Original Research Article

Trading Height for Education in the Marriage Market

MICHELA PONZO,[1*] AND VINCENZO SCOPPA[2]
[1]*Department of Economics and Statistics, University of Naples Federico II, Napoli, Italy, Naples 80126*
[2]*Department of Economics, Statistics and Finance, University of Calabria, Italy, Cosenza*

Objectives: Several empirical studies point out the relevance of individuals' physical attributes—such as height, weight, beauty—in the labor market. In the same way, physical characteristics may affect lifetime prospects through their impact on the selection of a partner in the marriage market. We analyzed to what extent an individual's height and weight (arguably affecting physical attractiveness, as documented in many studies) are related to lifetime economic outcomes through the marriage market, investigating whether individual height and weight affect the probability of marrying with a "high-quality partner," measuring quality as the partner's educational attainment or as the partner's prospective labor income.

Methods: Using a large Italian dataset of married (and cohabiting) couples—the 2005 Italian Health Conditions Survey which provides information on health conditions, individual characteristics, and socioeconomic variables—we estimated separate OLS and Ordered Probit regressions for females and males. Since weight might be endogenously determined, to avoid any estimation bias we also estimated a reduced form equation in which predetermined height affects directly and indirectly (through BMI) physical attractiveness and, as a consequence, the choice of a partner with a given educational attainment.

Results: Our findings suggest that height is a desirable trait in mating selection affecting the partner's socioeconomic characteristics: we found that taller individuals tended to mate with more educated partners, controlling for their own educational level—to take into account the tendency for assortative mating for education—and for other personal traits such as age, geographical residence, city size, and the presence of health problems. On the other hand, we showed that individuals with higher BMI were married to partners with lower levels of education. The results also provide evidence of non-linearity in the relationship between height and educational attainment of the partner. These findings are confirmed for both males and females, but being taller seems to be more relevant for males, while being thinner is more important for females. We have also found that taller and thinner females and males tend to be married with partners earning higher labor incomes. These findings were robust to a number of checks.

Conclusions: Our findings confirm that the physical characteristics that an individual brings to the marriage market influences the outcome in this market: physical attractiveness is exchanged in the marriage market for a higher educational attainment and the ability to earn a higher labor income. Am. J. Hum. Biol. 27:164–174, 2015.

Physical attributes, such as height, weight, and beauty, tend to affect directly labor market outcomes of individuals. Hamermesh and Biddle (1994) show that physical attractiveness is a significant determinant of wage levels. Persico et al. (2004), as well as Case and Paxson (2008), find that taller individuals earn higher wages. Averett and Korenman (1996) argue that obese women receive lower earnings. Cawley (2004) shows further evidence of a negative association between wages and obesity. Judge and Cable (2004) document that tall men tend to have higher self-esteem, a better social status, and higher levels of income. Ponzo and Scoppa (2013) show that professors' physical attractiveness positively affect students' teaching evaluations.

Physical attributes may affect lifetime economic prospects also through their impact on the selection of a partner. The physical characteristics that an individual brings to the marriage market influence the outcome on this market, that is, the socioeconomic characteristics of the partner he/she mates. Through this channel, the impact of physical attributes on the labor market might be reinforced on the marriage market, with further possible negative effects on income inequality and social mobility.

Assortative mating along a variety of physical attributes and socioeconomic status is well documented in the literature: individuals tend to match with partners with similar attributes in terms of age, race, education, physical appearance, height, and body mass index. The prevalence of assortative mating in physical attributes and socioeconomic status has been widely shown in different fields including anthropology, psychology, sociology, economics, human biology, and evolutionary literatures which document significant and positive correlations for many individual traits (see, among others, Choo and Siow, 2006; Courtiol et al., 2010a; Kurzban and Weeden, 2005; Pawlowski, 2003; Silventoinen et al., 2003; Spuhler, 1982; Stulp et al., 2013b; Weeden and Sabini, 2005; Weiss, 1997).

Additional Supporting Information may be found in the online version of this article.

*Correspondence to: Michela Ponzo, Department of Economics and Statistics, University of Naples Federico II, Via Cintia Monte S. Angelo, I-80126, Napoli, Italy, Naples, 80126. E-mail: michela.ponzo@unina.it

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In general, positive sorting in mating can arise because of aligned or agreed-upon preferences—whereby everyone values the same attributes (“vertical mate preferences”)—or people’s preferences for partners who are similar to themselves along various characteristics (“horizontal preferences”) or, alternatively, because of search frictions[1], independent of preferences, since people tend to meet (at school, college, on the job, at social events and so on) individuals who are similar to themselves.

Individual stature is a particular trait that has long attracted interest in the literature on mating formation since height is one of the most obvious aspects of physical appearance. A number of papers in the human biology and evolutionary literature show that females prefer tall men but the preferred male height depends positively on females’ own height. Less clear are the preferences of men: men prefer women shorter than themselves but, given that, a variety of studies reach different conclusions if men prefer taller or shorter women (see Courtiol et al. 2010a, for an excellent review) (Courtiol et al., 2010a summarize the existing body of studies on female and male preferences for height).

More specifically, in the literature three salient patterns emerge regarding individual preferences for height, in addition to the assortative mating pattern common to several other traits: (1) “the male-taller norm”: men prefer women shorter than themselves and, conversely, women prefer men taller than themselves (Gillis and Avis, 1980); (2) “the male not too tall norm”: the male is preferred taller than the female, but he should not be too tall (Courtiol et al., 2010a; Stulp et al. 2013a); (3) preferences for differences in height depend on one’s own height: shorter men and taller women prefer smaller height differences while taller men and shorter women prefer larger differences (Pawlowski, 2003).

Interestingly, Courtiol et al. (2010a) find that the preferences for height are better represented by a quadratic function, an inverted U-shape, both for males and females. Furthermore, both sexes prefer heights that are above the sample means, although not too much. Courtiol et al. (2010b) and Stulp et al. (2013a) investigate how well partner preferences align with actual partner characteristics with respect to height and body mass index (BMI) in both men and women. They find that preferences tend to translate in actual mating, although only modestly, and the influence of preferences on effective mating could differ by gender.

With regard to BMI and physical attractiveness, the tendency for assortative mating is confirmed by a wide evidence (see in particular Weeden and Sabini, 2005). Tovée et al. (1998) and Swami (2008) show that BMI is fundamental for female sexual attractiveness (much more important than the waist/hip ratio), mainly because BMI is shown to be a good predictor of health and reproductive potential. More ambiguous results emerge for the role of BMI for male attractiveness: Wells et al. (2007) argue that BMI is a good proxy for male physical attractiveness while Maisey et al. (1999) show that BMI is a significant determinant but waist-chest ratio is the most important factor. Rooth (2009) finds that individuals change their judgments from attractive to unattractive when manipulated photos make a person of normal weight appear to be obese. Braun and Bryan (2006) find that males and females report that physical features, including face, body shape, and weight, are important in their assessments of the desirability of a potential mate, although the importance differs by gender, in that males value more these aspects.

In the economics field, there are a number of articles, mainly for the US, showing that physical attributes are important determinants of the partner’s economic characteristics and that assortative mating is prevalent among many physical and socioeconomic characteristics (Becker, 1991; Choo and Siow, 2006). Hamermesh and Biddle (1994) find some evidence that physically unattractive women are married to lower educated husbands. Averett and Korenman (1996) find that obese women are married to husbands earning lower incomes. In contrast, men do not seem to be penalized in terms of wife’s education or income if they are less attractive or obese. Oreffice and Quintana-Domeque (2010) show that heavier women are married to less educated husbands, while shorter men are married to less educated wives; Herpin (2005) finds that the probability of being married is lower for shorter men. Smits and Monden (2012) evaluate the role of female height in the Indian marriage market, finding that taller women are more likely to get married, marry husbands with better labor market positions, and their husbands are less likely to die prematurely or leave through divorce.

A more recent stream of evidence investigates partner selection and the nature of mating preferences through online dating services rather than through married couples. These studies show that individuals typically consider a large number of traits when choosing a mate but emphasize the relevance of physically observable attributes such as age, height and weight on desirability and on mate selection. Belot and Francesconi (2010) find that both women and men value physical attributes: women prefer men who are tall, while men are more attracted to women who are slim. Partner’s education and occupation have also an impact on desirability of both men and women. Fisman et al. (2006) find that men put more attention on physical attractiveness while women respond more to intelligence and exhibit a preference for men who grew up in affluent neighborhoods. Similar evidence emerges in Hitsch et al. (2010) and Lee (2009): looks and physique are important determinants of preferences, in particular men typically avoid tall women and have a strong distaste for women with a large BMI and both sexes exhibit a strong preference for a partner with high education and high income.

All in all, a wide range of evidence in different fields shows the importance of physical characteristics in determining actual mating: individual height and body mass index are traits that are likely to determine physical attractiveness of both males and females, although to a different extent. Furthermore, socioeconomic characteristics—such as education and income—turn out to be valuable traits in the marriage market.

Using a large Italian dataset of married and cohabiting couples—the 2005 Italian Health Conditions Survey

[1]Search frictions” is an expression borrowed from the labor market literature. Most real-world transactions involve various forms of impediments to trade, or “frictions,” mainly due to imperfect information and difficulties in matching. In the context we are analyzing, individuals do not have complete information on potential mating, may have trouble finding the partners they are looking for, to know their characteristics and their preferences, to meet with every potential partner, and so on.).

which provides information on health conditions, individual characteristics, and socioeconomic variables—we aimed to investigate whether physical and socioeconomic characteristics are important in determining actual pairings in the Italian marriage market and whether preferred physical characteristics are exchanged with better economic status in this market. More specifically, we analyzed if taller and thinner individuals tend to marry with higher educated partners and with partners earning higher incomes.

Preliminarily, we showed that both BMI and height have an impact on the educational attainment of the partner. Since weight might be endogenously determined[2], to avoid possible estimation biases we estimated a reduced form equation in which predetermined height affects directly and indirectly (through BMI) physical attractiveness and, as a consequence, the choice of a partner with a given educational attainment.

Taking into account the tendency for assortative mating by controlling for an individual's own educational level, we found strong evidence that taller men and women (controlling for a large number of individual and partner characteristics) tend to be married to more highly educated individuals.

Furthermore, by imputing prospective labor income (from another large dataset) to each individual on the basis of sector of work, type of occupation, geographical areas of residence, and gender, we found that taller and thinner men and women tend to be married to partners earning higher labor income.

THE DATA

The dataset we used for our empirical analysis is the latest available wave (2004–2005) of the Italian Health Conditions Survey provided by the Italian National Statistical Office (ISTAT). This survey was conducted on a nationally representative sample of 50,474 households for a total of 128,040 individuals and provides information on health conditions, individual and socioeconomic characteristics. All household members have been interviewed. Individuals were also asked to evaluate their height and weight, in addition to standard socioeconomic information (age, gender, education, marital status, health conditions, household wealth, etc.).

We restricted our sample to individuals who were currently married or cohabiting, when both partners were present (to gather individual information on each of them), whose age was between 25 and 60 years. We discarded all the other individuals who were not part of a couple. This left us with a sample of 40,012 observations (20,006 for gender).

Following a common practice in the economic literature, we used education as a discrete variable and recoded education considering the years necessary to attain a given educational level. Education (in years) was set at 0 for no educational qualification; 3 for some primary school; 5 for primary school; 8 for middle school; 11 for some High School; 13 for High School; 16 for First Level Degree, 18 for Second Level Degree and 21 for postgraduate qualification.[3]

In the dataset, we observed the type of town or city where individuals live through a six-category variable: "Metropolitan areas: Center"; "Metropolitan areas: Periphery"; "More than 50,000 inhabitants"; "Inhabitants between 10,000 and 50,000"; "Inhabitants between 2,000 and 10,000"; "Less than 2,000 inhabitants." We built six dummy variables to take into account in the regressions the type of city where individuals live.

Furthermore, we built two dummy variables for taking into account if an individual suffers from health problems: *Health Problems* was equal to 1 if the individual suffers from serious health problems (disability, blindness, deafness, and so on), *Some Health Problems* was set equal to 1 if the individual suffers from less serious health problems.

Summary statistics for the main variables used in the analysis are separately reported for females and males in Table 1 (Panel a). In Panel (b) we report descriptive statistics for all the variables without separation by gender. Males tend to be older than females, 45.6 against 42.4. Females and males have almost the same level of education (10.3 and 10.2 years of education, respectively, for females and males).

Average height is 162.8 centimeters for females and 174.1 for males. BMI was defined as an individual's body weight in kilograms divided by the square of his/her height in meters. BMI is 23.8 for females, while it is 26.2 for males. Instead of using an individual's weight, in our econometric analyses, following a common practice, we used BMI.[4]

At the bottom of Table 1 we show the degree of correlation of some personal traits among partners. Couples exhibit a strong degree of sorting in age (Pearson's correlation coefficient, ρ, is 0.90) and in years of education ($\rho = 0.62$) suggesting selection of a partner based on similar traits. There is also a positive correlation among partners in height ($\rho = 0.27$) and BMI ($\rho = 0.24$), although the correlation is less remarkable.

We also report in Tables A1 and A2 in the Supporting Information, a correlation table for these traits at the individual level, for each gender. We show that for both sexes, height and education are positively correlated, height and age, and age and education are negatively correlated. BMI has a negative correlation with education and a positive correlation with age.

[2]In the Econometrics literature, an "endogenously determined variable" in a regression is an explanatory variable that could be correlated with the error term, generating some sort of estimation bias (see for example the textbooks of Stock and Watson, 2010, or Wooldridge, 2012). In our context, endogeneity may arise because of omitted variables (some factors affecting both BMI and the dependent variables are omitted) or because of simultaneous causality (BMI could affect the partner's education but partner's education may as well affect an individual's BMI.

[3]Alternatively, if we simply used a scale 0–8 we would impose that the difference between, say, primary school (coded 2) and lower secondary school (coded 3) is the same as the difference between lower secondary school and High School (coded 4). However, the difference in the first case consists of three years of education, but it is equal to five years in the second case. Using years of education allow the estimates to take into account the differences existing among attainment levels that would be lost using a scale 0–8. However, as robustness checks in Some Robustness Checks section we ran our regressions using education as an ordinal variable and estimated our model with ordered probit.

[4]This variable is more independent of height than it is of weight and is arguably a better measure of fat than weight and is related to attractiveness more strongly than weight; moreover, it reduces problems of multicollinearity.

TABLE 1. Descriptive statistics

	Mean	Std. dev.	Min	Max
Panel A. Summary statistics				
Females				
Education (yrs)	10.336	3.977	0	21
Height	162.832	6.024	140	190
Age	42.363	8.472	25	60
BMI	23.789	3.924	15.570	41.914
Males				
Education (yrs)	10.248	3.946	0	21
Height	174.083	6.844	137	204
Age	45.584	8.603	25	60
BMI	26.201	3.299	16.406	41.743
Panel B. Descriptive statistics on the whole sample. All the variables				
Female	0.500	0.500	0	1
Education (yrs)	10.292	3.961	0	21
Height	168.458	8.557	137	204
Age	43.974	8.688	25	60
Age (partner)	43.974	8.688	25	60
Labor income	15,756.26	34,57.801	2,900	97,683.34
Body mass index	24.995	3.821	15.571	41.914
North-West	0.216	0.412	0	1
North-East	0.204	0.403	0	1
Centre	0.167	0.373	0	1
South	0.301	0.459	0	1
Islands	0.111	0.314	0	1
Some health problems	0.077	0.266	0	1
Health problems	0.021	0.142	0	1
Metropolitan areas: centre	0.091	0.287	0	1
Metropolitan areas: periphery	0.100	0.300	0	1
City size <2 s	0.085	0.278	0	1
City size 2 s–10 s	0.304	0.460	0	1
City size 10 s–50 s	0.262	0.440	0	1
City size >50 s	0.157	0.364	0	1
Panel C. Correlation among individual traits in couples				
	Education	Height	Age	BMI
Correlation males–females	0.618	0.266	0.902	0.235

Data from the Health Conditions Survey (2004–2005). Sample: 40,012 observations: 20,006 males and 20,006 females.

EMPIRICAL RESULTS: PARTNER'S EDUCATION, HEIGHT, AND BMI

Our aim was to analyze whether an individual's height and BMI are related to spousal education, given his/her own educational level. We examined the effect of individual height and body mass index on the educational attainment of the partner by estimating the following equation:

$$Partner\_Education_i = \beta_0 + \beta_1 Height_i + \beta_2 BMI_i + \beta_3 Education_i + \beta_4 X_i + u_i \quad (1)$$

where $Partner\_Education_i$ represents the educational level of i's partner, $Height_i$ and BMI_i represent, respectively, the height and the body mass index of individual i, $Education_i$ is the educational level of i (to take into account the tendency for assortative mating for education) and X_i is a vector of other demographic and personal traits (age, health problems, geographical areas, city sizes) (We control for five city size dummies in our regressions, leaving the category "Less than 2,000 inhabitants" as the reference category. Moreover, we control for four geographical area dummies leaving "North-West" as the reference category.), u_i is an error term capturing idiosyncratic shocks or unobserved individual characteristics.

We preliminarily estimated Eq. (1). However, whereas height and education are characteristics that are predetermined or typically acquired before marriage, weight tends to vary in response to several factors (for example, the partner's education level could affect their own BMI—through eating habits, lifestyle etc.—rather than the opposite). Therefore, since BMI might be endogenously determined, we exploited the fact that height contributes to BMI: $BMI_i = f(Height_i)$.

By substituting the latter in (1), we estimated:

$$Partner\_Education_i = \beta_0 + \beta_1 Height_i + \beta_2 f(Height_i) + \beta_3 Education_i + \beta_4 X_i + u_i \quad (2)$$

in which $Partner\_Education_i$ is some non-linear function of *Height*. Eq. (2) can be thought of as a reduced form equation of the impact of *Height* on partner's education, capturing both the direct effect of height on attractiveness—and then on partner's socioeconomic attributes—and the indirect effect of height through BMI. The advantage of estimating Eq. (2) is that it avoids including BMI that could be correlated to the error term, generating some sort of estimation bias.

We estimated separate OLS regressions for females (Table 2) and males (Table 3) since—as shown in many works mentioned in Introduction section—the impact of height might differ by gender and also the level of height considered "optimal" is different for men and women. In all the regressions, standard errors (reported in parentheses) were corrected for heteroskedasticity (using the Huber and White procedure).

In the first specification of Table 2 (column 1) we regress the husband's educational level on female height and BMI, controlling for the female's own educational level. Results show that taller women tend to be mated with more educated partners: females 10 centimeters taller are married with males with 0.18 more years of education (t-stat(20,002) = 4.88, $P = 0.00$). In terms of Standard Deviation (SD), a woman with 1 more SD in height is married on average to a man with 0.12 additional years of education.

In contrast, females with higher BMI are married to males having lower levels of education: one more standard deviation in BMI reduces by 0.29 the educational level of her partner. We also estimated by including—instead of the variable BMI—the dummy "overweight" (equal to one if BMI ranges between 25 and 29) and the dummy "obese" (equal to one if BMI is 30 or over). We found a strong negative effect of these variables on the partner's education both for men and women (results are not reported to save space).

Furthermore, we found evidence of strong assortative mating, as their own educational level has a strong impact on the partner's educational attainment: one more year of education increases the partner's educational level by 0.59 (t-stat(20,002) = 94.7; $P = 0.00$).

Controlling for their own educational level in the multiple regression allowed us to neutralize the effect of assortative mating occurring for education. Therefore, the effect of height in these regressions is captured by considering the impact of different levels of height on partner's education among individuals with the same level of education (then averaging over all possible educational

TABLE 2. Female height and husband's education. OLS estimates. Dependent variable: husband's education

	(1)	(2)	(3)	(4)	(5)
Height	0.0182*** (0.0037)	0.5118*** (0.1411)	0.5798*** (0.1424)	0.5977*** (0.1413)	0.6163*** (0.1411)
Height Squared		−0.0015*** (0.0004)	−0.0017*** (0.0004)	−0.0018*** (0.0004)	−0.0018*** (0.0004)
Body Mass Index	−0.0732*** (0.0058)	−0.0725*** (0.0058)			
Education	0.5924*** (0.0063)	0.5923*** (0.0063)	0.6071*** (0.0061)	0.5966*** (0.0063)	0.5863*** (0.0064)
Age				0.0162*** (0.0027)	0.0194*** (0.0027)
North-East				0.1169* (0.0699)	0.0804 (0.0697)
Centre				0.1064 (0.0734)	0.1012 (0.0730)
South				−0.0498 (0.0622)	0.0253 (0.0622)
Islands				−0.2363*** (0.0799)	−0.1364* (0.0801)
Some Health Problems				−0.2632*** (0.0796)	−0.2488*** (0.0792)
Health problems				−0.5164*** (0.1557)	−0.4787*** (0.1556)
Metropolitan areas: Center				1.0721*** (0.1076)	1.0593*** (0.1074)
Metropolitan areas: Periphery				0.4080*** (0.0973)	0.3924*** (0.0971)
City Size 2 s–10s				0.1060 (0.0805)	0.1032 (0.0804)
City Size 10 s–50 s				0.3937*** (0.0838)	0.3818*** (0.0837)
City Size >50 s				0.8441*** (0.0935)	0.8285*** (0.0933)
Height (husband)					0.0373*** (0.0034)
Constant	2.8975*** (0.6412)	−37.2584*** (11.5028)	−45.2410*** (11.5937)	−47.8226*** (11.5058)	−55.1811*** (11.5029)
Adjusted R^2	0.388	0.389	0.384	0.393	0.397

This reports OLS estimates. Data from the Health Conditions Survey (2004–2005). In each regression, we use 20,006 observations. Standard errors (reported in parentheses) are corrected for heteroskedasticity (Huber and White procedure). The symbols ***, **, * indicate that coefficients are statistically significant, respectively, at the 1, 5, and 10% level.

levels). Since we are controlling for their own level of education, the higher educational attainment of the partner of taller individuals is not due to the correlation between their own height and their own education.

In column (2) we tested for nonlinear effects of height by adding *Height Squared*. Results show—since *Height Squared* is negative and statistically significant—that taller women tend to mate with better educated partner, but also that a concave relationship exists between tallness and partner's educational attainment, with an optimal level of female height around 169 cm. Females taller than this threshold seem to be less successful on the marriage market.

In column (3) we omitted BMI since, as explained above, it may be endogenously determined, and we exploited only the variations of BMI determined by different levels of height [see Eq. (2)]. The strong effect of height on the partner's educational level are confirmed.

In order to avoid biases deriving from the omission of variables related to both height and educational level, in column (4) we included a number of controls for individual's age, health problems, dummies for geographical areas and city size. (In particular, by controlling for age in our regressions we are able to take into account both the fact that height increases over time and that height decreases with age (in both cases, younger people turn out to be taller): the multiple regression framework—by including age as explanatory variable—allows us to estimate the effect of variations in height on the dependent variable, taking as constant the age of individuals.)

The impact of height on partner's educational level is confirmed in this specification: taller women marry with more educated partners (until 171 cm, corresponding to the 90th percentile: after this level female height influences negatively partner's education). At the sample mean level for female height, an increase of one Standard

TABLE 3. Male height and wife's education. OLS estimates. Dependent variable: wife's education

	(1)	(2)	(3)	(4)	(5)
Height	0.0606*** (0.0033)	0.4517*** (0.1066)	0.4678*** (0.1065)	0.3697*** (0.1054)	0.3474*** (0.1052)
Height squared		−0.0011*** (0.0003)	−0.0012*** (0.0003)	−0.0009*** (0.0003)	−0.0009*** (0.0003)
Body mass index	−0.0492*** (0.0067)	−0.0488*** (0.0067)			
Education	0.5962*** (0.0061)	0.5955*** (0.0061)	0.5992*** (0.0061)	0.5784*** (0.0062)	0.5761*** (0.0063)
Age				−0.0621*** (0.0027)	−0.0606*** (0.0027)
North-East				−0.1764*** (0.0684)	−0.1832*** (0.0683)
Centre				0.0488 (0.0729)	0.0513 (0.0728)
South				−0.3342*** (0.0621)	−0.3296*** (0.0621)
Islands				−0.1478* (0.0805)	−0.1217 (0.0806)
Some health problems				−0.2097** (0.0832)	−0.2055** (0.0831)
Health problems				−0.4623*** (0.1417)	−0.4581*** (0.1416)
Metropolitan areas: center				0.4759*** (0.1054)	0.4825*** (0.1053)
Metropolitan areas: periphery				−0.0991 (0.0972)	−0.0917 (0.0972)
City size 2 s–10 s				0.0062 (0.0799)	0.0095 (0.0798)
City size 10 s–50 s				0.1109 (0.0831)	0.1154 (0.0830)
City size >50 s				0.4095*** (0.0925)	0.4142*** (0.0925)
Height (wife)					0.0221*** (0.0038)
Constant	−5.0277*** (0.6027)	−39.0982*** (9.2804)	−41.9968*** (9.2616)	−28.6359*** (9.1812)	−29.9816*** (9.1787)
Adjusted R^2	0.395	0.395	0.393	0.414	0.415

This reports OLS estimates. Data from the Health Conditions Survey (2004–2005). In each regression we use 20,006 observations. Standard errors (reported in parentheses) are corrected for heteroskedasticity (Huber and White procedure). The symbols ***, **, * indicate that coefficients are statistically significant, respectively, at the 1, 5, and 10% level.

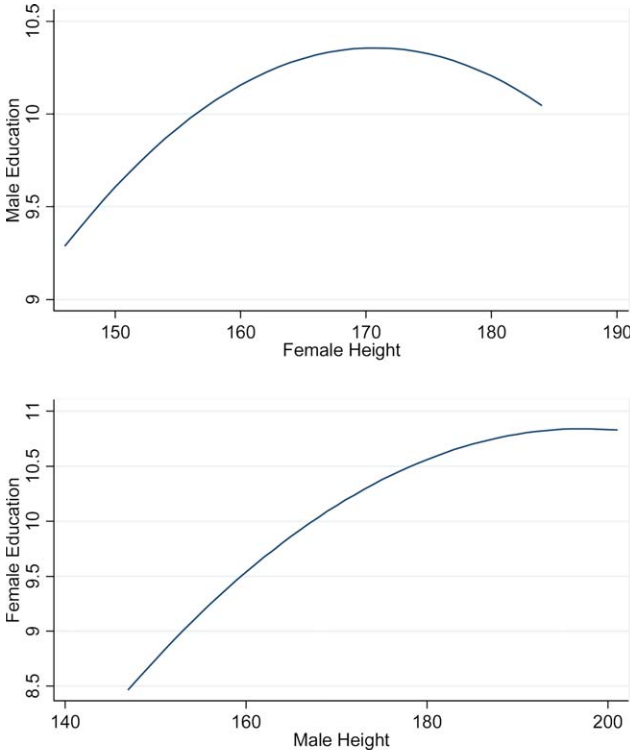

Fig. 1. Own height and predicted partner's education.

Deviation (6.84 cm) in height implies 0.19 more years of education in her husband (t-stat(19,990) = 7.36; $P = 0.00$). Therefore, a female with height 1 SD below the mean is predicted to marry a man with 10.06 years of education, whereas a female with height 1 SD above the mean is predicted to marry a man with 10.44 years of education.

Our estimates in column (4) show also that age is negatively associated with the dependent variable. (We also tested for nonlinear age effects in each model but we do not find any evidence for them (results not reported).), educational levels tend to increase with the size of the city where individuals live, educational levels are lower in southern regions and individuals with health problems are married to partners with lower levels of education.

In column (5), controlling also for the husband's height, we found that the latter has a high rate of correlation with the husband's educational level: taller individuals attain more education (maybe because they are healthier, more self-confident, or come from families with better socioeconomic backgrounds). Nonetheless, the effect of female height on the husband's education remains almost unchanged also when we control for the husband's height.

In Table 3 we estimated the same specifications for males, using as a dependent variable their wife's educational level. In column (1) we found that taller men marry better educated females, while men with higher BMI are married to women with lower education. Consistent with previous findings in the literature, the negative effect of weight is much lower for males than for females: 1 SD more in BMI reduces by 0.16 the wife's predicted years of education. The effect of height, on the other hand, seems to be more relevant for men. Similar results are obtained in columns (2) and (3) of Table 3, replicating the respective specifications for females in Table 2.

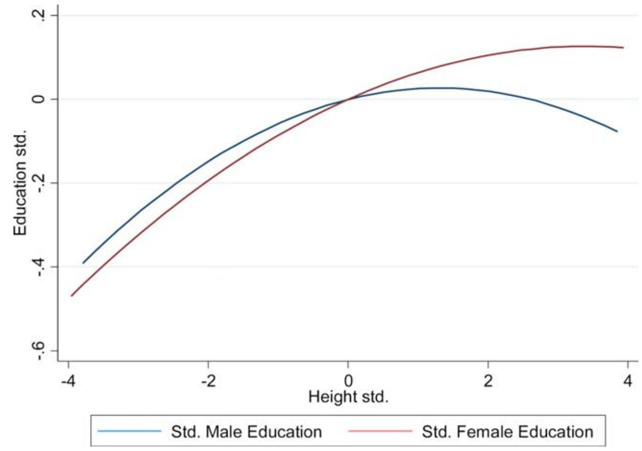

Fig. 2. Height and predicted partner's education: standardized variables.

In column (4), our preferred specification with height in quadratic form and with the full range of controls, we found that taller men are married to better educated women. The relationship is again concave, increasing to a maximum at 197 cm. At the sample mean of male height, an increase of one Standard Deviation in a man's height increases his partner's educational level by about 0.30 years of education (t-stat(19,900) = 12.92; $P = 0.00$). A man with height 1 SD below the mean is predicted to marry a female with 10.03 years of education, whereas a man with height 1 SD above the mean is predicted to marry a female with 10.63 years of education.

Therefore, it seems that male height plays a more relevant role in mating with a highly educated partner. Other findings were similar to the results obtained for females: in particular, it is confirmed that a strong tendency for assortative mating and age has a negative effect: 10 more years of age reduces by about 0.60 the partner's educational level.

In column (5), controlling also for the wife's height, we found that the effect of male height on his wife's educational level remains more or less unchanged. Similar to males, we found that taller females tend to be more educated. (In order to test if the effect of height on partner's education is increasing along the education gradient we have built two interaction terms: *Education* × *Height* and *Education* × *Height Squared*. The interaction terms were jointly not significant (results not reported).)

In Figure 1, we show the relationship between height and the predicted partner's educational level based on column (4) of Tables 2 and 3 (for females and males, respectively): the Figure 1 shows the concave relationship between height and partner's education for both sexes, making evident that there exists a "preferred" level of height that maximizes the partner's educational level.

To make clearer the relationship between height and partner's education, in Figure 2 we also show the same relationships once we have standardized height and the partner's educational level by sex.

In Figure 3 we also show the relationship between one's own BMI and their partner's education (again standardizing BMI and partner's educational level by sex). It is evident that BMI is negatively correlated with the partner's educational level, and this effect is especially strong for females.

SOME ROBUSTNESS CHECKS

In order to check the robustness of our results, in this section we firstly consider the partner's educational level as an ordinal variable (in this way, only the rank of the educational levels matters, not the difference among each of them) and we estimate separate Ordered Probit regressions for women and men of the most complete specification (Tables 2 and 3, column 4). Results are reported in Table 4.

Ordered Probit estimates show, similar to OLS estimates, that for both females and males an increase in height is associated with a positive and significant increase in the educational attainment of the partner.

Second, we also experimented using a scale 0 to 8 for education and we found very similar results (results are reported in the Tables A3–A4 in the Supporting Information).

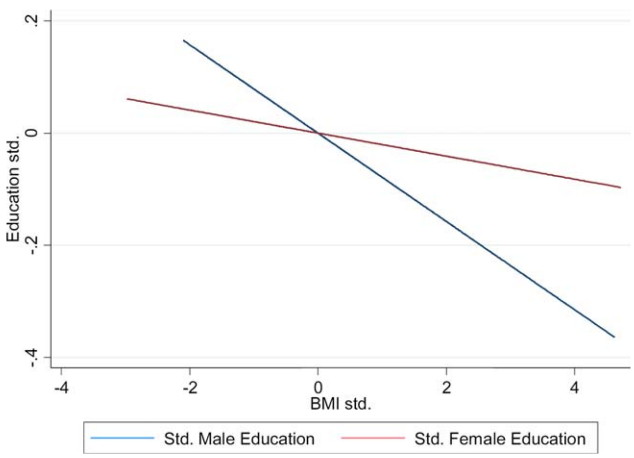

Fig. 3. BMI and predicted partner's education: standardized variables.

Third, to avoid any spurious correlation between their own level of education and the partner's educational level, we estimated four separate regressions, one for each educational level of the individual i (primary school; middle school; high school; college or postgraduate qualification). Given their own educational level, we evaluated the impact of their own height on the partner's educational attainment. Panel (a) of Table 5 shows OLS estimates for females, while panel (b) reports the corresponding estimates for males.

In column (1) we focus on the sample of females with 5 or less years of education: we found that height has an impact on the partner's educational level according to a concave function. This is also true in columns (2), (3), and (4), in which we focus, respectively, on females with 8, 13, and 16 (or more) years of education.

The same pattern emerges for men. Those who have reached a given educational attainment are married to more highly educated wives if the former are taller. For females, in column (2) coefficients are marginally significant. Estimating without height squared, we found a highly significant effect of height (t-stat(7,345) = 2.46; P = 0.02). For males, in column (4) coefficients on height are not significant. Estimating without height squared, we found a highly significant effect of height (t-stat(2,137) = 2.74; p = 0.01).

To evaluate the influence of outliers, we also estimated previous specifications discarding observations for females whose height was below 145 or above 185 cm and for males whose height was below 150 or above 200 cm (56 observations deleted). The estimation results were almost identical.

PARTNER'S LABOR INCOME, HEIGHT, AND BODY MASS INDEX

Unfortunately, we did not directly observe individuals' labor earnings in the dataset Health Conditions Survey, but we have information on the sector in which one works, the type of occupation and the geographical area of residence.

TABLE 4. Own height and partner's education. Ordered probit estimates

	(1)	(2)	(3)	(4)
	Husband's education	Husband's education	Wife's education	Wife's education
Height	0.2029*** (0.0493)	0.2305*** (0.0496)	0.1492*** (0.0377)	0.1510*** (0.0377)
Height squared	−0.0006*** (0.0002)	−0.0007*** (0.0002)	−0.0004*** (0.0001)	−0.0004*** (0.0001)
Body mass index	−0.0282*** (0.0021)		−0.0080*** (0.0023)	
Education	0.2019*** (0.0029)	0.2053*** (0.0029)	0.2009*** (0.0029)	0.2013*** (0.0029)
Age	0.0046*** (0.0010)	0.0025** (0.0010)	−0.0235*** (0.0010)	−0.0239*** (0.0010)
North-East	0.0552** (0.0242)	0.0409* (0.0241)	−0.0568** (0.0239)	−0.0580** (0.0239)
Centre	0.0542** (0.0255)	0.0386 (0.0254)	0.0190 (0.0256)	0.0168 (0.0255)
South	0.0103 (0.0220)	−0.0290 (0.0218)	−0.1176*** (0.0221)	−0.1238*** (0.0220)
Islands	−0.0598** (0.0283)	−0.0770*** (0.0283)	−0.0349 (0.0285)	−0.0382 (0.0285)
Some health problems	−0.0710** (0.0286)	−0.0938*** (0.0285)	−0.0780*** (0.0302)	−0.0815*** (0.0302)
Health problems	−0.1589*** (0.0576)	−0.1797*** (0.0576)	−0.1604*** (0.0523)	−0.1649*** (0.0522)
Metropolitan areas: center	0.3113*** (0.0373)	0.3187*** (0.0374)	0.1224*** (0.0371)	0.1246*** (0.0371)
Metropolitan areas: periphery	0.1268*** (0.0341)	0.1302*** (0.0341)	−0.0613* (0.0342)	−0.0602* (0.0342)
City size 2 s–10 s	0.0287 (0.0283)	0.0330 (0.0284)	−0.0045 (0.0280)	−0.0050 (0.0280)
City size 10 s–50 s	0.1130*** (0.0294)	0.1179*** (0.0295)	0.0188 (0.0291)	0.0191 (0.0291)
City size >50 s	0.2507*** (0.0327)	0.2578*** (0.0327)	0.1109*** (0.0324)	0.1124*** (0.0324)
Pseudo R^2	0.163	0.160	0.169	0.168

This reports Ordered Probit estimates (Partner's Education is considered an ordinal variable). Data from the Health Conditions Survey (2004–2005). In each regression we use 20,006 observations. Standard errors (reported in parentheses) are corrected for heteroskedasticity (Huber and White procedure). The symbols ***, **, * indicate that coefficients are statistically significant, respectively, at the 1, 5, and 10% level.

TABLE 5. Separate regressions for each educational level. OLS Estimates.

Panel (a): Dependent variable: Husband's education	Females (1)	Females (2)	Females (3)	Females (4)
Height	0.6330** (0.2871)	0.3527* (0.2170)	0.5339** (0.2610)	1.9375*** (0.5498)
Height squared	−0.0020** (0.0009)	−0.0010 (0.0007)	−0.0015* (0.0008)	−0.0058*** (0.0017)
Body mass index	−0.0511*** (0.0127)	−0.0720*** (0.0081)	−0.0917*** (0.0112)	−0.1248*** (0.0256)
Wife's educational level	≤5 years of education	8 years of education	11–13 years of education	≥16 years of education
Observations	2,959	7,360	7,438	2,249
Adjusted R^2	0.013	0.028	0.042	0.066
Panel (b): Dependent variable: wife's education	**Males (1)**	**Males (2)**	**Males (3)**	**Males (4)**
Height	0.8328*** (0.2721)	0.4863*** (0.1553)	0.3571* (0.2167)	0.0346 (0.4243)
Height squared	−0.0024*** (0.0008)	−0.0012*** (0.0004)	−0.0009 (0.0006)	−0.0000 (0.0012)
Body mass index	0.0178 (0.0143)	−0.0214** (0.0097)	−0.0447*** (0.0127)	−0.0666*** (0.0248)
Husband's educational level	≤5 years of education	8 years of education	11–13 years of education	≥16 years of education
Observations	2,867	7,953	7,034	2,152
Adjusted R^2	0.035	0.077	0.056	0.032

This reports OLS estimates. Data from the Health Conditions Survey (2004–2005). Standard errors (reported in parentheses) are corrected for heteroskedasticity (Huber and White procedure). The symbols ***, **, * indicate that coefficients are statistically significant, respectively, at the 1, 5, and 10% level.

To overcome the problem of missing information on labor income, we use the Survey on Household Income and Wealth (SHIW) of the Bank of Italy (six waves with consistent data are available: 2002, 2004, 2006, 2008, 2010, 2012) totaling 38,570 individual observations of employed individuals. In this Survey, in addition to standard demographic and socioeconomic characteristics, individuals report their yearly labor earnings.

Using the Survey on Household Income and Wealth we calculated the average labor income for each sector, type of job qualification, geographical residence, and gender. Then, we imputed to each individual in our sample from the Health Conditions Survey a predicted level of income on the basis of his/her job, sector, geographical area, and gender. Income was set to zero for individuals without a job on the labor market.

In the two datasets we had available for matching a quite large number of categories: nine different sectors (1-Agriculture; 2-Manufacturing; 3-Construction; 4-Wholesale and retail trade, Restaurants, Hotels; 5-Transportation, Communications; 6-Financial and insurance activities; 7-Real estate activities, IT; 8-Public administration, Education, Health; 9-Other Service Activities); seven different types of job qualifications (1-Manager; 2-Junior manager/cadre; 3-White-collar; 4-Blue Collar; 5-Entrepreneur; 6-Professionals; 7-Self-employed); 5 different geographical residence (1-North-West; 2-North-East; 3-Center; 4-South; 5-Islands); and finally we had a distinction by gender.

Therefore, we ended up with 630 ($9 \times 7 \times 5 \times 2$) different cells of which 577 are non-null (for a few combinations of sector and position we did not find any observation).

We purposefully did not use age because our aim was to estimate a sort of "average income" for each different category. The assumption is that individuals—when young—could form an expectation of the prospective income of potential partners on the basis of their sector of activity, accessible qualification, gender, and geographical area.

The imputed average labor income is 15,756 (in 2012 euros) with a SD of 3,457. Reassuringly, imputed average incomes by categories are widely consistent with well-known statistics: for example, we found that labor income is about 33% lower for females, it is higher in the Northern regions, slightly lower in the Central regions (5.8% less), and much lower in Southern regions (about 22% less). More importantly, we found that years of education (not used in the imputation exercise) are strongly correlated to labor income: precisely, each year of education increases labor earnings by about 4%. (In the labor economics literature the standard estimates of the returns to education are about 6% when using complete individual data. Considering the measurement errors determined by our imputation exercise, we believe that the approximation is quite good.) All in all, these findings reassure us that our imputation of income is a satisfactory approximation of the actual labor income.

We estimated specifications (1) and (4) of Tables 2 and 3 using as dependent variables the imputed labor income of the partner (measured in euros of year 2012). Results are reported in Table 6.

Interestingly, we found that taller females and males tend to be married to partners gaining higher labor incomes, confirming that height represents an asset on the marriage market. On the other hand, female and male individuals with higher body mass tend to mate with partners earning lower incomes. Specifically, from column (2) of Table 6 we found that an increase of one SD in female height (at its sample mean) is associated with an increase of about 480 euros (or 2.6%) of the husband's labor income. Similarly, from column (1) an increase of one SD in female body mass index decreases the husband's income by 424 euros (−2.3%).

With regard to males, from columns (3) and (4) of Table 6 our estimates show that one more SD in male height is associated with a higher wife's income of 459 euros (+4.5%). For an increase of one SD in male BMI we observe a decrease of 164 euros (−1.6%) in his wife's income.

These results for income are consistent with the effects found in the Some Robustness Checks section for educational attainments. However, one should be aware that these estimates are only suggestive because labor income is not predetermined and could be affected by many factors, creating several threats to the internal validity of estimations (due, in particular, to omitted variables or simultaneous causality).

Standardizing all the variables to compare the effects of height and BMI on partner's education and labor income

TABLE 6. Own height and partner's labor income. OLS Estimates. Dependent variable: partner's labor income (in 2012 euros)

	(1)	(2)	(3)	(4)
	Husband's labor income	Husband's labor income	Wife's labor income	Wife's labor income
Height	58.243*** (9.106)	813.844** (335.334)	66.263*** (6.991)	67.190*** (6.988)
Height squared		−2.295** (1.035)		
Body mass index	−106.026*** (13.465)		−41.015*** (13.720)	
Education	544.240*** (15.467)	560.566*** (15.309)	481.295*** (13.101)	483.788*** (13.056)
Age	137.809*** (6.651)	129.541*** (6.553)	30.133*** (5.380)	28.256*** (5.334)
North-East	610.140*** (166.420)	558.955*** (166.329)	116.725 (136.462)	110.311 (136.434)
Centre	−629.075*** (182.858)	−687.960*** (182.920)	−1,674.723*** (149.331)	−1,685.878*** (149.395)
South	−3,564.429*** (153.088)	−3,720.690*** (152.246)	−5,933.355*** (131.611)	−5,965.072*** (131.174)
Islands	−4,168.303*** (171.018)	−4,233.918*** (170.974)	−5,354.163*** (167.688)	−5,371.246*** (167.661)
Some health problems	−540.560*** (185.826)	−628.036*** (185.437)	−224.286 (174.573)	−242.530 (174.323)
Health problems	−966.877*** (363.652)	−1,034.726*** (365.017)	−365.895 (284.015)	−389.208 (283.616)
Metropolitan areas: center	1,063.238*** (261.554)	1,093.798*** (262.164)	−775.318*** (214.902)	−763.058*** (214.946)
Metropolitan areas: periphery	299.942 (245.680)	308.361 (245.989)	−612.753*** (201.147)	−606.947*** (201.185)
City size 2 s–10 s	53.182 (203.256)	63.074 (203.553)	−43.667 (163.867)	−46.241 (163.963)
City size 10 s–50 s	259.341 (209.031)	273.482 (209.364)	−293.328* (168.808)	−291.741* (168.928)
City size >50 s	469.758** (223.483)	498.003** (223.922)	−235.586 (191.501)	−226.977 (191.667)
Constant	1,611.998 (1,623.292)	−6.28e + 04** (27,134.329)	−3,708.027*** (1,340.226)	−4,870.285*** (1,289.333)
Sample	Females	Females	Males	Males
Adjusted R^2	0.162	0.160	0.239	0.239

This reports OLS estimates. Data from the Health Conditions Survey (2004–2005) matched with the Survey on Household Income and Wealth (Bank of Italy) for labor income. Standard errors (reported in parentheses) are corrected for heteroskedasticity (Huber and White procedure). The symbols ***, **, * indicate that coefficients are statistically significant, respectively, at the 1, 5, and 10% level.

(Table 7), and estimating the so-called "beta coefficients" (the beta coefficients are the regression coefficients obtained by first standardizing all variables to have a mean of 0 and a standard deviation of 1), we found that the magnitude of the effects tends to be slightly stronger for education than for income. This is probably due to the fact that education is typically easily observable at the moment of mating, whereas prospective labor income can only be predicted with errors.

TABLE 7. Beta coefficients from regressions in Tables 2, 3, and 6

Education	Height	BMI
Female	0.045	−0.072
Male	0.075	−0.050
Income		
Female	0.043	−0.051
Male	0.062	−0.018

The beta coefficients are the regression coefficients obtained by first standardizing all variables to have a mean of 0 and a standard deviation of 1.

CONCLUDING REMARKS

Several empirical works have shown the relevance of individuals' physical attributes—such as height, weight, beauty—in the labor market. In a similar way, physical characteristics may affect lifetime prospects through their impact on the selection of a partner in the marriage market.

Many studies in different fields, and in particular in economics and in human biology, have shown the importance of height and BMI for individual attractiveness and, therefore, in mating preferences and in forming actual pairings.

Using a large dataset of about 20,000 Italian cohabiting couples, we have investigated whether individual attractiveness, measured for BMI and height, affects the choice of a mate with a better socioeconomic status. Our aim was to analyze if physical attractiveness is exchanged in the marriage market for a higher educational attainment and for the ability to earn a higher income.

First of all, we found a strong tendency for assortative mating for education: 1 more year of education in an individual increases his/her partner's educational level by about 0.6 years. Furthermore, regressing the partner's height on their own height and a number of controls we found that 1 more cm for males increases by 0.19 cm female's height, while 1 more cm for females increases by 0.22 cm male's height. (Similarly, Stulp et al. (2013) show that for every cm increase in male height, partner's height increases by 0.17 cm and for every cm increase in woman's height, partner's height increases by 0.19 cm.) These findings are in line with the wide evidence cited in Introduction section about the prevalence of assortative mating among many physical and socioeconomic traits.

Our main findings suggest that height is a desirable trait in mate selection that affects the partner's socioeconomic characteristics: we found that taller individuals tend to mate with more educated partners, controlling for the former's educational level and for other personal traits such as age, geographical residence, and the presence of health problems. The effect of height turns out to be highly statistically significant in all the specifications. The results also provide evidence of non-linearity in the relationship between height and educational attainment of the partner. These findings are confirmed for both males and females but being taller seems to be more relevant for males. More specifically, we found that at the sample mean an increase of one Standard Deviation in height for a woman implies 0.19 more years of education in her husband, whereas an increase of one Standard Deviation in a man's height increases his partner's educational level by about 0.30 years of education. For both males and females we found an inverted U-shape relationship, with an "optimal height" for males of 197 cm and for females of 169 cm.

The inverted U-shaped relationship is nicely consistent with the evidence that emerged from the study of Courtiol et al. (2010a): in line with this research we also find that height is important—although to a different extent—both for males and females and both sexes prefer heights that are significantly above the sample means.

The uncovered concave relationship within our large sample of Italian couples also confirms the "male not too tall norm." We also found confirmation of "the male-taller norm" in that in only 4.57% of the couples is the female taller than the male. Stulp et al. (2013a) show that men are taller than their partner in 92.5% of the couples.

We showed that individuals with higher BMI are married to partners with lower levels of education. BMI is always highly statistically significant. One more standard deviation in female BMI reduces by 0.29 years the educational level of her partner, while an increase of one standard deviation in a man's BMI reduces by 0.19 the educational level of his partner. Therefore, being thinner is more important for females while height is more important for males.

We also found that taller and thinner females and males tend to be married with partners who earn higher labor incomes. More precisely, an increase of one standard deviation of height is associated with an increase of about 2.6 to 4.5% in the yearly labor income of one's partner. An increase of BMI reduces the partner's labor income by about 1.6 to 2.3%.

Thus, our results show that heavier and shorter individuals are penalized not only on the labor market, but tend to obtain lower economic prospects also on the marriage market. In line with the studies of, among others, Hamermesh and Biddle (1994), Averett and Korenman (1996), Oreffice and Quintana-Domeque (2010), our findings confirm for Italian couples that the physical characteristics that an individual brings to the marriage market influences the outcome on this market: physical attractiveness is exchanged in the marriage market for a higher educational attainment and for the ability to earn a higher income.

Our results turn out to be robust to a number of checks: different control variables, different functional forms of variables, ordered probit estimates, scale of measured variables, presence of outliers, etc.

Nonetheless, similarly to other studies on this topic, our study suffers from some limitations. First of all, the empirical analysis might be affected by measurement errors since height and weight are self-reported variables, and, as shown in Wooldridge (2012), these errors would tend to bias the estimates downward. This problem could especially affect individual's labor income which we imputed on the basis of sector of work and job position.

A second problem of our analysis could derive from the non-random sample selection: married individuals are a specific subsample of all individuals (in technical terms, the sample could be selected on the basis of our dependent variables causing OLS to be biased and inconsistent). However, since the large majority of individuals from 25 to 60 in Italy tend to be part of a couple (about 85%), the problem in practice may not be very relevant.

Finally, some omitted factors could be correlated to our variables of interest and simultaneously affect the dependent variable causing estimation bias. To avoid this problem we have controlled for a quite large number of variables (own education, age, geographical residence, health problems, city size indicators), but we cannot completely exclude that some biases remain, in particular in estimating the effect of BMI but less so for height (which is a pre-determined variable).

Future research on this topic, using, for example, the BMI of brothers or sisters (as new data become available) as an instrumental variable of an individual's BMI, could improve the empirical analysis.

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