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The effects of Assortative Matching on Job and Marital Satisfaction through University Attendance*

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Abstract

This paper examines how the decision to acquire higher education may affect job and marital satisfaction. We propose a theoretical model where individuals decide whether to attend university both for obtaining higher job satisfaction and for meeting potential partners. As the probability of marrying an educated partner increases (due to positive educational assortative matching), the average ability of university students falls, since more (low ability) students are willing to attend university. Two effects can be withdrawn: (i) average job satisfaction decreases, while (ii) marital satisfaction increases. We then test the model using the British Household Panel Survey for years 1996-2008, using a dynamic bivariate model. Consistent with the theoretical predictions, we find that higher education is correlated with lower average job satisfaction. In addition, the higher education of the partner increases marital satisfaction.

JEL Numbers: I21, J12

Keywords: higher education, job satisfaction, marital satisfaction.

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1 Introduction

This paper investigates how the decision to attend university affects 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*). Some of these advantages may be captured by the satisfaction with job (Ross and Reskin, B. F., 1992). Second, attending university increases the chances of meeting an educated partner, as the educational levels of partners are strongly interrelated. Past research has shown strong evidence of increases in the educational resemblance of spouses since 1940s in United States.[1]

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 where individuals differ in their ability and decide whether to attend university or not. The decision on attending university gives job satisfaction in the working life that can be positive or negative according to their ability. In other words, attending university would guarantee a better job, but the cost of performing the task depends on an individual's ability and it may offset the job benefits, resulting in a low or negative job satisfaction. After education decisions, men and women are matched in marriage. We assume that individuals prefer marrying an educated partner, because of a better income to share, a more interesting conversation, or more open-mindedness.[2]

The matching process can be either *random* or *assortative* (Chade *et al.*, 2016). Random matching takes place when partners meet each other by

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

[2] See Stanley *et al.* (2006), Halford *et al.* (2003), Silliman *et al.* (2001), Sayers *et al.* (1998) and Hahlweg and Markman, 1988).

chance. Assortative matching occurs if an individual meets the partner in any situation where the educational level influences the chance of a meeting: at school, at work, or in social occasions related to the level of education acquired.[3] We assume that, with random matching, the partner could be either educated or uneducated. Conversely if the matching is assortative, the partner will exhibit the same educational level of the individual. The presence of assortative matching implies that acquiring higher education increases the chance of marrying an educated partner (Peters and Siow, 2001). This gives an incentive in acquiring higher education to increase the chance of marrying an educated partner, since they are the favourites.

The theoretical results show that, as the probability of assortative matching increases, university attendance increases, the expected marital satisfaction increases while the marginal and average job satisfaction decrease. These results can be explained as follows. Some individuals might find it convenient to acquire higher education even if their ability is low, implying negative job satisfaction at work. This because the negative job satisfaction is compensated by the higher probability of marrying an educated partner. This effect gets stronger the higher the probability that the matching is assortative: university attendance increases, the average ability of graduates decreases, so that in equilibrium the average job satisfaction may be negative. This result is driven by the increase in marital satisfaction, since more educated individuals imply higher partner's average quality.

To test the theoretical model, we analyse a sample of individuals using the British Household Panel Survey (BHPS) for years 1996-2008. The data have a longitudinal nature, even though we do not observe variability on the decision for taking higher education (most of the respondent has already finished their education carrier[4]. Instead, we verify the existence of assortative

[3]Along the paper, the term "assortative matching" refers in fact to "educational assortative matching", that is, a positive correlation in partners' educational level when individuals meet at school or in school-related events.

[4]For this reason we can not use a structural model to investigate for the university

matching, dividing the married couples in matched educated or not. The matched couples with higher education background compose around 35% of the sample. We then investigate for the effects of education on both marital and job satisfaction through a dynamic bivariate model. The results show that job satisfaction will decrease on average for those who have acquired higher education, whereas the education of the partner will increase the marital satisfaction. The overall empirical results qualitatively corroborate the theoretical findings. The paper is organised as follows. Section 2 presents some of the related literature. The theoretical model is developed in Section 3; the analysis of equilibrium is illustrated in Section 4; Section 5 describes the data and the variables used, while the empirical model is presented in Section 6 along with the empirical results. and concluding remarks are in the last section.

2 Related literature

This paper is related to three different branches of the literature, namely the literature on education and assortative matching, on job satisfaction and on marital satisfaction. In the former, Peters and Siow (2001) analyse a setting where education acts as a pre-marital investment to increase the quality of the future spose. They find that, in the presence of assortative matching, the parental investments are bilaterally efficient in large marriage markets. This gives an incentives 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 job markets where a low level of schooling is required. Booth and Coles (2010) investigate how partnership affect the educational investment decisions and the joint labour

decision.

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] Our paper shares with these studies the link between education and assortative matching. However, in these contributions there is no link to job and marital satisfaction. The paper is also related to the literature that investigates the relationship between job satisfaction and education.[6] Meng (1990) uses the Social Change in Canada Survey for 1981. He finds that education increases workers' freedom to decide how to perform the job, workers' influence on the decisions of supervisors, and their content with the physical environment of the job. Isdon (1990) analyses the Quality of Employment Survey for 1977, reporting no significant effects of education in job satisfaction. Clark (1996) and Clark and Oswald (1996) examine the BHPS for 1991. Clark (1996) shows that individuals with longer schooling have comparative lower levels of job satisfaction, as do men, middle-aged people, those working longer hours, and employees in larger establishments. Clark and Oswald (1996) find that the overall job satisfaction is declining in the level of education when income is held constant, and satisfaction depends inversely on workers' comparison wage rates. Most recently, Florit and Vila-Lladosa (2007) study the Spanish Household Survey for 1998. They show that the effects of education on job satisfaction are mainly indirect effects transmitted though the influence of schooling on workers' health status, wages and other observable job characteristics. Fabra and Camison (2009) estimate a structural equations model (SEM) using Spanish data, to assess the influence of education on workers' satisfaction. This strategy allows them to separate the

[5]Other relevant contributions in this literature are Fernandez *et al.* (2005), Baker and Jacobsen (2007), Chiappori *et al.*(2006) and Nosaka (2007).

[6]Previous studies analysed job satisfaction related to training (Jones *et al.,* 2009), temporary jobs (Booth, Francesconi and Frank, 2002), unionisations (Bryson, Cappellari and Lucifora, 2004) and work environment (Gazioglu and Tansel, 2006).

direct effect of education on job satisfaction from the set of indirect effects resulting from the characteristics of the job. Our potential contribution to this literature is to propose a theoretical interpretation to the relationship between job satisfaction and education.

Finally, the paper is related to the marital satisfaction literature. Here the levels of education between partners are usually considered as control variables (e.g., Glenn, 1990; White and Rogers, 2000). There are 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. This paper contributes 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. Further, it investigates the interaction between job and marital satisfaction due to educational choices.

3 A simple model

We study an economy with a population of couples. Since we are interested in determining the relationship between the level of education of partners and their job and marital satisfaction, we do not consider both single and divorced individuals. Each member of the couple belongs to a one of two subpopulations of same size, one of men and one of women. The members of each subpopulation differ in ability, labeled $\theta_i \in [0,1], i = m\ (men), w$ $(women)$, respectively, distributed with same density $f(\theta_i)$ and cumulative distribution function $F(\theta_i)$, and ability is higher the *lower* θ_i.

At the beginning of the game, of each member of the couple is 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 men and women is denoted as $\sigma_m, \sigma_w \in [0,1]$, respectively.

We assume that, in the job market, a non-educated individual obtains a benefit normalised to zero while an educated individuals receives an educational benefit $y_i > 0$, since to attend university is generally necessary to gain access to better paid, less tiring or more sophisticated jobs. Thus y_i can be seen as a better salary as well as an improvement in work conditions, the quality of job, hours worked, and so on. Also, I assume that the men's educational benefit is higher than the women's, $y_m > y_w$. This hypothesis reflects the empirical evidence that, *ceteris paribus*, women generally face worse job conditions than men.[7]

On the other hand, performing a graduate job requires effort that depends on the ability of an individual. I denote the utility cost of a graduate job as $c\theta_i$, where $c > 0$. This represents the fact that more able individuals make less effort in doing a graduate job.

Finally, we define job satisfaction as the educational benefit net to the utility cost, $y_i - c\theta_i$. This implies that job satisfaction is strictly related on the job type and the educational requirements to obtain it. Hence we abstract from working conditions (i.e., distance between home and job, relationship with colleagues and so on). I assume $c > y_m$, so that the lowest-ability individual has negative job satisfaction by attending university and prefers to go to work immediately.

After deciding whether to attend university, each individual marries one of the opposite sex and the couples are formed. As stressed in the introduction, we assume that to marry an educated partner gives marital satisfaction $b > 0$. Given the benefits and costs for attending university and marital satisfaction, the payoff matrix is the following:

[7]For example, Burchell *et al.* (2007) shows some evidence of it for European countries in the period 1990-2005. There is a peristent gender inequality in many aspects of working conditions. In particular women are under-represented in senior positions, are more likely to have part-time jobs, their health is most affected by their work. Women are also less likely to be the main earner in the home because they tend to be segregated into the lower-paid jobs. In addition, the gender pay gap provides an economic rationale which reinforces women's position as the primary person responsible for the home and care responsibilities.

		women	
		educated	not educated
men	educated	$y_m - c\theta_m + b, y_w - c\theta_w + b$	$y_m - c\theta_m, b$
	not educated	$b, y_w - c\theta_w$	$0, 0$

3.1 Matching

The expected payoff of individuals depends on the way a couple is matched. A matching can be *random* or *assortative* (Tampieri, 2016). 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 the acquired education. For example, a match between an engineer and a labourer sharing the passion for sports is totally casual. 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, $\sigma_w \in [0, 1]$, while the probability for a woman to marry an educated man is the probability that a man is educated $\sigma_m \in [0, 1]$. 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 school or in any social event which is somehow related to participants' educational level. Meeting at school 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 partners have the same education with probability one.

We denote the probability of assortative matching as $\beta \in [0, 1]$, being exogenous and independent from the distribution of abilities. Somehow, the probability of assortative matching is determined by the institutional setting considered. A factor that influences β is, for instance, the years of schools

required to obtain a high school or a university diploma. For example, the more the students are required to spend time together at university, the higher the probability of finding a partner with higher education (Blossfeld and Timm, 2003). School tracking also influences the probability of assortative matching. Postponing school tracking keeps a more heterogeneous group of pupils together for a long time, by decreasing the probability of assortative matching (Holmlund, 2007).

In order to determine the matching mechanism, we make some hypothesis on the proportion of educated individuals. In particular, we focus on the case where there is a larger number of educated men than educated women, $\sigma_m > \sigma_w$.[8]

To assume more educated men than women is consistent with the previous assumption $y_m > y_w$, which implies that the incentive for men to achieve a graduate job is higher than for women. In fact, the gap in schooling between men and women is narrowing down. Goldin *et al.* (2006) show that, in many developed countries, women now have more schooling than men. Of the 17 OECD countries with sufficient data, they document that university enrollment rates of women were below those of men in 13 countries in the 1980s, but by 2002, women university enrollment rates exceeded those of men in 15 countries. However, our empirical analysis is based on a sample of individuals who attended higher education along the past 50 years, where the gap between men and women in higher education was straightforward in favour of men.

[8]The focus on this case does not exclude the existence of a symmetric equilibrium or an asymmetric equilibrium where the number of educated women is higher than the number of educated men. The matching mechanism changes according to which assumption we make on the proportion of educated individuals.

Table1. Marriage matching

Men's matching	**Probability**
edu man + edu woman	$(1-\beta)\sigma_w + \beta\frac{\sigma_w}{\sigma_m}$
edu man +unedu woman	$1 - \left[(1-\beta)\sigma_w + \beta\frac{\sigma_w}{\sigma_m}\right]$
unedu man + edu woman	$(1-\beta)\sigma_w$
unedu man + unedu woman	$1 - [(1-\beta)\sigma_w]$
Women's matching	
edu woman + edu man	$(1-\beta)\sigma_m + \beta$
edu woman +unedu man	$1 - [(1-\beta)\sigma_m + \beta]$
unedu woman + edu man	$(1-\beta)\sigma_m + \beta\left(\frac{\sigma_m - \sigma_w}{1-\sigma_w}\right)$
unedu woman + unedu man	$1 - \left[(1-\beta)\sigma_m + \beta\left(\frac{\sigma_m - \sigma_w}{1-\sigma_w}\right)\right]$

The matching mechanism is summarised in Table 1. According to the assumption $\sigma_m > \sigma_w$, with assortative matching educated men marry an educated woman with probability $\frac{\sigma_w}{\sigma_m}$ and every educated woman finds an educated partner. On the other hand, none of the uneducated men marries an educated woman, while some uneducated women will marry an educated man.

3.2 University choice equilibrium

The equilibrium in higher education decisions occurs when no individual wants to change his or her choice of education. This is represented by the pair of abilities (θ_w^*, θ_m^*) where individuals are indifferent between studying or not.

Educated individuals have ability below θ_i^*, so the value of θ_i^* increases as their number increases. As a consequence, θ_i^* is equal to the probability to be educated, i.e., $\sigma_w = F(\theta_w^*)$ and $\sigma_m = F(\theta_m^*)$. In order to obtain explicit analytical results, we assume uniform distribution of ability for both subpopulations. This implies $F = \theta_i$, so that the equilibrium solutions can

be rewritten as $\sigma_w = \theta_w^*$ and $\sigma_m = \theta_m^*$.

Given the payoff matrix, the matching mechanism and the assumptions on the distribution of ability, men and women decide to attend university if their expected payoff of studying is higher than the expected payoff of going to work. The following proposition shows the equilibrium in educational choices.

Proposition 1 *An equilibrium in educational choices exists and it is given by the pair* (θ_m^*, θ_w^*) *which is solution of the system:*

$$\begin{cases} \theta_m^* = \frac{(1-\theta_w^*)(y_w - c\theta_w^*)+b\beta}{b\beta} \\ \theta_w^* = \frac{(c\theta_m^{*2} - \theta_m^* y_m)}{b\beta} \end{cases} \tag{1}$$

Proof. See the appendix. ■

3.3 Analysis of equilibrium

In this section we examine the equilibrium properties, in particular related to a variation of the probability of assortative matching. Tractability prevents us to elicit analytical results, thus we build up a computational example of equilibrium. The parameters values are chosen in such a way that the model assumptions hold: $\theta_m^*,\ \theta_w^* \in [0,1]$, and $c > y_m > y_w$. In particular, we assign the following values: educational benefit, $y_m = 0.2, y_w = 0.15$, marital satisfaction, $b = 0.4$, utility cost of a graduate job $c = 1$.

In the numerical exercise, we consider the effects of changes in β on marginal and average job satisfaction and on expected marital satisfaction. While marginal job satisfaction is helpful to understand the changes in equilibrium, average job satisfaction and expected marginal satisfaction can be tested in the empirical exercise that follows. Marginal job satisfaction (i.e., the job satisfaction of the individual being indifferent between studying or not) is $y_m - c\theta_m^*$ for men and $y_w - c\theta_w^*$ for women. The average job satisfaction of educated individuals is denoted as AJ_i and is obtained by maintaining the

assumption of uniform distribution, $AJ_i = \dfrac{y_i - c\bar{\theta}_i + y_i - c\theta_i^*}{2}$, where $\bar{\theta}_i$ is the highest level of ability of an individual. Since $\bar{\theta}_i = 0$ for every i, then $AJ_i = \dfrac{2y_i - c\theta_i^*}{2}$.

The expected marital satisfaction of educated individuals is denoted by EM_i and depends on the probability of an educated individual to marry an educated partner. According to Proposition 1, this is

$$EM_m = \left[(1-\beta)\theta_w^* + \beta\frac{\theta_w^*}{\theta_m^*}\right] b,$$

for educated men and

$$EM_w = \left[(1-\beta)\theta_m^* + \beta\right] b,$$

for educated women.

Table 2 illustrates the results. The ability of the average student decreases with β. As assortative matching increases, both marginal and average job satisfaction decrease. Moreover, while marginal job satisfaction is always negative, average satisfaction becomes negative for high probabilities of assortative matching. On the other hand, expected marital satisfaction increases the higher the probability of assortative matching. These results may be explained as follows. As assortative matching increases, the probability of marrying a partner with the same level of education increases. Educated persons are preferred as partners since they give positive marital satisfaction. As a consequence, individuals might decide to attend university even if their job satisfaction will be negative, as this can be offset by the increased probability of marrying an educated partner.

Table 2. Computational example of equilibrium.

	β	**0.1**	**0.3**	**0.5**	**0.7**	**0.9**
Parameters	$y_m = 1$; $y_w = 0.9$, $c = 1.1$, $b = 1, \gamma = 1$					
θ_m		0.374	0.426	0.482	0.539	0.594
θ_w		0.292	0.351	0.405	0.450	0.539
Marginal	*men*	- 0.032	- 0.104	- 0.178	- 0.253	- 0.326
job satisfaction	*women*	- 0.038	- 0.113	- 0.188	- 0.259	- 0.326
Average	*men*	0.08	0.05	0.01	- 0.03	- 0.06
job satisfaction	*women*	0.06	0.02	- 0.02	- 0.05	- 0.09
Expected	*men*	0.100	0.178	0.246	0.302	0.345
marital satisfaction	*women*	0.124	0.205	0.276	0.334	0.381

4 The data

We use data from the British Household Panel Survey (BHPS) that began in 1991 and was designed as an annual survey of the adult population in UK (Taylor *et al.*, 2008). It is a nationally representative sample of more than 5,000 households, totalling approximately 10,000 individual interviews. It is a longitudinal survey in which all adult members of each household are available to be interviewed each year. The primary purpose of BHPS data is to collect detailed information on demographics and socio-economic behaviour of the UK households, such as household's consumption, income, geographic mobility, labor market outcomes etc. Our sample includes valid observations from 1996 until 2008 (12 years), excluding the years 1991,1995 due to the lack of information about marital satisfaction. The sample consists in around 15076 couples (30152 individuals) of men and women aged between 21 and 65 years who provided complete information at the interview dates, who are married or in a relationship and live in the same household.[9] We do

[9]In order to build up a sample of only couples, we keep individuals "living with the partner". When the partner is not participating to the interview, the observation is dropped.

not include individuals aged below 21 as according to the British university system, they might not have had the opportunity to complete their higher education.

4.1 Explanatory variables and Summary Statistics

BHPS provides information on the educational degree obtained. We construct a binary variable taking value of one in case any of the respondents have obtained a degree higher than college (A level or the Scottish Qualification Certificate) and zero otherwise.[10] Given the fact that our sample is based only on couples, we are able to identify also the education level of the partner. We thus, create another dummy variable to indicate if the level of education of the partner is higher or not. We seek any positive association between higher education and the partner's higher education, which would indicate a high probability of assortative matching. Table 3 shows a cross-tabulation of the two constructed variables, and clearly points out that around 35% of the individuals who declare to have higher education are matched with higher educated partner.

[10]In terms of educational system, the UK Government is responsible for England, and the Scottish Government, the Welsh Assembly Government and the Northern Ireland Executive are responsible for Scotland, Wales and Northern Ireland, respectively. While the systems in England, Wales and Northern Ireland are more similar, the Scottish system is quite different

Table 3. Matching couples with Higher Education[11]

	Observations	Percentage
Higher Education		
Partner with No Higher Education	5684	18.85
Partner with Higher Education	10494	34.80
Total	16178	53.65

Notes: Source BHPS 1996-2008

Once we established the presence of positive educational assortative matching within the data, we examine the measures of job and marital satisfaction. BHPS provides information for a wide range of satisfaction outcomes, like job, marital, life etc. Related to job satisfaction BHPS asks, using a 7 point rating scale, the question: "*All things considered, how satisfied or dissatisfied are you with your present job overall?*". Meanwhile, related to the marital satisfaction, the BHPS asks individuals the following question: "*How dissatisfied or satisfied are you with your husband/wife/partner?*"Respondents again could answer on a scale from one (totally unsatisfied, 1) and seven (very satisfied, 7). In Table 4. we compare job and marital satisfaction to life overall satisfaction, as to examine their relative value. Marital satisfaction is highly correlated to the overall satisfaction, (nearly 0.45) whereas job satisfaction accounts for less (around 0.26) According to Table 4, the correlation between job and marital satisfaction and between life and job/marital satisfaction is quite low.

[11]The correlation coefficient between couples with higher education is around 0.24.

Table 4. Correlation between overall, job and marital satisfaction.

	Overall satisfaction	Job satisfaction	Marital satisfaction
Overall satisfaction	1		
Job satisfaction	0.268	1	
Marital satisfaction	0.455	0.071	1

Even though, the aim of our empirical test is to show how higher education, both of the individual and the partner, is going to affect job and marital satisfaction. Since these two outcomes in our context are interrelated, we deem to explain their variability using a dynamic bivariate model, where job and marital satisfaction are transformed from ordinal scale into two dummies.[12] For a robust explanation of the two satisfaction outcomes we control for a range of exogenous variables, candidates to explain both job and marital satisfaction. We use gender, age, age squared, monthly income, job hours, professions type,[13] whether or not an individual is responsible of kids and whether or not the individual is employed (self-employed). We add 5 regional dummies,[14] and control for the waves of the panel using 12 years dummies. Table 5 shows the descriptive statistics of the full sample, men and women. The mean for job satisfaction is 5.358 for men and 5.500 for women, whereas in terms of marital satisfaction we do not see a significant differences between male and female (the average is around 6.2). In terms of higher education we see that males are 6% more that females. The average age is around 41 years for men and 39 for women. Most couples are from Southern England and the fewest are from Wales. Manual jobs are the most

[12]we cut the two scales at their medium point (4), and produce two dummy variables indicating whether the respondent is satisfied or not with the job or the partner

[13]We use five main job qualifications, derived by the Standard Occupational Classification (SOC): professional, manager, administrative, technician and manual. For every qualification, we create a dummy variable.

[14]As regions we consider 5 macro areas: Northern England, Middle England, Southern England, Scotland and Wales For each of them we create a dummy variable. We exclude from the analysis individuals from Northern Ireland, for the strong segregation in marriages between Catholics and between Protestants in this area (Jerkins, 1997), which may cause distortions in the analysis of assortative matching.

common for both genders, followed for men by management and for women by administrative jobs. We see that there is a high gender gap in terms of monthly wages, with men earning 900 pounds on average more than females.

5 The Empirical Model

5.1 A Bivariate Dynamic Model for Job and Marital Satisfaction

To address the issue of interrelated dynamics of job and marital satisfaction, we use a bivariate dynamic probit model with random effects. For the individual i declaring to be satisfied with both partner and job, the following equations are used to specify them at each time t:

$$Y^*_{s,i,t} = \beta_s x'_{i,t} + \lambda_{s,s} y_{s,it-1} + \lambda_{s,r} y_{r,i,t-1} + \alpha_{s,i} + u_{s,i,t} \tag{2}$$

$$Y^*_{r,i,t} = \beta_r x'_{it} + \lambda_{r,s1} y_{s,i,t-1} + \lambda_{r,r} y_{r,i,t-1} + \alpha_{r,i} + u_{r,i,t} \tag{3}$$

$$Y_{j,i,t} = \left\{ \begin{array}{l} 1 \text{ if } \ y^*_{s,i,t} > 0 \\ 0 \text{ if } \ else \end{array} \right\} \qquad \text{for } j = s, r;\ t = 1, 2, ...T \tag{4}$$

The dependent variables are the two dummy indicators: $Y_{s,i,t}$ is equal to one if the individual i declares to be satisfied with his job at time t, zero otherwise, and $Y_{r,i,t}$ is equal to one if i if the respondent is satisfied with his partner t, zero otherwise. In the model represented by Equations (2)–(4), $x_{i,t}$ is a vector of control variables, assumed to be strictly exogenous, and β_s and β_r are the two vectors of parameters of interest to be estimated.[15] discusses also the special case when $\lambda_{s,r} = 0$ and $\lambda_{r,s} = 0$ and the two Equations (2) and (3) become two separate univariate dynamic probit models whose only link is the error correlation. The error terms $u_{s,i,t}$ and $u_{r,i,t}$ are assumed to be independent over time and to follow a bivariate normal distribution, with

[15] Alessie et. al. 2004

Table 5. Descriptive analysis.

Variable	Full sample				Men				Women			
	Mean	Std Dev	Min	Max	Mean	Std Dev	Min	Max	Mean	Std Dev	Min	Max
Dependent Variables												
Job satisfaction (Not at all=1; Complete=7)	5.429	1.274	1	7	5.358	1.2825	1	7	5.500	1.262	1	7
Marital satisfaction (Not at all=1; Complete=7)	6.294	1.049	1	7	6.347	0.989	1	7	6.242	1.104	1	7
Socio-Demographic Controllers												
Higher education (No=0; Yes=1)	0.536	0.498	0	1	0.569	0.495	0	1	0.503	0.500	0	1
Age	40.503	10.114	21	65	41.473	10.121	21	65	39.533	10.013	21	65
Unemployed (No=0; Yes=1)	0.012	0.109	0	1	0.013	0.117	0	1	0.010	0.100	0	1
Kids (No=0; Yes=1)	0.230	0.421	0	1	0.001	0.038	0	1	0.459	0.498	0	1
Weekly Job Hours	34.4	10.49	1	99	39.7	7.41	3	99	29.3	10.45	1	99
Monthly Wage	1642	1222	21	71058	2091	1366	27.3	71058.9	1171	847	21.6	20558
Job Occupations												
Manager	0.171	0.376	0	1	0.223	0.416	0	1	0.119	0.324	0	1
Professional	0.107	0.310	0	1	0.109	0.312	0	1	0.105	0.307	0	1
Technician	0.130	0.336	0	1	0.114	0.318	0	1	0.146	0.353	0	1
Administrative	0.175	0.380	0	1	0.080	0.272	0	1	0.270	0.444	0	1
Manual	0.414	0.492	0	1	0.471	0.499	0	1	0.357	0.479	0	1
Regions												
Wales	0.140	0.347	0	1	-	-	-	-	-	-	-	-
Scotland	0.187	0.390	0	1	-	-	-	-	-	-	-	-
Southern England	0.288	0.453	0	1	-	-	-	-	-	-	-	-
Middle England	0.142	0.349	0	1	-	-	-	-	-	-	-	-
Northern England	0.230	0.421	0	1	-	-	-	-	-	-	-	-
Observations	**30152**				**15076**				**15076**			

zero means, unit variances and cross-equation covariance ρ_u. The model also includes individual random effects, $\alpha_{s,i}$ and $\alpha_{r,i}$, following a bivariate normal with variances $\sigma_{\alpha,s}$ and $\sigma_{\alpha,r}$ and covariance ρ_α. we assume that $(\alpha_{s,i},\ \alpha_{r,i},)$, $(u_{s,i,t},\ u_{r,i,t})$ and x_{it} are orthogonal.[16] The main advantages of multivariate dynamic random-effects models is their ability to distinguish between unobserved heterogeneity (random effects) and state dependence (the lagged dependent variable). It allows contemporaneous job satisfaction to be partly explained by the marital satisfaction at $t-1$ (the lagged state dependent variable) but also enables to control for the contemporaneous *spillover effects* between the two states because $\rho_\alpha \neq 0$. The parameters in the vectors β's represent the marginal effects of the various independent variables. The coefficients of our interest are those related to higher education of both individual and the partner. We aim to show that higher education negatively impacts job satisfaction, instead having a higher educated partner will positively affect marital satisfaction.

5.2 Results

Table 6 shows the results of our model estimated by (2-3) regarding the full sample, along with the two subsamples (men and women).[17] The first part of Table 6 presents the results for job satisfaction. As clearly pointed out, job satisfaction is significantly higher for males, decreases with age and is significantly interrelated with past job satisfaction and marital satisfaction, for all the three samples. This result is in line with the previous evidence with British data (Clark, 1996). The coefficient of our interest, higher education, is negative in all the three samples. Even though the coefficient is not signifi-

[16]The last assumption implies that x_{it} are strictly exogenous. The uncorrelation of individual effects with the other variables is a strong assumption, but we rely on Alessie-et-2004 who compares the results of a similar model with a Linear Probability Model for both variables.

[17]The marginal effects for all the possible combinations for the full sample are presented in Appendix 7.2.

cant, the direction of the the effect (negative) is consistent with the prediction of our theoretical model. Having children shows positive but not significant effects on job satisfaction, as well as job hours and monthly individual wage. Job hours is significant for women and positively related, whereas the monthly wage is decreasing job satisfaction for males. The self-employment coefficient is highly significant and positive only for males. Meanwhile none of the job occupation is significant (reference category is manual), except for administrative where the relationship is negative.

The results on marital satisfaction are reported in the second part of Table 6. On average, men are less satisfied with their partner (even though not significant) and age again is decreasing marital satisfaction. Any job type is negatively related to marital satisfaction compared to manual jobs, apart from administrative jobs. Being employed and having kids is negatively related to marital satisfaction and these effects are significant only for the males sample. Also, self-employed males seem to be more satisfied with their partner. Job hours and monthly wage are negatively related, and the effects in these case are significant for women. Educated individual are relatively less satisfied by their marriage compared to uneducated ones. Finally, there is a positive and significant relationship between marital satisfaction and the partners' levels of education. This effect on average is significant for the full sample, but when considering the two subsamples, males seems to increase their marital satisfaction when having an educated partner. These results are consistent with our theoretical findings, and they are in line with the previous evidence in the literature on marital satisfaction (some examples are Stanley *et al.*, 2006, Hahlweg and Markman, 1988, Halford *et al.*, 2003, Sayers *et al.*, 1998, Silliman *et al.*, 2001).

6 Concluding remarks

In this paper we examined the impact of higher education in marital and job satisfaction. Our theoretical model showed that the presence of assortative matching increases the proportion of both educated men and women. This has two main effects; marginal and average job satisfaction fall and marital satisfaction increase. The empirical test with the British Household Panel Survey for years 1996-2008 is consistent with the outlined theory: job satisfaction diminishes with the higher the educational qualification, while marital satisfaction increases when the partner has higher education.

Table 6. Bivariate Model for Job and Marital Satisfaction

	Full Sample		Men		Women	
	Coeff	S.E	Coeff	S.E	Coeff	S.E
Job Satisfaction						
Male	0.16***	(0.04)				
Age	-0.02*	(0.01)	-0.01	(0.02)	-0.03*	(0.02)
Agesq	0.01**	(0.00)	0.01	(0.00)	0.01**	(0.00)
Job Sat (t-1)	1.26***	(0.03)	1.29***	(0.04)	1.21***	(0.05)
Marital Sat (t-1)	0.20***	(0.03)	0.18***	(0.04)	0.23***	(0.04)
Higher Education	-0.02	(0.03)	-0.01	(0.04)	-0.02	(0.04)
Partner with Higher Education	-0.03	(0.03)	-0.02	(0.04)	-0.04	(0.04)
Have children	0.04	(0.04)	0.01	(0.05)	-0.19	(0.18)
Monthly Wage	-0.01	(0.00)	-0.01**	(0.00)	0.01	(0.00)
Job hours	0.01	(0.00)	0.01	(0.00)	0.01*	(0.00)
Self-Employed	0.54***	(0.11)	0.57***	(0.12)	0.22	(0.26)
Emlployed	0.04	(0.08)	0.08	(0.10)	-0.16	(0.15)
Manager	-0.03	(0.04)	-0.05	(0.07)	0.01	(0.05)
Professional	-0.02	(0.05)	0.04	(0.07)	0.01	(0.07)
Technician	-0.01	(0.04)	0.03	(0.06)	0.01	(0.06)
Administrative	-0.19***	(0.04)	-0.18***	(0.05)	-0.19**	(0.08)
Constant	-1.43***	(0.28)	-1.39***	(0.37)	-1.20***	(0.42)
Marital Satisfaction						
Male	-0.03	(0.03)				
Age	-0.04***	(0.01)	-0.03**	(0.01)	-0.04***	(0.01)
Agesq	0.01***	(0.00)	0.01**	(0.00)	0.01***	(0.00)
Job Sat (t-1)	0.19***	(0.03)	0.22***	(0.04)	0.16***	(0.05)
Marital Sat (t-1)	1.57***	(0.03)	1.55***	(0.04)	1.58***	(0.04)
Higher	-0.02	(0.03)	-0.07*	(0.04)	0.01	(0.04)
Partner with Higher Education	0.04*	(0.02)	0.07**	(0.03)	0.02	(0.03)
Have children	-0.12***	(0.03)	-0.17***	(0.04)	-0.57	(0.47)
Monthly Wage	-0.01**	(0.00)	0.01	(0.00)	-0.01***	(0.00)
Job hours	0.01	(0.00)	-0.01	(0.00)	0.01	(0.00)
Self-Employed	-0.15	(0.09)	-0.23**	(0.10)	0.28	(0.24)
Employed	-0.06	(0.07)	-0.11	(0.08)	0.15	(0.16)
Manager	0.01	(0.03)	-0.05	(0.05)	0.04	(0.04)
Professional	-0.02	(0.04)	-0.05	(0.06)	0.01	(0.06)
Technician	-0.05	(0.04)	-0.08	(0.05)	-0.02	(0.05)
Administrative	0.06*	(0.03)	0.05	(0.04)	0.05	(0.06)
Constant	0.37	(0.23)	0.11	(0.32)	0.30	(0.37)
Wave Dummies	Yes		Yes		Yes	
Regional Dummies	Yes		Yes		Yes	
Constant	0.10***	(0.02)	0.09***	(0.02)	0.11***	(0.03)
N	19448		9699		9749	

Source: BHPS 1996-2008

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Appendix

6.1 Proof of Proposition 1

Given the matching mechanism, the expected payoffs for men are:

$$E\Pi\left(ed.man\right)=\left(\left(1-\beta\right)\theta_{w}^{*}+\beta\frac{\theta_{w}^{*}}{\theta_{m}^{*}}\right)\left(y_{m}+b\right)+$$

$$\left(1-\left(\left(1-\beta\right)\theta_{w}^{*}+\beta\frac{\theta_{w}^{*}}{\theta_{m}^{*}}\right)\right)y_{m}-c\theta_{m},$$

and

$$E\Pi\left(non-ed.man\right)=\left(1-\beta\right)\theta_{w}^{*}b,$$

respectively, where the first part of both equations represents the expected payoff of marrying an educated woman and the second part of the first equation is the expected payoff of marrying a non-educated woman. The expected payoffs for women are:

$$E\Pi\left(ed.woman\right)=\left(\left(1-\beta\right)\theta_{m}^{*}+\beta\right)\left(y_{w}+b\right)+$$

$$\left(1-\left(\left(1-\beta\right)\theta_{m}^{*}+\beta\right)\right)y_{w}-c\theta_{w},$$

and

$$E\Pi\left(non-ed.woman\right)=\left(\left(1-\beta\right)\theta_{m}^{*}+\beta\left(\frac{\theta_{m}^{*}-\theta_{w}^{*}}{1-\theta_{w}^{*}}\right)\right)b,$$

respectively, where the first part of both equations represents the expected payoff of marrying an educated man and the second part of the first equation is the expected payoff of marrying a non-educated man. Men and women will prefer to study until the expected payoff of attending university is higher than expected payoff of going to work at once:

$$E\Pi\left(ed.man\right) \geq E\Pi\left(non-ed.man\right),$$

and

$$E\Pi\left(ed.woman\right) \geq E\Pi\left(non-ed.woman\right).$$

Hence, a man attends university if and only if:

$$\left[(1-\beta)\theta_w^* + \beta\frac{\theta_w^*}{\theta_m^*}\right](y_m + b) +$$

$$\left[1-\left((1-\beta)\theta_w^* + \beta\frac{\theta_w^*}{\theta_m^*}\right)\right] y_m - c\theta_m$$

$$\geq (1-\beta)\theta_w^* b,$$

while a woman attends university if and only if:

$$\left((1-\beta)\theta_m^* + \beta\right)(y_w + b) +$$

$$\left(1-\left((1-\beta)\theta_m^* + \beta\right)\right) y_w - c\theta_w$$

$$\geq \left[(1-\beta)\theta_m^* + \beta\left(\frac{\theta_m^* - \theta_w^*}{1-\theta_w^*}\right)\right] b.$$

Substituting and rearranging, we get the proposition.

Following that $\sigma_m > \sigma_w$, the equilibrium in Proposition 1 exists for $\theta_m^* > \theta_w^*$. This is shown by the following corollary.

Corollary 1 *Given $y_m > y_w$, then $\theta_m^* > \theta_w^*$.*

Proof. The requirement $\theta_m^* > 0$ implies, by Proposition 1, $\left(1-\theta_w^*\right)\left(y_w - c\theta_w^*\right)+$

$b\beta \geq 0$, where the sufficient condition of positivity is $y_w \geq c\theta_w^*$. On the other hand $\theta_w^* > 0$ entails $\theta_m^* (c\theta_m^* - y_m) > 0$. This holds only if $y_m < c\theta_m^*$. Since $y_m > y_w$ by assumption, then $c\theta_m^* > y_m > y_w > c\theta_w^*$, which implies $\theta_m^* > \theta_w^*$.
■

6.2 Marginal Effects for the Bivariate Dynamic Model-Full Sample

Table 7. Marginal Effects for Full Sample

	(1) p11		(2) p10		(3) p01		(4) p00		(5) Job Sat		(6) Marital Sat	
Job Satisfacton												
Male (d)	0.016***	(0.004)	0.012***	(0.002)	-0.028***	(0.011)	0.0002	(0.010)	0.028***	(0.006)	-0.012	(0.012)
Age	-0.003***	(0.001)	0.001	(0.0008)	-0.013***	(0.003)	0.016***	(0.003)	-0.004*	(0.002)	-0.016***	(0.003)
Agesq	0.001***	(0.001)	-0.001	(0.001)	0.001***	(0.001)	-0.001***	(0.001)	0.001**	(0.001)	0.001***	(0.001)
Job Sat (t-1) (d)	0.240***	(0.009)	0.115***	(0.006)	-0.166***	(0.010)	-0.189***	(0.008)	0.355***	(0.012)	0.074***	(0.011)
Marital Sat (t-1)(d)	0.078***	(0.003)	-0.042***	(0.002)	0.488***	(0.007)	-0.524***	(0.008)	0.036***	(0.0049)	0.566***	(0.008)
Higher Education (d)	-0.003	(0.003)	-0.001	(0.002)	-0.003	(0.009)	0.008	(0.009)	-0.004	(0.005)	-0.007	(0.009)
Partner with Higher Edu.(d)	-0.002	(0.003)	-0.003*	(0.002)	0.017*	(0.009)	-0.0114	(0.008)	-0.006	(0.005)	0.0153	(0.009)
Have Children (d)	-0.001	(0.002.)	0.007**	(0.003)	-0.047***	(0.012)	0.041***	(0.011)	0.006	(0.007)	-0.048***	(0.013)
Monthly Wage	-0.001	(0.0001)	0.001	(0.0001)	-0.001*	(0.001)	0.001**	(0.001)	-0.001	(0.001)	-0.001**	(0.001)
Job Hours	0.001	(0.0001)	-0.001	(0.0001)	0.001	(0.0005)	-0.001	(0.0004)	0.001	(0.0003)	0.001	(0.0001)
Self-employed (d)	0.067***	(0.019)	0.064***	(0.016)	-0.125***	(0.032)	-0.007	(0.032)	0.132***	(0.032)	-0.057	(0.036)
Employed (d)	0.002	(0.009)	0.005	(0.005)	-0.025	(0.025)	0.018	(0.025)	0.007	(0.014)	-0.023	(0.026)
Manager (d)	-0.003	(0.004)	-0.002	(0.003)	0.006	(0.012)	-0.001	(0.012)	-0.006	(0.007)	0.003	(0.012)
Professional (d)	-0.002	(0.005)	-0.001	(0.003)	-0.004	(0.015)	0.006	(0.015)	-0.002	(0.009)	-0.006	(0.016)
Technician (d)	-0.002	(0.005)	0.001	(0.003)	-0.015	(0.014)	0.016	(0.013)	-0.0001	(0.008)	-0.018	(0.014)
Administrative (d)	-0.018***	(0.004)	-0.014***	(0.002)	0.041***	(0.012)	-0.008	(0.011)	-0.032***	(0.006)	0.022*	(0.012)
Marital Satisfaction												
Male (d)	0.016***	(0.004)	0.012***	(0.002)	-0.028***	(0.011)	0.002	(0.010)	0.028***	(0.006)	-0.012	(0.011)
Age	-0.003***	(0.001)	0.0003	(0.0008)	-0.012***	(0.003)	0.016***	(0.003)	-0.003*	(0.002)	-0.016***	(0.003)
Agesq	0.001***	(0.0001)	-0.001	(0.0001)	0.001***	(0.0004)	-0.0002***	(0.0001)	0.0001**	(0.0002)	0.0002***	(0.0001)
Job Sat (t-1) (d)	0.240***	(0.009)	0.115***	(0.006)	-0.166***	(0.010)	-0.189***	(0.008)	0.355***	(0.011)	0.074***	(0.011)
Marital Sat (t-1)	0.078***	(0.003)	-0.042***	(0.002)	0.488***	(0.007)	-0.524***	(0.008)	0.0365***	(0.004)	0.566***	(0.008)
Higher Education (d)	-0.003	(0.003)	-0.001	(0.002)	-0.003	(0.009)	0.008	(0.009)	-0.004	(0.005)	-0.007	(0.009)
Partner with Higher Edu. (d)	-0.002	(0.003)	-0.003*	(0.002)	0.017*	(0.009)	-0.011	(0.008)	-0.006	(0.005)	0.015	(0.009)
Have children (d)	-0.001	(0.001)	0.007**	(0.003)	-0.047***	(0.012)	0.040***	(0.011)	0.006	(0.007)	-0.048***	(0.012)
Monthly Wage	-0.001	(0.001)	0.001	(0.001)	-0.001*	(0.001)	0.001**	(0.001)	-0.001	(0.001)	-0.001**	(0.001)
Job Hours	0.001	(0.001)	-0.001	(0.001)	0.001	(0.001)	-0.003	(0.001)	0.001	(0.001)	0.001	(0.001)
Self-employed (d)	0.067***	(0.019)	0.064***	(0.016)	-0.125***	(0.032)	-0.007	(0.032)	0.132***	(0.032)	-0.057	(0.036)
Employed (d)	0.002	(0.009)	0.004	(0.005)	-0.025	(0.024)	0.018	(0.025)	0.007	(0.014)	-0.023	(0.026)
Manager (d)	-0.003	(0.004)	-0.002	(0.003)	0.006	(0.012)	-0.005	(0.012)	-0.006	(0.007)	0.003	(0.012)
Professional (d)	-0.002	(0.005)	-0.001	(0.003)	-0.004	(0.015)	0.006	(0.015)	-0.002	(0.009)	-0.006	(0.016)
Technician (d)	-0.002	(0.005)	0.001	(0.003)	-0.015	(0.014)	0.016	(0.013)	-0.001	(0.008)	-0.018	(0.014)
Administrative (d)	-0.018***	(0.004)	-0.014***	(0.002)	0.040***	(0.012)	-0.008	(0.011)	-0.032***	(0.006)	0.022*	(0.012)
N	19448		19448		19448		19448		19448		19448	

Marginal effects; Standard errors in parentheses

(d) for discrete change of dummy variable from 0 to 1

$*p < 0.10$, $**p < 0.05$, $***p < 0.010$