The Impact of Female Empowerment on Income Inequality
—Evidence from 96 Countries

Yujiao Li[1]

[1] The University of Sydney, School of Economics, Sydney, Australia
yuli7895@uni.sydney.edu.au

Abstract

This paper examines the impact of female empowerment on income inequality. The causes of income inequality have been widely discussed, but few studies pay attention to gender factors. This paper constructs indicators from the perspectives of reproductive health, political and educational rights, labor market participation and gender equality to measure women's empowerment in a country. The hypothesis here is that female empowerment can help promote income equality. After using the ordinary least square method to study the observations from 96 countries, the baseline results confirm this hypothesis. Keeping other conditions constant, empowering women in terms of fertility, politics, education and labor participation can reduce income inequality, although the significance is different. Moreover, equality of power between male and female can also promote overall income equality. In order to eliminate potential simultaneity problems, instrumental variables are used. The results of the two-stage least square method are basically consistent with the baseline results. Quantile analysis provides interesting insights. In countries with large Gini index, female participation in the labor market does not have a significant impact on income equality.

Keywords: *Female empowerment, income inequality, Gini index, instrumental variable, quantile regression.*

1.INTRODUCTION

Decades ago, women were not respected as they are now. They did not have the right to vote, could not legally own property, were not allowed to go out to work, and even could not decide their own marriage and childbirth. In the process of economic progress, women's well-being is gradually improved, with more freedom to participate in labor and more opportunities to create wealth. Changes in women's job opportunities and social welfare have impact on the overall economic situation of countries. There is a high probability that this impact may be reflected in income inequality. This paper examines whether the expansion of female rights will have an impact on total income inequality.

The level of female power is very uneven around the world. In many developed countries today, women are fully respected and even enter important positions in various industries to become decision makers. However, gender inequality still exists even today in some backward areas of the world due to feudal culture and unfair legal system. These backward areas can often be found to have both underdeveloped economic levels and more serious income inequality. There are many such studies, which reflect that gender is a factor worthy of consideration in the study of economic issues. Gender empowerment measures index (GEM) was used by the United Nations Development Program to measure female power in a country. The scatter plot drawn with this index and per capita GDP shows that the level of women's empowerment varies greatly between countries. Highly developed countries are more in the upper right corner, while less developed countries are more in the lower left. It is found by the study that women's rights are closely related to the country's economic development, and the correlation coefficient is as high as 0.8 [6]. The existence of this correlation provides a possible clue. The improvement of women's rights changes the previous gender roles to a certain extent. More women are no longer confined to housework, but participate in wealth creation. This change not only promotes the overall economic development, but also make the distribution of wealth more equal within countries.

Income inequality has existed for a long time, and researchers have never stopped exploring its causes.

Policymakers have also been trying to find ways to reduce inequality according to various possible causes. There are many studies pay attention to this topic from different angles, including history, politics, sociology and so on. This paragraph lists the potential factors affecting income inequality as the basis for the selection of variables below. Due to their representativeness and proven relevance, the following potential factors are often selected in empirical analysis. First, historical factors are widely mentioned. Among them, nations' colonial past is a potential driver of inequality [1]. The influence of colony may come from exploitation of resources [8]. Moreover, population characteristics such as immigration [5] and total population also have an impact on income inequality [4]. Second, the degree of development of a country will also affect income inequality. Kuznets' research in this field shows that with economic development, inequality in a country will first increase and then decrease [12]. According to experience, adding per capita GDP and the square of per capita GDP in the model can better measure the level of economic development. The development of a country can also be reflected in its degree of globalization, which also affects income inequality [11]. In addition, the influence of macroeconomic conditions is also considered in the literature. For instance, inflation tends to have a greater impact on low-income families [2] and high unemployment affects the income of working-class workers [9], all of which exacerbate income inequality.

The above studies analyse the causes of income inequality from traditional economic indicators such as GDP and inflation. In recent years, some scholars have also noticed that gender roles and power differences can be studied as a part of the potential causes of a country's overall income inequality. Most of them focus on female labor force and female employment, and find that women's greater participation in labor reduces income inequality [7]. Moreover, there is also some literature that focuses on women's empowerment in other areas. The increase of female representatives in the government promotes the policy to be fairer to women [3], which is reflected in the increase of women's voting rights and marriage and childbirth decision-making rights. This paper constructs indicators from four broad dimensions to investigate the impact of women's empowerment on income inequality. The specific construction and research methods are discussed in the next section.

2. METHODOLOGY

2.1. Model and Data

As mentioned above, many literatures in the past regard women's employment or participation in labor as an indicator to measure women's rights. From the perspective of cross-border comparison, this single index is not comprehensive. While referring to past experience, this paper also considers broader indicators that can reflect women's empowerment, including reproductive health, the right to participate in politics, access to education and so on. With the addition of more indicators, the impact of women's empowerment on income inequality can be examined from more dimensions. Further, it also provides some opportunities to obtain more detailed information. For instance, even if labor participation remains unchanged, expanding women's political rights may help reduce overall income inequality. Such researches may have some enlightenment on how to formulate relevant policies.

$$Income\ inequality = \alpha + \beta_i FE_i + \boldsymbol{\theta X} + \varepsilon_i \quad (1)$$

The observation object of this paper is countries, and the sample contains the information of a total of 96 countries. The empirical model can be written in the above general form, where FE represents each index of women's empowerment, matrix X contains other potential influencing factors of income inequality, α and ε are constant term and error term, respectively.

For the dependent variable, Gini index, as an international common index to measure the income gap of residents in a country or region, is selected to measure income inequality. Due to different calculation methods and emphases, the Gini index is not unique. The Gini index used in the following estimation is provided by the World Bank. It integrates the primary household survey database and the Luxembourg Income Study database. Table 1 shows the definition and descriptive statistics of variables used in the model.

Table 1: Definition and descriptive statistics of variables.

Variable	Definition	Mean	Standard deviation
Panel A. female empowerment (FE)			
RHI	Female reproductive health index, measured by maternal mortality ratio (MMR) and adolescent birth rates (ABR) (%)	24.84	26.40
PEI	Female political and educational index, measured by proportion of parliamentary seats occupied by females (PR) and proportion of adult females and males aged 25 years and older with at least some secondary education (SE) (%)	40.06	14.82

LMI	Female labor market index, measured by labor force participation rate of female aged 15 years and older (LFPR) (%)	53.74	11.17
GII	Gender inequality index, higher values imply greater inequality (%)	29.16	19.29
Panel B. income inequality			
GINI	A measure of individual or family income inequality in a country, higher values imply greater inequality (%)	35.81	6.99
Panel C. other variables			
Pop	Total population (million)	4.80	15.17
GDPpc	Log of per capita GDP (current US$)	8.98	1.39
GDPpc2	Log of per capita GDP – squared (current US$)	82.62	24.81
Inf	Inflation, GDP deflator (annual %)	9.07	57.05
Unemp	Unemployment rate (% of total labor force)	7.50	4.89
Glob	Globalization index (% of GDP)	69.17	14.14

This paper focuses on whether female's empowerment affects income inequality, so the main independent variables is female empowerment (FE). This paper uses four different dimensions of indexes to measure the degree of female empowerment in each country. They are female's reproductive health index (RHI), female's political and educational rights index (PEI), female's labor market index (LMI), and gender inequality index (GII). See Table 1 for specific definitions. The data source of these four women's empowerment indexes come from the Human Development Reports of United Nations Development Program. The specific construction methods of each index are as follows.

$$RHI = (\frac{10}{MMR} \times \frac{1}{ABR})^{1/2} \qquad (2)$$

$$PEI = (PR \times SE)^{1/2} \qquad (3)$$

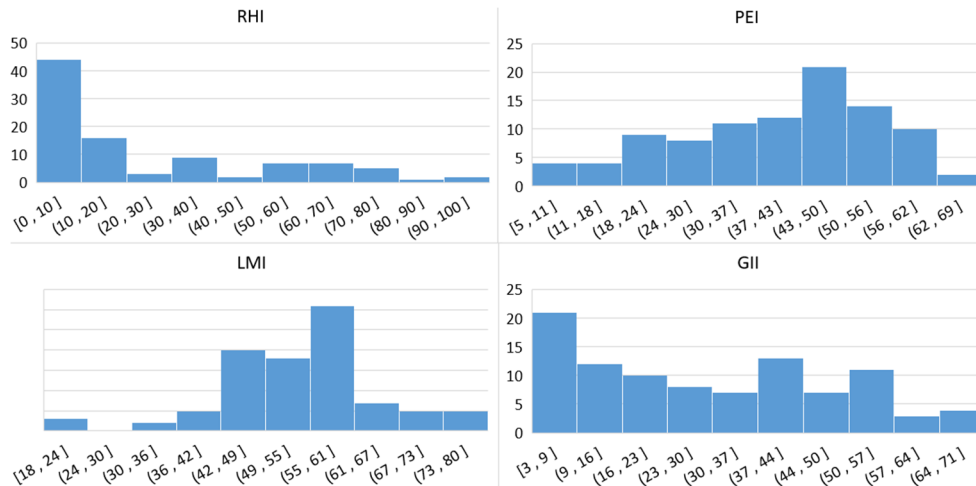$$LMI = LFPR \qquad (4)$$

Figure 1: Histograms of female empowerment indexes.

Figure 1 shows the histograms of the four constructed female empowerment indexes. The frequency distribution of relevant data can be roughly seen from the figure. Among them, female reproductive health index shows obvious right deviation, and most values are concentrated in 0% to 20%. In contrast, the distributions of female political and educational index and female labor market index are more symmetrical. Data of gender inequality index of various countries is relatively scattered. It should be noted that the higher the GII value, the lower the empowerment of women. The other three indicators are in contrast, with larger values representing greater female rights.

In addition to the above main variables, other influencing factors are included in matrix $\boldsymbol{X}$. This paper refers to the influencing factors that mentioned in the literature review part, and the following relevant independent variables are selected and added to the model. Data related to population, gross national product (and its square), inflation and unemployment are from the World Bank's World Development Indicators Database. Furthermore, in order to measure globalization, the KOF globalization index developed by KOF Swiss Economic Institute is selected here [10]. This index measures the degree of globalization of a country from three dimensions: economy, politics and society.

All data used in this article are available in the public domain. In order to ensure the reliability of each observation information, 96 countries with relatively complete data are selected as samples. In addition, the sample is selected to cover countries with diversified economic and human development levels as far as possible.

2.2. Estimation

As the baseline, ordinary least squares estimation is selected to study whether women's empowerment has an impact on a country's income inequality. The above four female empowerment indexes are taken as the main explanatory variables in turn. It must be noted that, there is potential simultaneity problem in the above model. The expansion of women's rights may help income equality, and income equality may also accelerate women's access to power. In order to solve this problem, this paper also employs an instrument variable to make two-stage least squares estimation of the model. The selection of instrumental variable and the specific research process are introduced in the results section.

3.RESULTS AND DISCUSSION

3.1. Baseline Model

The OLS estimation results are shown in Table 2. Focus on the results of the four indicators on women's empowerment, the results of OLS estimates confirm the view that giving women more power will reduce income inequality in a country. Among them, the results of reproductive health, labor market participation and gender inequality significantly affect income inequality, while the results of women's political and educational rights are not significant.

Table 2: OLS results.

Dependent variable: Gini Index (GINI)				
MODEL	1.1	1.2	1.3	1.4
RHI	-0.18***	-	-	-
	(0.04)	-	-	-
PEI	-	-0.10	-	-
	-	(0.07)	-	-
LMI	-	-	-0.16***	-
	-	-	(0.06)	-
GII	-	-	-	0.43***
	-	-	-	(0.07)
Pop	0.03	0.05	0.05	0.06*
	(0.04)	(0.04)	(0.04)	(0.04)
GDPpc	-5.73	4.50	7.51	9.86*
	(5.85)	(6.11)	(6.09)	(5.28)
GDPpc2	0.44	-0.22	-0.44	-0.38
	(0.33)	(0.33)	(0.33)	(0.28)
Inf	0.02**	0.03**	0.02	0.02**
	(0.01)	(0.01)	(0.01)	(0.01)
Unemp	0.32***	0.35**	0.40***	0.36***
	(0.12)	(0.13)	(0.13)	(0.11)
Glob	-0.14	-0.17	-0.17*	0.05
	(0.09)	(0.11)	(0.10)	(0.10)
Constant	62.61**	26.52	4.32	-39.95
	(24.27)	(26.17)	(27.27)	(25.23)
R-squared	0.63	0.51	0.55	0.61

The results of model 1.1 show that every 0.01 unit increase in the female reproductive health index will reduce the Gini index by 0.18. The significance of this result indicates that countries with low maternal mortality and adolescent birth rates have lower income inequality. When women have more work rights and participate more in the labor market, it will also significantly reduce income inequality in specific regions (model 1.3). In addition, when the focus is on gender inequality and not limited to women, model 1.4 suggests that the reduction of one point of gender inequality index GII will lead to the reduction of 0.43 points of income inequality index Gini. This shows us a possible mechanism. The link between women's empowerment and income inequality may come not only from women's rights themselves, but also from the differences between men's and women's rights. In other words, if there is a huge gap in the rights of people of different genders in a country, women are more likely to be exploited, thus increasing overall income inequality. Another indicator of women's empowerment observed in this paper is women's political and educational power. Although the significance is not strong, there are also signs that empowering women through more parliamentary seats and more educational opportunities can reduce income inequality.

The results in Table 2 have some other findings. Countries with large population bases tend to be more difficult to achieve income equality, which confirms that higher fertility may be associated with higher inequality. Per capita GDP does not show a clear relationship with income inequality, and so does the square term. Income inequality is also closely related to high inflation. One explanation is that low-income families tend to hold a larger proportion of current assets, which makes them more vulnerable to inflation, thereby increasing income inequality. Unemployment reduces the possibility of low-income people obtaining income through labor, and is also an important factor to aggravate a country's income inequality. The increase of unemployment rate per unit will increase the Gini index by 0.35. The results also show that the degree of national globalization described by the KOF index has a positive impact on reducing income inequality. Although model 1.4 shows slight opposition. This may be achieved through mechanisms such as trade and financial openness.

3.2. Potential Simultaneity Issue

The OLS models in table 2 are not completely reliable because there is likely to be a two-way relationship between women's empowerment and income inequality, that is, there is a potential simultaneity problem. The impact of women's empowerment on income inequality has been discussed above. Next, this paper takes into account that income inequality may affect women's access to power.

In order to solve the problem of simultaneity, this paper uses two-stage least squares estimation to study four female empowerment indicators again. For simplicity, this paper selects an instrumental variable that is related to four women's empowerment indicators at the same time - the origin of a country's law. As a key historical factor, the origin of law affects the possibility of women's access to power and equality in a national legal system. In addition, institutional inertia may also affect the progress of a country to achieve equality through various economic factors. The estimation results of 2SLS are reported in table 3.

Table 3: 2SLS results.

	Dependent variable: Gini Index (Gini) (2SLS)			
MODEL	*2.1*	*2.2*	*2.3*	*2.4*
RHI	-0.34***	-	-	-
	(0.13)	-	-	-
PEI	-	-0.50*	-	-
	-	(0.26)	-	-
LMI	-	-	-0.36	-
	-	-	(0.39)	-
GII	-	-	-	1.03***
	-	-	-	(0.31)
Pop	0.012	0.05	0.05	0.08*
	(0.04)	(0.05)	(0.05)	(0.05)
GDPpc	-14.12*	9.51	-6.27	19.25**
	(8.56)	(7.44)	(12.74)	(8.22)
GDPpc2	1.01*	-0.41	0.40	-0.68*
	(0.53)	(0.38)	(0.75)	(0.39)
Inf	0.02**	0.04***	0.03*	0.02*
	(0.01)	(0.02)	(0.02)	(0.01)
Unemp	0.31**	0.43***	0.18	0.39***
	(0.13)	(0.16)	(0.23)	(0.15)
Glob	-0.07	0.03	-0.32*	0.43*
	(0.11)	(0.17)	(0.17)	(0.22)
Constant	89.87***	-1.01	98.21	143.90**
	(32.01)	(33.65)	(76.77)	(60.81)
R-squared	0.41	0.38	0.18	0.47

For each female empowerment index concerned, the estimation result of 2SLS is basically consistent with that of OLS. Female reproductive health remains a significant factor affecting income inequality (model 2.1), as does the gender inequality index GII (model 2.4). It is worth noting that after the instrumental variable method is used in model 2.2, the role of expanding women's political and educational rights in reducing income inequality becomes more obvious. However, the impact of women's labor market participation is not as significant as in OLS estimation.

Consistent with the baseline forecast, the impact of inflation and unemployment on a country's income inequality remains significant. The role of aggregate economic level (measured by GDP) remains indistinct. In model 2.4 about gender inequality, each coefficient shows significance, and the goodness of fit of this model is also the best of the four models.

3.3. Quantile Analysis

The impact of female empowerment on countries with different levels of income inequality may be various in magnitude. Countries with large gaps in income inequality are likely to have quite different historical backgrounds and political systems, which may lead to different effects of female empowerment. When women's rights do improve, some unique factors at the national level may amplify or reduce the impact of this improvement. Therefore, this paper adopts quantile regression and reports the results in table 4 below.

Next, quantile regressions are adopted to study the above hypothesis. The results are shown in Table 4.

Table 4: Quantile analysis.

Dependent variable: Gini Index (Gini)											
Panel A: RHI			Panel B: PEI			Panel C: LMI			Panel D: GII		
q25	*q50*	*q75*	*q25*	*q50*	*q75*	*q25*	*q50*	*q75*	*q25*	*q50*	*q75*
-0.17**	-0.19***	-0.15*	-0.18	-0.07	-0.01	-0.17***	-0.18*	-0.18	0.36***	0.53***	0.49***
(0.03)	(0.04)	(0.08)	(0.08)	(0.13)	(0.13)	(0.06)	(0.07)	(0.07)	(0.12)	(0.17)	(0.12)

The results in table 4 prove that the above hypothesis is true in some specific dimensions. Panel C shows the impact of women's labor market empowerment on income inequality. This effect is significant only in q25 and q50 quantiles, but not in q75 quantile. This shows that in countries with serious income inequality, women's participation in labor does not have an obvious effect on income equality. This may be due to the fact that in countries with extremely unequal income, objectively existing salary or redistribution policies prevent women from obtaining income through participation in labor.

Furthermore, as shown in panel A and panel D, female reproductive health and gender inequality are significant in every quantile regression. Interestingly, these two factors both have the strongest effect in q50 quantile regressions. Panel B can also confirm the results of the baseline model. The improvement of women's political and educational status does not significantly help reduce income inequality.

4.CONCLUSION

Income inequality has always been a frequently studied topic in the field of economics. In previous studies, gender factors were rarely mentioned. This paper examines the impact of women's empowerment on the country's overall income inequality from four different perspectives.

The main assumption of this paper is that the greater the empowerment of women in the country, the lower the overall income inequality. The results of the empirical model basically support this hypothesis. Specifically, women's access to more reproductive health, politics, education and participation in labor can help reduce income inequality in the region. Although the significance of these factors on income inequality is not equal. Furthermore, inequality between men and women also has a significant impact on income inequality. People in countries with relatively equal gender are more likely to receive more equal income.

Subsequently, the join of instrumental variable solves the potential issue of simultaneity. The results are basically consistent with the baseline. This adjustment makes the role of women's political and educational power on income inequality more obvious. However, at this time, the significance of the impact of labor market participation is reduced.

Policy makers often ignore the impact of gender power on income inequality. This study can bring some enlightenment. Inequality in income distribution may be partly due to the lack of empowerment of women. Paying more attention to the protection of women's reproductive health may be more effective than other measures. Gender equality also helps a country achieve better redistribution.

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