Investigating the Impact of the Nine-year Compulsory Education Policy on Female Attainment of College Education in China

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Abstract:
The average value of female pre-tax labor income shares in China decreased substantially from 1990 to 2020 and its value was always under 0.50, which meant females' pre-tax labor income was less than males'. The education level difference between males and females was also still apparent. After the Nine-year Compulsory Education Law was implemented in 1986, and the Compulsory Education Law of the People's Republic of China was officially revised in 2006, more and more people were being educated. However, even in 2019, there were still many uneducated women, nearly two and a half times as many as men.

Through this project, we explore how the Nine-year Compulsory Education Policy affects females' education attainments, especially college education. We describe the trends in female pre-tax labor income share in China from 1999 to 2019. We use linear regression to compare the proportion of females with college education levels before and after the Nine-year Compulsory Education Policy. We compare females' data with males' and discuss the possible reasons for inequality. Our results suggest that the Compulsory education policy does have a positive effect on college education levels, but there remains some inequality between males and females in college education.

Background:
From World Inequality Database[1], China's female labor income share (pre-tax labor income) from 1990 to 2020 has been retrieved and visualized as follows.
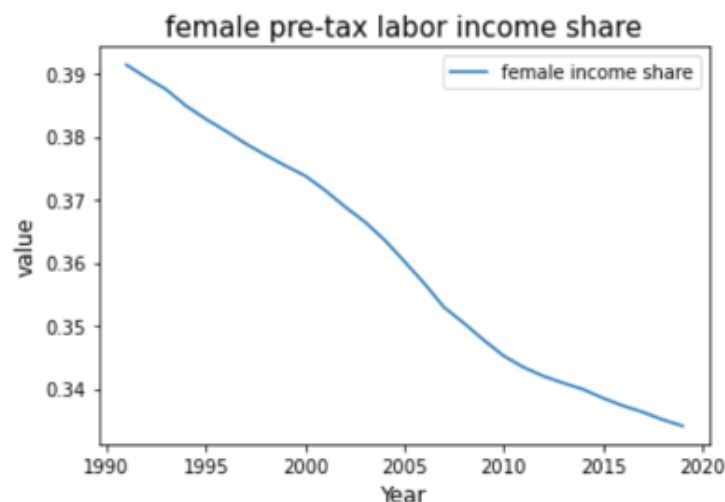

Figure 1: Female Pre-tax Labor Income Share

Figure 1 shows that the average value of female pre-tax labor income shares in China decreased substantially from 1990 to 2020. Also, females' pre-tax labor income share was always under 0.50, which meant females' income share was less than males.

In 1986, the Nine-year Compulsory Education Law was implemented. Compulsory education is a national education that school-age children and adolescents must receive according to the law and that the state, society, and family must guarantee. The annual limit is nine years, which is also called Nine-year Compulsory Education. The Nine-year Compulsory Education has the basic characteristics of being compulsory, free, universal, and secular.[2] In 2006, the Compulsory Education Law of the People's Republic of China was officially revised. The newly revised Compulsory Education Law finally makes it clear that "the state shall fully include compulsory education in the scope of financial security, and the funds for compulsory education shall be guaranteed by The State Council and local governments in accordance with the provisions of this law".[3] After the Nine-year Compulsory Education Law was implemented in 1986, and the Compulsory Education Law of the People's Republic of China was officially revised in 2006, more and more people were being educated. The data on population by sex and educational level which are obtained from the Sample Survey on Population Changes from 1998 to 2018 have been collected and visualized as follows from the National Bureau of Statistics of China.[4]
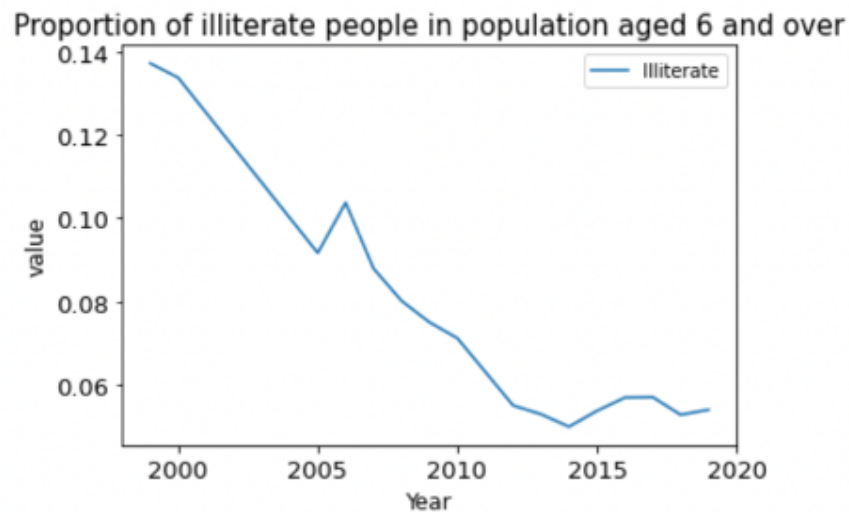

Figure 2: Proportion of Illiterate People in Population Aged 6 and Over

Figure 2 shows that the percentage of people who were illiterate was generally falling rapidly.

However, the education level difference between males and females is also still apparent. Even in 2019, there were still many uneducated women, nearly two and a half times as many as men.
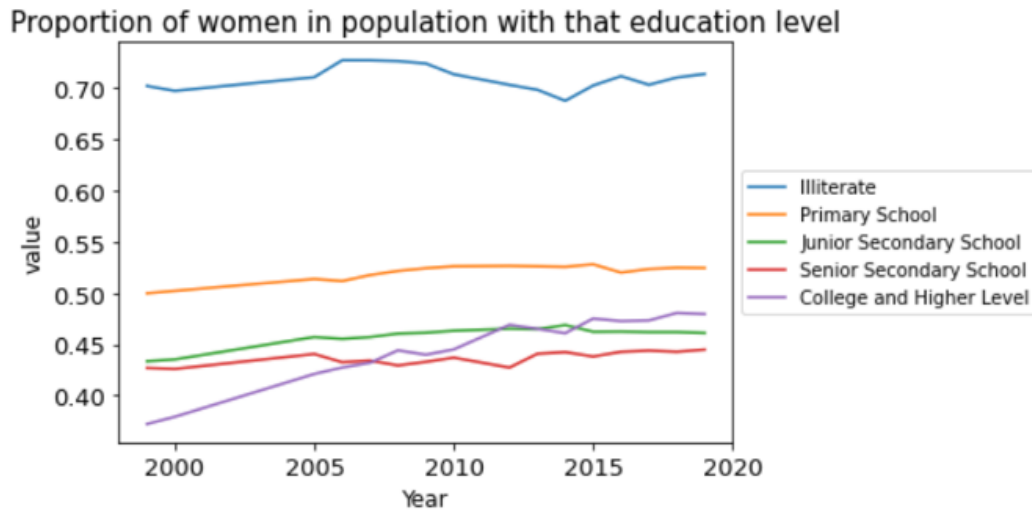
Figure 3: Proportion of Women in Population with Certain Education Levels

As Figure 3 shows, among people who were illiterate, nearly 70% of them were female. Almost half of the people whose education level was primary school were female. Less than half of the people at higher education levels were female, but the trends were on the rise.
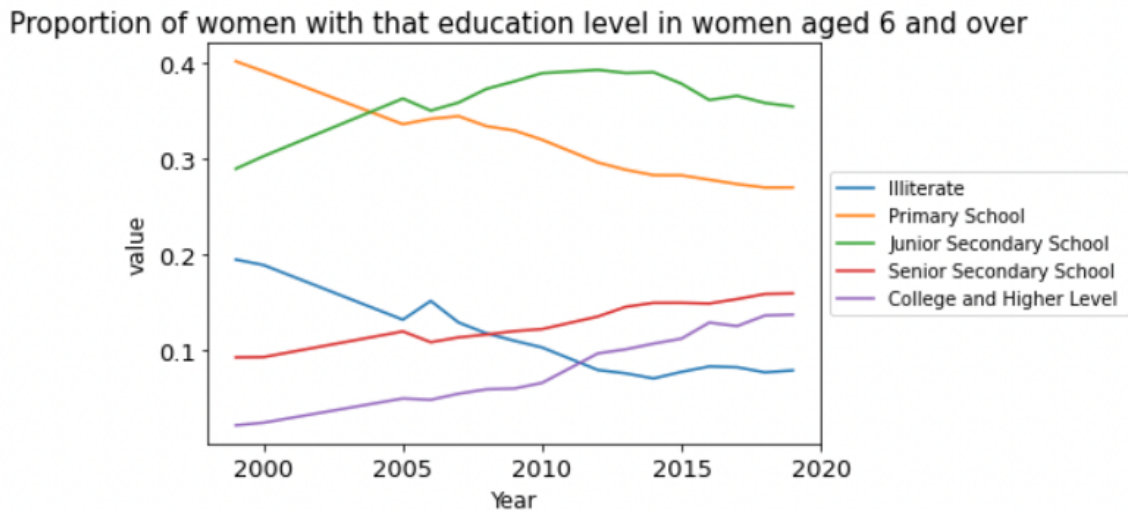

Figure 4: Proportion of Women with Certain Education Levels in Women Aged 6 and Over

As Figure 4 shows, the proportion of women whose education level was illiterate or primary school decreased rapidly, and meanwhile, the proportion of women at higher education levels increased considerably.

Data description:
We retrieved the data from the website of the National Bureau of Statistics of China. Data in the file are obtained from the National Sample Survey on Population Changes and the sampling fraction is different from year to year. Our discussion is based on the proportion so that different sampling fractions would not affect our results. The Compulsory Education Law of the People's Republic of China was passed in 2006 and covers nine-year compulsory education (from

primary school to junior high school). Because of the three-year high school system in China, we believe that the effects of the policy will be somewhat lagged, so we look at data before and after 2009 (three years after the law was passed) to get an idea of the effect. The time period for the data is from 1999 to 2019, and it's separated into two periods: 1999-2009 and 2010-2019. Education level means the highest education level that a person achieved with college and higher education levels. The outcome variables we consider are the proportion of the population with college and higher education levels in the population aged 6 and over, the proportion of women with college and higher education levels in women aged 6 and over, and the proportion of women in the population with college and higher education levels.

Methods:

I used linear regression in this research. Linear regression is a statistical learning approach for predicting a quantitative response Y on the basis of a single predictor variable X. It assumes that there is approximately a linear relationship between X and Y.[5] After using data to estimate the coefficients and get the intercept, future outcomes can be predicted.

I used linear regression to predict "counterfactual" trends (what the trend in college education level would have been if the Nine-year Compulsory Education Policy had not been implemented). I used *sklearn*[6] to build linear regression models and use *matplotlib*[7] to visualize the results in Python. By comparing the predicted proportions and the actual proportions, the effects of the Nine-year Compulsory Education Policy can be shown.

Results:

Proportion of the population with college and higher education levels in the population aged 6 and over
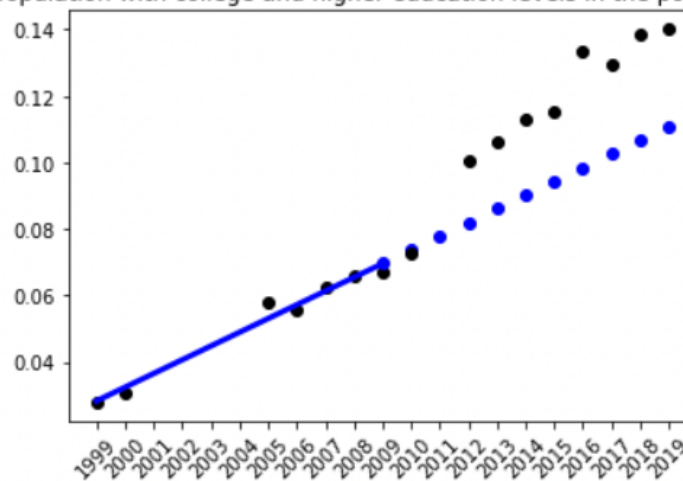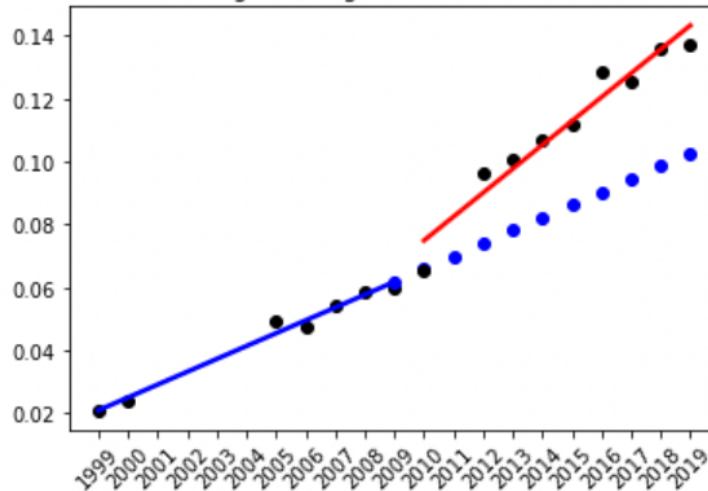
Coefficient: 0.00413067 Intercept: -8.22899061
Figure 5: Proportion of Population with College and Higher Education Levels in Population Aged 6 and Over

In Figure 5, the black data points are from the dataset which shows the proportion of the population with college and higher education levels in the population aged 6 and over. The blue line and blue data points are the predictions from linear regression based on data before 2009. The prediction showed the trend of the proportion of the population with college and higher education levels in the population aged 6 and over if the Compulsory Education Law were not released.

As the predicted proportion and real proportion show, after 2009 (three years after the Compulsory Education Law of the People's Republic of China was officially revised), the proportion of the population with college and higher education levels in the population aged 6 and over grows up rapidly and is much higher than predicted.

Proportion of women with college and higher education levels in women aged 6 and over

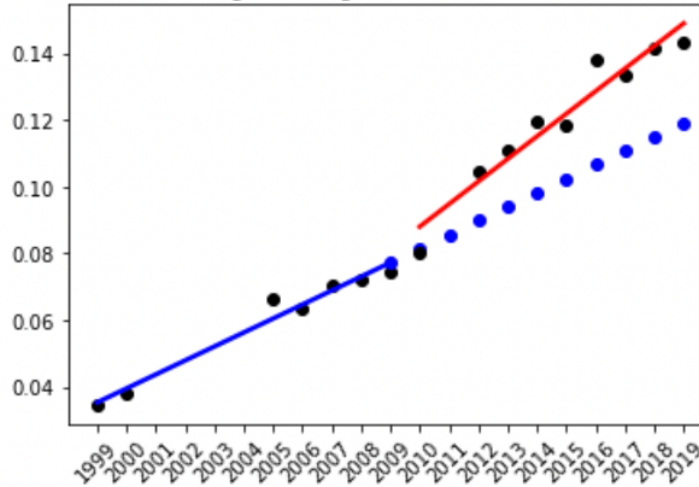*[Blue Line] Coefficient: 0.00407479 Intercept: -8.12449768*
[Red Line] Coefficient: 0.00758237 Intercept: -15.16568884
Figure 6: Proportion of Women with College and Higher Education Levels in Women Aged 6 and Over

In Figure 6, the black data points are from the dataset which shows the proportion of women with college and higher education levels in women aged 6 and over. The blue line and blue data points are the predictions from linear regression based on data before 2009. The red line is the prediction from linear regression based on data after 2009. The prediction showed the trend of the proportion of women with college and higher education levels in women aged 6 and over if the Compulsory Education Law were not released.

As the predicted proportion and real proportion show, after 2009 (three years after the Compulsory Education Law of the People's Republic of China was officially revised), the proportion of women with college and higher education levels in women aged 6 and over grows rapidly and is much higher than predicted. The angle between the blue line and the red line is about 0.201 degrees.

Proportion of men with college and higher education levels in men aged 6 and over

[Blue Line] Coefficient: 0.00419254 Intercept: -8.34561016
*[Red Line] Coefficient: 0.00677074 Intercept: -13.52121371*
Figure 7: Proportion of Men with College and Higher Education Levels in Men Aged 6 and Over

In Figure 7, the black data points are from the dataset which shows the proportion of men with college and higher education levels in men aged 6 and over. The blue line and blue data points are the predictions from linear regression based on data before 2009. The red line is the prediction from linear regression based on data after 2009.

As the predicted proportion and real proportion show, after 2009 (three years after the Compulsory Education Law of the People's Republic of China was officially revised), the proportion of men with college and higher education levels in men aged 6 and over grows rapidly and is much higher than predicted (if the Compulsory Education Law were not released). The angle between the blue line and the red line is about 0.148 degrees.

The angle between the blue line and the red line in Figure 7 is less than the one in Figure 6, which suggests that the policy's effect on the male population was less than on the female population.
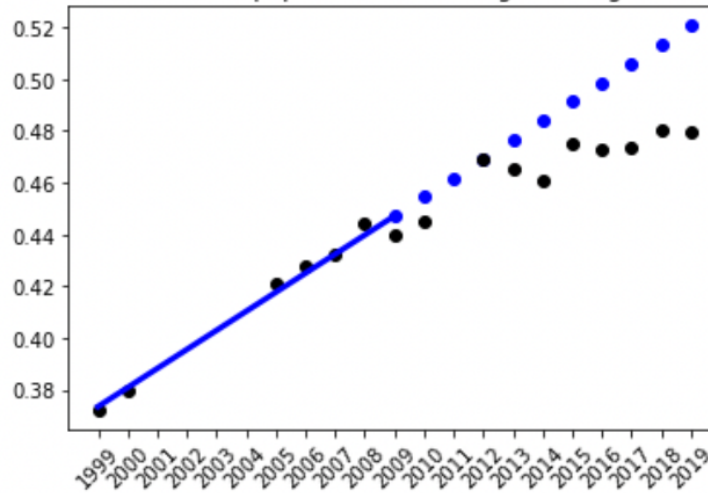
Coefficient: 0.00735752 Intercept: -14.3342387
Figure 8: Proportion of Women in Population with College and Higher Education Levels

In Figure 8, the black data points are from the dataset which shows the proportion of women in the population with college and higher education levels. The blue line and blue data points are the predictions from linear regression based on data before 2009.

As the predicted proportion and real proportion show, after 2009 (three years after the Compulsory Education Law of the People's Republic of China was officially revised), the proportion of women in the population with college and higher education levels decreases and is lower than predicted (if the Compulsory Education Law were not released). That might be because more and more males go to college and higher education.
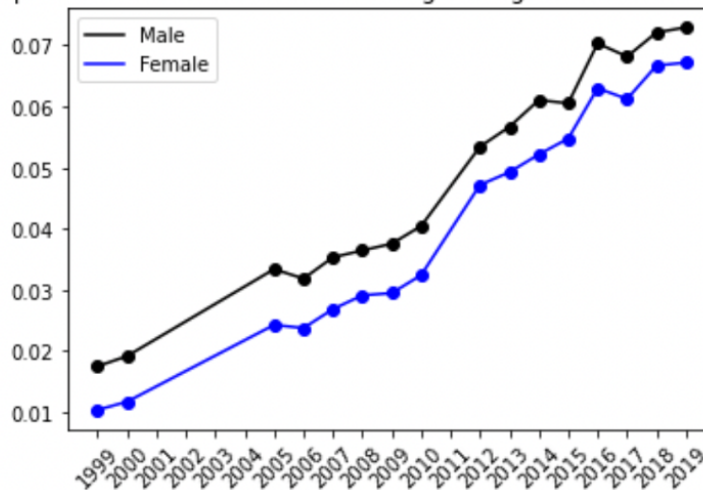

Figure 9: Proportion of Men and Women at College or Higher Education Over Time

In Figure 9, the black line and the black data points are from the dataset which shows the proportion of men with college and higher education levels in the population aged 6 and over.

The blue line and the blue data points are from the dataset which shows the proportion of women with college and higher education levels in the population aged 6 and over.

As this plot shows, the proportion of men with college and higher education levels is always higher than the proportion of women with college and higher education levels. That is the reason why the proportion of women in the population with college and higher education levels after 2009 is lower than predicted although the policy's effect on the male population was less than on the female population.

Discussion of results:
Before the Nine-year Compulsory Education Policy, almost one percent of women aged 6 and over had attended college or higher education, while less than two percent of men aged 6 and over had attended college or higher education. After the Nine-year Compulsory Education Policy was officially revised, more and more people had access to school, which helped some of them go to college. Our results when we look at solely the male population or solely the female population suggest that the policy's effect on the male population was less than on the female population. However, when we look at the whole population, we see that the proportion of males going to college was always higher and continued to be higher than the proportion of females. Thus, when we look at specifically the population of people at college or higher education levels, we see that the proportion of women was lower than predicted, as it was likely that an increased proportion of the male population going to college corresponded to a larger number of males attending college than that same proportion might indicate for the number of females.

In addition, people's educational ideas, supervision strength, and the imbalance in economic and cultural development between urban and rural areas might affect both compulsory education and college education. In some rural areas, some people think that it is unnecessary for girls to study because they will soon get married. Girls who grew up in such families may prefer working early to help support families instead of going to school. Education authorities in remote areas might have weaker supervision than those in better-developed areas. Due to the imbalance in economic and cultural development between urban and rural areas, there are huge gaps in educational funds, thus affecting basic education facilities and faculty qualifications.

Since linear models are used, it is assumed that there is a linear relationship between proportions and time when there probably is not. Hopefully, the results still have some value in that they provide a summary of the relationship between education levels and the Nine-year Compulsory Education Policy. But the results should not be used as a predictive model. It should be cautioned against using this type of model for prediction and decision-making. This model is more useful in examining past trends.

Because many people had already been in the workforce when the Nine-year Compulsory Education Policy was passed, there might be a time lag on the effects of the compulsory education policy on the average value of female pre-tax labor income shares. We predict that the female income share will increase in 10-20 years due to the lagged effects of the compulsory education policy.

Conclusion:

Our results suggest that the Compulsory education policy does have a positive effect on college education levels, but there remains some inequality between males and females in college education. Traditional preferences for sons are still deep-rooted in China, particularly in rural communities.

There remain questions about the relationship between education level and gender inequality. Our analysis only includes two variables and does not account for other variables that may help in explaining the relationship between education level and gender inequality. In future work, it would be helpful to find or collect individual-level data so that we could connect education level with college outcomes and income later in life. Further research on education levels and income of females aged 25 and over can be done. In addressing gender inequality, our results suggest that the compulsory education policy was helpful in increasing college education levels across the whole population, but we are not able to see a significant change in gender inequality due to this policy. This may mean that in order to address gender inequality in college education, compulsory education alone won't be sufficient to solve the problem, we may need other policies.

References:

[1] World Inequality Database, http://wid.world/data.

[2] The National People's Congress of the People's Republic of China, www.npc.gov.cn/npc/c2306/200012/b75b3a951ce840b690c75a7507fc0794.shtml.

[3] The Compulsory Education Law, www.npc.gov.cn/npc/c30834/201901/21b0be5b97e54c5088bff17903853a0d.shtml.

[4] The National Bureau of Statistics of China, www.stats.gov.cn/english/Statisticaldata/AnnualData/.

[5] James, Gareth, et al. "Linear Regression", *An Introduction to Statistical Learning: With Applications in R*, pp. 61–62.

[6] *Scikit-learn: Machine Learning in Python*, Pedregosa et al., JMLR 12, pp. 2825-2830, 2011.

[7] J. D. Hunter, "Matplotlib: A 2D Graphics Environment", *Computing in Science & Engineering*, vol. 9, no. 3, pp. 90-95, 2007.