An Empirical Analysis of the Impact of Unemployment Rate and Economic Development Level on Income Inequality

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Abstract:

This study used linear regression analysis to inspect influence of unemployment rates and economic development levels on income inequality in the United States and Germany. The results indicate that the level of economic development is the main driving factor for inequality of income in America, while in Germany, high unemployment and inflation can exacerbate income inequality. This study emphasizes the importance of labor market policies, social welfare policies, and tax policies in reducing income inequality. While the analysis only covers two countries, the results have significant policy implications for addressing income inequality. Future research can expand on the factors that contribute to income inequality.

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1.0 INTRODUCTION

Income inequality has always been a long-standing problem in many countries around the world. In recent years, this issue has attracted attention due to its adverse effects on economic growth, social stability, and poverty reduction. Although the factors contributing to income inequality are complex and multifaceted, this study focuses on the impact of unemployment rates and economic development levels in America and Germany on income unfairness. In addition, this study analyzed how foreign direct investment and consumer price indices affect income inequality in these two countries. The United States and Germany are two prominent economies with vastly different economic systems, but both countries are struggling with income inequality. Similarly, in Germany, although the country is famous for its strong welfare state, income inequality has been increasing since the beginning of the 21st century.

The purpose of this research is to improve our comprehend and understanding of the driving factors of income unfairness in America and Germany. From the perspective of national governments, this study is important and meaningful as income inequality can affect economic growth, social welfare, and political stability. By identifying the key determinants of income inequality, policymakers can develop effective policies to address this issue. The relevance of this study lies in increasing literature on the effect of unemployment rate and economic development level on income unfairness, while also considering foreign direct investment and consumer price index as potential drivers of income inequality. Previous studies either focused solely on unemployment or economic development or did not explore the role of foreign direct investment and consumer price indices in shaping income inequality. This study provides a comprehensive analysis that considers all four factors simultaneously, which is crucial for policymakers seeking to design effective policies to reduce income inequality.

This paper is guided by three research objectives: firstly, using relevant economic data from the United States and Germany, to study the connection between economic development level, unemployment rate, and income unfairness; Secondly, study the role of foreign direct investment and consumer price indices in causing income inequality in these two countries; Thirdly, analyze the potential interaction between these factors and income inequality. To achieve these goals, this study uses the Gini coefficient as the dependent variable, and unemployment rate, per capita GDP, CPI, and FDI as independent variables. The main part of this paper is organized as follows:

2.0 shows the trend of changes in the Gini coefficient in Germany and the United States. 3.0 presents a literature review of the references used in the research paper. 4.0 discusses data and regression analysis methods. Finally, 5.0 introduces and discusses the empirical analysis results. 6.0 Draw conclusions.

2.0 Trend

Figure 1 shows the trend changes in Gini coefficient in Germany from 1991 to 2018. In economics, the Gini index is a statistical discrete measure aimed at representing income inequality, wealth inequality, or consumption inequality. In this chart, the closer the Gini index is to 0, the more equal it is, while the closer the index is to 100, the more unequal it is. From this graph, it can be seen that the German Gini coefficient presents a fluctuating upward trend.
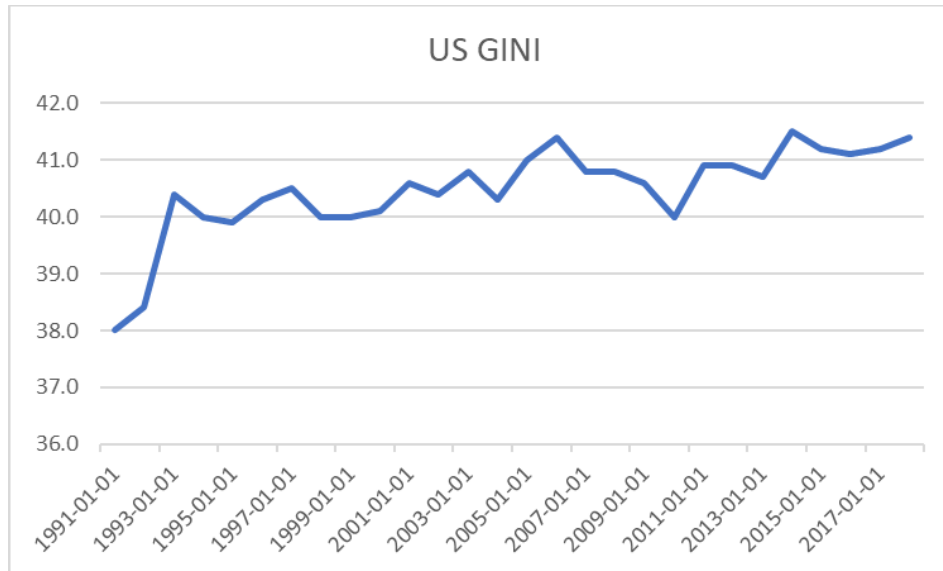
Figure1: Variation Diagram of Gini Coefficient in Germany
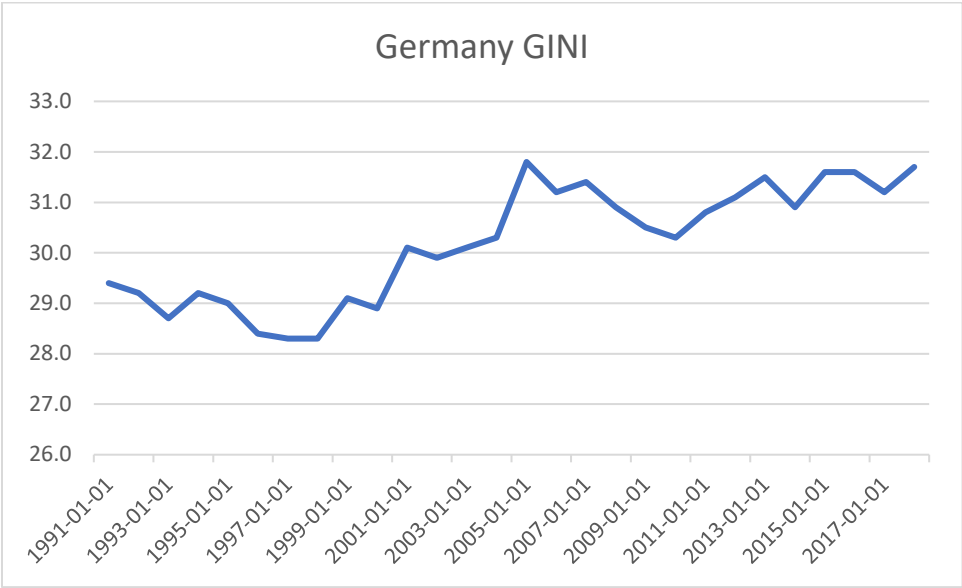
Source: FRED Economic Data

Figure 2 shows the change trend of the Gini coefficient in United States from 1991 to 2018. From this graph, it can be seen that the United States Gini coefficient presents a fluctuating upward trend.

Figure2: Variation Diagram of Gini Coefficient in United States

US GINI

Source: FRED Economic Data

3.0 LITERATURE REVIEW

Not only in the America and Germany, but also in other countries, income inequality is a major issue. The study investigated the factors that contribute to income inequality. This literature review examines previous research findings on factors affecting income unfairness in America and Germany. The paper by Autor and Dorn (2013) found that the key factors leading to inequality of income in America are the increase of less-technical ability service industry works and the unequal supply of the America manpower market. Heimberger (2018) conducted a cross-border analysis and found that employment has a remarkable influence on income unfairness. The paper suggests that countries with higher employment rates are accompanied by lower levels of income unfairness, which is higher in countries with lower employment rates. Meanwhile, Rehm and Biewen (2014) argue that the connection between unemployment rate and income inequality in Germany changed in the early 21st century. They found that unemployment is no longer an important predictor of income inequality in Germany. This discovery is not only found by Rehm and Biewen, but also by Schmid and Modrack (2014), which found that this relationship weakened in the early 21st century. The study attributed the change to policies aimed at increasing the flexibility of the German labor market.

Burkhauser, Larrimore, and Simon's (2012) paper showcases the economic fitness of the American bourgeoisie, and they found that although this class did not decline, it did not experience substantial growth. The OECD (2011) released a report on the intensification of income inequality, which found that in the past few decades, income inequality has risen in most OECD countries, with the America having the highest level of income inequality. Meanwhile, Saez (2017) studied income unfairness in America and found that income inequality is at its highest level since the 1920s. In addition, research has found that between 2009 and 2015, the highest 1% of people accounted for 52% of the total income growth in the US, which is a typical manifestation of income inequality. Economic development level has also been found to be a significant factor in income inequality. Kaldor (1957) proposed that economic growth would lead to a reduction in income inequality, because economic growth will increase the demand for labor, leading to an increase in worker wages.

However, subsequent research results were mixed. Dollar and Kraay (2002) used 40 years of data from 63 countries and found that economic growth has a slight adverse effect on income unfairness, but this effect is not statistically remarkable. Meanwhile, Alesina and Rodrik (1994) found no clear relationship between income unfairness and economic growth in a sample of 16 developed countries. More recent researches have focused on the impact of globalization on income unfairness. Milanovic (2016) argued that globalization has contributed to the rise of income inequality by creating winners and losers in the global economy. The winners tend to be highly skilled workers in developed countries, while the losers tend to be low-skilled workers in developing countries. Milanovic also found that the indirect impact of globalization has led to a decrease in the proportion of labor income to GDP, further exacerbating income inequality. Similarly, Stiglitz (2012) argued that globalization has contributed to the rise of income inequality by allowing capital to flow freely across borders, while labor remains constrained by national borders. This has led to a situation where capital owners can extract more value from workers, while workers are unable to negotiate better wages and working conditions. Stiglitz also pointed out that the impact of globalization will also lead to a decrease in the power of trade unions, further weakening the bargaining power of workers, thereby affecting their ability to compete for their legitimate rights. Other scholars have pointed out the role of technological change in leading to income unfairness. Brynjolfsson and McAfee's (2014) study suggests that technological progress leads to extreme inequality in the labor market, where highly skilled

workers benefit from acquiring new technologies, while low-skilled workers are easily replaced due to a lack of technology. They also pointed out that the decrease in the proportion of labor income due to technological progress has further exacerbated income inequality.

In summary, the literature review indicates that the connection between unemployment rate and income unfairness is worth studying and varies among countries. However, higher employment rates tend to lead to lower levels of income unfairness. Moreover, the review highlights the growing income inequality in many countries, particularly in the United States. Policymakers should consider implementing measures to address income inequality, such as policies aimed at increasing employment rates, progress sive taxation, and social welfare programs. The literature on the effect of unemployment rates and economic development levels on income unfairness is extensive and multifaceted. Although there is consensus that employment rates and economic growth can have a certain effect on reducing income unfairness, the relationship is complex and depends on a range of factors, including globalization, technological change, and government policies. It is evident that addressing income inequality requires comprehensive consideration, taking into account various factors, and seeking to create more equitable resource and opportunity allocation.

4.0 Data and empirical methodology
4.1DATA

The study used data from 1991 to 2018. This paper mainly uses time series for research. The data mainly comes from the Federal Reserve's economic data website. The publicly available FRED data includes data on major economic indicators in the United States and Germany. Table 1 and Table 2 provide a summary of statistical data.

Table 1 Describe the statistical analysis about Germany

Variable	n	min	max	average	sd
GINI	28	28.300	31.800	30.193	1.153
unemployment rate	28	3.400	11.200	7.400	2.135

Table 1 Describe the statistical analysis about Germany

Variable	n	min	max	average	sd
CPI	28	0.315	5.075	1.809	1.142
Foreign direct investment net inflows	28	-20.410	248.010	57.095	55.074
GDP per capita	28	30615.140	42928.741	36124.968	3903.955

According to the descriptive statistical analysis of sample data in Germany, the average GINI is 30.193, the average unemployment rate is 7.400, and the average CPI is 1.809. The average Foreign direct investment net inflows were 57.095 and the average GDP per capita was 36,124.968.

Table 2 Describe the statistical analysis about United States

Variable	n	min	max	average	sd
GINI	28	38.000	41.500	40.471	0.796
unemployment rate	28	3.900	9.630	5.933	1.593
CPI	28	0.012	0.334	0.188	0.075
Foreign direct investment net inflows	28	30.310	511.430	219.135	129.923
GDP per capita	28	38739.800	59607.390	49978.277	6097.942

According to the descriptive statistical analysis of sample data in America, the average of GINI is 40.471, the average of unemployment rate is 5.933, and the average of CPI is 0.188. The average for Foreign direct investment net inflows was 219.135, while the average for GDP per capita was 49,978.277.

4.2 EMPIRICAL MODEL

The model of this research paper is:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$$

Table3 Variable meaning and description

	symbol	variable	meaning
dependent variable	Y	GINI	a measure of income inequality within a population
Core explanatory variables	X1	Unemployment Rate	The proportion of labor force who are in process of seeking job despite temporarily losing their jobs
	X2	GDP per capita	the total GDP of a country divided by its population
control variable	X3	Customer Pirce Index	This is used to measure the average price at which households purchase a basket of goods and services
	X4	Foreign direct investment net inflows	This represents an investment by a company from country A in a company or entity

			from country B.

These independent variables are significant indicators of a country's economic performance and can have a substantial effect on income unfairness. The unemployment rate, for instance, may be positively correlated with income inequality since the unemployed may have little access to income and resources, while those who are employed earn relatively higher incomes. The per capita GDP is positively associated with income inequality as higher levels of wealth may translate into a higher concentration of income among the rich. CPI, on the other hand, may have a negative association with income inequality since inflation disproportionately affects those with low-income. Finally, FDI may have a positive association with income inequality since it may lead to more concentration of wealth among foreign investors, who are often wealthy.

In summary, this model seeks to explain income inequality by examining the connection between the Gini index and the independent variables of unemployment rate, per capita GDP, CPI, and FDI. By understanding these relationships, policymakers can develop strategies that may help to mitigate income inequality and promote a more equitable distribution of wealth within a society.

5.0 EMPIRICAL RESULTS

The empirical results are shown in Table 4.

Table4: Regression results for the Germany and United States

Variable	Germany	United States
constant	-111.783*** (-6.214)	-23.865* (-1.938)
unemployment rate	0.183* (2.526)	-0.112* (-1.883)
GDP per capita	13.375*** (8.012)	6.065*** (5.241)

	0.265*	-1.074
CPI	(2.213)	(-0.828)
Foreign direct investment net inflows	-0.003	-0.002
	(-1.170)	(-1.464)
n	28	28
R^2	0.810	0.708
Adjust R^2	0.777	0.658
F	$F_{(4,23)} = 24.501, p=0.000$	$F_{(4,23)} = 13.959, p=0.000$
The values in parentheses are T values *P<0.05 **P<0.01 ***P<0.001		

R^2, with values ranging from 0 to 1, indicates a higher degree of fit for the model as it approaches 1, indicating that the independent variable can explain 81% of the variation of the dependent variable.

F-test is used to test whether the independent variable has statistical significance to the regression model of the dependent variable.

Germany:

Using the data in Table 4, the Gini modulus is used as the dependent variable, with unemployment rate, per capita GDP, CPI, and net foreign direct investment as independent variables. Through linear regression analysis, it can be concluded that the formula for this model is: GINI=-111.783 + 0.183*unemployment rate + 13.375*GDP per capita + 0.265*CPI- 0.003*Foreign direct investment net inflows, The R square value is 0.810. It means that the unemployment rate, GDP per capita, CPI and Foreign direct investment net inflows can explain 81.0% of the change in GINI. The study found that the model passed the F-test (F=24.501, p=0.000<0.05). This indicates that at least one of the factors such as unemployment rate, per capita GDP, CPI, and net inflows of foreign direct investment will have an impact on the Gini coefficient. The final especially analysis indicates that: The regression index value of unemployment rate is 0.183(t=2.526, p=0.019<0.05), which means that unemployment rate will have a remarkable active effect on GINI. The regression index value of GDP per capita is 13.375(t=8.012, p=0.000<0.01), which means that GDP per capita will have a remarkable positive effect on GINI. The regression index value of CPI is 0.265(t=2.213, p=0.037<0.05),

indicating that CPI will have a remarkable positive influence on GINI. The regression index value of Foreign direct investment net inflows was -0.003(t=-1.170, p=0.254>0.05). This means that Foreign direct investment net inflows will not affect GINI. The summary analysis shows that unemployment rate, GDP per capita and CPI will have a significant positive impact on GINI. However, Foreign direct investment net inflows will not affect GINI.

United States:

By analyzing the data in Table 4, with Gini coefficient as the dependent variable and unemployment rate, per capita GDP, CPI, and net foreign direct investment as independent variables, and using linear regression analysis method, the formula of the model can be obtained as follows: Gini coefficient=-23.865--0.112 * unemployment rate+6.065 * per capita GDP -1.074 * CPI-0.002 * net foreign direct investment. The R-squared value of the model is 0.708, which represents the unemployment rate, per capita GDP CPI and net inflows of foreign direct investment can explain the 70.8% change in the Gini coefficient. When F-test was conducted on the model, the data showed that the model passed the F-test (F=13.959, p=0.000<0.05). In other words, at least one of the factors such as unemployment rate, per capita GDP, CPI, and net inflows of foreign direct investment will have an impact on the Gini coefficient. The regression index value of unemployment rate is -0.112(t=-1.883, p=0.072>0.05), which means that unemployment rate will not have an impact on GINI. The regression index value of GDP per capita is 6.065(t=5.241, p=0.000<0.01), which means that GDP per capita will have a remarkable active effect on GINI. The regression index value of CPI is -1.074(t=-0.828, p=0.416>0.05), which means that CPI has no impact on GINI. The regression index value of Foreign direct investment net inflows was -0.002(t=-1.464, p=0.157>0.05). This means that Foreign direct investment net inflows will not affect GINI. The summary analysis shows that GDP per capita has a significant positive impact on GINI. However, unemployment rate, CPI and Foreign direct investment net inflows do not affect GINI.

Table 5 Multiple collinearity test

	Germany VIF	United States VIF
unemployment rate	2.179	1.127
GDP per capita	2.967	2.671
CPI	1.698	1.174
Foreign direct investment net inflows	1.322	2.820

Assuming a serious collinearity problem occurs, the analysis results will be instability, and the sign of the regression index will be completely inverse to the reality status. This will result in insignificant outcomes for independent variables that should be significant, while insignificant outcomes for independent variables that should not be significant. In this case, the effect of multicollinearity should be eliminated. From Table 5, it can be seen that the VIF of the independent variable is less than 10. This result can be considered that there is no multicollinearity in the independent variable.

Table 6 Robust test

	Germany	United States
constant	-110.668***	-14.064
	(-5.971)	(-1.064)
Lag1_unemployment rate	0.203**	-0.048
	(2.696)	(-0.800)
Lag1_GDP per capita	13.257***	5.094***
	(7.706)	(4.067)
Lag1_CPI	0.225*	0.563
	(1.808)	(0.474)
Lag1_Foreign direct investment net inflows	-0.000	-0.001
	(-0.086)	(-0.865)
n	27	27
$R2$	0.805	0.630

Adjust R^2	0.769	0.563
F	$F_{(4,22)}=22.674, p=0.000$	$F_{(4,22)}=9.380, p=0.000$

Purpose: To test the reliability of the regression results (whether the obtained research conclusions are stable)

In order to test the robustness of the model, first-order lag processing is carried out on the independent variables. The lag regression results show that GDP per capita has a stable positive impact on GINI. For Germany, unemployment rate has a remarkable positive effect on GINI. For the United States of America, the unemployment rate has a volatile effect on GINI. To sum up, the level of economic development has a remarkable active effect on income gap, that is, the higher the level of economic development, the income gap will increase significantly. In terms of unemployment rate, the impact of higher unemployment rate on income gap is different in the United States and Germany. In Germany, the higher unemployment rate will significantly increase the income gap, while in America, the unemployment rate has a stable influence on income gap.

6.0 CONCLUSION

This study aims to research the effect of unemployment rate and economic development level on income inequality in America and Germany. This study uses linear regression analysis to test the connection between the dependent variable (Gini index) and the independent variable (unemployment rate, GDP per capita, CPI, and FDI). Based on the results of regression analysis, the study found that in Germany, unemployment rate, per capita GDP, and CPI have an outstanding positive effect on income inequality (measured by the Gini index). In America, research has found that only per capita gross domestic product has a remarkable active influence on income inequality, while unemployment rate, CPI, and foreign direct investment net inflows did not affect income inequality significantly.

The results of this study provide important insights into the factors contributing to income inequality in Germany and the United States. Specifically, in Germany, income inequality is positively correlated with high unemployment and inflation. In contrast, in the

United States, measured by per capita GDP, income inequality is largely driven by the level of economic development. The findings are consistent with previous research that has shown that economic development, as well as labor market policies, social welfare policies, and tax policies, are important determinants of income inequality (Bourguignon, 2015). The study has some limitations that should be considered. Firstly, the analysis only includes four independent variables, and there may be other factors that contribute to income inequality that are not included in the model. Secondly, the study is based on cross-sectional data, and causality cannot be established with certainty. Finally, as this analysis only covers the United States and Germany, its results may not be widely applicable to other countries.

In conclusion, the study provides important insights into the impact of unemployment rate and economic development level on income inequality in the United States of America and Germany. The findings suggest that economic development level is an important determinant of income inequality in the United States, while unemployment rate, per capita GDP, and CPI are important determinants of income inequality in Germany. The findings have important policy implications for addressing income inequality in these countries, including policies that promote economic growth, reduce inflation, and address labor market inequalities. Future research could explore the impact of other factors on income inequality, including tax policies, social welfare policies, and other economic and social factors.

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