Assortative Mating in Taiwan and Income Inequality

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Abstract

Educational homogeneous marriages have become more prominent in America and Western Europe. This trend has had implications for social and economic mobility. In this report, I find similar increases in Taiwan's level of assortative mating by education over time using the Family Income Survey from 1981-2020. The methodology used to quantify assortative mating builds off of the sorting parameters from Eika et al (2019)[1]. Taiwan shows a more persistent increase in positive sorting in recent years whereas many western countries have seen plateaus. Additionally, I perform random sorting of couples to act as a counterfactual to estimate the impact of assortative mating on the Gini coefficient and find a 2-4 percentage point decrease depending on the year, implying that assortative mating has a consistent and stark relationship with income inequality. More discussion and exploration

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is required to arrive at or rule out a causal link between assortative mating and income inequality in Taiwan.

1 Introduction

Education and marital status seem to have an ever growing connection. One way this is showcased is through the phenomenon of educational homogeneous marriages. Educational homogeneous marriages occur when both spouses have the same level of education. Studies such as Eika et al (2019) and Greenwood et al (2014)[2] have looked at measures of assortative mating across the United States and Western Europe and found that it has been increasing throughout the 20th century and stagnating since the 1980s. These studies also attempted to link this phenomenon to income inequality, suggesting that as assortative mating increases, so does household income inequality. Throughout this internship at National Taiwan University I investigated, using the Taiwanese Family Income Survey Data from 1981-2019, if these trends are also occurring in Taiwan, to what extent, and if there's a link between it and income inequality.

2 Literature Review

There seems to be a divergence in the literature in how best to estimate the degree of assortative mating. Greenwood et al (2014) wanted to find if assortative mating has increased since 1960. Using US census data from 1960-2005, they used linear regression with fixed effects to estimate this. The regression measured the impact of a husband's education on his wife's education. The correlation coefficient increases over time, suggesting that

assortative mating increased. The effect was persistent for the entire duration of the data set the study utilized.

On the other hand, Eika et al (2019) had the same question, and found that assortative mating only increased until 1980, then stagnated. This difference is in part due to the differences in methodologies. While Greenwood used fixed effects, Eika used parametric decomposition, while criticizing the use of regression as it fairs poorly against the identification problem that this particular relationship faces. In particular, the increase in women's education. Are men and women sorting themselves into homogeneous marriages more often, or have women just become more educated? Eika's decomposition method addresses this through sorting parameters which control for this increase. I employed a similar method to this in our investigation. Eika also dis-aggregated relationships by race, and found that it is stronger among African Americans due to the fact that cohabitation yields a stronger relationship between sorting and inequality than marriage, which is more common among African American families. While we do dis-aggregate impacts based on educational attainment, we do not differentiate by ethnicity.

There is also the general question of if educational assortative mating's relationship to inequality, if increases inequality and to what extent. While both Eika and Greenwood found a positive correlation between positive sorting and income inequality, this is not ubiquitous. For example, Breen et al (2011)[3] found that positive sorting in the United States had a negative impact on income inequality. In a counterfactual world where sorting rates did

not increase like they did, income inequality would be higher, but only by a modest amount. This is somewhat reflected in Anderson et al (2012)[4] which used Denmark as a case study. Finding that increase in income inequality does indeed have a positive relationship with assortative mating, but it is mostly driven by changes in educational attainment in men and women and not necessarily their likelihood to choose a partner.

Isolating a causal relationship between assortative mating and income inequality has been a challenge for contemporary literature due to the endogenous nature of the outcome and independent variables. While Torche (2010)[5] found strong positive relationships between assortative mating and inequality in Brazil, Mexico, and Chile, the author also expressed that it's a start case study of the limitations of single aggregate measures of spousal education.

3 Data Analysis

For our research, we only looked at working age adults who are married. Observations which included household heads over 65 or under 25 were dropped, as well as households where the head was someone unmarried. Education was coded, for most years, as being 0-10, where 0 was the lowest level of education and 10 being the highest. However, for some years of the survey, this was reversed. In line with contemporary literature, we re-coded these levels as 1-5, where 1 is less than high school (denoted as HS-) and 5 is a graduate degree (C+). We created contingency tables for each year as seen in the appendix

as Figure 1 and Figure 2 for 2019 and 1981 respectively. These simple contingency tables show the percentage of couples who have the corresponding education levels. Along the diagonal of these tables is where homogeneous marriage occurs: two partners having the same level of education. One way to measure this is by adding each diagonal entry and getting a value for each year. This approach shows this type of marriage has been decreasing over time, however that doesn't tell the complete story. This is where we employ the sorting parameters.

$$S(e_f, e_m) = \frac{P(E_f{=}e_f, E_m{=}e_m}{P(E_f{=}e_f)P(E_m{=}e_m)}$$

$S(e_f, e_m)$ is a conditional probability that produces a measure of how likely a marriage is to occur relative to a randomized counterfactual. If the term is equal to 1, this indicates that a marriage is just as likely to occur as if randomized. If less than 1, it's happening less frequently than expected, if greater, the opposite is true.

As is shown in Figure 3 and Figure 4, it appears that assortative mating has leveled out over time. In the earlier years the sorting parameters in the high education levels was extremely high due to the low number of people having these degrees at the time, especially women. It also has become more common for sorting to occur at lower income levels. In another similarity to Eika, this trend is common among Western countries as well. Positive sorting has stagnated or decreased at high education levels and increased at lower

education levels, especially those who have less than high school education. Figure 6 demonstrates this level of educational assortative mating trending over time, dileniated by education level.

Note that C+ was omitted from this graph due to readability issues; it shows a similar decline to C as is reflected in the tables. After this, we calculated the weighted average for educational homogeneous marriages for each year, across all education levels, and found that it has been steadily increasing since 1980. This is divergent from the United States and Western European, which have stagnated since the 1980s. The only study that we looked at that found an increase since the 1980s in America was Greenwood, which used linear regression, unlike Eika and this investigation.

4 Assortative Mating and Inequality

The implications that this has for economic and social outcomes for Taiwanese citizens are widespread. One of the consequences that this increasing lack of social mobility with respect to education may have is income inequality. The Gini coefficient is a commonly used measure of inequality, it takes a value between 0 and 1, the closer to 1 the more unequal an economy is. Using our data, we calculated the coefficient for each year, and then performed random sorting to see the impact of a randomized counterfactual on inequality.

This task provided some difficulty, the data set from the Family Income Survey is designed so that each observation is an entire household. In order to randomize, we had to split each observation up into two, assigning "husband" or "wife" and their respective incomes to each. After this was performed, we wrote a script which calculated the Gini coefficient of each year, and randomly matched the data 10 times, calculating the gini each time, averaging them out at the end. All of this information was stored in a data set. This allowed us to see the real level of income inequality over time, in addition to an imaginary world where all of the spouses were randomly assigned to each other.

As is shown in Figure 6, randomizing the spouses to each other had a negative impact on the Gini coefficient. If spouses randomly married each other there would be less income inequality. On average, randomization had an effect of decreasing the Gini coefficient by 2-4 points. However, this is not to say that educational homogeneous mating increases the Gini coefficient by 2-4 percentage points. There are likely omitted variables yet to be explored and controlled for. As an example, in this randomized counterfactual, spouses from across the country could marry, geography and many other variables could be biasing the correlation coefficient in a positive and negative way. However, it seems to be the case that homogeneous marriages have a positive correlation with income inequality, even if causality has not yet been clearly ascertained. This is inline with other literature on assortative

mating in Western countries that has documented links between educational homogeneous marriages and income inequality.

5 Conclusion and Discussion

In comparison to other literature looking at Western countries, it appears that Taiwan is on a similar, yet not identical trend. In our research we documented an increase in assortative mating since 1980, in contrast to America which has stagnated since the same time. We also have shown that the increase in assortative mating has been in large part driven by people with less education marrying each other, while there has been a decrease in positive assortative mating in higher levels of education. We have also looked at the impact of randomizing spouses on the Gini coefficient of Taiwan, and found a significant decrease in the level of inequality ranging from 2-4 points depending on the year.

Unlike Breen (2011), a counterfactual estimation of the absence of educational sorting, I find a decrease in inequality. However, these two estimations are not identical as I randomized sorting while Breen holds sorting at a constant, as does Greenwood.

More discussion, exploration, and research would be beneficial to understanding the extent and degree of the ramifications of this increase in positive assortative mating in Taiwan. Other studies such as Eika (2019) have pointed out that occupational assortative mating is an even stronger predictor of ho-

mogeneous marriages in that respect. There could also be more exploration in line with Greenwood (2014) regarding linear regression with fixed effects.

6 References

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4. Breen, R., Andersen, S. H. (2012). Educational assortative mating and income inequality in Denmark. Demography, 49(3), 867-887.

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7 Appendix

husband_education	wife_education					
	HS-	HS	C-	C	C+	Total
HS-	7.47	3.08	0.27	0.38	0.00	11.21
HS	0.88	7.03	0.44	0.82	0.00	9.18
C-	2.14	19.12	13.35	3.30	0.27	38.19
C	0.05	2.97	2.58	20.49	1.37	27.47
C+	0.00	0.33	1.26	4.62	7.75	13.96
Total	10.55	32.53	17.91	29.62	9.40	100.00

Figure 1: 2019

husband_education	wife_education					
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2

Figure 2: 1981

husband_education	wife_education					
	HS-	HS	C-	C	C+	Total
HS-	7.47	3.08	0.27	0.38	0.00	11.21
HS	0.88	7.03	0.44	0.82	0.00	9.18
C-	2.14	19.12	13.35	3.30	0.27	38.19
C	0.05	2.97	2.58	20.49	1.37	27.47
C+	0.00	0.33	1.26	4.62	7.75	13.96
Total	10.55	32.53	17.91	29.62	9.40	100.00

Figure 3: 2019

husband_education	wife_education					
	HS-	HS	C-	C	C+	Total
HS-	64.35	1.79	0.30	0.14	0.00	66.58
HS	5.46	2.13	0.38	0.16	0.00	8.13
C-	9.46	5.50	1.62	0.55	0.01	17.15
C	1.60	2.73	1.30	2.02	0.05	7.71
C+	0.02	0.11	0.11	0.16	0.03	0.44
Total	80.89	12.26	3.72	3.04	0.10	100.00

Figure 4: 1981

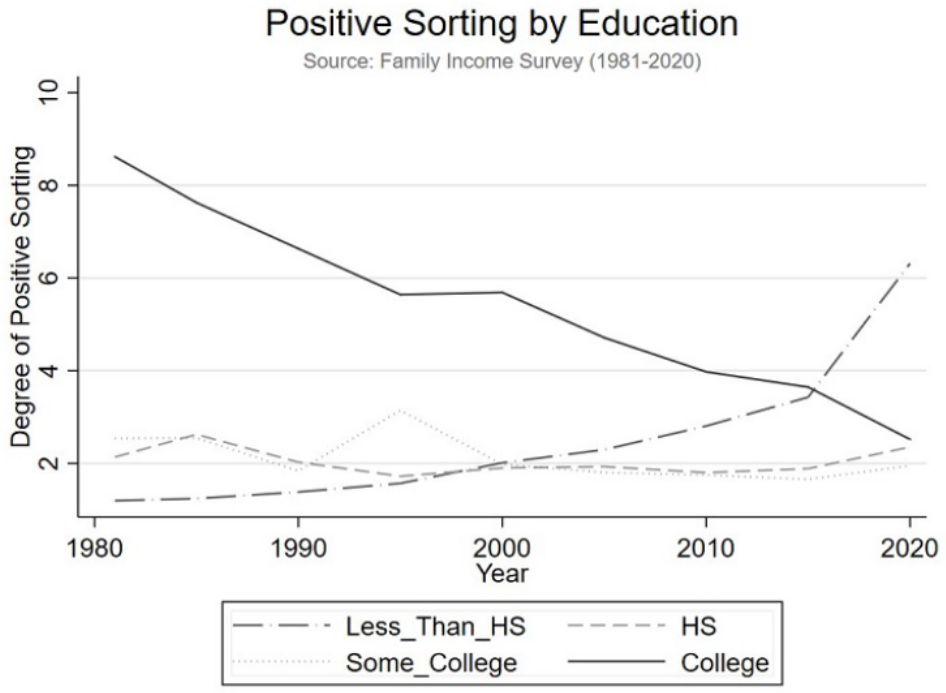

Figure 5:

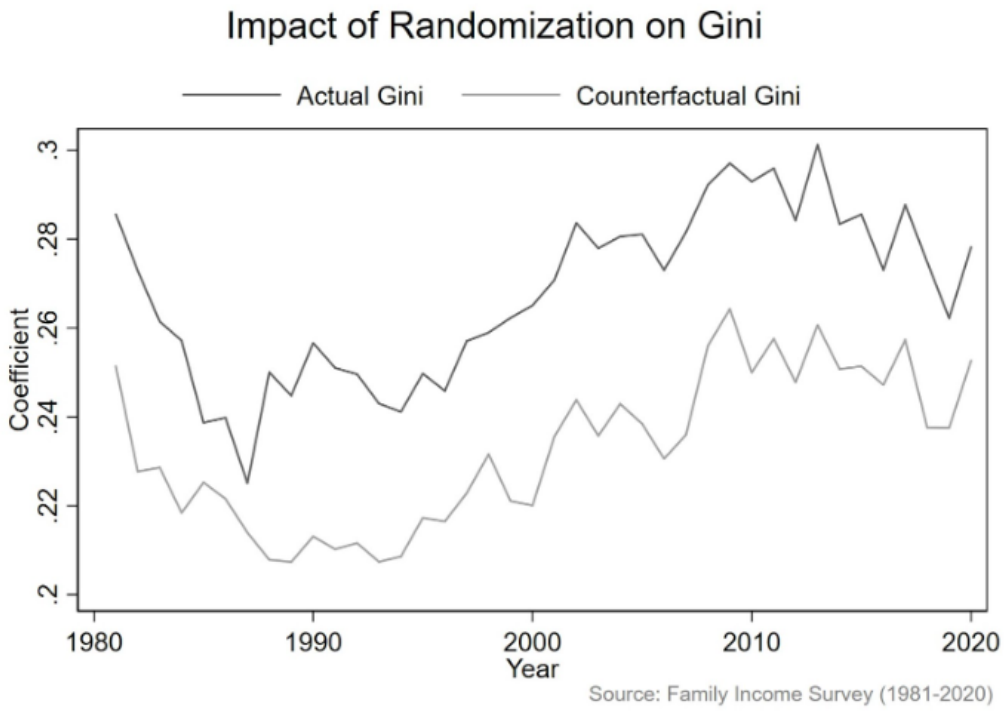
Impact of Randomization on Gini
Actual Gini
Counterfactual Gini
Coefficient
.2
.22
.24
.26
.28
.3
1980
1990
2000
2010
2020
Year
Source: Family Income Survey (1981-2020)

Figure 6: