

In the Short-Term Global Economic Environment: How do the Consequences of Covid-19 Affect Inequality in Income Levels Between Genders

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ABSTRACT

This paper focuses on whether trends in the world economy have had an impact on gender inequality resulting in income inequality between men and women. This paper is examining which variables are significant causes of the existence of the gender income gap, in the context of negative world economic growth and the impact of Covid-19. To study these factors, the paper also uses a large amount of data from the HDR (Human Development Reports), discussing the means and regression analysis of the variables, for example, average schooling year and unemployment rate. The regression model is optimized by removing insignificant variables, and the influence of these dependent variables on wage difference is analyzed according to the regression data. Ultimately the paper concludes that at a time when the world economy is trending in a negative direction, rising unemployment rates are going to have a greater impact on the income inequality between men and women in the world than past few years. Specifically, it is causing the income gap to become even larger in the face of the already unequal income between men and women.

Keywords: *Income inequality, gender inequality, covid-19, unemployment rate*

1. INTRODUCTION

In March 2020, the World Health Organization officially declared the novel corona-virus (COVID-19) a pandemic (World Health Organization, 2020)^[11]. With the global economic impact of the epidemic, short-term economic growth trends are not encouraging. The IMF has lowered its global growth forecast for 2020 from 3.3% to -3%, with developed economies expected to shrink by -6.1% and COVID-19 global GDP losses next year likely to be around US\$9 trillion (Long & Ascent, 2020)^[18]. In an environment of negative economic growth, economic activity decreases, unemployment pressure on the world's population rises sharply and income levels fall at the same time. Under these conditions, the issue of income inequality due to gender differences is once again at the forefront of today's society and a major challenge on the road to sustainable human development.

Even before the onset of the epidemic, income inequality due to a range of gender inequalities had been a problem that was difficult to address on a global scale. Now the problem of income inequality has been exacerbated by COVID-19. Farré et al. (2020)^[9] collected a large amount of Spanish household data on unemployment and income in May 2020 and found that the economic shock and social panic caused by

COVID-19 increased gender inequality in paid and unpaid work in the short term (Farré, L., Fawaz, Y., González, L., & Graves, J., 2020)^[9]. COVID-19 has had a strong impact on service industries and has caused many countries to experience a decline in GDP, economic recession, and ultimately a significant increase in unemployment and income inequality through its impact on global supply chains and international trade (Ibn-Mohammed et al., 2021)^[12].

Because income inequality has persisted as a widespread problem, most current academic research has been based on data from one region and the general impact of COVID-19 on the economy to explain income inequality, but it has not been possible to accurately describe the effective factors of COVID-19 affecting income inequality between men and women. It seems necessary to investigate the relationship between the current increase in income inequality and COVID-19. Through the research, we can find the specific relevant factors leading to income inequality between genders, so as to obtain relatively mature solutions for these factors to narrow the inequality gap. Therefore, the objectives of this study are as follows: 1. The economic consequences of COVID-19. 2. The prevalent factors contribute to income inequality between men and women at the global level. 3. The economic consequences of COVID-19 have a new impact on these factors.

2. LITERATURE REVIEW

Kuhn and Shen (2013)^[16] show that there is a great deal of gender discrimination in the Chinese labour market in online recruitment advertisements. They found that advertisements for women had a variety of requirements other than work experience, such as their appearance, body shape, age and even childbirth plans; while advertisements for men had essentially only age and work experience requirements. Henrik (2019)^[14] claims that women's income levels drop sharply after the birth of their first child, which results in women earning about a fifth less than men over a lifetime. As described in the two studies mentioned above, they argue that income inequality between men and women is due to gender discrimination and the birth of a child. However, neither study discusses in detail the causal relationship between the factors contributing to income inequality between men and women and the income gap because of regional and data sample limitations. I would prefer to discuss the causal relationship between gender differences in income disparity and multiple factors in a global context that is influenced by the economic consequences of COVID-19.

2.1 Education

Coady and Dizioli (2018)^[5] found that a statistically different relationship between average years of schooling and income inequality for different groups, which may be positively or negatively correlated. Although they do not use gender as a variable, there is still a lot of uncertainty about the possible correlation between years of schooling and income inequality between men and women. Balamoune–Lutz and McGillivray (2015)^[3] even used the data to find that gender inequality in education may have a positive impact and contribute to higher earnings but is accompanied by greater gender inequality and income inequality. Taking these studies together I suspect that years of schooling by gender in the broader context of COVID-19 influence does not have a strong correlation with income inequality between men and women and that the correlation between them is likely to be negative.

2.2 Unemployment Rate and Labor Force Participation Rate

Bošković and Njegovan (2012)^[4] analysis of labour market trends over the last decade shows that the status of women has deteriorated, participation in economic activity and employment has decreased, unemployment has increased, and the average time spent looking for work and the share of women in traditionally female occupations has increased. Albanesi and Şahin (2018)^[2] find that labour force dependency convergence leads to an increase in women's labour force participation rate from 43% in 1970 to 60% in 2000, while men's labour force participation rate decreased from 80% in 1970 to

75% in 2000. Fad'oš and Bohdalová (2019) examined the relationship between gender inequality and unemployment levels and found that unequal treatment of women in the labour force is prevalent in society. Landivar, Ruppner, Scarborough and Collins (2020)^[17] note that COVID-19 exacerbates gender inequality and has a long-term negative impact on female employment. Mothers with young children are the most severely affected, with the largest declines in labour force participation rates. This is consistent with my conjecture. I think covid-19 has further exacerbated the inequality between men and women while increasing the unemployment rate and in the world. And in an environment where the labour participation rate of women has been lower than that of men, the impact on women's income is greater, and the gender income gap is opened again.

2.3 Life Expectancy and Share of Parliament

In their study, Kim and Kim (2014)^[13] point out that gender inequalities in education and labour force participation appear to have a significant potential impact on healthy life expectancy at birth. This is a side note that the causes of gender inequality in today's society tend to interact in a cycle. Dreher et al. (2015)^[7] develop that women face on average much lower political representation than men in all developing regions. Assisting women in health and education and empowering them with certain political rights can be effective in reducing gender inequality. Mastracci (2017)^[19] Women's gender inequality is largely concentrated in public sector management, administration and politics. Policies that increase women in parliament, leadership, and ministerial positions mitigate inequality as measured by the Gender Gap Index. The findings of Kolip and Lange (2018)^[15] show that gender inequality affects life expectancy and average life expectancy for both men and women and those gender equality policies remain necessary. Aburto et al. (2021)^[11] said that in 2020, most countries lose more life expectancy for men than for women because of COVID-19. But this does not seem to affect the original income inequality trends.

3. METHODOLOGY

This study will use a quantitative research method so that the data can be observed more intuitively. The impact of each different factor on the gender-wage gap is studied through significance and correlation analysis, so that this paper can demonstrate the impact of the gender gap on earnings in 2020 after being influenced by COVID-19. And whether there are any major changes compared to the data for 2019. The primary data was collected from the United Nations, Human Development Reports (2021)^[11] with 167 countries selected for observation, including most countries in the world. The dependent variable is the income gap between men and women and the five independent variables provided in the data-set are the average school

year, labour force participation rate, life expectancy, the share of seats in parliament, and unemployment rate. A descriptive analysis of the Measures of Central Tendency (i.e. mean, median and mode) of the five independent variables was used to provide a simple understanding of gender inequality. A correlation study was then conducted as a regression equation. By regressing each of the independent variables, the two least significant variables were selected, removed and finally regressed again using three independent variables that were relatively more relevant to the income gap between men and women. Finally, the significance of the regression results was tested using T-Text.

3.1 Income Difference

First, I chose the 167 countries' estimated gross national income per capita of male and female wage data from Human development reports (2021)^[11] and used these global data as a basis to calculate the average wage difference between men and women as \$12,247.4. This means that men in each group earn on average \$12,247.4 more per year than women. As shown in Figure 1, the plurality and median of the wage gap are not convincing because only half of the sample significantly shows the wage gap between men and women. The gender wage gap for each country will be used as the dependent variable in the data below.

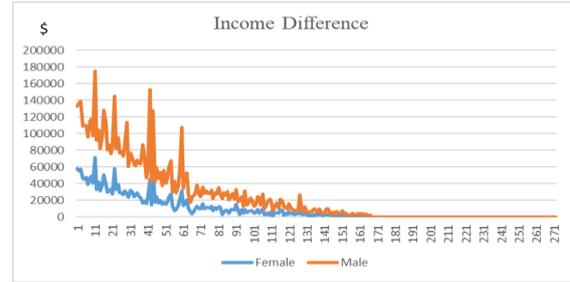


Figure 1 A line graph of the wage differential between men and women (women minus men) in 167 countries' estimated gross national income per capita, by the size of the gap.

3.2 All variables regression

Based on data from Human development reports (2021)^[11], I found five variables that are related to the relationship between gender and income inequality: average years of schooling, labour force participation rate, life expectancy, unemployment rate and share in parliament. The correlations were determined by using regression equations and analytical plots for the five independent variables of female minus male averages and income gaps from the data for 167 countries. And to prepare for my final plan to remove the two least significant independent variables. The following equation was obtained from Table 1.

$$Y = -16888.65 - 3165.70 \beta_1 + 99.99 \beta_2 + 895.82 \beta_3 - 2143.28 \beta_4 - 66.99 \beta_5$$

β_1 is average years of schooling (AYS), β_2 is labor force participation rate (LFPR), β_3 is life expectancy (LE), β_4 is unemployment rate (UR), β_5 is share in parliament (SP).

Table 1. Relationship between Average Years of Schooling, Labor Force Participation Rate, Life Expectancy, Parliamentary Share, Unemployment and Income Gap by Gender

Multiple R	0.60851				
R Square	0.37029				
Adjusted R ²	0.35073				
Standard Error	8530.8				
Observations	167				
ANOVA					
	df	SS	MS	F	SF
Regression	5	6.90E+09	1.40E+09	18.9349	8.75E-15
Residual	161	1.20E+10	7.30E+07		
Total	166	1.90E+10			
	COE	SE	t Stat	P-value	L 95%
Intercept	-16888.66	2661	-6.3467	2.10E-09	-22143.6
Schooling	-3165.698	662.87	-4.7757	4.00E-06	-4474.7
Labor Participation	99.99566	50.3772	1.98494	0.04885	0.5104

Life Expectancy	895.814	358.676	2.49756	0.01351	187.499
Unemployment	-2143.276	397.695	-5.3892	2.50E-07	-2928.6
Share of Parliament	-66.98737	29.6968	-2.2557	0.02544	-125.63

The \bar{R}^2 of this regression is 0.37, which indicates that 37% of the difference in wages between women and men is influenced by five independent variables: Average Years of Schooling, Labor Force Participation Rate, Life Expectancy, Parliamentary Share and Unemployment. Because the \bar{R}^2 is 0.37, the fit of the model is not excellent and the model needs to be corrected. So I decided to remove the three independent variables with relatively large p-values, i.e., relatively insignificant enough: labour force participation rate, life expectancy, and parliamentary share. Finally, we do an

F-test to see if all the job variables are jointly zero, and if they are not jointly zero, we have to keep all the job variables.

$$H_0: \beta_2 = \beta_3 = \beta_5 = 0$$

$$H_1: \beta_2, \beta_3 \text{ and } \beta_5 \text{ are not zero}$$

When all three independent variables are equal to zero, the value of the F-test according to Table 2 is equal to 6.29 This indicates that these three variables are indeed not very effective in explaining the variation in the income gap between men and women.

Table 2: Relationship between Labor Force Participation, Life Expectancy, Parliamentary Share, and Income Gap by Gender

Multiple R	0.322055				
R Square	0.103719				
Adjusted R ²	0.087223				
Standard Error	10114.9				
Observations	167				
	df	SS	MS	F	S F
Regression	3	1.9E+09	6.4E+08	6.28756	0.000460
Residual	163	1.7E+10	1E+08		
Total	166	1.9E+10			
	COE	SE	t Stat	P-value	95%
Intercept	-12028.7	2897.53	-4.1514	5.31E-05	-17750.26
Life Expectancy	508.0313	378.506	1.3422	0.181397	-239.3756
Parliament	-72.8053	35.0402	-2.0778	0.039299	-141.9966
LaborParticipation	220.8066	55.0916	4.00799	9.3E-05	112.02137

4. RESULT

4.1 Average Years of Schooling

Table 3: The relationship between average years of schooling and gender income gap

Regression Statistics					
Multiple R	0.338858				
R Square	0.114825				
Adjusted R ²	0.10946				
SE	9990.934				
Observations	167				
ANOVA					
	df	SS	MS	F	SF
Regression	1	2.136E+09	2.1E+09	21.40374	7.49E-06
Residual	165	1.647E+10	1E+08		
Total	166	1.861E+10			
	COE	SE	t Stat	P-value	95%
Intercept	-12331.2	894.74871	-13.781	3.03E-29	-14097
MSY	-3176.62	686.62731	-4.6264	7.49E-06	-4532

In Table 3 is an independent variable. The dependent variable is the difference in average earnings between the different genders (i.e. female minus male). We can obtain an equation like this.

$$Y = -12331.15 - 3176.7 \text{ AYS}$$

According to the data obtained from the calculation, the average years of schooling for females minus males is -0.656 years, meaning that on average every female in the world attends 0.656 years less school than males. This is because the average difference is negative. So according to the equation above, every time the average years of schooling for women increases by one year, which means that the difference between the average years of schooling for men and women decreases by one year; the income gap between men and women narrowed by \$3,176.7, which is the average wage for women increases by \$3,176.7. But even if the average years of schooling finally make women exceed that of men, there is still a large gap in their average earnings. And according to the R-squared value, it is again shown that only 11.5% of the difference in earnings by gender is represented by the change in the difference in the average years of schooling by gender. The p-value of the t-test in this model is $7.5E-06 < 0.05$ and the test

statistic is -4.63, so the correlation between the two data sets is highly significant.

Therefore, we reject the hypothesis $H_0: MYS=0$ and consider that the difference between the average years of schooling of men and women significantly affects the difference between the wages of men and women. Once equal to zero, it affects the average wage difference between men and women. The regressions use 95% confidence intervals, and the range of impact on the difference in average earnings between genders is \$4582.33 and \$1820.92 for each year of change in the difference of the average years of schooling.

4.2 Unemployment Rate

In this section, I assume that the average unemployment rate for males in 167 countries around the world is in unit 1 and the female unemployment rate makes use of the male unemployment rate as a percentage of the base. Using the data, the average female unemployment rate minus the male unemployment rate is obtained as 0.58. This means that on average, for every 1% increase in the male unemployment rate, the female unemployment rate increases by 1.58%.

Table 4: The relationship between the unemployment rate and gender income gap

Regression Statistics					
Multiple R	0.49653813				
R Square	0.24655011				
Adjusted R Square	0.24198375				
Standard Error	9217.61617				
Observations	167				
ANOVA					
	df	SS	MS	F	SF
Regression	1	4.6E+09	4.59E+09	53.99267	8.83E-12
Residual	165	1.4E+10	84964448		
Total	166	1.9E+10			
	COE	SE	t Stat	P-value	Lower 95%
Intercept	-8651.4351	745.618	-11.603	3.87E-23	-10123.62
UR	-2761.1402	375.769	-7.34797	8.83E-12	-3503.076

In Table 4, the independent variable is the difference in unemployment rates between the sexes, while the difference in average earnings is treated as the dependent variable. Thus, we can obtain the following equation.

$$Y = -8651.4 - 2761.1 UR$$

In this equation, for every 1% decrease in the rate of female unemployment over male unemployment, the average earnings gap decreases by \$2,746.1, which means that women's wages increase by \$2,746.1. This means that the higher the female unemployment rate is, the more pronounced the earnings gap is. Based on the R-squared equal to 24.7%, we can know that the 24.7% change in the average wage gap between men and women is caused by the change in the ratio of the

female unemployment rate over the male unemployment rate.

The p-value of the t-test of this model is 8.8E-12 and the static value of the test is -7.3; therefore, we reject the hypothesis that $H_0: UR=0$ and consider that the difference in the unemployment rate between men and women significantly affects the difference in the average wage between men and women. This implies that the difference in the rate cannot be zero. There is a 95% confidence interval for the male/female unemployment rate ratio, implying that every 1% change in the rate will have an impact on the difference in average wages between men and women, ranging from \$2019.2 to \$3503.1.

4.3 Multiple Regression

Table 5: Multiple Regression Analysis of Average Years of Schooling and Unemployment Rate

Regression Statistics					
Multiple R	0.566309				
R Square	0.320706				
Adjusted R ²	0.312422				
Standard Error	8778.903				
Observations	167				

ANOVA					
	df	SS	MS	F	SF
Regression	2	5.97E+09	2.98E+09	38.7136	1.693E-14
Residual	164	1.26E+10	7706915		
Total	166	1.86E+10			
	COE	SE	t Stat	P-value	95%
Intercept	-10465.67	829.5359	-12.61629	6.148E-26	-12103.616
MYS	-2577.988	609.2762	-4.231231	3.857E-05	-3781.0253
UR	-2548.024	361.4112	-7.050208	4.728E-11	-3261.6435

After adjusting for the three relatively non-significant variables, the new regression model Table 5 has an R-squared of 0.34. With a total sample size of 167 countries, this is only weakly correlated, still makes this an acceptable regression model. The correlation suggests that 34% of the average wage gap between men and women can be explained by this model. A new equation was obtained.

$$Y = -10465.7 - 2578 \alpha_1 (AYS) - 2548 \alpha_2 (UR)$$

In the remaining two variables, it can be found that average years of education and unemployment rate have essentially the same effect on the wage gap between genders, and both are highly significant. Through multiple regression analysis, average years of schooling and unemployment rate are two important causes of gender inequality that eventually lead to income inequality.

5. DISCUSSION

Comparing the data of Conceição (2019)^[6] in the "Human Development Report 2019" for the years 2007-2018 and the data given in the report in 2021 "The statistics for 2019", the results indicate a visible trend of increasing income inequality due to gender inequality. Because income inequality and gender-related inequality can interact through multiple factors, gender inequality directly contributes to the income gap. Consistent with the hypothesis, COVID-19 does increase gender and income inequality. These results build on the existing evidence that both unemployment and average years of schooling are important contributors to gender and income inequality given the available data, however the effect of COVID-19 on average years of schooling is long-term and does not produce sharp fluctuations in the short term. Therefore, the difference in unemployment rates by gender is the ultimate factor that should be most affected by COVID-19 to increase gender inequality and thus make a big change globally. Because COVID-19 only existed for one month in 2019, the data for 2019 should only be affected to a limited extent and does not give a complete picture of the trend of increasing income inequality due to gender inequality that correlates well with

COVID-19. Although it can only be said that there is a very obvious upward change in inequality in the past 2019 development environment, the upward trend in 2019 is more obvious by comparing the data, which also means that the international community may have been affected by the same factor at the same time. And many scholars affirm this also makes the claim that the consequences caused by COVID-19 have an increased impact on gender and income inequality somewhat confirmed. It is just not possible to analyze the exact extent of the impact of COVID-19 on inequality using large global data. These data will hopefully help scholars who have plans to analyze UN Development Agency data for 2020, which was affected by COVID-19 for a full year, to get a more specific picture of how the data changed and the extent of the impact. It also gives scholars who are currently studying the impact of the economic environment around the world some help from the underlying economic data. As Gonzales et al. (2015)^[10] have argued, gender inequality is closely related to income inequality for all income groups in countries at different stages of development. In developed countries, the gender gap in education is gradually narrowing, economic opportunities of different genders are becoming more equal, and income inequality is mainly caused by the rate of participation in economic activities. In developing countries, gender gaps in education and health are more unequal. Women are so eager for equal opportunities that efforts to achieve gender equality and increase female economic participation are more conducive to development outcomes and lower income inequality.

6. CONCLUSION

COVID-19 had serious consequences for the world economy, leading to a recession, a significant rise in unemployment, and a worsening of already long-standing gender inequalities caused by income inequality. From the study of Human development reports 2021 data, five factors were found to influence the gender inequality index and finally lead to the income gap between genders, namely, average years of schooling, labor force participation rate, Since the differences between men and women in labour force participation rate, life expectancy and share in

parliament and the income gap Since the significance of the differences between men and women in labour force participation rate, life expectancy and share in parliament is not very strong, the three variables that are relatively insignificant are removed. Finally, through a series of individual variables regression analysis and model optimization, the two most significant and most influential variables on income inequality, average years of schooling and unemployment rate, were selected. Combined with today's context, COVID-19 does not bring about substantial fluctuations in the average years of schooling of men and women in the short term, so only COVID-19's effect on the increase the unemployment rate is the most important factor that exacerbates income inequality in 2019. But because COVID-19 does not have an impact on the whole year in 2019, the data for 2020 are relatively important. And because global data for 2020 are not available, it can only be predicted that COVID-19 will continue to have a negative impact on economic activity in the future, and will further exacerbate income inequality caused by gender inequality. This study can clearly analyze the significant factors affecting gender income inequality, and can help countries or international organizations committed to reducing income inequality find the right direction and more effective solutions. In conclusion, I think the impact of COVID-19 on unemployment and other factors in 2019 is already significant, but the impact on economic participation is expected to be even greater in 2020.

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