Marriage of Equals and Inequality

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1 Introduction

As in the case of individual wages and earnings, the family income disparity in the U.S. has sharply widened over the last several decades (Levy, 1998). Between 1980-2009, the share of aggregate income received by the lowest fifth families fell from 4.4 percent to 3.7 percent, whereas, for the top five percent families it increased from 16.2 to 21.3 percent (U.S. Census Bureau). In Addition, women have increased their education substantially more than men and a great deal of studies in the sociological literature have documented an increase in educational homogamy in the last three decades (Schwartz and Mare, 2005; Mare, 2008). Two main factors known to cause changes in educational homogamy rate are: (a) changes in the preferences of marriage candidates for certain characteristics in a spouse, and (b) changes in the opportunity structures to meet potential partners resulting from educational distributions of the two sex groups. Most sociological studies, using log linear models, suggest that preference for homogamy have changed across cohorts in the US to produce an increase in homogamy, even after accounting for the changes in the marginal distribution of males and females in each education group. However, as it will be shown in this paper, conclusions drawn about trends of homogamy depend on the educational grouping scheme. In addition, the contribution of this study is to provide estimates for the preference structure using a structural framework and test the hypothesis of increasing preference for educational homogamy.

In this context, there is a growing concern as to the contribution of assortative matching to inequality and its intergenerational reproduction. Indeed, rising rates of marital homogamy are one of the leading explanations for the rise in income inequality across households (Esping-Andersen, 2007; Kenworthy, 2004) and for the degree of intergenerational economic persistence (Chadwick and Solon, 2002). Fernandez et al. (2005), using an OLG model, suggest a feedback mechanism between income inequality across education groups and assortative marriage in which "..[an] increase in inequality increases sorting by making skilled workers less willing to form households with unskilled workers", that is, increase in inequality increases the odds for homogamy. This in turn further increases inequality in the next generation to the extent

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that children inherit the educational characteristics of their parents. While there are numerous studies on the trends of educational homogamy, little is known on the extent of their contribution to the rise in economic inequality. This study looks at to what extent these two trends are related, in particular, looking at the role of mate selection in influencing overall income inequality.

The structure of the paper is as follows. Section II (not included for the moment) reviews the literature. In Section III (not included), I analyse the trends of homogamy for the last four decades and find no general trend of increased homogamy when distinguishing between Bachelor and Postgraduate degrees. To the extent that there is variation in spouse selection across cohorts, I examine its impact on the growth in earnings inequality between dual earners households in the United States. I analyse two birth cohorts, 1948-52, and 1968-72 using data from the March CPS. The results contradict that the change in marriage pattern is the main determinant of rising inequality in family earnings (as argued by Esping-Andersen (2007); Hyslop (2001); Kenworthy (2004)). In Section IV (attached below), using a structural approach, I rely on the estimation of a behavioral model to provide estimates of the preferences driving the observed pattern in mate selection for the old cohort. These estimates, kept constant, are used to generate a marriage pattern for the younger cohort. Results of the following exercise do not support radical changes in preferences for the different education classes.

2 Theoretical Framework and Estimation

The analysis requires a structural model to quantify the effects of increased female education and earning differentials vs. increase in preferences towards homogamy. Studies based on reduced form approach use spousal correlations indices in explaining individuals' sorting outcomes. Observations on who matches with whom contain richer information than just simple associations. They reflect individual's preferences in partner choice. These cannot be addressed in a reduced form approach and call for a structural examination. In my model, building on Fernandez et al. (2005), individuals have a taste for different education groups. Homogamous couples benefit from matching with someone that is alike. The argument being, similarity between spouses facilitates agreements on basic life goals, priorities, and expectations, and these common grounds lead to more stable marriages. Curtis and Ellison (2002) argue that similarity in culture, and values reduces conflict in spouses' decisions, such as childrens education, choice of residence's location, and the allocation of time and money. Education contains a social or cultural element. Indeed, some studies conclude that homogamy with respect to education stabilizes a marriage (Weiss and Willis, 1997; Jalovaara, 2003; Tzeng, 1992). Marriage choices are then motivated in part by the desire to stay in the same education group and cannot be modeled as solely an economic decision, i.e., selection over the partner's wage attributes.

The main structural parameters of the model are the relative "wedge" parameters, which are preference parameters defined as the perceived utility gains partners of education group i derive from a spouse of education i rather than j. I estimate such parameters for the different cohorts by matching the empirical frequencies of educational intermarriages (e.g., HS dropout-HS, HS-College, etc.) with those implied by my model via a minimum distance procedure. I will then test whether these parameters are significantly different across cohorts and simulate different counterfactuals.

2.1 Model

In this framework, sorting arises from the efforts of agents of different education types to segregate themselves from the rest. In addition, agents of each type have a taste for the different types θ_{ij}. One can think of this effort as the cost that an agent is willing to bear in order to live with someone that is alike. The benefits of homogamy are intrinsic in homogamous marriage unions. Reasons could be numerous as similar spousal education may facilitate agreements on the composition and level of public goods, having the same social circle, preference to reside in a more segregated neighborhood, having the children attend a more segregated school, or belonging to a more exclusive social club. Therefore, $\theta_{ii} \succ \theta_{ij}$. But, an agent of any education group finds it more difficult to meet a spouse who shares their education level if the relevant group is a minority. He might have to compensate for that by exerting higher effort. Effort to segregate should then depend on the distribution of the opposite sex population by education.

Let i, $j = 1$,...,5 index the different education groups, *HS dropout*, *HS*, *Some College*, *Bachelor* and *Post-graduate*, respectively. All agents belonging to education group i (j) are identical. Let $\lambda_{m,i}$ be the fraction of type i males and $\lambda_{f,j}$ be the fraction of type j females in the population. Clearly, $\sum_i \lambda_{m,i} = 1$ and $\sum_j \lambda_{f,j} = 1$. Let π_{ii}^{m} denote the probability that a male (female) of education group i (j) is married to a female (male) of type j (i). Let $\alpha_{i(j)}^{m(f)}$ denote the effort that a type i male (j female) exert in order to marry homogamously (with a type $j = i$ female (male)) in a restricted marriage pool, where effort is chosen by each type i (j) agent. This effort results in a probability of being able to obtain, in the restricted pool, a match with an agent of the opposite sex of its own type. However, not for sure at all times. This occurs as in addition to its own effort, the agent's probability to match for sure at that stage depends on how large is the opposite sex's restricted pool of the same type. If the opposite sex's restricted pool is at least as large as the agent's then the match will be realized with certainty with probability $\alpha_{i(j)}^{m(f)}$. In times where this condition does not hold, the event will occur with the later probability adjusted for the available sex ratio. Note that the sex ratio will depend on both sexes' effort to be in their respective restricted market as well as on their proportions in the population.

Consider a two rounds matching process. In the first round of matching, agents are matched only with their own skill group, hereafter the restricted pool. The following example illustrates the process. Take a type i male, given his effort level, with probability $\alpha_i^m \left(\frac{e^{\frac{\lambda_{f,i}\alpha_i^f}{\lambda_{m,i}\alpha_i^m}}}{1+e^{\frac{\lambda_{f,i}\alpha_i^f}{\lambda_{m,i}\alpha_i^m}}} \right)$, he is married in the restricted pool creating a homogamous union. The fraction represents the effective "eligible" gender ratio in the restricted pool. With probability $1 - \alpha_i^m \left(\frac{e^{\frac{\lambda_{f,i}\alpha_i^f}{\lambda_{m,i}\alpha_i^m}}}{1+e^{\frac{\lambda_{f,i}\alpha_i^f}{\lambda_{m,i}\alpha_i^m}}} \right)$, he is not married in the restricted pool, and hence he marries in the common random matching pool, which is formed of all agents who are not married in their types' respective restricted pools.

Let $R_i^{f/m} = \left(\frac{e^{\frac{\lambda_{f,i}\alpha_i^f}{\lambda_{m,i}\alpha_i^m}}}{1+e^{\frac{\lambda_{f,i}\alpha_i^f}{\lambda_{m,i}\alpha_i^m}}} \right)$

I now write

$$\pi_{ii}^m = \alpha_i^m R_i^{f/m} + (1 - \alpha_i^m R_i^{f/m}) \frac{(1 - \alpha_i^f R_i^{m/f})\lambda_{f,i}}{\sum_{k=1}^5 (1 - \alpha_k^f R_k^{m/f})\lambda_{f,k}} \tag{1}$$

and

$$\pi_{ij}^m = (1 - \alpha_i^m R_i^{f/m}) \frac{(1 - \alpha_j^f R_j^{m/f})\lambda_{f,j}}{\sum_{k=1}^5 (1 - \alpha_k^f R_k^{m/f})\lambda_{f,k}} \tag{2}$$

(similarly for females)

The associated cost with the effort to segregate when the proportion of your type (i) in the opposite sex is $\lambda_{f,i}$ is not education nor gender specific:

$$c(\alpha_i^m, \lambda_{f,i}) = \eta \frac{(1 - \lambda_{f,i})^2}{2} \frac{(\alpha_i^m)^2}{2} \tag{3}$$

The utility of marriage derives from pooled earnings (consumption) and a subjective gain:

$$V_{ij} = ln[w_{mi} + w_{fj}] + \theta_{ij} \tag{4}$$

The parameters θ_{ii} are specific to the education group; the parameters θ_{ij}, for any i and $i \neq j$, are normalized to zero in the actual estimation. Therefore, given the assumption made earlier θ_{ii}'s are positive and create a "surplus".

When choosing the effort level, all agents take the composition of the "effective" restricted and common pool as given (i.e., the effort levels of everyone else) since each agent is infinitesimal and hence does not affect the composition. In equilibrium the composition of these pools will be required to be consistent with all the agents' choices. Denote A_{ii}^m a type i's probability to match homogamously in the common pool and A_{ij}^m his (her) probability of marrying a type j agent in the common pool. The marriage maximization problem of type i (j) agent is

$$Male: \max_{0 \leq \alpha_{m,i} \leq 1} \pi_{ii}^m V_{ii} + \sum_{i \neq j} \pi_{ij}^m V_{ij} - c(\alpha_i^m, \lambda_{f,i}) \tag{5}$$

s.t.

$$\pi_{ii}^m = \alpha_i^m R_i^{f/m} + (1 - \alpha_i^m R_i^{f/m}) A_{ii}^m \quad \forall i, \tag{6}$$

and

$$\pi_{ij}^m = (1 - \alpha_i^m R_i^{f/m}) A_{ij}^m \quad i \neq j, \tag{7}$$

In equilibrium,

$$A_{ii}^m = \frac{(1 - \alpha_i^f R_i^{m/f})\lambda_{f,i}}{\sum_{k=1}^5 (1 - \alpha_k^f R_k^{m/f})\lambda_{f,k}} \quad \forall i, \tag{8}$$

and

$$A_{ij}^m = \frac{(1 - \alpha_j^f R_j^{m/f})\lambda_{f,j}}{\sum_{k=1}^5 (1 - \alpha_k^f R_k^{m/f})\lambda_{f,k}} \quad i \neq j, \tag{9}$$

where

$$R_k^{f/m} = \left(\frac{e^{\frac{\lambda_{f,k}\alpha_k^f}{\lambda_{m,k}\alpha_k^m}}}{1 + e^{\frac{\lambda_{f,k}\alpha_k^f}{\lambda_{m,k}\alpha_k^m}}} \right), \quad k = 1, \ldots, 5 \tag{10}$$

$$R_k^{m/f} = \left(\frac{e^{\frac{\lambda_{m,k}\alpha_k^m}{\lambda_{f,k}\alpha_k^f}}}{1 + e^{\frac{\lambda_{m,k}\alpha_k^m}{\lambda_{f,k}\alpha_k^f}}} \right), \quad k = 1, \ldots, 5 \tag{11}$$

Similarly for females.

The structural model reduces to the following system of equations: (6)-(11), (13)-(16),

$$\frac{\partial c}{\partial \alpha_i^m}(\alpha_i^m, \lambda_{f,i}) = R_i^{f/m}(1 - A_{ii}^m)V_{ii} - R_i^{f/m} \sum_{j, i \neq j} A_{ij}^m V_{ij} \quad \forall i, \tag{12}$$

$$\frac{\partial c}{\partial \alpha_j^f}(\alpha_j^f, \lambda_{m,j}) = R_j^{m/f}(1 - A_{jj}^f)V_{jj} - R_j^{m/f} \sum_{i, i \neq j} A_{ij}^f V_{ij} \quad \forall j. \tag{13}$$

The parameters of the model consist of the taste parameters θ_{ii} , for any i and $i = j$, and η. Let ϑ denote the vector of parameters.

I use data from the 1978-1992 March Current Population Surveys (CPS) data on the composition of marriages by education level of the spouses and the distribution in the population by education level and gender. The analysis covers the birth cohort of young adults born between 1948-52. Consistent with the notation in the model, I have data on π_{ij}^f for all ij; π_{ij}^m for all ij; $\lambda_{m,i}$ for all i; and $\lambda_{f,j}$ for all j.

The solution to the reduced equations above define a mapping, $\tilde{\Pi}(\vartheta)$, from $\lambda_{m,i}$ and $\lambda_{f,j}$ for all i and j and ϑ into $\pi_{ij}^{m(f)}$ for all i and j. Given the subjective values associated with homogamous marriage unions, θ_{ii}, an equilibrium in the marriage market will be the solution of the fixed point problem of (3),(6)-(11),and (13)-(18).

I use a minimum distance estimation procedure that matches the vector $\hat{\Pi}$ of empirical moments $(\hat{\pi}_{ij})$ from the data with the vector $\tilde{\Pi}(\vartheta)$ of moments implied by the model for a given choice of ϑ. Formally, given a square weighting matrix Ω_N^* (where N denotes the total sample size), the minimum distance estimator $\hat{\vartheta}$ minimizes

$$J_N(\vartheta) \equiv [\hat{\Pi} - \tilde{\Pi}(\vartheta)]^\top \Omega_N^* [\hat{\Pi} - \tilde{\Pi}(\vartheta)] \tag{14}$$

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