are more capable to exclude irrelevant alternatives and to process and acknowledge their limited information when making decisions.

Thus, our assumption that individuals choose someone with numeric ability similar to their own one to form a family, if met, may reinforce this mechanism through interactions and externalities, amplifying further its impact.

3 Empirical Framework and Data

3.1 Empirical Framework

The model I estimate in the next section grounds on Dupuy and Galichon (2014),[1] who extend the Choo and Siow (2006) marriage model, where marriage matching is based on discrete attributes, to include continuous attributes.

Males and females, denoted respectively with m and w, search for a partner in the set of their acquaintances, indexed respectively by $k \in \mathbb{N}$ and $l \in \mathbb{N}$. The search leads to a one-to-one bipartite matching model with transferable utility, after couples are matched the number of males and fe-

[1] I here provide a brief presentation of the methodology, please see Dupuy and Galichon (2014) for details and proofs.

males in the sample is the same. Each male has a series of attributes $x \in X = \mathbb{R}^{dx}$ and each female has attributes $y \in Y = \mathbb{R}^{dy}$.

A male and a female will match when the matching, namely, the probability density that a couple with certain attributes is formed, maximizes the total utility of the couple. Formally, the utility of a man m with attributes $x_m = x$ matching with a woman w with attributes y_k^m is $U\left(x, y_k^m\right) + \frac{\sigma}{2}\varepsilon_k^m$ and similarly the utility of a woman w with attributes $y_w = y$ matching with a man m with attributes x is $V\left(x_l^w, y\right) + \frac{\sigma}{2}\eta_l^w$, where $U\left(x, y_k^m\right)$ and $V\left(x_l^w, y\right)$ are the utilities based on the observable attributes of the potential partner, σ is a parameter that measures intensity of unobserved heterogeneity, and ε_k^m and η_l^w are the two sympathy shocks for respectively candidate husbands and candidate wives, $\{(y_l^m, \varepsilon_l^m), k \in M\}$ is Poisson distributed with intensity $dy \times \varepsilon^{-\varepsilon} d\varepsilon$ (the same applies to the other partner with a change in notation). Dupuy and Galichon (2014) show that this framework leads to a continuos multinomial logit model.

The two probability distributions for males and females choosing a partner with attributes x and y are, respectively:

$$\pi_{Y|X}(y|x) = \frac{\exp[U(x,y)/(\sigma/2)]}{\int\limits_Y \exp[U(x,y')/(\sigma/2)]dy'} \tag{1}$$

and

$$\pi_{X|Y}(x|y) = \frac{\exp[V(x,y)/(\sigma/2)]}{\int\limits_X \exp[V(x',y)/(\sigma/2)]dx'}. \tag{2}$$

The maximization problem is as follows:

$$\max_{\pi \in M(P,Q)} \int\int_{X \times Y} \Phi(x,y)\pi(x,y)dxdy - \sigma \int\int_{X \times Y} \log \pi(x,y)\pi(x,y)dxdy \tag{3}$$

namely, the maximization of the utility function subject to the probability the matching occurs. In this optimization problem, $\Phi(x,y)$ is the joint utility and it is the sum of the utilities of the two partners, $\pi(x,y)$ is the probability distribution that a couple with characteristics (x,y) is formed, σ is the parameter that measures the intensity of unobserved heterogeneity and P and Q are the probability distributions of the attributes of males and females. The continuous multinomial logit guarantees independence across disjoint subsets (i.e., the independence of irrelevant alternatives), which allows to rule out the presence of a *systematic* sympathy shock (i.e., correlated sympathy shock across observables) for both candidate partners. It could be appropriate to accommodate a *random* sympathy shock for attributes, because of partner preferences; however, if most of the matching is determined through observables, the impact of unobservables in marriage sorting can be considered negligible.

The maximization process allows to derive the two equilibrium utilities for husbands and wives; the equilibrium matching is unique and stable (i.e., no partner prefers another matching) and it maximizes social gains.

Dupuy and Galichon (2014) show that, under a quadratic parametrization assumption of the utility function, $\Phi(x,y)$, which can be written as $\Phi_A(x,y) = x'Ay$, where A, a $d_x \times d_y$ matrix, is the *affinity matrix* whose elements are defined as

$$A_{ij} = \frac{\partial^2 \Phi(x,y)}{\partial x_i \partial y_j}, \tag{4}$$

the cross-derivative allows the researcher to identify *mutual attractiveness*.[2] When an element of the matrix is positive, there is positive assortative matching (i.e., complementarity) between the attributes of the husband and the wife, while when the element of the affinity matrix is negative there is negative assortative matching (i.e., the attributes of the two partners are substitutes). The asymmetry of the affinity matrix indicates the presence of heterogeneous preferences between candidate husbands and wives in the matching process. Finally, the structural approach, by controlling for marginal distributions controls for the possible presence of misleading results due to correlations across variables.

Once the matrix has been estimated it is possible to conduct a saliency analysis, a method proposed by Dupuy and Galichon (2014) that consists in performing a singular value decomposition

[2] Note it is impossible to identify *absolute attractiveness*. Identification can be reached up to a separable additive function; only the cross-derivative $\partial^2 \phi\,(x,y)\,/\partial x \partial y$, whose elements constitute the affinity matrix, A_{ij}, can be identified, while we cannot identify the first derivatives with respect to x and y.

of the renormalized affinity matrix. Saliency analysis allows to determine the attributes on which the marriage sorting decision of couples is based and the indices of *mutual attractiveness*, namely, pairs of indices for the two partners explaining a mutually exclusive part of the joint utility.

3.2 Data

The British Household Panel Study Understanding Society data set (BHPSUS) is one of the national surveys conducted in various countries (other examples are the American Panel Study of Income Dynamics (PSID), the German SocioEconomic Panel (GSOEP) and the DNB Household Survey (DHS)) that not only include demographics of the interviewed individuals, but also have records of physical characteristics, such as for instance height and BMI, and personality traits, that can be crucial to understand individual behavior, such as who marries whom.

The attributes I use to study marriage sorting are as follows: Numeric Ability as measure for cognitive skills, height, body mass index (BMI), the Big 5 personality Traits (Conscienciousness, Extraversion, Agreableeness, Neuroticism, Openness to Experience), risk propensity and later in the paper the maximum level of education.[3]

Numeric ability (*Numeric*) takes values from 0 to 5 and it is a count of the number of problems the respondent has been able to solve. Following the literature (e.g., Dupuy and Galichon, 2014) I also use the maximum level of education attained by each individual (*MaxEdu*), which ranges from 1 to 3, where it takes value 1 if the individual has almost some degree of compulsory elementary education, 2 some intermediate level of education (i.e., a high school degree) and 3 higher education or any further higher education.

The ‘Big 5’ personality traits are measures for noncognitive skills: Conscienciousness, Extraversion, Agreableeness, Neuroticism (or Emotional Stability, depending on how the question is formulated in each survey), and Openness to Experience. They range from 1 to 7, where 1 cor-

[3]In the main analysis I omit the maximum level of education because it could be questioned that the joint utilization of numeric ability and education may generate collinearity problems; however, I provide estimation results also including educational attainment in order to show that the relevance of numeric ability is not a result of its omission.

responds to the lowest value and 7 to the highest value of each trait. Conscientiousness (*Consc*) captures the ability to self-discipline, to stay focused of a person, to comply with rules and to plan in advance. Openness to experience (*Open*) measures the extent to which a person is open to something new, the need for intellectual stimulation and imagination. Extraversion (*Extrav*) catches the degree of interaction with others, the tendency to be involved in social activity and warmth of a person. Neuroticism (here *Neurot*) measures anxiety, depression and how well individuals can control their emotions under stress. Finally, Agreeableness (*Agree*) measures the tendency to trust others, altruism, cooperation, and the ability of a person to have harmonious and balanced relations with other individuals. In line with the previous work (Dupuy and Galichon, 2014) I also control for risk taking propensity of each person. *Risk* takes values from 1 to 10, where 1 corresponds to the lowest value for propensity and 10 to the highest.

Following the marriage literature I also consider height of the individuals (*Height*, expressed in centimeters) and the value of the Body Mass Index (*BMI*). This index captures the extent to which an individual is underweight (a $BMI < 18.5$), normal weight ($18.5 \leq BMI < 24.99$), overweight ($25 \leq BMI < 29.99$) or obese ($BMI \geq 30$). In the regression I will use the exact value of BMI (continuous measure) for each individual.

To conduct the analysis, I need information for all the variables used for both males and females. In order to retrieve values for all the attributes I use the first three waves of the BHPSUS, corresponding to the years 2009-2011;[4] then, I keep the couples for which I have full information about the attributes, and I preserve the first year for each couple. I also restrict the sample to couples whose partners' age ranges between 18 and 44, so to offset the structural differences in marriage sorting over time. Thus, the sample starts with 31,023 couples, that reduce to 8,712 after eliminating the couples for which numeric ability, BMI and Height are missing, and to 4,876 after eliminating the missing values for the remaining attributes. Finally, imposing the age limit leads to a further reduction in the number of couples, which reduce to 1,487, that is, 2,974 indi-

[4]While some of the variables used are available in a single wave (e.g., noncognitive skills), others may be observed over multiple waves (i.e., education and BMI). For these attributes I use either the individual average or the maximum value across the available values. This does not affect the results because they are computed using values from 1 to at most 3 consecutive years.

viduals. As it is generally the case for survey data, it should be reckoned that also the BHPSUS is affected by attrition; the attributes are standardized in the structural estimation, as in Dupuy and Galichon (2014), to make results comparable across attributes. The variables, their source and their definition are presented in the Appendix.

4 Results

Figure 1 presents a first preliminary evidence of our assumption. It shows the repartition of couples of the BHPSUS sample by their numeric ability.

- Please enter Figure 1 about here -

While, luckily, there are not many individuals and couples who scored low and who are pairing to each other, the majority of couples have intermediate levels of numeric ability and there is evidence of mutual attractiveness in this attribute. It is worth noticing that a good proportion of the candidate partners who scored 5 (the highest value) decided to marry each other.

Table 1 presents descriptive statistics for the characteristics of males and females. On average, husbands are older than wives. Also, the variable for cognitive skills (*Numeric*), indicates that husbands have a slight comparative advantage in terms of crystallized intelligence; education (*MaxEdu*) is slightly higher for wives: the last two results align to the existing literature suggesting that females outperform males in educational attainment and a disappearance, in more gender-equal societies as the United Kingdom, of differences across genders in test performance (The Department for Education, 2009; Halpern et al., 2007; Guiso et al., 2008; The Department for Education, 2019). In line with the literature (Borghans et al., 2009), the propensity to take risk is higher for husbands than for wives. Females are more conscientious than males, but also more neurotic. Openness to experience is slightly higher for husbands, while wives are more extroverted and also on average more agreeable than husbands. Finally, anthropometrics reflect the genetic differences across genders, since husbands have higher values of BMI and are overall taller than wives; furthermore, the BMI index indicates that both husbands and wives are on average slightly overweight because both samples have average values above 25 and below 30, which are respectively the thresholds for overweight and obesity; since the sample is restricted to relatively young couples, the finding is a further evidence that obesity is a problem in the United Kingdom (e.g., OECD, 2017).

- Please enter Table 1 about here -

However, in order to understand whether and the extent to which numeric ability influences marriage sorting a more structural analysis is needed. This analysis is shown in the rest of the paper.

Table 2 presents the results for the estimation of the affinity matrix on the couples of the sample.

- Please enter Table 2 about here -

The on-diagonal entries, which measure the impact of mutual attractiveness in a specific attribute on the joint utility function, show that all the attributes, but agreeableness and extraversion, are directly relevant to explain marriage sorting. Numeric ability is one of the characteristics that most contribute to the joint utility of the couples, second only to *Height*: increasing height of both partners by 1 standard deviation increases the joint utility of a couple by 0.28 units, while increasing cognitive skills increases it by 0.19 units.

The off-diagonal entries show if two given characteristics of the partners are complementary or substitutes and it represents the importance of cross gender interactions between attributes. Cognition is not only directly but also indirectly important to explain who marries whom; the results show that, for both partners, there is a trade-off between numeric ability and BMI, that is, there is a negative interaction between numeric ability of individuals and BMI of their partner. Also, the asymmetry of the affinity matrix suggests that husbands and wives have different preferences for attributes of the partner: the joint utility of a couple whose husband is relatively more intelligent benefits from having a wife that is more open to experience, and husbands' intelligence interacts negatively with risk propensity and agreeableness of a wife; instead, wife's numeric ability negatively interacts with husband's conscientiousness, and increasing wife's numeric ability by one standard deviation has the same impact on the joint utility disregarding changes in the remaining attributes.

Similarly, height of husbands has a negative interaction with conscientiousness of wives and a positive one with their neuroticism; instead, increasing wife's height by a standard deviation increases the joint utility of couples whose husband is more open to experience relatively more (the entry is 0.09), but there is a negative interaction between wife's height and husband's neuroticism and agreeableness. BMI, the other physical attribute, is also relevant to explain the matching and the on-diagonal estimated parameter, 0.14, is also among the most sizeable, confirming the importance of physical characteristics in marriage sorting.

The on-diagonal entry for *Risk* is also high: with a value of 0.14 this attribute reveals the presence of positive assortative matching in risk propensity. The negative correlation between risk of both partners and agreeableness of their respective partner may suggest (although further investigation is needed) that individuals who are relatively more risk lovers do not enjoy the company of partners that are too compassionate or kind because their behavior may be not stimulating.

Regarding the 'Big 5' personality traits, individuals with similar levels of both conscientiousness and openness to experience are attracted to each other (both the on-diagonal entries are 0.09); instead, neuroticism, with an on-diagonal entry of -0.10, is a substitute, suggesting that if a partner is neurotic the couple is, comprehensively, better off if the other partner is more emotionally stable. The off-diagonal entries indicate that the personality traits contribute to the joint utility of the couple also indirectly and suggest that preferences between the two subsamples are heterogeneous. For instance, increasing husband's conscientiousness by one standard deviation raises the joint utility of the couple whose wife is more agreeable relatively more (the off-diagonal entry is 0.09), the interaction between wife's conscientiousness and husband's agreeableness is not significant. The other off-diagonal entries may be similarly interpreted and they also highlight the presence of non homogeneous preferences across genders. Also, in accord with the existing literature (Borghans et al., 2008; Dupuy and Galichon, 2014), some personality traits are more relevant than others for the choice of the partner and the determination of the joint utilty of the couples.

In addition, the bottom part of the table reports in Panel A the share of joint utility explained by the indices, and in Panel B the principal component analysis to investigate how much is explained by the indices. Panel A shows that most of the indices are statistically significant. Also, the observables explain the totality of the joint utility, so we can safely assume that the attribute specific random sympathy shock is negligible; the first four indices explain about the 74 per cent of the total utility.

In Panel B the principal component analysis suggests that the first index, which explains the 23.32 per cent of the total observed matching utility, loads for both husbands and wives on numeric ability: this result is a further confirmation of the importance of this attribute for marriage sorting; instead, the second index loads on physical characteristics and the third index loads on personality.

Thus, all in all, the results show that all the attributes jointly explain, directly and/or indirectly, the joint utility of the British couples. Besides, the asymmetry of the matrix remarks the presence of heterogeneous preferences across husbands and wives. The saliency analysis further reinforces this finding and remarks the relevance of numeric ability in marriage matching.

Finally, Table 3 presents the matrix estimated by adding to the list of attributes the maximum level of education attained. The table indicates that the results for our variable of interest hold and are very similar to the entries of Table 2. While now the maximum level of education is, together with *Height*, the highest on-diagonal entry, *Numeric* is the third most important attribute in the matrix, it is more relevant than *Risk* and *BMI*.

- Please enter Table 3 about here -

The saliency analysis for Table 3 is shown at the bottom of the table. Once again, the observables explain the totality of the joint utility. The first four indices explain about the 70 per cent of the total utility. The principal component analysis in Panel B confirms that the first index loads on both *MaxEdu* and *Numeric*, confirming the complementarity of these two attributes, and *Open*; the second loads on physical characteristics and partly again on *Numeric*, the third on personality. It is also interesting that the effect of cognition is smoothed across the three indices. So, this table confirms that the results in Tables 2 are not driven by the omission of educational attainment.

5 Discussion and Conclusions

The paper provides evidence on the impact of cognition in the choice of the partner and shows that partners with similar numeric ability are attracted to each other. All in all, the findings indicate that individuals are more likely to marry partners that are similar to them in terms of physical characteristics, cognition, and personality: there is significant negative assortative matching only in neuroticism. The attributes are also indirectly relevant, to various extents, for the determination of the joint utility of the couple; furthermore, the asymmetry of the affinity matrix reveals heterogeneous preferences in marriage between husbands and wives.

Mutual attractiveness in numeric ability has non-trivial implications for household dynamics. Individuals with high numeric ability have, generally, qualities that lead them to be successful in several lifetime outcomes. The evidence produced so far reveals that they have a substantial comparative advantage with respect to the rest of the population.

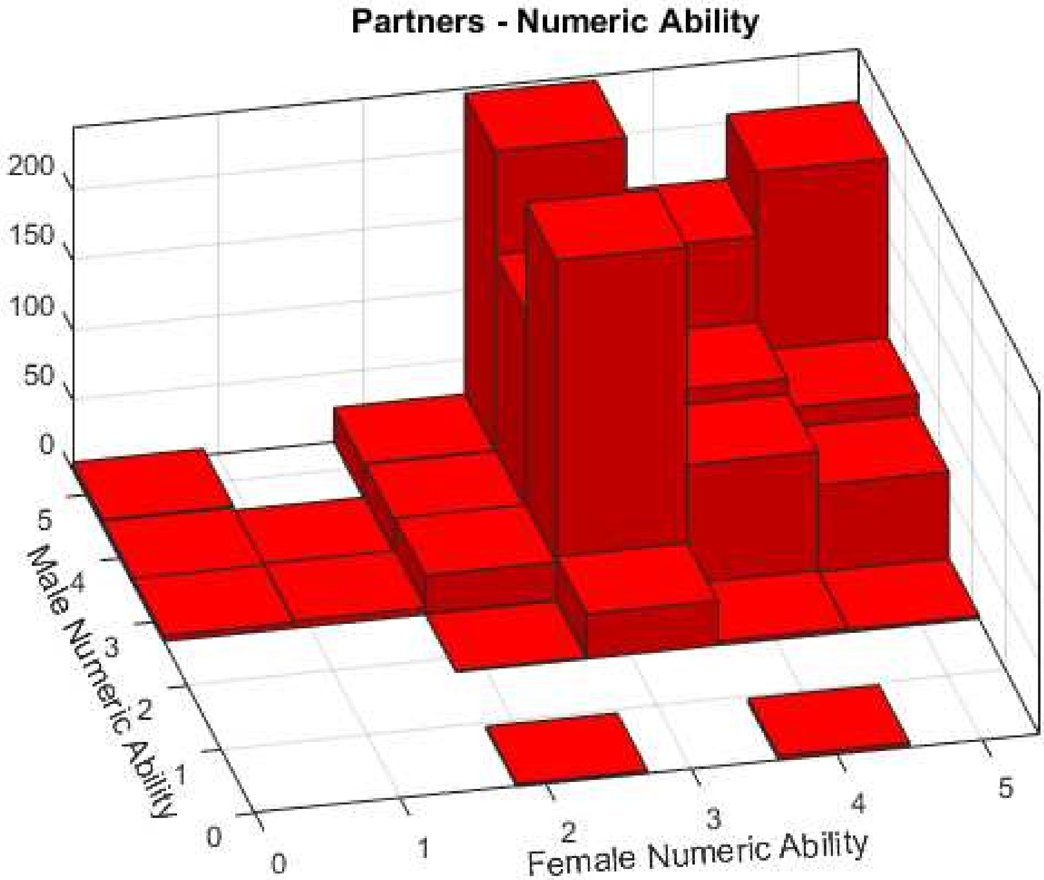
Then, our results are compatible with a scenario where differences in success largely vary between the relatively few families where both partners score high in numeric ability and all the other families in a population. The divergence is expected to be drastic when we compare families with the highest score (5) and those where both partners have low scores (e.g., 0 to 2), but they are likely to be very large also when we compare the couples with the highest scores and those with intermediate levels. We expect couples with the highest values of numeric ability to be more able, other things equal, to face shocks, to endure and to be resilient, and to be more likely to detect and seize the opportunity in several contexts: these predictions are not limited to few situations, such as the job market and the career path, financial matters, savings and wealth, but they have broad applicability. For instance, the trade-off found earlier in the paper between numeric ability of both partners and BMI of their respective partner, highlights that couples with high levels of cognition are well aware of the importance to stay fit and healthy. So, the results are consistent with an overall significantly better performance of these couples with respect to all the other couples of the sample.

Besides, even more importantly, our findings suggest the above differences will be magnified by interactions between the two partners and the externalities they generate. These implications will not be limited to the life of the two partners as a couple, but they will similarly influence, through direct socialization, the life of their offsprings, leaving scope for future research.

Tables and Figures

Figure

Figure 1



Tables

Table 1: Descriptive Statistics for Matched Males and Females

	Males			Females		Range		p-values
	Observations	Mean	Standard Deviation	Mean	Standard Deviation	Minimum	Maximum	
Age	1,487	35.62	5.72	33.86	5.91	19	44	0.000
Numeric	1,487	4.07	0.93	3.62	0.98	0	5	0.000
MaxEdu	1,487	2.39	0.65	2.49	0.59	1	3	0.001
Consc	1,487	5.44	0.98	5.58	1.00	1	7	0.000
Neurot	1,487	3.38	1.32	4.02	1.34	1	7	0.000
Open	1,487	4.76	1.12	4.48	1.22	1	7	0.000
Extrav	1,487	4.52	1.23	4.79	1.22	1	7	0.000
Agree	1,487	5.41	1.00	5.65	1.00	1	7	0.000
Risk	1,487	6.00	2.37	5.11	2.32	0	10	0.000
BMI	1,487	27.89	6.83	27.37	5.86	18.2^m 16.4^w	163.2^m 53.9^w	0.000
Height	1,487	177.50	7.74	163.45	6.37	84.2^m 144.3^w	202.2^m 186.6^w	0.000

Notes: Descriptive statistics for matched males and females. Superscripts *m* and *w* indicate ranges for males and females respectively.
Source: BHPSUS, years 2009, 2010, 2011 and author's calculation.

Table 2: Affinity Matrix and Saliency Analysis

	Wives								
Husbands	**Numeric**	**BMI**	**Height**	**Risk**	**Consc**	**Open**	**Agree**	**Neurot**	**Extrav**
Numeric	0.19***	-0.13***	0.01	-0.04*	0.03	0.07***	-0.15***	-0.01	0.04
	[6.262]	[-2.366]	[0.221]	[-1.299]	[0.874]	[2.294]	[-4.822]	[-0.164]	[1.140]
BMI	-0.08***	0.14**	-0.04	0.04	0.01	-0.03	-0.06***	-0.00	0.01
	[-3.364]	[2.478]	[-0.814]	[1.221]	[0.286]	[-1.694]	[-2.594]	[-0.061]	[0.235]
Height	-0.03	0.04	0.28***	0.04	-0.05**	-0.02	-0.02	0.05*	0.03
	[-1.025]	[0.717]	[5.848]	[1.129]	[-1.573]	[-0.796]	[-0.471]	[1.798]	[0.853]
Risk	0.01	-0.06	-0.05	0.14***	-0.02	-0.04	-0.05***	0.02	-0.02
	[0.268]	[-1.375]	[-1.296]	[3.563]	[-0.566]	[-1.339]	[-1.629]	[0.650]	[-0.570]
Consc	-0.06*	0.06	-0.01	0.04	0.09***	-0.07***	0.09***	0.00	0.04
	[-1.790]	[1.269]	[-0.171]	[1.287]	[2.884]	[-2.122]	[2.691]	[0.127]	[1.169]
Open	0.02	-0.06	0.09*	0.06	-0.03	0.09***	-0.03	0.02	0.06*
	[0.656]	[-1.157]	[2.066]	[1.828]	[-0.851]	[2.898]	[-0.922]	[0.622]	[1.834]
Agree	0.01	-0.02	-0.09**	-0.13***	-0.03	0.05	-0.02	-0.01	0.02
	[0.150]	[-0.487]	[-2.139]	[-3.802]	[-0.927]	[1.447]	[-0.658]	[-0.305]	[0.652]
Neurot	-0.02	-0.02	-0.10*	0.03	-0.09***	-0.01	0.02	-0.10***	-0.07*
	[-0.514]	[-0.528]	[-2.428]	[0.976]	[-2.949]	[-0.361]	[0.499]	[-3.022]	[-1.851]
Extrav	-0.04	0.00	0.03	-0.05	-0.03	-0.01	0.09***	-0.10***	-0.06
	[-1.364]	[0.086]	[0.820]	[-1.444]	[-0.835]	[-0.401]	[2.658]	[-2.946]	[-1.573]
					Saliency Analysis				
					Panel A: Share of Joint Utility Explained				
	I1	**I2**	**I3**	**I4**	**I5**	**I6**	**I7**	**I8**	**I9**
Share of joint utility explained	23.32	22.61	14.89	12.94	9.88	7.33	5.08	2.50	1.46
Standard deviation of shares	1.90	2.62	2.54	2.02	2.03	1.99	1.94	1.95	2.03
					Panel B: Indices of Attractiveness				
	I1 M	**I1 W**	**I2 M**	**I2 W**	**I3 M**	**I3 W**			
Numeric	0.75	0.58	0.21	0.14	-0.05	-0.01			
BMI	-0.29	-0.53	-0.13	-0.06	-0.31	0.02			
Height	-0.29	-0.22	0.78	0.89	0.13	0.28			
Risk	0.08	-0.19	-0.04	0.16	-0.71	-0.84			
Consc	-0.37	-0.03	-0.07	-0.01	-0.13	-0.09			
Open	0.17	0.33	0.36	0.09	-0.11	0.21			
Agree	0.25	-0.43	-0.25	-0.17	0.39	0.35			
Neurot	0.02	-0.00	-0.35	0.27	-0.08	-0.23			
Extrav	-0.19	0.07	-0.11	0.21	0.45	-0.04			

Notes: *** indicates significance at the 1% level, ** at the 5%, and * at the 10% level. t-statistics are in parentheses. In Panel A the shares of joint utility explained by the attributes and the standard deviation of each share are reported. I1-I9 indicate the indices created by the singular value decomposition of the affinity matrix. I1-I3 in Panel B indicate the respective indices for males (M) and females (W).
Source: BHPSUS, years 2009, 2010, 2011 and author's calculation.

Table 3: Affinity Matrix and Salience Analysis adding Education

	Wives									
Husbands	**Numeric**	**Maxedu**	**BMI**	**Height**	**Risk**	**Consc**	**Open**	**Agree**	**Neurot**	**Extrav**
Numeric	0.15***	0.04	-0.08*	-0.00	-0.04*	0.02	0.02	-0.15***	-0.01	0.03
	[4.822]	[1.170]	[-1.628]	[-0.004]	[-1.156]	[0.561]	[0.734]	[-4.816]	[-0.389]	[1.025]
MaxEdu	0.11***	0.27***	-0.16***	0.03	-0.03	0.02	0.18***	0.01	0.09***	0.01
	[2.996]	[5.849]	[-3.249]	[0.664]	[-0.835]	[0.697]	[5.141]	[0.155]	[2.444]	[0.347]
BMI	-0.07***	-0.02	0.14***	-0.04	0.05	0.02	-0.02	-0.04*	-0.00	0.01
	[-3.019]	[-0.600]	[2.508]	[-0.691]	[1.349]	[0.689]	[-1.059]	[-1.977]	[-0.049]	[0.217]
Height	-0.05*	0.10***	0.05	0.28***	0.04	-0.06*	-0.04	-0.02	0.06**	0.03
	[-1.860]	[2.663]	[0.920]	[5.696]	[1.060]	[-1.850]	[-1.326]	[0.656]	[2.120]	[0.840]
Risk	0.01	-0.02	-0.06	-0.05	0.14***	-0.02	-0.05	-0.05*	0.02	-0.02
	[0.266]	[-0.525]	[-1.266]	[-1.298]	[3.615]	[-0.550]	[-1.466]	[-1.663]	[0.531]	[-0.585]
Consc	-0.06*	-0.05	0.06	-0.01	0.05	0.09***	-0.07**	0.09***	-0.00	0.04
	[-1.683]	[-1.184]	[1.230]	[-0.185]	[1.345]	[2.870]	[-2.109]	[2.646]	[-0.059]	[1.089]
Open	-0.02	0.12***	-0.03	0.08*	0.06	-0.04	0.06*	-0.03	0.03	0.06*
	[-0.593]	[2.844]	[-0.647]	[1.833]	[1.749]	[-1.157]	[1.775]	[-1.028]	[0.818]	[1.698]
Agree	0.00	-0.00	-0.02	-0.09**	-0.13***	-0.03	0.05	-0.02	-0.01	0.02
	[0.065]	[-0.106]	[-0.359]	[-2.114]	[-3.736]	[-0.961]	[1.340]	[-0.661]	[-0.296]	[0.604]
Neurot	-0.01	-0.07*	-0.02	-0.10***	0.04	-0.09***	-0.02	0.02	-0.11***	-0.07*
	[-0.433]	[-1.735]	[-0.342]	[-2.335]	[1.049]	[-2.790]	[-0.596]	[0.501]	[-3.164]	[-1.780]
Extrav	-0.02	-0.06	-0.02	0.04	-0.05	-0.02	0.01	0.09***	-0.10***	-0.06
	[-0.538]	[-1.539]	[-0.335]	[0.933]	[-1.470]	[-0.625]	[0.397]	[2.684]	[-2.903]	[-1.529]
					Saliency Analysis					
					Panel A: Share of Joint Utility Explained					
	I1	**I2**	**I3**	**I4**	**I5**	**I6**	**I7**	**I8**	**I9**	**I10**
Share of joint utility explained	26.15	19.99	12.94	11.11	10.66	8.26	4.40	4.00	1.77	0.72
Standard deviation of shares	1.66	1.85	2.12	2.12	1.70	1.71	1.72	1.63	1.66	1.72
					Panel B: Indices of Attractiveness					
	I1 M	**I1 W**	**I2 M**	**I2 W**	**I3 M**	**I3 W**				
Numeric	0.28	0.28	0.29	0.36	0.37	0.16				
MaxEdu	0.75	0.67	0.24	-0.09	-0.16	-0.01				
BMI	-0.20	-0.35	-0.16	-0.38	0.23	-0.04				
Height	0.27	0.32	-0.76	-0.73	-0.05	-0.22				
Risk	-0.05	-0.07	0.05	-0.28	0.66	0.67				
Consc	-0.22	-0.00	-0.20	0.02	-0.05	-0.00				
Open	0.31	0.35	-0.20	0.25	0.15	-0.26				
Agree	0.01	-0.17	0.33	-0.09	-0.27	-0.61				
Neurot	-0.26	0.28	0.24	-0.18	0.07	0.16				
Extrav	-0.15	0.13	0.03	-0.11	-0.49	0.09				

Notes: *** indicates significance at the 1% level, ** at the 5%, and * at the 10% level. t-statistics are in parentheses. The shares of joint utility explained by the attributes and the standard deviation of each share are reported. I1-I10 indicate the indices created by the singular value decomposition of the affinity matrix for males (M) and females (W).
Source: BHPSUS, years 2009, 2010, 2011 and author's calculation.

A Appendix

Table A1 reports the list of variables, their definitions and sources.

Table A1: List of Variables, Definitions and Source

Variables	Definition	Source
Age	age of respondent (r henceforth)	BHUS, ‘w’_dvage
Agree	indicator ranging from 1 to 7 (where 7 is the highest) that measures r agreeableness	BHUS, c_big5a_dv
Neurot	indicator ranging from 1 to 7 (where 7 is the highest) that measures r neuroticism	BHUS, c_big5n_dv
Extrav	indicator ranging from 1 to 7 (where 7 is the highest) that measures r extraversion	BHUS, c_big5e_dv
Consc	indicator ranging from 1 to 7 (where 7 is the highest) that measures r conscientiousness	BHUS, c_big5c_dv
Open	indicator ranging from 1 to 7 (where 7 is the highest) that measures r openness to experience	BHUS, c_big5o_dv
Numeric	indicator ranging from 1 to 5 (where 5 is the highest) that measures r numeric ability. It is the count of correct answers to questions asked to test numeric ability. It tests skills in everyday problem-solving and financial abilities.	BHUS, c_cgna_dv
BMI	it measures r’s body mass index. The value for each individual is used (continue measure). In general, BMI indicates if the r is underweight (<18.5), normal weight ($18.5 < BMI < 24.99$), overweight ($25 < BMI < 29.99$), or obese ($BMI >= 30$)	BHUS, b_bmival c_bmival
Height	variable taking the value of the r height in centimeters	BHUS, b_height c_height
Risk	indicator measuring the propensity to risk of the r. It ranges from 0 to 10 (where 10 is the highest).	BHUS, a_scriska
MaxEdu	indicator measuring the highest level of education attained by the r. 1 means the r has at most a compulsory level of education, 2 indicates the r has an intermediate level of education (at most a high school education degree), and 3 indicates the r has a higher education or further education degree.	BHUS, ‘w’_hiqual_dv

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