DISEI - Università degli Studi di Firenze

Working Papers - Economics

The Effects of Educational Assortative Matching on Job and Marital Satisfaction

ALESSANDRO TAMPIERI

Working Paper N. 17/2018

DISEI, Università degli Studi di Firenze
Via delle Pandette 9, 50127 Firenze, Italia
www.disei.unifi.it

The Effects of Educational Assortative Matching on Job and Marital Satisfaction*

Alessandro Tampieri†

July 18, 2018

Abstract

This paper studies how the decision to attend university may affect job and marital satisfaction. We propose a theoretical model with educational assortative matching, where individuals differ in their ability, and educated spouses are preferred in the marriage market. Thus, individuals decide whether to attend university both for obtaining higher job satisfaction and for meeting educated partners. Job satisfaction is modelled to take into account the working conditions of the average educated individual as the reference type, toward which educated individuals compare themselves (Luttmer 2005, Clark and Oswald, 1996). We show that, as the probability of educational assortative matching increases, the average ability of educated individuals falls, since more low ability students are willing to attend university for marital reasons. This ultimately raises job satisfaction because, by lowering average ability, it also lowers the working conditions of the reference type. Expected marital satisfaction also increases, as more educated individuals enter the marriage market. We test the model using the dataset Marital Instability Over the Life Course for years 1980-2000, by estimating the effects of an increase in educational assortative matching on job and marital satisfaction. The empirical results confirm the theoretical findings.

JEL Numbers: I21, J12.

Keywords: higher education, job satisfaction, marital satisfaction.

*I would like to thank Giovanni Angelini, Cristina Bernini, Alessandra Casarico, Alessandro Cigno, Giuseppe Croce, Gianni De Fraja, Maria De Paola, Gianna Giannelli, Abbi Kedir, Matteo Lippi Bruni, Laurens Cherchye, Susan Murray, Joanna Poyago-Theotoky, James Rockey, and the seminar audience at LISER 2017 for helpful comments. I am particularly indebted to Majlinda Joxhe for many discussions that lead to substantial improvements of the paper. The usual disclaimer applies.

†University of Florence and CREA, University of Luxembourg, alessandro.tampieri@unifi.it.

1 Introduction

The interaction between education and marriage has been object of a recent interest in the economic literature.[1] In this perspective, education has been studied as a pre-marital investment to improve the quality of future spouses: by assuming a positive relationship in partners' characteristics (i.e., positive assortative matching), acquiring education increases the chance of marrying an educated spouse, who will rise the household income. Yet, one aspect that has not been documented is how individual well-being is influenced by education decisions combined with marriage outcomes. The analysis of well-being matters because the nexus between income and happiness is not obvious, *a priori*. Indeed, since Easterlin (1974), there is substantial evidence that a higher income per capita might not improve well-being:[2] obtaining a graduate wage does not necessarily imply greater happiness. In addition, educational choices also affect the pool of potential spouses, and indirectly the satisfaction in marriage. Hence the expectations on future job and marital satisfaction may help explaining why an individual engages in higher education.

In this paper we investigate how the decision to attend university influences job and marital satisfaction. The idea is that acquiring higher education has two main effects in an individual's life. First, higher levels of education are more likely to access secure jobs with better salaries and higher skill levels (Card, 1999, and Harmon *et al.*, 2001, and Fabra and Camisón, 2009, *inter alia*). Second, attending university increases the chances of meeting an educated partner. Past research has shown strong evidence of increases in the educational resemblance of spouses since the 1940s.[3] Why do partners tend to have similar educational levels? This may be explained by the same lifestyle choices: partners with similar education levels are more likely to share professional duties, spare time activities and view of life like fertility decisions (Cochrane, 1979).

We propose a theoretical model with non-transferable utility, where individuals differ in their ability and decide whether to attend university. Job satisfaction is modelled in such a way to consider both the gains from a graduate job (Ross and Reskin, 1992), and the role played by comparing income of other educated workers (Luttmer 2005, Clark and Oswald, 1996). In particular, we take the average educated worker as the "reference type": in the comparison, individuals feel better if they perform relatively better than the reference type. Together with education decisions, we model the marriage market and assume that the quality of a relationship is positively related to the partner's level

[1] See section 2 for an overview of the literature.

[2] For the debate on the relationship between income and happiness see Easterlin and Angelescu (2009), Clark *et al.*, (2008), Easterlin (2005), *inter alia*.

[3] See Schwartz and Mare (2005), Lewis and Oppenheimer, (2000), Smits *et al.* (2000), Pencavel (1998), Qian (1998), Qian and Preston (1993), Kalmijn (1991a, 1991b) and Mare (1991), *inter alia*.

of education. There is indeed a number of studies suggesting that the quality of marital relationships is positively associated with partners' education. Some examples are Stanley *et al.* (2006), Halford *et al.* (2003), Silliman *et al.* (2001), Sayers *et al.* (1998), Hahlweg and Markman (1988). In particular, Bruze (2011) shows that individuals exhibit strong preferences for non-financial traits of the partner related with years of education.

The matching process can be either *random* or *assortative* (Tampieri, 2016). Random matching takes place when partners meet each other by chance. Thus, for each individual, a partner is randomly drawn from the population of the opposite gender. We assume that an individual who decides not to attend university meets a partner with random matching, while an individual who attends university may meet a partner either with random matching or with assortative matching.[4] Assortative matching occurs if an educated individual meets the partner in any situation where the educational level influences the chance of a meeting: at the university, during the university life, or in related social occasions. With this type of matching, both partners have university education with certainty.

The presence of educational assortative matching implies that acquiring higher education increases the chance of marrying an educated partner (Peters and Siow, 2001). In turn, since an educated partner improves the quality of marriage, assortative matching gives an incentive to attending university to increase the chance of marrying an educated partner.

The theoretical results show that, as the probability of assortative matching increases, university attendance rises. This implies that more low ability students enroll to university, thus the ability and the working conditions of the average educated individual fall. In turn, educated workers feel better from the comparison with the reference type, and job satisfaction increases. In addition, the expected marital satisfaction of an educated persons increases, since the proportion of educated individuals increases in the marriage market.

To test the theoretical model, we analyse a sample of individuals using the Marital Instability Over the Life Course for years 1980-2000. With this panel, we are able to know whether spouses have met at school. With this information, we build up an exogenous measure to determine the level of educational assortative matching in certain sub-populations, given by geographical region, ethnic origins and religion. Mirroring the theory, we verify if our measure of assortative matching is able to explain the level of job and marital satisfaction: the empirical test is consistent with our theoretical results. To the best of our knowledge, this is the first analysis that investigates an interaction

[4]Along the paper, we will use the term "assortative matching" and "educational assortative matching"interchangeably, referring to a positive correlation in partners' educational level when individuals meet at school or in school-related events.

between job and marital satisfaction explained by university choice.

The remainder of the paper is organised as follows. Section 2 briefly surveys some the relevant literature. The theoretical model is developed in Section 3; Section 4 describes the data and the variables used for the empirical test, while the econometric model is presented in Section 5 along with the empirical results. Concluding remarks are in the last section.

2 Literature

This paper is mainly related to the literature on education and assortative matching. Peters and Siow (2001) analyse a setting where parents invest in their child education with the aim to increase the quality of the future spouse. They find that, in the presence of assortative matching, the parental investments are bilaterally efficient in large marriage markets. This gives an incentive to invest in education to match better partners. Chiappori *et al.* (2009) examine a framework with schooling investment and endogenous marital matching, where spouses specialise either in homework or market production. They find that women attain higher schooling levels than men to avoid labour market discrimination in labour markets where a low level of schooling is required. In the same line of research, Chiappori *et al.* (2016a) develop a more complex framework with a time component, where the theory is empirically evaluated through a fully-fledged structural model. Booth and Coles (2010) investigate how partnership affects the educational investment and the joint labour supply decisions of couples. They consider two matching types, one where partners marry for money and one where they marry for love. The former yields a more efficient investment, whereas romantic matching raises aggregate productivity through an increase in the number of educated women.[5] On the empirical side, there exists a recent literature on multidimensional matching. Chiappori *et al.* (2012) analyse marriage matching along multiple dimensions. By assuming separability and conditional independence of partners' characteristics, the matching mechanism can be modelled as a one-dimensional index which exhibits the trade-off between characteristics and can be empirically tested. Chiappori *et al.* (2010) develop a matching model where preferences are based on the partners socio-economic quality and smoking status. They find a gender-based relationship between smoking and the education levels. Our paper shares with these studies the link between education and assortative matching. However these contributions do not model job and marital satisfaction.

[5]Other relevant contributions in this literature are Fernandez *et al.* (2005), Baker and Jacobsen (2007), Chiappori *et al.*(2016c) and Nosaka (2007).

The paper is also related to the literature that investigates the relationship between job satisfaction and education (Florit and Vila-Lladosa, 2007, Clark, 1996, Clark and Oswald, 1996, Idson, 1990, and Meng, 1990, *inter alia*). Our contribution is mainly related to Luttmer (2005) and Clark and Oswald (1996), who highlight the role of comparison income in explaining job satisfaction. They find that satisfaction indeed depends inversely on workers' comparison wage rates. Our potential contribution to this literature is to propose a theoretical framework to interpret the relationship between job satisfaction and education that takes into account the role of comparing income.

Finally, the paper is linked to the literature on marital satisfaction. There are a number of studies suggesting that the quality of marital relationships is positively associated with partners' education (Stanley *et a.*et al., 2006, Halford *et al.*, 2003, Silliman *et al.*, 2001, Sayers *et al.*, 1998, Hahlweg and Markman, 1988, *inter alia*). This paper can contribute to this literature by providing both further evidence to the positive relationship between marital satisfaction and the partner's level of education and a theoretical explanation to it.

3 A simple model

We study an economy with two populations of the same size, one of men and one of women. The members of each population differ in ability, labeled $\theta_i \in [0,1], i = w\ (women), m\ (men)$, respectively, distributed with same density $f(\theta_i)$ and cumulative distribution function $F(\theta_i)$. We assume non-transferable utility. Initially, each individual is a single, and decides whether to attend university or to work immediately. We refer to individuals who attended university as "educated" individuals. The proportion of educated women and men is denoted as $g_w, g_m \in [0,1]$, respectively.

In the labour market, a non-educated individual obtains a payoff normalised to zero, $u_i^{ned} = 0$, while the payoff obtained by an educated individuals is:

$$u_i^{ed} = y_i - \delta \bar{y}_i - c, \tag{1}$$

where superscripts *ned* and *ed* stand for "not educated"and "educated", respectively. The first part of (1), $y_i = e\theta_i, e > 0$ represents the educational benefit in the labour market. It entails that attending university is generally necessary to gain access to better paid, less tiring or more sophisticated jobs. Thus $e\theta_i$ can be seen as a better salary as well as an improvement in working conditions, job quality, hours worked, and so on. In addition, the educational benefit is increasing on individual ability. The second component of

educational payoff is the average payoff of educated individuals $\bar{y}_i$, multiplied by $\delta \in (0,1)$. This part represents the job conditions level against which an individual compares herself or himself. The individual with average ability level among educated ones is the "reference type"for each $i \in \{w, m\}$. Parameter $\delta \in (0,1)$ describes the relative importance of social comparison. The fact that the educational benefit is declining in the job conditions of the reference type is standard in the social psychology, as well as in the economic literature in job satisfaction: it is used to model aspects of job satisfaction driven by comparison of job conditions, such as envy, jealousy or inequity (Luttmer, 2005, and Clark and Oswald, 1996, *inter alia*). The last component of (1), $c > 0$, catches the utility cost of studying effort.

After deciding whether to attend university, each individual either marries one of the opposite sex or remains single. The probability of marrying, denoted by $\eta \in (0,1)$, represents the exogenous chance of meeting the right person, and it is independent on the individual's type. We assume that marriage is stable, so that individuals are not allowed to divorce. We denote as ϕ the benefit for personal relationships. As stressed in the introduction, we assume that marrying an educated partner gives a positive marital surplus, $b > 0$. Conversely, being single or married with an uneducated partner yields a payoff normalised to zero, so that:

$$\phi = \begin{cases} b & \text{if partner is educated} \\ 0 & \text{if single or partner is uneducated} \end{cases}$$

In the marriage literature with transferable utility since Becker (1973), the surplus from marriage is related to the complementarities among partners' characteristics:[6] for instance, if levels of education are assumed to be complement, then an educated individual enjoys a higher marital surplus from an educated partner than an uneducated one. Moreover, marriage may give idiosyncratic non-monetary benefits which are also education-specific.[7] Our assumption is conversely based on a large empirical evidence (outlined in the introduction) showing that marriage quality increases when the partner is educated. In addition, we will verify whether this assumption indeed holds in the empirical section. Given the benefits and costs for attending university and marital satisfaction, the payoff matrix is the following:

[6]Technically, a household utility function is said to be super-modular, if partners' characteristics are complements, and sub-modular, if they are substitutes.

[7]See Choo and Siow, (2006), and Chiappori *et al.* (2009) and (2016b).

		women	
		educated	not educated
men	educated	$u_m^{ed}+\phi, u_w^{ed}+\phi$	$u_m^{ed}+\phi, \phi$
	not educated	$\phi, u_w^{ed}+\phi$	ϕ, ϕ

Payoff matrix

3.1 Matching

We outline here the matching rules of the model. A matching can be *random* or *assortative*. In this setting, a matching is not determined by an individual's decision, rather it represents the way people meet.

Random matching occurs anytime a meeting takes place in situations that are unrelated to university attendance. For example, a match between an engineer and a labourer sharing the passion for sports is independent of their education levels. Two individuals meeting in a bar or a club can have completely different educational backgrounds. Thus the probability for a man to marry an educated woman is given by the probability that a woman is educated, denoted by $g_w \in [0,1]$, while the probability for a woman to marry an educated man is the probability that a man is educated, denoted by $g_m \in [0,1]$. As a consequence, with random matching, an individual's level of education is not related to the partner's education.

Assortative matching takes place whenever an individual meets the partner at the university or in any social event which is related to participants' educational levels. Meeting at university parties or in social environments related to previous school friendships are examples of assortatively matched couples. In this case, the partners' education is positively related. For the sake of simplicity, we assume perfect correlation, that is, with assortative matching both partners have university education with probability one.

Hence, uneducated individuals meet only through random matching,[8] while educated individuals meet with assortative matching with probability $\gamma \in [0,1]$ and with random matching with probability $1-\gamma$. The probability of assortative matching is exogenous and independent from the distribution of abilities. Somehow, this probability is determined by the institutional setting considered. A factor that influences γ is, for instance, the years of university required to obtain a university diploma. The more the students are required to spend time together at university, the higher the probability of finding a partner in that environment (Blossfeld and Timm, 2003).

In order to determine the matching mechanism, we make some hypothesis on the proportion of educated individuals. In particular, we focus on the symmetric case where

[8]It can be shown that this assumption does not affect the properties of the results.

there is the same number of educated men than educated women, $g_m = g_w$. Notice that this does not exclude the existence of asymmetric equilibria where, say, the number of educated men is higher than the number of educated women, or *vice versa*. Indeed, the matching mechanism changes according to which assumption we make on the proportion of educated individuals. However, the model is more appealing and the message of the paper is better highlighted by setting aside gender differences on education levels.

The matching mechanism is illustrated in Table 1. According to assumption $g_m = g_w$, with assortative matching every educated individual, either a man or a woman, finds an educated partner with probability 1.

Table 1. Marriage matching

i's matching, $i, j \in \{m, w\}, i \neq j$	Probability
ed. i + ed. j	$\eta\left[(1-\gamma)g_j+\gamma\right]$
ed. i +ned. j	$\eta\left[1-\left((1-\gamma)g_j+\gamma\right)\right]$
ned i + ed. j	ηg_j
ned i + ned j	$\eta\left(1-g_j\right)$

3.2 University choice equilibrium

In their university choice, all women and men decide whether to get higher education by comparing the expected payoff of attending university with the alternative case of going to work immediately. The expected payoffs for an educated and uneducated individual i are, respectively:

$$E\mathcal{U}_i^{ed} = u_i^{ed} + \eta\left[(1-\gamma)\, g_j + \gamma\right] b, \tag{2}$$

$$E\mathcal{U}_i^{ned} = \eta g_j b. \tag{3}$$

Note that the matching mechanism affects only the chance of getting the marital surplus. An individual attends university if and only if $E\mathcal{U}_i^{ed} \geq E\mathcal{U}_i^{ned}$. Hence, an *equilibrium* in higher education decisions occurs when no individual wants to change her or his choice of education. This is represented by the pair of abilities $\left(\hat{\theta}_w, \hat{\theta}_m\right)$ where individuals are indifferent between studying or not. Further, we need to put some restrictions on utility cost of studying to ensure that at least some individuals have an incentive to attend university.

Assumption 1 *Suppose* $c < e\theta_i - \delta\bar{u}_i^{ed}$.

Since educated individuals have ability above $\hat{\theta}_i$, g_i can be rewritten as

$$g_i = \int_{\hat{\theta}_i}^{1} f(\theta_i)\, d\theta_i, \quad \forall i \in \{w, m\},$$

and in turn $\bar{y}_i = e \int_{\hat{\theta}_i}^{1} \theta_i f(\theta_i)\, d\theta_i$. In order to obtain explicit results, we assume uniform distribution of ability for both sub-populations. This implies $F = \theta_i$, so that the equilibrium proportion of educated individuals can be rewritten as $g_i = 1 - \hat{\theta}_i$, while their average education payoff is $\bar{y}_i = e\frac{1+\hat{\theta}_i}{2}$ for every $i \in \{w, m\}$.

Given the payoff matrix, the matching mechanism and the assumptions on the distribution of ability, equations (2) and (3) become:

$$E\mathcal{U}_i^{ed}\left(\hat{\theta}_i, \hat{\theta}_j\right) = e\left(\theta_i - \delta\frac{1+\hat{\theta}_i}{2}\right) - c + \eta\left[(1-\gamma)\left(1-\hat{\theta}_j\right) + \gamma\right] b, \tag{4}$$

and

$$E\mathcal{U}_i^{ned}\left(\hat{\theta}_i, \hat{\theta}_j\right) = \eta\left(1-\hat{\theta}_j\right) b. \tag{5}$$

Indifferent women and men have the expected payoff given by the following system:

$$\begin{cases} E\mathcal{U}_w^{ed}\left(\widehat{\theta}_w, \widehat{\theta}_m\right) = E\mathcal{U}_w^{ned}\left(\widehat{\theta}_w, \widehat{\theta}_m\right) \\ E\mathcal{U}_m^{ed}\left(\widehat{\theta}_w, \widehat{\theta}_m\right) = E\mathcal{U}_m^{ned}\left(\widehat{\theta}_w, \widehat{\theta}_m\right) \end{cases} \tag{6}$$

Solving system (6) yields the equilibrium in educational choices.

Proposition 1 *Let Assumption 1 hold. A symmetric equilibrium in educational choices exists and it is given by the pair* $\left(\hat{\theta}_m, \hat{\theta}_w\right)$*, where:*

$$\hat{\theta}_m = \hat{\theta}_w = \frac{2c + \delta e}{2b\gamma\eta + e(2-\delta)}. \tag{7}$$

Notice that Assumption 1 requires

$$c < \hat{c} \equiv \frac{\delta e^2(1-\delta)}{2b\gamma\eta + \delta e}.$$

We are now able to examine the equilibrium properties. In particular, we are interested in analysing how the probability of educational assortative matching γ affects job and marital satisfaction for educated individuals. In our theoretical model, job satisfaction of individual with ability θ_i can be obtained from the first part of equation (4), and it is given by the educational gain $e\theta_i$ plus the individual comparison with the reference type,

$\bar{y}\left(\hat{\theta}_i\right)$:

$$Job_{\theta_i}\left(\hat{\theta}_i\right) = e\left[\theta_i - \frac{\delta(b\gamma\eta + c + e)}{e(2-\delta) + 2b\gamma\eta}\right]. \tag{8}$$

Conversely, individual θ_i's expected marital satisfaction can be obtained by the last part of equation (4), and it is given by:

$$EM_{\theta_i}\left(\hat{\theta}_j\right) = b - \frac{b(1-\gamma)(2c+\delta e)}{2b\gamma\eta + e(2-\delta)}. \tag{9}$$

Differentiating (8) and (9) with respect to γ we get, respectively:

$$\frac{\partial Job_{\theta_i}}{\partial \gamma} = \frac{\eta\delta be(2c+\delta e)}{\left[e(2-\delta) + 2b\gamma\eta\right]^2} > 0,$$

$$\frac{\partial EM_{\theta_i}}{\partial \gamma} = \frac{b(2c+\delta e)\left[2b\eta + e(2-\delta)\right]}{\left[e(2-\delta) + 2b\gamma\eta\right]^2} > 0.$$

Corollary 1 *An increase in the probability of educational assortative matching brings about an increase in both job satisfaction and expected marital satisfaction.*

Corollary 1 is the central result of the paper and may be explained as follows. As assortative matching increases, the probability of marrying a partner with the same level of education increases. Since educated persons are preferred as partners, more individuals with relatively lower ability are willing to attend university to increase their chance of marrying an educated partners. This generates a positive externality in terms of job satisfaction: the reference type, represented by the individual with average ability among educated ones, has lower ability for higher levels of assortative matching. Thus the negative effect given by comparison is weaker.

4 Empirical analysis

4.1 The dataset

We test our theoretical results using data from the "Marital Instability Over the Life Course" study (Booth, Amato, Johnson, & Edwards, 1993). This dataset is a 6-wave panel survey built on a U.S. representative sample of married individuals. It began in 1980, based on telephone interviews conducted with a sample of married persons: The respondents were younger than 55 years and selected through a clustered random-digit dialling procedure. The initial respondents were then re-interviewed five times, during the years 1983, 1988, 1992, 1997 and 2000. The aim of the survey was to determine the main reasons of marital instability along the life course.

The dataset adopted also provides information for a wide range of satisfaction outcomes. Related to job satisfaction, we use the question "*On the whole, how satisfied (is your husband/your wife/are you) with this job? Would you say very satisfied, moderately satisfied, a little dissatisfied, or very dissatisfied?* ".
Responses to this question ranged from 1 (not very satisfied) to 4 (very satisfied). Related to marital satisfaction, we consider the question "*Taking all things together, how would you describe your marriage? Would you say that your marriage is very happy, pretty happy, or not too happy?*". Unlike for job satisfaction, responses to this question ranged from 1 (not too happy) to 3 (very happy). The two constructed indexes of satisfaction will be our variable of interest for testing the theoretical predictions of the model.

Our dependent variables will be affected by a set of individual characteristics candidates to explain both job and marital satisfaction. Since, as it will be clear shortly, we will take into account the presence of fixed effects in our estimation, we restrict our attention on time-variant control variables: age, number of children, household income, number of hours at work in a week and spouses' health. Table 2a illustrates the descriptive statistics for our covariates. Our sample exhibits an average age of 43 years, and it is composed by 40 % males. The household income is given by ranges and we can conduct analysis only by cutting the sample into two categories: Household with less than 200000$ per year or otherwise. As the tables shows around 86 % of our families are above the threshold of 20,0000$. The variable "Hours worked per week"considers both hours at work, time to go to work and hours of work spent at home. It shows an average of about 44 hours worked per week. Finally, health is self rated, where 1 corresponds to "poor health", and 3 stands for "very healthy". On average, both partners feel quite healthy, rating their health 3.26 out of 4.00 for respondents, and 3.27 out of 4.00 for spouses.

Regarding the distribution of our dependent variables, on average respondents declare to be satisfied with their job (3.37 out of 4.00) and marriage (2.57 out of 3). Our econometric analysis will try to identify how this two outcome are going to be affected not only by individual fixed effects but also by the level of the assortative matching.

Table 2a. Descriptive analysis

Variable	Mean	Std Dev	Min	Max	Obs
Job satisfaction (not at all=1; complete=4)	3.37	0.749	1	4	5,606
Marital satisfaction (not at all=1; complete=3)	2.57	0.565	1	3	7,450
Respondent's Sex (female=0; male=1)	0.402	0.490	0	1	12,124
Age	43.51	11.41	16	76	8,168
Age squared	41.08	11.54	15	75	4,146
Respondent's years of schooling	13.42	2.62	0	25	12,124
Spouse's years of schooling	13.47	2.85	0	27	2,019
Number of children	2.40	1.48	0	14	8,102
Household income (below 20,000$=0; above=1)	0.864	0.342	0	1	7,876
Hours worked per week including travel to work, and work done for the job at home	44.77	14.71	1	102	5,549
Respondent's health (self rated: not at all=1; complete=4)	3.26	0.748	1	4	8,049
Spouse's health (self rated: not at all=1; complete=4)	3.27	0.742	1	4	7,457

4.2 Identification of Assortative Matching

Our theoretical analysis is based on the fact that educational assortative matching gives an incentive to attend university. This happens because, with a certain probability, an individual can meet his or her partner at school. This probability is exogenous and depends on the characteristics of the population considered. In other words, we need to calculate an exogenous parameter that will allow us to identify our γ of the model.

In order to detect this effect empirically, we make use of the additional information provided in the dataset. In the first wave (1980), the dataset has information on whether respondents have talked to their spouse at school ("*Did you talk with each other in school?*"). By employing this variable, we generate a dummy, equal to 1 if the respondents has talked to his or her spouse at school, and if both have more than twelve years of schooling. This choice of years of education to determine university attendance reflects the institutional setting considered, namely, the American education system, where twelve

years of education corresponds to the key stage and amounts to the pre-college education. Unfortunately, in the next waves, the question "Talk to spouse in school?"is not present. Hence, for these waves, the dummy is 1 only for those individuals who remain in the same marriage since 1980.[9]

Table 2b. Descriptive analysis

	Mean	Std Dev	Min	Max
Region				
Metropolitan West	0.145	0.352	0	1
Metropolitan North Central	0.169	0.374	0	1
Metropolitan North East	0.151	0.358	0	1
Metropolitan South	0.161	0.368	0	1
Non-metro West	0.046	0.210	0	1
Non-metro North Central	0.107	0.310	0	1
Non-metro North East	0.068	0.252	0	1
Non-metro South	0.149	0.356	0	1
Religion				
Protestant	0.575	0.494	0	1
Catholic	0.278	0.448	0	1
Jewish	0.022	0.149	0	1
None	0.066	0.248	0	1
Other	0.057	0.231	0	1
Ethnicity				
White	0.880	0.324	0	1
Black	0.052	0.222	0	1
Hispanic	0.048	0.214	0	1
Other	0.018	0.133	0	1
Observations				12,124

To represent the variable of assortative matching as a macro characteristic of a certain population, we evaluate the logs of the average answer to this question on populations that differ in terms of geographical residence and some cultural aspects, such as religion and ethnicity. There is indeed substantial evidence that these factors matter at explaining marital choices (Vasquez-Tokos 2017, Sherkat 2004, and Di Maggio and Mohr 1985, *inter alia*). Table 2b illustrates the descriptive statistics for the dummies of these three

[9]The percentage of assortative matching in our dataset is around 2.5% overall.

characteristics, that we use to build of measure of assortative matching. While the sample is fairly distributed across the country, a higher proportion of white Protestants emerges.

Since our measure of γ identifies the level of exogenous assortative matching and varies by region, race and religion, it will also control for these individual characteristics in the estimation. Our empirical analysis focuses on determining the relationship between this assortative matching γ and each satisfaction parameters (job and marital satisfaction). Table 3 gives the spatial distribution of assortative matching across regions. The variability is quite high starting from very low assortative matching like for Metropolitan areas as North Central (0.03%) to higher South (3.5%).

Table 3. Distribution of Assortative Matching across Regions

Variable - assortative matching Regions	Mean	Std Dev	Min	Max	Obs
Metro: West	0.017	0.026	0	0.25	679
Metro: North Central	0.003	0.007	0	0.018	840
Metro: North East	0.015	0.029	0	0.5	718
Metro: South	0.035	0.043	0	1	736
Non-metro: West	0.027	0.022	0	0.09	292
Non-metro: North Central	0.043	0.037	0	0.5	553
Non-metro: North East	0.015	0.081	0	1	327
Non-metro: South	0.045	0.110	0	1	684

5 The Empirical Model

5.1 Education of spouse and Marital Satisfaction

Before to proceed with the empirical test, we must verify that, as assumed in the theoretical model, marrying an educated partner yields a positive benefit (i.e., parameter b). This is indeed one of the incentives to attend university when assortative matching is present. In order to hold empirically, we must verify a positive correlation between the partner's level of education and the individual marital satisfaction in our dataset.

Table 4 provides a simple correlation test for the two variables of interest; individual marital satisfaction and the level of education of the partner. As the table illustrates, the coefficient is rather low even though positively correlated. This simple test is verifying our main theoretical assumption of the existence positive correlation between the two.

Table 4. Correlation test among partner's education and marital satisfaction

Variable: Marital Satisfaction	
Partner's Education	0.01**
	(0.004)
Constant	2.45***
	(0.058)
R-squared	0.003
Observations	2,015

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

5.2 Econometric specification

We perform an ordered logit fixed effect model to show the relationship between the exogenous assortative matching and the two outcomes of interest; job and marital satisfaction. In line with the American education system, we consider all the respondents who attended more than twelve years of education, representing educated individuals in the theoretical model.

From a methodological perspective, the starting point is a latent variable model:

$$s_{it}^{*} = x_{it}'\beta + \alpha_i + \varepsilon_{it}, i = 1, .., N \; t = 1, ..., T,$$

where $s_{it}^{*} \in \{\text{job, marital}\}$ is a latent measure of the satisfaction of respondent i in period t, x_{it} is the vector of control variables and β is the vector of coefficients to be estimated. Finally, α_i is the unobserved, time invariant component which might be correlated with x_{it}, while ε_{it} is the error term. We are able to observe s_{it} which is related to s_{it}^{*} as follows

$$s_{it} = k \text{ if } \tau_k < sat_{it}^{*} \leq \tau_{k+1}, \quad k = 1, ..., K.$$

We assume that the threshold parameters τ_k are strictly increasing in k ($\tau_k < \tau_{k+1} \forall k$) with $\tau_1 = -\infty$ and $\tau_{K+1} = +\infty$. If ε_{it} is independent and logistic-distributed, the probability of observing k for individual i at time t is

$$\Pr\left(s_{it} = k | \, x_{it}, \alpha_i\right) = \Lambda\left(\tau_{k+1} - x_{it}'\beta - \alpha_i\right) - \Lambda\left(\tau_k - x_{it}'\beta - \alpha_i\right),$$

where the cumulative distribution function $\Lambda(\cdot)$ is the logistic function.

Unfortunately, in this type of model, α_{ik} cannot be estimated consistently, in turn affecting the consistency of β. This situation is the so-called "incidental parameters problem" (Neyman

and Scott, 1948). We solve this issue using the "Blow-up and Cluster" (BUC) estimator (Baetschmann *et al.*, 2015). The BUC estimator estimates the model using all K-1 cutoffs simultaneously, and assuming $\beta_2 = \beta_3 = ... = \beta_K$. This is obtained by building a dataset where each individual is repeated K-1 times. At every repetition, a different cutoff is used to collapse the dependent variable. Then the expanded sample is estimated using the standard conditional maximum likelihood estimator (Chamberlain, 1980).[10]

5.3 Empirical results

Table 5a summarises the results for job and marital satisfaction. Age does not significantly affect any of the satisfaction outcomes. The number of children intuitively is decreasing in marital satisfaction. In line with Easterlin paradox, both measures of satisfaction are negatively affected by the level of income, but the estimated coefficient of income is statistically significant only for marital satisfaction. Moreover, hours worked per week are not significant. Finally, respondent's health is positively related to both satisfactions, while spouses' health is not significant. Let us turn now on the effect of educational assortative matching. Job and marital satisfaction significantly increase with the level of assortative matching. This is in line with our theoretical results and in particular with Corollary 1.

We conclude the section by examining the odds ratio which, in logit models, gives the constant effect of a control variable on the likelihood that one outcome will occur. The results are shown in Table 5b. For each child in the household, the odds of high satisfaction in marriage (score 3) is $1-0.711 = 0.289$ times lower than medium satisfaction, which is in turn 0.289 times lower than low satisfaction. A high level of marital satisfaction is $1-0.487 = 0.513$ less likely for households with income higher than $20,000$\$. A one-unit increase in respondent's health yields a 1.306 times increase in job satisfaction and an 1.392 times increase in marital satisfaction. Finally, a one-unit increase in assortative matching brings about a 1.078 times increase in job satisfaction and 1.109 times increase in marital satisfaction.

[10]For details, see Baetschmann *et al.* (2015).

Table 5a: ordered logit fixed effects: job and marital satisfaction

Dep. variable	job satisfaction	marital satisfaction
	(1)	(2)
Age	−0.040	−0.056
	(0.081)	(0.107)
Age squared	0.097	0.060
	(0.079)	(0.106)
number of children	−0.044	−0.341**
	(0.102)	(0.147)
household income	−0.204	−0.719**
(below 20,000$=0; above=1)	(0.274)	(0.349)
Hours worked per week	0.005	−0.001
(including travel to work, and work done for the job at home)	(0.005)	(0.006)
Respondent's health	0.267**	0.331**
(self rated: not at all=1; complete=4)	(0.126)	(0.141)
Spouse's health	−0.138	0.148
(self rated: not at all=1; complete=4)	(0.126)	(0.177)
Assortative matching	0.076*	0.104**
(not at all=0; complete=1)	(0.045)	(0.049)
obs	1,872	1,057

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table 5b: odds ratio: job and marital satisfaction

Dep. variable	job satisfaction	marital satisfaction
	(1)	(2)
Age	0.960	0.945
Age squared	1.101	1.061
number of children	0.956	0.711**
household income	0.815	0.487**
Hours worked per week	1.005	0.999
Respondent's health	1.306**	1.392**
Spouse's health	0.871	1.159
Assortative matching	1.078*	1.109**
obs	1,872	1,057

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

6 Concluding remarks

In this paper we have examined the impact of educational assortative matching on job and marital satisfaction. In the theoretical model, individuals differ in ability, and educated spouses are preferred in the marriage market. They choose whether to attend university or not, and then they are matched in the marriage market. The presence of educational assortative matching determines a positive correlation in the education level of partners. This implies that individuals decide whether to attend university both for obtaining higher job satisfaction and for meeting educated partners. As the probability of educational assortative matching increases, more low-ability students are willing to attend university to increase their chance to marry an educated partner. As a consequence, the average ability of educated individuals falls, which in turn raises job satisfaction. Marital satisfaction increases too, this due to the higher proportion of educated individuals in the marriage market. The empirical test corroborates the theoretical results.

Compliance with Ethical Standards: The author declares that he has no conflict of interest.

References

[1] Baetschmann, G., Staub, K.E. and Winkelmann, R. 2015. Consistent estimation of the fixed effects ordered logit model. *Journal of the Royal Statistical Society A* **178**: 685-703.

[2] Becker, G.S. 1973. A theory of marriage: Part I. *The Journal of Political Economy* **81** (4): 813-46.

[3] Blossfeld, H.P. and A. Timm, eds. 2003. *Who Marries Whom? Educational Systems as Marriage Markets in Modern Societies.* Dordrecht, The Netherlands: Kluwer Academic Publishers.

[4] Booth, A. and Coles, M. 2010. Education, matching and the allocative value of romance. *Journal of the European Economic Association* **8** (4): 744-775.

[5] Bruze, G. 2011. Marriage choices of movie stars: Does spouses education matter? *Journal of Human Capital* **5**: 128.

[6] Chamberlain, G. 1980. Analysis of covariance with qualitative data. *Reviev of Economic Studies* **47**: 225-238.

[7] Chiappori, P. A., Costa Dias, M., and Meghir, C. 2016a. The marriage market, labor supply and education choice. mimeo.

[8] Chiappori, P. A., Iyigun, M.F. ,and Weiss, Y. 2009. Investment in schooling and the marriage market. *American Economic Review* **99** (5): 1689-1713.

[9] Chiappori, P. A., Oreffice, S., and Quintana-Domeque, C. 2012. Fatter Attraction: Anthropometric and Socioeconomic Matching on the Marriage Market. *Journal of Political Economy* **120**: 659695.

[10] Chiappori, P. A., Oreffice, S., and Quintana-Domeque, C. 2016b. Bidimensional Matching with Heterogeneous Preferences: Education and Smoking in the Marriage Market. *Journal of the European Economic Association.* Forthcoming.

[11] Chiappori, P. A., Salanie, B., and Weiss, Y. 2016c. Partner choice, investment in children, and the marital college premium. *HCEO Working paper* **27**.

[12] Clark, A. E., and Oswald, A.J. 1996. Satisfaction and comparison income. *Journal of Public Economics* **61**: 359-381.

[13] Clark, A. E., Frijters, P., and Shields, M. 2008. Relative income, happiness, and utility: An explanation for the Easterlin paradox and other puzzles. *Journal of Economic Literature* **46**: 95-144.

[14] Cochrane, S. H., 1979. *Fertility and education: what do we really know?* Baltimore Md.: The Johns Hopkins University Press.

[15] Di Maggio, P., and Mohr, J. 1985. Cultural capital, educational attainment, and marital selection. *American Journal of Sociology* **90**: 1231-1261.

[16] Easterlin, R. A. 1974. Does economic growth improve the human lot? Some empirical evidence. In *Nations and Households in Economic Growth: Essays in Honor of Moses Abramovitz*, ed. R. David and M. Reder. New York: Academic Press, 89125.

[17] Easterlin, R. A. 2005. Feeding the illusion of growth and happiness: A reply to Hagerty and Veenhoven. *Social Indicators Research* **74**: 42943.

[18] Easterlin, R. A. and Angelescu, L. 2009. Happiness and growth the world over: time series evidence on the happiness-income paradox. *IZA Discussion Paper* **4060**.

[19] Florit E. F. and Vila Lladosa L. E. 2007. Evaluation of the effects of education on job satisfaction: Independent single-equation vs. structural equation models. *International Advances in Economic Research* **13**: 157-170.

[20] Hahlweg, K. and Markman, H. 1988. The effectiveness of behavioral marital therapy: empirical status of behavioral techniques in preventing and alleviating marital distress. *Journal of Consulting and Clinical Psychology* **56**: 440–447.

[21] Halford, K. W., Markman, H. J., Kline, G. and Stanley, S. M. 2003. Best practice in couple relationship education. *Journal of Marital and Family Therapy* **29**: 385–406.

[22] Idson, T. L. 1990. The establishment size, job satisfaction and the structure of work. *Applied Economics* **22**: 1007-1018.

[23] Jerkins, R. 2001. *Rethinking ethnicity: arguments and explorations*. SAGE pubblications, London.

[24] Kalmijn, M. 1991a. Shifting Boundaries: Trends in Religious and Educational Homogamy. *American Sociological Review* **56**: 786–800.

[25] Kalmijn, M. 1991b. Status Homogamy in the United States. *American Journal of Sociology* **97**: 496–523.

[26] Lewis, S. K. and Oppenheimer, V.K.2000 Educational assortative mating across marriage markets: Non-hispanic whites in the United States *Demography* **37**: 29-40.

[27] Luttmer, E.F.P.2005 Neighbors as negatives: relative earnings and well-being. *Quarterly Journal of Economics* **120**: 963-1002.

[28] Mare, R.D. 1991. Five Decades of Educational Assortative Mating. *American Sociological Review* **56**: 15–32.

[29] Meng, R. 1990. The relationship between unions and job satisfaction. *Applied economics* **22**: 1635-1648.

[30] Peters, M. and Siow, A. 2002. Competing premarital investments. *The Journal of Political Economy* **110**: 592-608.

[31] Pencavel, J. 1998. Assortative mating by schooling and the work behavior of wives and husbands. *American Economic Review* **88**: 326-9.

[32] Qian, Z. and Preston, S.H. 1993. Changes in American Marriage, 1972 to 1987: Availability and Forces of Attraction by Age and Education. *American Sociological Review* **58**: 482–95.

[33] Qian, Z. 1998. Changes in Assortative Mating: The Impact of Age and Education, 1970–1990. *Demography* **35**: 279–92.

[34] Ross, C. E., and Reskin, B. F. (1992). Education, control at work, and job satisfaction. *Social Science Research* **21**: 134-148.

[35] Sayers, S. L., Kohn, C. S. and Heavey, C. 1998. Prevention of marital dysfunction: Behavioral approaches and beyond. *Clinical Psychology Review* **18**: 713-744.

[36] Schwartz, C., Mare, R. 2005. Trends in educational assortative marriage from 1940 to 2003. *Demography* **42**: 621-646.

[37] Sherkat, D.E. 2004. Religious intermarriage in the United States: trends, patterns, and predictors. *Social Science Research* **33**: 606-625.

[38] Silliman, B., Stanley, S. M., Coffin, W., Markman, H. and Jordan, P. L. 2001. Preventive interventions for couples. *In H. Liddle, D. Santisteban, R. Levant, & J. Bray (Eds.), Family psychology: Science-based interventions*: 123-146.

[39] Smits, J., W. Ultee, and J. Lammers. 2000. More or Less Educational Homogamy? A Test of Different Versions of Modernization Theory Using Cross-Temporal Evidence for 60 Countries. *American Sociological Review* **65**: 781-88.

[40] Stanley, S.M., Johnson, C.A., Amato, P.R. and Markman, H.J. 2006. Premarital education, marital quality, and marital stability: findings from a large, random household survey. *Journal of Family Psychology* **20** (1): 117-126.

[41] Tampieri, A. 2016. Over-education and assortative matching in partnership: A theoretical analysis. *Education Economics* **26** (1): 312-328.

[42] Vasquez-Tokos, J. 2017. *Marriage Vows and Racial Choices* . Russell Sage Foundation. New York.