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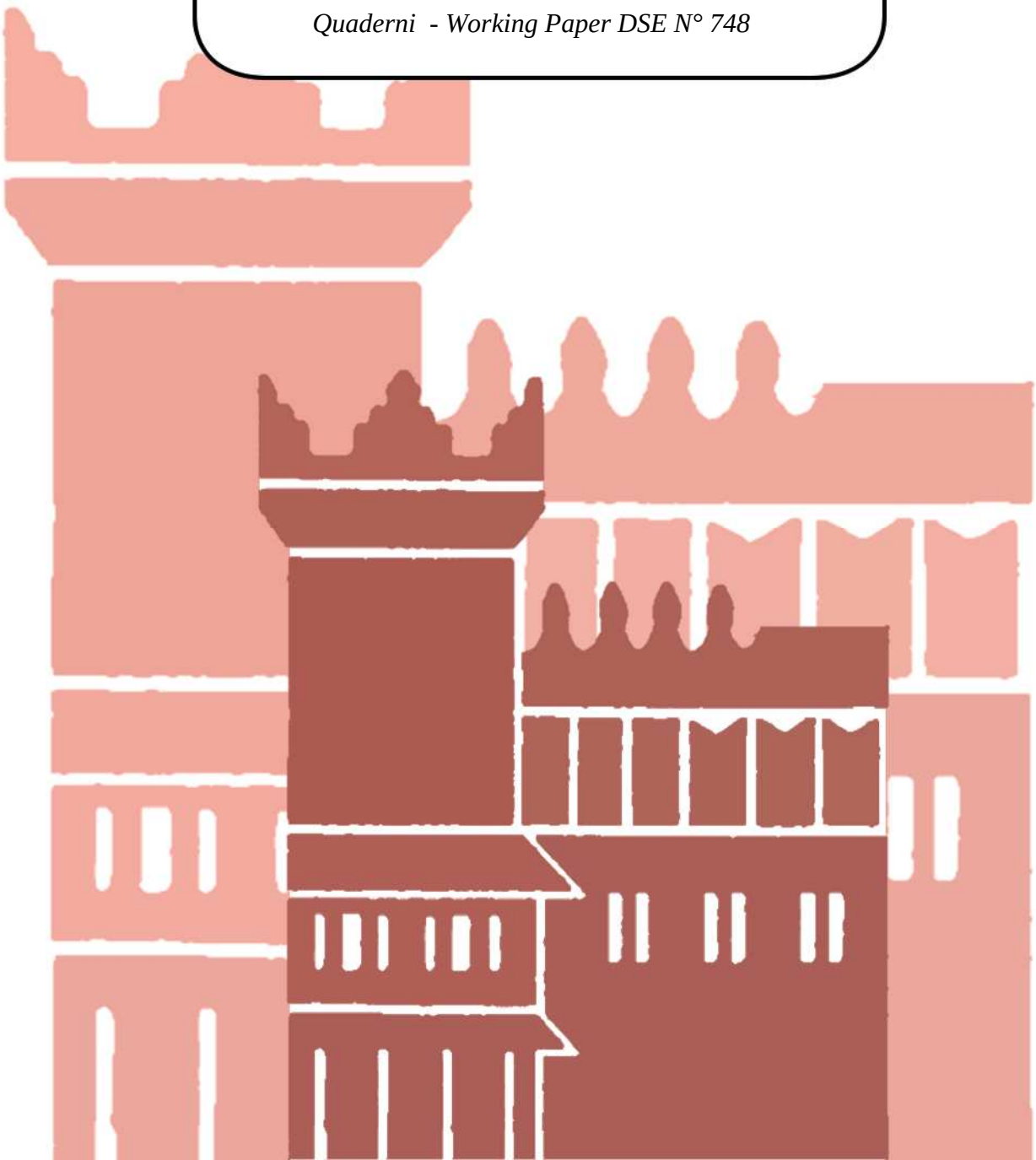

Sex and the Uni: How Assortative Matching Affects Graduate Earnings*

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Abstract

This paper examines how assortative matching affects graduate earnings through the choice of attending university. We build up a model where individuals decide whether to attend university for increasing both their future income and the probability to marry an educated partner. The theoretical results suggest that, as assortative matching increases, the number of graduates increases and their earnings fall. The test using the British Household Panel Survey for years 1991-2006 supports the theoretical findings.

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1 Introduction

There is substantial evidence of a persistent drop in graduate earnings, which may be due to the large increase in the supply of university graduates along the last decades[1]. Nonetheless the trend in higher education enrollment is still increasing[2]. Here we propose a possible explanation for these facts.

This paper examines how the presence of assortative matching influences graduate earnings through the decision of whether attending or not university. We build up a theoretical model to highlight the relationship between higher education, assortative matching and graduate earnings and then we test the model empirically. Our idea is that acquiring higher education increases the chance of marrying[3] an educated partner, as the educational levels of partners are strongly interrelated.

Why do partners tend to have similar educational levels? This may be explained by lifestyle choices: similar-educated partners are more likely to share professional duties, spare time activities and view of life. Also, the "fertility intentions" are similar between partners with similarities in education: educated individuals prefer to delay conception relative to the general population (Cochrane, 1979). In contrast, large differences in the partners' educational level have negative effects on experienced life satisfaction (Frey and Slutzer, 2006). We refer to the similarity in partner's educational levels as "assortative matching"[4]. Past research has shown strong evidence of increases in the educational resemblance of spouses since at least the 1940s in

[1] See Goldin and Margo (1992) Goldin and Katz (1999) and Pritchett (2001).

[2] See Dennis (2005).

[3] Throughout the paper, we will use the verb "to marry" not necessarily considering the marriage institution, but referring to a general long-term relationship between partners. Marriage indeed has undergone a process of deinstitutionalization and a weakening of the social norms that define partners' behavior-over the past few decades (Cherlin, 2004, Schoen and Canudas-Romo, 2005).

[4] The expression "assortative matching" has been coined by Gary Becker (1973), and it alludes to a relationship (either positive or negative) between characteristics of partners. Here we refer to the similarity in level of education between partners.

United States (Kalmijn 1991a, 1991b; Mare 1991; Pencavel 1998; Qian and Preston 1993; Smits *et al.* 2000, Schwartz and Mare, 2005).

We consider two populations, one of men and one of women. In each population, the members differ in ability and decide whether to attend university or not. To attend university costs effort but it gives a higher income in the case that the number of graduates in the job market is not too high, otherwise the employers may offer lower wages given the high labour supply. Afterwards men and women are matched in marriage. We assume that individuals prefer to marry a partner who attended university, as they generally have a better income to share, a higher social status, a more interesting conversation and so on. The matching can be random or assortative. Random matching takes place when partners meet each other by chance. Thus the partners' levels of education are unrelated to one another. Assortative matching occurs if an individual meets the partner at the university, or in any situation where the educational level influences the chance of a meeting. In this case the partners' education is positively related. Whether matching is assortative depends on the institutions and tradition of a society: for example, the more the educational system requires that students spend time together, the more likely the matching will be assortative.

The theoretical results show that, as the probability of assortative matching increases, university attendance increases and the graduates' earnings decrease. The intuition behind these results is the following: an increase in assortative matching means that the probability of marrying a partner with the same level of education is higher. Since graduates are preferred as partners, individuals might decide to attend university in part to increase the chance of marrying one of them. This in turn increases the number of graduates in the job market and lowers their salary.

Our idea is not necessarily that individuals attend university to have more chance of marrying an educated partner deliberately. Still, they know that university attendance increases this chance. In other words, even though they

generally do not choose university according to their expectation of future marriage, they are, more or less consciously, aware that higher education decisions affect their social network, their friends type and eventually the pool of partner's candidates.

To test the theoretical model, we analyse a sample of couples taken by the British Household Panel Survey (BHPS) for years 1991-2006. We test for a relationship between the graduates' income and assortative matching. The empirical findings support the theoretical results.

There are some contributions that relate educational and marital decisions and earnings. In Fernandez *et al.* (2005) the compromise between love and money may be a cause of intergenerational inequality. In their model agents decide to become skilled or unskilled and form households. When a skilled individual meets an unskilled individual with high match quality, there will be a tradeoff between forming a household with relatively lower consumption but high match quality and continuing the search for a match. They show that it is possible to have steady states with a high degree of sorting (skilled agents form households predominantly with others who are skilled; unskilled form households predominantly with unskilled), high inequality and low per capita income.

Chiappori *et al.* (2009) study jointly educational and marital decisions. Education affects the distribution of surplus between spouses directly through their income, and indirectly by increasing the chance of marrying an educated partner and modifying the roles within the marriage. When there is no difference between male and female wages and family roles, then a positive assortative matching emerges. On the other hand with asymmetry in the wage premium and different roles in the family, then education is acquired asymmetrically and an equilibrium emerges where educated individuals marry uneducated individuals. In this model assortative matching endogenously emerge, while we assume it as exogenously given by the cultural characteristics of the society considered.

Konrad and Lommerud (2010) study a model with search frictions in the marriage market where individuals care of both the partner's income and the emotional match with him/her. An individual with high income may not choose a partner with emotional match but lower income. Redistributive income taxation or matching institutions based not on partners' income but on partners' emotional preferences may ease this problem.

The paper is organised as follows. The theoretical model is developed in Section 2; the analysis of equilibrium is illustrated in Section 3; Section 4 describes the empirical analysis and concluding remarks are in the last section.

2 A simple model

We study an economy with two populations, equally large, one of men and one of women. The members of each population differ in ability, labeled $\theta_i \in [0,1], i \in \{m,w\}$, m $(men), w$ $(women)$, respectively, and distributed with same density $f(\theta_i)$ and c.d.f. $F(\theta_i)$. In our model, ability is higher the *lower* θ_i.

We consider a single generation where men and women decide whether to attend university or to work immediately. We refer to individuals who attended university as "educated" individuals. The proportions of educated men and women are denoted as $\sigma_m, \sigma_w \in [0,1]$, respectively.

We assume that at work a non-educated individual obtains a wage normalised to zero while an educated individuals will receive a "wage premium" $y_i - \gamma(\sigma_m + \sigma_w) \in \Re$, $y_i > 0$, $\gamma > 0$, represented by a positive salary bonus y_i which decreases as the number of graduates increases. In other words the more the graduates, the lower the benefit of obtaining a degree, since the employers can offer lower wages[5]. For simplicity throughout the paper we set $\gamma = 1$.

[5]For simplicity we will not model the labour demand of employers.

We assume that the men's salary bonus 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[6].

Educated individuals have a utility cost of education $C = c\theta_i$, $c > 0$ representing the fact that more able individuals make less effort in attending university.

After the decision of education, every individual marries one of the opposite sex. We assume that to marry an educated partner gives a benefit $b > 0$, because of a better income to share, a more interesting conversation, or more open-mindedness[7]. Thus the payoff matrix is the following:

		Women: edu	Women: unedu
Men	edu	$y_m+b-c\theta_m-(\sigma_m+\sigma_w)$, $y_w+b-c\theta_w-(\sigma_m+\sigma_w)$	$y_m+b-c\theta_m-(\sigma_m+\sigma_w)$, b
	unedu	b, $y_w-c\theta_w-(\sigma_m+\sigma_w)$	$0,0$

2.1 Matching

The expected payoff of individuals depends on the marriage matching. This can be *random* or *assortative*.

Random matching occurs when partners meet each other by chance. Within this framework, random matching happens anytime a meeting takes place in situations that are unrelated to the acquired education. For example,

[6]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.

[7]A large empirical evidence support this assumption (Stanley *et al.,* 2006, Hahlweg and Markman, 1988, Halford *et al.*, 2003, Sayers *et al.*, 1998 Silliman *et al.*, 2001).

a match between an engineer and a labourer sharing the passion for football and playing in the same team is totally casual. Two individuals meeting at the grocery store can have completely different educational backgrounds. Hence the probability for a man to marry an educated woman is σ_w (i.e., the probability that a woman is educated) and the probability for a woman to marry an educated man is σ_m (i.e., the probability that a man is educated), regardless of the individuals' level of education.

Assortative matching occurs when an individual meets the partner at university or in any situation where the educational level influences the chance of a meeting. For example when individuals attend the same social environment given by previous school friendships, or when a certain activity is related to the studies attended, like individuals with a degree in arts meeting in a museum or in an exhibition, and so on. In all these cases, the partners' education is positively related. For the sake of simplicity, we assume perfect correlation, that is, partners have the same education with probability one.

We denote the probability of assortative matching as $\beta \in [0, 1]$. This is exogenously determined by the educational system of a certain society. For example, the more the students are required to spend time together at university, the higher the probability of assortative matching[8]. Another example is the role of school tracking, that is the separation of pupils by academic ability into groups for all subjects within a school (Gamoran, 1992). An educational system that postpones school tracking keeps a more heterogeneous group of pupils together for a long time, by decreasing the probability of assortative matching[9].

[8]Blossfeld and Timm (2003) analyse the relationship between educational system and marital assortative matching in many western countries. Their results show that the more time individuals spend at school, the greater the chance of marrying a partner with similar education (i.e., the higher β).

[9]Holmlund (2007) studies the effects of a school reform on marital assortative matching. She examines an educational reform, implemented in Sweden in the 1950s and 60s, which postponed tracking and extended compulsory education from seven to nine years. Her results show that this might have resulted in a reduction in assortative matching.

In order to determine the matching mechanism we need to make some hypothesis on the proportion of educated individuals. The different role in society and family of men and women makes us think that to assume differences in educational decisions according to sex is consistent to the real world. In particular we study the case where there is a larger number of educated men than educated women[10], i.e., $\sigma_m > \sigma_w$. To assume more educated men than women[11] is consistent with the previous assumption $y_m > y_w$, which makes think that, *ceteris paribus*, more men will attend university than women.

Table 1. 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	$1 - \left[(1-\beta)\sigma_m + \beta\left(\frac{\sigma_m - \sigma_w}{1-\sigma_w}\right)\right]$

[10]Note that the choice of focusing on this case does not imply that there is no symmetric equilibrium or an asymmetric equilibrium where the number of educated women is higher than the number of educated men. Obviously the matching mechanism changes according to which equilibrium we want to examine.

[11]In reality, 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.

Table 1 shows the matching mechanism. According to the case $\sigma_m > \sigma_w$, 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 Analysis of equilibrium

The equilibrium of the interaction in educational decisions between men and women 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^* (note that ability is higher the lower 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 $\sigma_m = F(\theta_m^*)$. Without loss of generality, we assume $F = \theta_i$, so we can rewrite the equilibrium solutions $\sigma_w = \theta_w^*$ 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. This is shown by the following lemma.

Lemma 1 *A man attends university if and only if:*

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

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

$$\geq (1-\beta)b,$$

while a woman attends university if and only if:

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

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

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

$$E\Pi\left(ed.man\right) = \left((1-\beta)\theta_w^* + \beta\frac{\theta_w^*}{\theta_m^*}\right)(y_m + b) +$$
$$\left(1 - \left((1-\beta)\theta_w^* + \beta\frac{\theta_w^*}{\theta_m^*}\right)\right) y_m - c\theta_m - (\theta_m^* + \theta_w^*),$$

and

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

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:

$$E\Pi\left(ed.woman\right) = \left((1-\beta)\theta_m^* + \beta\right)(y_w + b) +$$

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

and

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

respectively, where 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

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

which gives the lemma. ■

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:*

$$\begin{cases} \theta_m^* = \dfrac{y_w + b\beta - a_w\left(c+1\right)\left(1-a_w\right) - a_w y_w}{\gamma + b\beta - \gamma a_w} \\ \theta_w^* = \dfrac{a_m\left(ca_m + \gamma a_m - y_m\right)}{b\beta - a_m} \end{cases} \tag{1}$$

To interpret Proposition 1, we need to analyse the effects of a variation in assortative matching. To do that, we study the comparative statics through a computational example of equilibrium. However, this do not claim utmost realism, and we do not calibrate and fine-tune the model in order to achieve an optimal fit with real world data. The parameters values are chosen in such a way that the following assumptions hold: θ_m^*, $\theta_w^* \in [0,1]$, and $y_m > y_w$. In particular, we assign the following values: salary bonus, $y_m = 1, y_w = 0.9$, marital benefit, $b = 1$, cost of education $c = 1$.

We consider the effects of an increase in assortative matching on the ability in equilibrium and on the wage premium. Table 2 illustrates the results. As assortative matching increases, both the marginal ability and the wage premium diminish.

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					
θ_m		0.374	0.426	0.482	0.539	0.594
θ_w		0.292	0.351	0.405	0.450	0.539
Wage	*men*	0.33	0.22	0.11	0.01	- 0.13
premium	*women*	0.23	0.12	0.01	- 0.09	- 0.23

These results may be explained in the following way. As assortative matching increases, the probability of marrying a partner with the same level of education increases, more individuals attend university, thus the individual who is indifferent between studying or not has lower ability. Also, as the number of graduates increase, the wage premium diminishes.

4 Empirical analysis

4.1 The data

The dataset used in our analysis is the British Household Panel Survey (BHPS). This is a nationally representative random sample survey of households in Britain, which started in 1991. The BHPS was designed as an annual survey of each adult (16+) member of a sample of more than 5,000 households, making a total of approximately 10,000 individual interviews. The same individuals are interviewed in successive waves and, if they leave from original households, all adult members of their new households will also be interviewed.

We consider a sample for years 1991-2006, including 17595 couples (35190 individuals) of men and women aged between 21 and 65 years[12] who provided

[12]We do not take into account individuals aged below 21 because, according to the British university system, they might not have had the opportunity to complete their higher education.

complete information at the interview dates, who are married or in a relationship and live in the same household[13].

4.2 Income and assortative matching

According to the theoretical results, a high probability of assortative matching diminishes the wage premium. To control this, we keep only individuals who obtained a university degree and consider their income as a dependent variable. The BHPS provides information on the educational degree obtained. We construct a binary variable taking the value of the unity if individuals have obtained any degree higher than college (A level[14] or the Scottish Qualification Certificate[15]) and zero otherwise.

We use the variable "monthly gross income"as dependent variable. We consider assortative matching as the specific explanatory variable of the analysis. This is represented by a binary variable that is "one" if partners have the same education level (i.e., whether or not both attended or not university) and "zero" otherwise.

4.3 Control variables

The control variables are sex, age, age squared, regions, professions, unemployment, kids and hours worked.

As regions we consider five macro areas: Northern England, Middle Eng-

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

[14]The "Advanced Level General Certificate of Education"is the educational qualification for students aged 16-18 and is the standard entry qualification for assessing the suitability for applicants for academic courses in English, Welsh and Northern Irish universities.

[15]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.

land, 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.

We sort individuals according to their job. 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.

The variable "unemployment" is a dummy taking the value of one if the individual is currently unemployed and zero otherwise. The variable "kids" also is a dummy whose value is one if the individual is responsible of children under 16 years. Finally the variable "hours worked" is the number of hours that an individual normally works in a week.

4.4 Descriptive analysis

Table 3 shows the descriptive statistics of the full sample, men and women. The average age around 40 years for men and 38 for women. Most individuals are from Southern England and the least part comes from Wales. Although we are considering a sample of graduates individuals, manual jobs are the most common for both genders. The unemployment rate is about 1%. Women mainly have the responsibility of children. Men work on average 39 hours and women 30 hours per week. Finally, the positive levels of education with the partner is about 59% for men and 67% for women, suggesting a quite high presence of assortative matching.

4.5 The Empirical Model and results

In this paragraph we present the empirical specification. According to our theoretical results, we expect a negative relationship between income and

Table 3. Descriptive analysis.

Variable	Full sample				Men				Women			
	Mean	Std Dev	Min	Max	Mean	Std Dev	Min	Max	Mean	Std Dev	Min	Max
Monthly gross income	1798.35	1130.55	5.34	23888.38	2181.80	1204.78	65	23888.38	1364.57	853.05	15.34	9166.66
Age	39.54	9.71	21	65	40.82	9.74	21	65	38.09	9.46	21	65
Regions												
Wales	0.125	0.33	0	1	126	0.33	0	1	0.124	0.33	0	1
Scotland	0.178	0.38	0	1	0.176	0.38	0	1	0.181	0.38	0	1
Southern England	0.303	0.45	0	1	0.303	0.45	0	1	0.303	0.45	0	1
Middle England	0.136	0.34	0	1	0.135	0.34	0	1	0.136	0.34	0	1
Northern England	0.241	0.42	0	1	0.43	0	1	0.237	0.42	0	1	-
Job Occupations												
Manager	0.195	0.39	0	1	0.256	0.43	0	1	0.125	0.33	0	1
Professional	0.199	0.39	0	1	0.185	0.38	0	1	0.214	0.41	0	1
Technician	0.194	0.39	0	1	0.150	0.35	0	1	0.243	0.42	0	1
Administrative	0.127	0.33	0	1	0.066	0.24	0	1	0.196	0.39	0	1
Manual	0.284	0.45	0	1	0.340	0.47	0	1	0.220	0.41	0	1
Unemployment (No=0; Yes=1)	0.012	0.11	0	1	0.013	0.11	0	1	0.011	0.10	0	1
Kids (No=0; Yes=1)	0.223	0.41	0	1	0.002	0.45	0	1	0.473	0.49	0	1
Hours worked	35.33	10.05	2	99	39.51	7.68	2	99	30.60	10.31	0	99
Assortative	0.631	0.48	0	1	0.594	0.49	0	1	0.673	0.46	0	1
Observations	**11771**				**6248**				**5523**			

the probability of assortative matching. Indeed more individuals obtain a degree to increase the chance of marrying an educated partner, the number of graduates increases and the wage premium diminishes. The equation of income is:

$$\begin{aligned} y_{it} = \gamma_1 sex_{it} + \gamma_2 age_{it} + \gamma_3 age2_{it} + \gamma_4 regions_{it} + \gamma_5 prof_{it} + \\ + \gamma_6 unemp_{it} + \gamma_7 kids_{it} + \gamma_8 jhours_{it} + \gamma_9 ass_{it} + \varepsilon_{it}, \end{aligned} \tag{2}$$

where $i = 1, .., n$ and $t = 1, .., 15$ denote individuals and ages considered, respectively, y_{it} represents income, sex_{it}, age_{it} and $age2_{it}$ denote gender, age and age square, $regions_{it}$ collects the control variables about regions, $professions_{it}$ is a vector of the control variables about job qualification, finally $unemp_{it}$, $kids_{it}$, $jhours_{it}$ and ass_{it} are the variables unemployment, kids, hours worked and assortative matching, respectively. We perform a Hausman test by comparing a random with a fixed effects GLS model. The results tell us that the fixed effects is the most appropriate model for our analysis.

Table 4 shows the results. The relationship between age and income is increasing but concave. In Southern England and London, income is generally higher. The managerial jobs are the only profession types that ensures a significant higher income. As expected, unemployment and children responsibility are negatively related with income, while hours worked are positively related. Finally, income decreases as assortative matching increases. This is significant both for men and women. These results are consistent with the findings of the theoretical model, according to which the wage premium might decrease as the probability of assortative matching increases.

Table 4. Monthly gross income. GLS model with fixed effects.

Variable	Full Sample		Men		Women	
Age	190.41	***	289.75	***	108.46	***
	(8.47)		(12.91)		(9.52)	
Age squared	- 1.23	***	- 2.16	***	- 0.52	***
	(0.10)		(0.15)		(0.11)	
Regions (dummy variable omitted: Southern England)						
Wales	- 271.87	***	- 369.73	**	- 190.53	**
	(94.08)		(160.31)		(88.30)	
Scotland	- 58.39		- 108.65		24.64	
	(84.77)		(139.82)		(81.85)	
Middle England	58.78		- 191.48	*	245.58	***
	(64.21)		(105.79)		(62.11)	
Northern England	- 288.11	***	- 539.21	***	- 47.97	
	(54.48)		(88.21)		(53.80)	
Professions (dummy variable omitted: Manual)						
Professional	13.87		- 45.13		46.21	
	(30.13)		(46.45)		(31.65)	
Manager	142.46	***	107.38	***	99.48	***
	(26.37)		(38.21)		(30.93)	
Technician	20.53		- 2.53		20.25	
	(28.73)		(44.34)		(30.20)	
Administrative	- 21.53		- 64.56		- 34.96	
	(30.91)		(54.72)		(29.39)	
Unemployment	- 89.41	*	- 29.78		- 148.06	***
(No=0; Yes=1)	(53.82)		(85.86)		(53.91)	
Kids	- 237.55	***	139.46		- 121.68	***
	(29.17)		(250.67)		(22.27)	
Hours worked	20.90	***	9.46	***	28.58	***
	(1.04)		(1.81)		(0.97)	
Assortative	- 123.65	***	- 152.70	***	- 95.72	***
(No=0; Yes=1)	(32.85)		(51.50)		(33.71)	
Hausman	1985.56	***	1840.11	***	1548.12	***
Observations	**11771**		**6248**		**5523**	

Notes: the dependent variable is monthly gross income. Values of standard errors are presented in parenthesis. Significance at the 1%, 5% and 10% levels is indicated by ***, ** and * respectively.

5 Concluding remarks

We examined how assortative matching affects income through higher education decisions. In our model individuals decide whether to attend university for increasing both their future income and the probability to marry an educated partner. As a consequence a raise in assortative matching increases the number of graduates by making their wage premium fall. The empirical test with the British Household Panel Survey for years 1991-2006 may support our theoretical findings.

One critique to our approach can be that we do not take divorce into account. This can be relevant only if we assume a grade of relationship between the level of education and the probability of being divorced. In the case that there is no correlation or the probability of being divorced is negatively related to the amount of education, the "divorce effect" can be normalised to zero. On the contrary, in the case that the probability of being divorced is positively related to the amount of education, our analysis holds as long as the expected benefit obtained by an educated partner (net of the negative increased expected divorce) is positive.

References

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

[2] Blossfeld, H.-P. and A. Timm, eds. 2003. Who marries whom? Educational systems as marriage markets in modern societies. *Kluwer Academic Publishers.* Dordrecht, the Netherlands.

[3] Burchell, B., Fagan, C., O'Brien C. and Smith, M. 2007. Working conditions in the European Union: the gender perspective. *Report of European public health alliance* , European Union.

[4] Cherlin, A. J. 2004. The deinstitutionalization of American marriage. *Journal of Marriage and Family* **66** (4): 848-861.

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

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

[7] Dennis, M. 2005. Ten trends in higher education. *Magna Pubblications*.

[8] Fernandez, R., Guner, N. and Knowels, J. 2005. Love and money: a theoretical and empirical analysis of household sorting and inequality. *The Quarterly Journal of Economics* **120** (1): 273-344.

[9] Frey, B and Slutzer, A. 2002. Happiness and economics. *Princeton University Press*, Princeton.

[10] Goldin, C.,Margo. 1992 The great compression: The wage structure in the United States at mid-century. *The Quarterly Journal of Economics* **107** (1): 1-34.

[11] Goldin, C.,Katz, L. 1999. The returns to skill in the United States across the twentieth century. *National Bureau of Economic Research* working paper n.7126.

[12] Goldin, C.,Katz, L. and Kuziemko, I. 2006. The homecoming of American college women: A reversal of the college gender Gap. *Journal of Economic Perspectives* **20** (4): 133-156.

[13] Holmlund, H. 2006. Intergenerational mobility and assortative mating: effects of an educational reform. Working paper n 4/2006, *Swedish Institute for Social Research*, Stockholm.

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

[15] Kalmijn, M. 1991a. Shifting boundaries: Trends in religious and educational homogamy. *American Sociological Review* **56**: 786–800.

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

[17] Konrad, K.A. and Lommerud, K.E. 2010. Love and taxes - and matching institutions. *Canadian Journal of Economics* **43** (3): 919-940.

[18] Mare, R.D. 1991. Five decades of educational assortative mating. *American Sociological Review* **56**: 15-32.

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

[20] 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.

[21] Pritchett, L. 2001. Where has all the education gone? *The World Bank Economic Review* **15**(3): 367-391.

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

[23] Schoen, R., and Canudas-Romo, V. 2005. Committee timing effects on first marriage: twentieth-century experience in England and Wales and the USA. *Population Studies* **59** (2): 135-146.

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

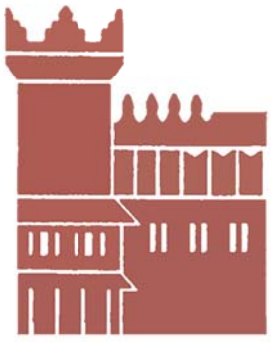
[25] Smits, J., W. Ultee, and J. Lammers. 2000. More or less educational homogamy? A test of different versions of modernization theory using cross-temporal evidence for 60 countries. *American Sociological Review* **65**: 781-88.

[26] Standard Occupational Classification. *National Statistics Pubblication*, United Kingdom.

[27] 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.

[28] Taylor, M. F., Brice, J., Buck, N., Prentice-Lane, E. 2008. British Household Panel Survey user manual. *Institute for National and Economic Research*, University of Essex.

[29] White, L. and Rogers, S. 2000. Economic circumstances and family outcomes: a review of the 1990s. *Journal of Marriage and Family* **62** (4): 1035-1051.



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