

Households and Inequality¹

Nezih Guner

(ICREA-MOVE, Universitat Autònoma de Barcelona, Barcelona GSE)

1 Introduction

Consider how different households in the U.S. and other industrialized countries look today relative to decades ago. First, a smaller proportion of the adult population is married today than it was in the past. A smaller number of people ever get married; if they do marry, they do so later in their lives; and they are more likely to divorce. The decline of marriage was more dramatic for some groups than others in the U.S. The fall in the fraction of the population that is married and the rise in divorce have been greater for the non-college educated.² These patterns are documented in Figure 1 for population between ages 25 and 54.³

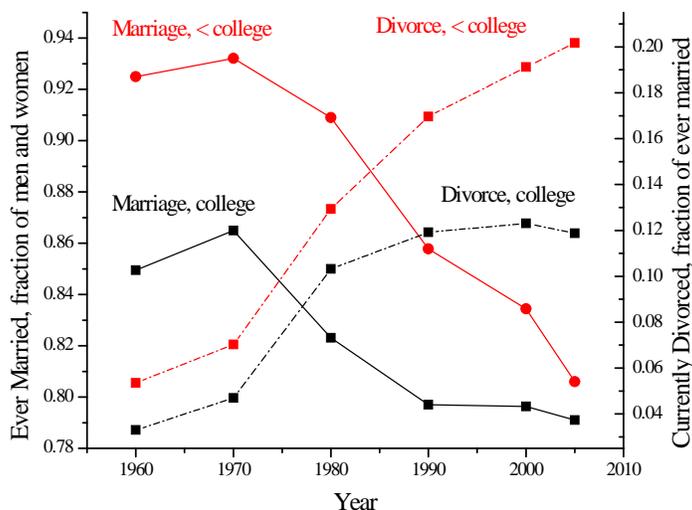


Figure 1: Marriage and Divorce by Education

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²The fact that the decline in marriage and the rise in divorce has affected college educated and non-college educated people differentially has been noted both by sociologists, Martin (2006), and economists, Stevenson and Wolfers (2007).

³This age group (25 to 54) is selected to make sure that the marriage statistics are not affected by the fraction of population going to college as college education is typically completed by age 25. It also corresponds closely to ages in which agents are active in the labor market. Looking at the fraction of population that is currently married, rather than those who are ever married, gives a very similar picture. Details about these and other facts cited here can be found in Greenwood, Guner, Kocharkov and Santos (2014, 2015).

Second, today people are more likely to get married to someone with a similar educational background. One way to measure the extent of assortative mating is to look at how correlated the educational attainments of husbands and wives are in the data. Consider all husbands and wives between ages 25 and 54 and split them into two educational groups (non-college educated and college educated). Given such data, one can create a contingency table that shows the fraction of marriages formed by different types of couples. This is done in Table 1. In 1960, for example, in about 86% of couples, both the husband and the wife had non-college education and this number declined to about 55% in 2005. Table 1 also shows, in parenthesis, the fraction of marriages that would arise if marriages between educational classes were formed completely randomly, i.e. the fraction of couples made by two college graduates would simply reflect the fraction of husbands and wives with college degrees. For example, if the marriages were random, there should be about 82% of couples with non-college education in 1960 and this number would decline to about 43%, reflecting the overall increase in education. The fact that the decline in this type of marriages was quite smaller in the data (a decline from 86% to 55%) is an indication of increasing positive assortative mating. One can also look at the simple correlation coefficient between husbands and wives education levels. This correlation coefficient was 0.41 in 1960 and increased to 0.52 in 2005.⁴

TABLE 1: ASSORTATIVE MATING, AGE 25-54

| | | 1960 | | 2005 | | |
|-----------|--|---------------|---------------|-----------|---------------|---------------|
| Husband | | Wife | | Husband | Wife | |
| | | < College | College | | < College | College |
| < College | | 0.855 (0.821) | 0.023 (0.056) | < College | 0.545 (0.427) | 0.108 (0.226) |
| College | | 0.082 (0.115) | 0.041 (0.008) | College | 0.109 (0.227) | 0.237 (0.120) |
| | | $\rho = 0.41$ | $n = 195,034$ | | $\rho = 0.52$ | $n = 288,423$ |

Third, the amount of time allocated to market work by married households has increased significantly. This was mainly driven by the dramatic increase in labor-force participation of married females. As Figure 2 shows, in 1960, about 32% of non-college educated women and 43% of college educated women were working. Now, the majority of them do so: 65% and 74%, respectively. As female labor-force participation rose, so did a married woman's contribution to the family income, from 16% in 1960 to 34% today, which is depicted in Figure 2 as well.

Fourth, the number of women with a college degree increased dramatically. In 1960, only about 7% of women between ages 25 and 54 had a college degree. Now, about 30% do so. Indeed today there are more women with a college degree than men in the U.S. as well as in many other industrialized countries – Becker, Hubbard and Murphy (2010).

Finally, the distribution of income among households became more unequal between 1960 and 2005. The left panel of Figure 3 shows the Lorenz curves for 1960 and 2005. Lorenz curves plot the cumulative share of income at each income percentile against the cumulative percentile of households. If income was equally distributed among households, these curves would coincide with the 45⁰ line. The Gini coefficient, which is twice the area between the Lorenz curves and the 45⁰ line, increased from 0.31 to 0.43 between 1960 and 2005. Another

⁴The rise in assortative mating has been noted before by sociologists Schwartz and Mare (2005).

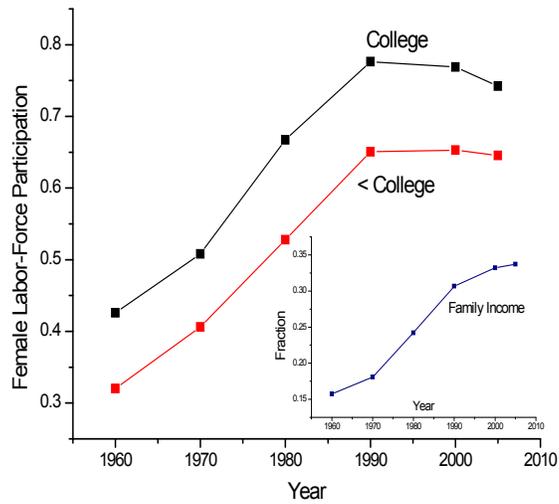


Figure 2: The Increase in Married Female Labor-Force Participation. The inset panel shows the contribution of married females to family income.

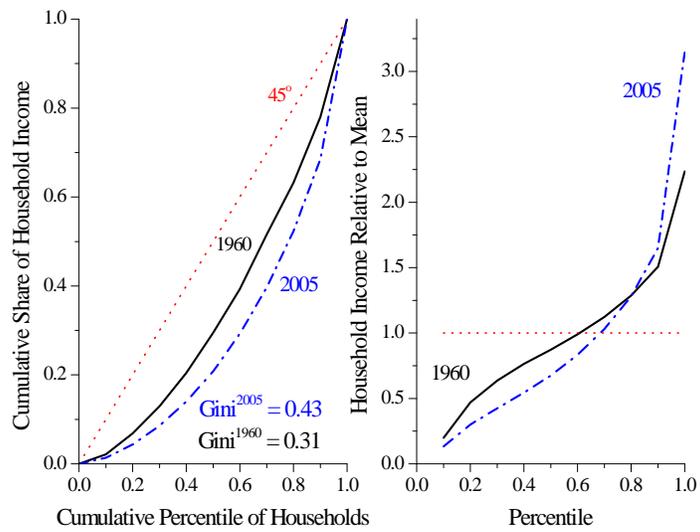


Figure 3: The Increase in Household Income Inequality

way to see this is by plotting the household income relative to the mean household income in each percentile; this is done in the right panel of Figure 3. The relative income for all households below the 80th percentile declined, while there was a significant increase for households that are at the top of the income distribution.

What economic factors can explain these changes? What is the contribution of the changes in household structure to rising income inequality?

2 Technology and the Households

People marry for both economic and non-economic reasons. A key economic advantage of marriage is that it allows partners to enjoy joint production and consumption within the same household. Following Becker (1965), one can think of a household as a factory, producing a wide range of household goods (meals, laundry, child care, just to name few). Marriage allows household members to benefit from specialization in their production activities. Marriage also allows households to enjoy economies of scale in consumption, as it takes less resources to accommodate two people within the same household than accommodating each in two separate households.

During the 20th century three important changes took place: First, overall economic well-being of agents increased with higher incomes. Second, there has been what one might call a household revolution as with technological progress a wide range of new household appliances (heaters, refrigerators, dishwashers, washing machines, microwave ovens) have been introduced to the market and their prices declined dramatically. As a result, a growing number of households purchased these appliances and are using them. Finally, the last decades of the 20th century also witnessed a dramatic change in the way market goods were produced. With the information technology revolution, education and associated skills become much more valuable in the labor market.⁵ This skill-biased technological change increased dramatically the skill premium, and as result, the value of education. Technological change, along with other factors, also reduced the gender wage gap between females and males. As brains become more important than brawns for the production, the gender gap, i.e. the earnings gap between men and women, also declined.⁶

How did these changes affect family? Consider first the increase in incomes. When people are poor, the advantage of joint consumption (sharing a house, furniture, appliances etc.) is really important. Then, a two-person household will be much more better off than a single-person one. As incomes grow, the importance of sharing diminishes and a trend to smaller households emerges. The improvements in household appliances had two effects. First, it allowed all adults, both married and single, to devote more time to market activities and less to household production.⁷ Second, household appliances lowered the economic incentives to get married by reducing the benefits of the traditional specialization of women at housework and men at market work. Both effects caused the relative benefits of single life to increase. The skilled-biased technological change resulted in skilled labor becoming more

⁵See Acemoglu (2002) for a review.

⁶The link between technical change and the gender gap was modelled by Galor and Weill (1996).

⁷Greenwood, Seshadri and Yorukoglu (2005) model the link between the improvements in household technologies and the rise in the female labor supply.

valuable relative to unskilled labor. This increased the skill premium. As a consequence, education became more attractive for males as well as for females. These forces, rise in the skill premium and decline in the gender gap, should cause people to become pickier about their mate, causing a decline in marriage and a rise in divorce. One would expect a rise in assortative mating, since educated individuals are also less willing to marry uneducated ones.⁸

What about income inequality? A rise in the skill premium directly heightens income inequality. If more high ability people go to college (relative to low ability ones), then the earnings differential between high and low ability individuals will widen. A higher skill premium also creates a greater incentive to match assortatively. So, changes in marriage patterns can intensify inequality. But, for this mechanism to have force, married women must work in the market. Otherwise, if women never worked, household income inequality would closely follow the inequality among men. At the same time, the rise in the number of single households, especially poor single households, also had an effect on rising income inequality.

3 Quantifying the Effects

How can one measure the extent to which technological changes affected the inequality among households? One way to do this is to use tools of modern macroeconomics and create *artificial economies* that can be compared with the data.⁹

Consider an artificial economy populated by males and females. Each agent is characterized by an innate ability (i.e. some are more able than others).¹⁰ Suppose each agent enters this artificial economy as a single and makes an once-and-for-all decision whether to get educated or not. After their education decisions, single males and females enter into a marriage market in which they meet other singles. When two single agents meet, they have to decide whether they should get married or remain single. Educated agents earn more than uneducated ones, i.e. there is a skill premium, and females earn less than males, i.e. there is a gender gap. A married couple must decide how to allocate their total time between labor market (i.e. working for a wage), and home production (i.e. spending time to produce home goods). Home goods are produced by time and household appliances. When two agents meet they are also assigned a random value for the quality of their relation, i.e. love. Some couples like each other a lot, while others do not. This is the non-economic benefit of a marriage. Also suppose that there is a utility bonus for marrying someone from the same educational background, which can represent the compatibility between partners. Given the total (economic and non-economic) value of a marriage, agents decide whether to get married or to remain single. Next period their match quality can change and they have to decide whether to stay married or get a divorce.

⁸The relation between the skill premium and assortative mating is studied by Fernandez, Guner and Knowles (2005).

⁹Aiyagari, Greenwood and Guner (2000) and Regalia and Rios-Rull (2001) were among the first papers that use such techniques to study changes in household and family structure.

¹⁰For a survey of heterogenous agents models in macroeconomics, see Heathcote, Storesletten and Violante (2009).

Marital decisions of agents in this artificial economy will create statistics that can be directly compared with the data. In this artificial economy, some agents will be married and some agents will be single (never married or divorced). Some agents will be getting married, while others will be getting a divorce. Some agents will get education and some will not. Some married females will decide to work in the market while others will not. Some households will be rich, while others will be poor.

Greenwood, Guner, Kocharkov and Santos (2015) build such an artificial economy and show that it can generate the changes that we observe in the U.S. economy between 1960 and 2005. Then, they ask how much of the rise in income inequality among households between 1960 to 2005 is driven by wages, and how much of it is due to propagation mechanisms stressed in their model (the decisions of households regarding education, marriage, and married female labor supply).

To address these questions, take the 1960 economy and change wages (the skill premium and the gender wage gap) and durable goods prices to their 2005 values. Though prices are changing, consider keeping the decisions regarding education, marriage, and married female labor-force participation *constant* at their 1960 values. With these modified prices and artificially fixed decisions, a new counterfactual steady state can be computed. Calculate the Gini coefficient for this hypothetical scenario.

The results are shown in column (2) in Table 2. Column (1) reports the Gini coefficient for the 1960 benchmark model economy. The Gini coefficient increases from 0.307 to 0.330. This constitutes 39 percent of the total increase in the Gini, from 0.307 to 0.366. So, shifts in wages are clearly an important driver of the hike in income inequality. Still, *the model's propagation mechanism* is very important, accounting for the remaining 61 percent.

Now redo the previous experiment but now allow households to adjust the labor-force participation decisions for married women. Education and marriage decisions are still kept at their 1960 values. Married female labor-force participation rises from 31.5 percent in the 1960 benchmark to 61.6 percent in this counterfactual economy because of cheaper consumer durables. The Gini coefficient, however, does not change, as seen in column (3). Changes in female labor-force participation alone do not affect inequality.

Next, keep married female labor-force participation decisions at their 1960 values and let marriage decisions change. The results are shown in column (4). When marriage decisions are allowed to react, the number of married individuals declines from 0.85 percent to 0.68 percent. This still results in higher inequality, since single households are much poorer than married ones. Marriage decisions account for about 18.6 percent (57.6 percent minus 39 percent) of the rise in income inequality.

In column (5), both marriage and labor-force participation decisions are allowed to adjust. Education decisions are still kept in their 1960 values. Allowing female labor-force participation and marriage decisions to react *together* accounts for 35.6 percent (74.6 minus 39 percent) of the total climb. The effect of changes in marriage patterns (who is married, who is single, and who marries with whom) is magnified when married women are allowed to adjust their labor-force participation. A rise in the skill premium and a reduction in the gender wage gap boost the tendency toward positive assortative mating. For this effect to be fully operational, married women must work. A skilled man is indifferent on economic grounds between a skilled and unskilled woman if neither of them works, assuming that skill doesn't affect a woman's production value at home. When both work, however, the skilled

woman becomes the more attractive partner, at least from an economic point of view.

Finally, the gap between columns (5) and (6) shows the contribution of endogenous education, and the subsequent induced changes in marriage and married female labor-force participation decisions, on income inequality. Not surprisingly, allowing education decisions to respond hikes income inequality. When the skill premium rises, more high-ability people will go to school. This amplifies the spread between what high- and low- ability people earn.

TABLE 2: DECOMPOSING THE INCREASE IN HOUSEHOLD INCOME INEQUALITY

| | <i>1960</i> | <i>Experiments</i> | | | | <i>2005</i> |
|----------------------|--------------|--------------------|--------------|--------------|--------------|---------------|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Decisions held Fixed | | Edu., Mar., LFP | Edu., Mar. | Edu., LFP | Edu. | |
| Gini | 0.307 | 0.330 | 0.330 | 0.341 | 0.351 | 0.366 |
| Change in Gini | 0.000 | 0.023 | 0.023 | 0.034 | 0.044 | 0.059 |
| Cumulative Change | 0.0% | 39.0% | 39.0% | 57.6% | 74.6% | 100.0% |

4 Conclusions

The last decades produced a dramatic change in the U.S. household and family structure. People, especially those with less education, are much less likely to get married and much more likely to divorce than they were decades ago. There is also more assortative mating as people are more likely to marry someone of the same socioeconomic class than in the past. At the same time, labor force participation of married women increased. Women are much more likely to go to college now. Household income inequality has intensified.

Greenwood, Guner, Kocharkov and Santos (2015) build a model of marriage and divorce to address these facts. Their analysis shows that while changes in wages structure (the rise in the skill premium and the decline in the gender wage gap) has a critical effect on the rising income inequality, their effect is magnified by the endogenous forces in their model: higher levels of educational attainment, stronger positive assortative mating, and the hike in married female labor-force participation magnify the rise in household income inequality.

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