



## THE NEXUS BETWEEN WOMEN'S HUMAN DEVELOPMENT INDEX AND WOMEN'S INCOME DISTRIBUTION

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### Abstract

*This research aims to investigate the relationship between women's income contributions and the Human Development Index (HDI) for women in Central Java Province over the period from 2014 to 2023. The analysis is based on secondary data provided by the BPS. The study employs a causality test to determine the direction and strength of the relationship between the two variables. The findings reveal that the HDI for women plays a significant role in influencing women's income contributions. Specifically, the HDI, which encompasses indicators such as education, health, and living standards, proves to be a key determinant of the variations in women's economic contributions within the province. This conclusion is supported by the R-squared value of 0.6238, indicating that 62.38% of the changes in women's income contributions can be explained by fluctuations in their HDI. These results highlight the crucial link between human development and women's economic participation, suggesting that policies aimed at improving women's HDI could lead to greater economic contributions from women in the region. Ultimately, the study provides valuable insights into how enhancing women's overall well-being positively impacts their role in regional economic development.*

**Keywords:** *Women's Human Development Index, women's income contribution, causality test*

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## INTRODUCTION

The Human Development Index (HDI) serves as an important tool for evaluating the overall development of a region by taking into consideration key factors such as health, education, and standard of living. It provides a comprehensive picture of the quality of life in a given area, and its role becomes even more significant when analyzing human development from a gender-specific perspective. Women's contributions to various sectors, including the economy, are essential, especially as they increasingly participate in both formal and informal sectors. In this context, the HDI for women is particularly useful, as it evaluates their quality of life based on factors such as income, life expectancy, and education level. Understanding the specific variables that impact the HDI for women is critical for enhancing human development, especially in the case of women, whose roles in social and economic progress are often overlooked but are crucial for sustainable growth.

In Central Java Province, women play an essential role in driving the economy, contributing significantly to both formal industries, such as manufacturing and services, as well as informal sectors, such as small-scale trade and agriculture. Women's income contribution, particularly within households and the regional economy, is a key metric for

measuring not only their welfare but also their economic independence. By examining the relationship between women's HDI and their income contributions, researchers can uncover important insights into how the economic empowerment of women influences broader human development indicators. This makes the study of the connection between women's HDI and income contributions an especially compelling and relevant area of research. Exploring this causal relationship offers the potential to provide a deeper understanding of the factors that drive women's well-being, economic participation, and development, especially in a dynamic and evolving economic landscape like Central Java.

Despite the increasing acknowledgment of women's contributions to economic development, there remains a significant gap in the literature regarding the direct relationship between women's Human Development Index (HDI) and their income contributions, particularly in the context of Central Java. While prior studies have explored various facets of women's empowerment and economic participation, few have quantitatively assessed how these factors interact to influence women's HDI over time. For instance, research by Klasen (2006) highlighted the importance of gender-sensitive measures in evaluating development outcomes but did not delve into the specific mechanisms linking income and HDI among

women in developing regions. Similarly, Rani et al. (2016) emphasized the role of female labor participation in economic growth, yet their work lacked a focused analysis on how income impacts women's HDI.

The novelty of this study lies in its empirical investigation of this underexplored relationship, employing a longitudinal approach to assess trends in women's HDI and income contributions from 2014 to 2023 in Central Java. By focusing on this specific geographic and temporal context, this research aims to fill the existing gaps and contribute valuable insights into how women's economic empowerment can enhance their overall quality of life, as reflected in HDI metrics. Additionally, the study will provide a framework for understanding the reciprocal influence between economic participation and HDI, which has implications for policy design aimed at promoting gender equality and sustainable development.

The foundation for understanding the interplay between gender and development has been laid by numerous scholars. Sen (1999) posited that development should be assessed through the lens of individual capabilities, emphasizing that enhancing women's capabilities is crucial for overall development. This perspective is echoed in the work of Kabeer (2012), who argued that women's economic participation significantly influences their

agency and well-being. However, while these studies advocate for women's empowerment, they do not provide empirical evidence specifically linking income contributions to HDI outcomes.

Additionally, the research conducted by Mlambo and Tchamyou (2018) illustrates the broader economic impact of women's labor force participation but does not directly correlate these findings with HDI metrics for women. Their study indicates that increasing women's economic involvement is associated with improved socio-economic indicators; however, a focused examination of how these economic contributions directly influence HDI remains absent.

Between 2014 and 2023, the role of women in Central Java's economic development has been shaped by various economic and social changes. For instance, increasing female participation in the workforce, coupled with several legislative measures aimed at empowering women, have had a significant impact on women's economic roles. These changes likely contribute to shifts in both women's HDI and their income contributions over time. Factors such as improved access to education, healthcare, and equal opportunities in employment may have contributed to these trends. However, despite progress, further research is required to determine whether there is a significant causal relationship between

women's income contributions and their HDI. Investigating how much women's income contribution influences their HDI, and vice versa, can provide crucial data to inform more effective policies aimed at improving women's welfare and advancing their economic empowerment.

The goal of this study is to explore the relationship between women's HDI and their income contributions in Central Java Province over the period of 2014 to 2023. Through this research, it is expected that new insights will be gained into the dynamics of human development from a gender-specific perspective, particularly in terms of the economic and social empowerment of women. This study aims to offer a clearer understanding of how women's participation in the economy can influence their overall quality of life, as measured by the HDI, and how improvements in women's HDI can, in turn, enhance their economic roles. Ultimately, the findings from this research are anticipated to be of great value to policymakers as they work to design more inclusive and responsive policies that take into account the needs of women, ensuring that economic and social progress is both equitable and sustainable for all.

Numerous studies have investigated the connection between women's Human Development Index (HDI) and their contributions to income, each providing

valuable insights into how these two factors influence each other. Rahmawati and Susilo (2019) discovered that when women's participation in the workforce increases, it has a direct and positive impact on raising the HDI for women across Indonesia. They found that as more women enter the labor market, the overall indicators of human development for women, particularly in terms of education, health, and economic welfare, improve. This suggests that encouraging women's involvement in the workforce plays a vital role in advancing gender-specific development outcomes.

Similarly, Sulistiani (2022) emphasized in her research that the financial contributions made by women have a significant ripple effect on household economic well-being. Her study highlights that as women contribute more to household income, not only does the immediate economic stability of families improve, but this also leads to an overall enhancement in human development indicators, reflected in higher HDI scores. By having access to better resources, women and their families are able to invest more in health and education, which contributes to a cycle of continuous improvement in well-being and opportunities.

Yusuf (2021) took a closer look at the regional context of Central Java, analyzing how human development for women has evolved over time. The research observed a significant

increase in women's HDI, driven by improvements in education and health outcomes. However, despite this progress, Yusuf (2021) pointed out that women's contributions to income still face numerous barriers. These include persistent wage gaps between men and women, as well as lower female participation in formal employment sectors, which tend to offer more stable and higher-paying jobs. His study highlights the need to address these systemic obstacles in order to fully realize the potential of women's income contributions in boosting their HDI. Overall, these findings stress the importance of understanding the dynamic and mutually reinforcing relationship between women's HDI and income contributions, which can help policymakers develop more inclusive and effective strategies for fostering gender equality and development.

Here, this study wants to address the following questions, first, is there a causal relationship between the Human Development Index (HDI) of women and their income contributions in Central Java Province from 2014 to 2023? Second, how does women's income contribution influence the increase in their HDI during this period?

While the primary objective of this research is to analyze the causal relationship between women's HDI and their income contributions in Central Java Province from 2014 to 2023

## **LITERATURE REVIEW**

### **Human Development Index (HDI) for Women**

The Human Development Index (HDI) is a tool used to evaluate the quality of life within a society, focusing on three key dimensions: health, education, and a decent standard of living. The HDI for women is specifically designed to measure the well-being of women in terms of human development. It is important because it highlights developmental achievements from a gender perspective, which can differ from the overall HDI. The overall HDI might not fully reflect gender disparities present in society (KemenPPPA, 2021).

In Indonesia, the HDI is measured according to the methodology established by the Central Statistics Agency (BPS), with a focus on three primary indicators: life expectancy at birth, average years of schooling, and adjusted per capita expenditure. These indicators are combined into a single index that represents the quality of human development in a given region. The women's HDI plays a vital role in reflecting the levels of education, health, and economic welfare of women, which can significantly influence their contribution to both the economy and society (BPS, 2020).

### **Women's Income Contribution**

Women's income contribution serves as an important measure of their participation in the economy. This participation includes various

aspects, such as the extent of women's involvement in the workforce, the type of work they engage in, and the income they earn. Women's income contribution affects not only household welfare but also broader regional economic development. In Central Java Province, an increase in women's income contribution is anticipated to positively impact the women's HDI, as income is a key component of HDI calculation (Rahmawati & Susilo, 2019).

Women's participation in the workforce in Indonesia continues to grow, supported by various policies aimed at promoting women's economic empowerment. However, challenges such as gender discrimination in the workplace, wage inequality, and the dual burden faced by working women persist. Therefore, analyzing women's income contribution and its connection to women's HDI is crucial for understanding how women can be further empowered in the context of human development (Sulistiani, 2022).

### **Causal Relationship between Women's Human Development Index and Women's Income Contribution**

Causality refers to the relationship between two variables, where a change in one causes a change in the other. This study investigates the causal link between the Human Development Index (HDI) for women and their income contribution, aiming to determine whether an increase in women's income contribution leads

to an improvement in women's HDI, or vice versa. The causality test used in this study is a statistical method to assess whether a cause-and-effect relationship exists between these two variables. According to economic and development theory, higher income for women can improve their access to education and healthcare, which in turn boosts their HDI. On the other hand, an increase in women's HDI, driven by better education and healthcare, can lead to greater workforce participation, thus raising women's income contribution. This shows that the relationship between these two variables is both dynamic and mutually reinforcing (Yusuf, 2021).

## **THEORITICAL FRAMEWORK**

The theoretical framework of this study integrates human development and feminist economics to analyze the relationship between women's Human Development Index (HDI) and their income contributions. Human development emphasizes enhancing quality of life through education, healthcare, and economic well-being, recognizing that improvements in these areas are crucial for both personal and societal advancement, particularly for women. Feminist economics critiques traditional economic theories for neglecting women's contributions and advocates for gender equality as essential for sustainable

economic growth. It highlights that empowering women through education, healthcare, and fair wages is vital for equitable progress.

This study posits a reciprocal relationship between women's HDI and income contributions, suggesting that improvements in one variable positively influence the other. For instance, as women's income increases, their access to education and healthcare improves, subsequently enhancing their HDI. Conversely, higher HDI correlates with increased economic participation. By employing this framework, the study aims to elucidate the dynamics between women's HDI and income contributions, informing policies that promote gender equality and human development.

Based on the theoretical framework and previous research, the hypotheses proposed in this study are, first, Hypotesis 1: There is a significant causal relationship between women's income contribution and the increase in women's Human Development Index in Central Java Province during the period 2014-2023. Second, Hypotesis 2: Increasing women's income contribution will significantly increase women's HDI in Central Java Province during the period.

## **RESEARCH METHODS**

This study utilizes secondary data obtained from the Central Statistics Agency (BPS) of

Central Java Province. The data covers the period from 2014 to 2023. The collected data consists of two primary variables: the Human Development Index (HDI) of women as the dependent variable, and women's income contribution as the independent variable.

Variabel which used in this research explained as follows: first, Human Development Index (HDI) for Women (Dependent Variable). HDI an index that measures the quality of human development from a women's perspective, encompassing dimensions such as education (average years of schooling and expected years of schooling), health (life expectancy), and decent living standards (per capita income).

Second, Women's Income Contribution (Independent Variable): The percentage of income generated by women to total household or regional income, reflecting women's economic participation in development.

This study employs the causality test method to analyze the relationship between women's HDI and women's income contributions. The methods used include: first Stationarity Test (Unit Root Test) To make sure the data utilized in the analysis is stationary. That is, has a constant mean, variance, and autocorrelation value over time—a stationarity test is performed. In order to avoid biased and erroneous regression results, this test is essential. In order to determine whether there

is a unit root in the data, the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests are employed in this stationarity test. Second model of Vector Autoregression (VAR) model, the dynamic association between female HDI characteristics and female income contributions is analyzed using the Vector Autoregression (VAR) model once the stationarity test and optimal lag have been determined. An econometric model that can represent the relationship between variables in a simultaneous system is the VAR model.

To ascertain whether women's income contributions may be used to forecast women's HDI or vice versa, the Granger Causality Test is performed to assess whether one variable can be used to predict another variable.

## RESULT AND DISCUSSION

The result of this study started with Multiple Regression Analysis Results shows in Table 1.

**Table 1.** Multiple Regression Analysis

Test	Result
Prob > F	0.0066
R-squared	0,6238
Adj R-squared	0.5768
Root MSE	1.006

Source: Data, processed

Prob > F (0.0066): This value indicates the overall significance of the regression model. Since the p-value is less than the typical alpha level of 0.05, we can reject the null hypothesis that there is no relationship between women's

income contributions and women's HDI. This suggests that the independent variable significantly explains variations in the HDI.

R-squared (0.6238): The R-squared value reflects the proportion of variance in the dependent variable (women's HDI) that can be explained by the independent variable (women's income contribution). An R-squared of 0.6238 suggests that approximately 62.38% of the variability in women's HDI can be accounted for by women's income contributions. This indicates a substantial relationship, although there is still around 37.62% of the variance unexplained by this model.

Adjusted R-squared (0.5768): The adjusted R-squared takes into account the number of predictors in the model, providing a more accurate measure when multiple independent variables are present. An adjusted R-squared of 0.5768 indicates that the model remains robust even when accounting for the degrees of freedom, although it shows a slightly lower explanatory power compared to the regular R-squared.

Root Mean Square Error (Root MSE = 1.006): The Root MSE provides an estimate of the standard deviation of the residuals (prediction errors). A Root MSE of 1.006 suggests that, on average, the predicted HDI values differ from the actual values by about 1.006 units. This value is useful for understanding the model's



accuracy; lower values indicate better predictive performance.

**Stationarity Test Results (Unit Root Test)**

The stationary test results are shown in the following results:

**Table 2.** Stationarity Test Results (Unit Root Test)

Test	Result
MacKinnon approximate p-value for Z(t)	0.9979

Source: Data processed

The p-value of 0.9979 is displayed in the stationarity test findings utilizing the Augmented Dickey-Fuller (ADF) Test. The fact that this number exceeds the 5% significance level (0.05) indicates that the study's data are not steady. The average, variance, and covariance of non-stationary data are time-varying, and this can have an impact on the precision of regression findings and forecasts in time series data analysis.

**Vector Autoregression (VAR) Model Results**

The Vector Autoregression (VAR) results are shown in the following results:

**Table 3.** Vector Autoregression (VAR) Model Results

Variable	Test	Result
Human Development Index (HDI) for Women -> women's income contributions	Lag 1	-3308485

Source: Primary Data, processed

The variable women's income controbution at L1 (lag 1) has a coefficient of 0.33, according to the Vector Autoregression (VAR) model that

was employed. Accordingly, human development index (women) will grow by 0.33 units in the present period for every unit increase in human development index (women) in the preceding period. In time series analysis, this suggests a lag effect between the independent and dependent variables that must be taken into account.

**Granger Causality Test Results**

The Granger Causality Test results are shown in the following results:

**Table 4.** Granger Causality Test Results

Equation	Excluded	chi2	df	Prob.chi2
X1	Y	9.4602	2	0.009

Source: Primary Data, processed

The Granger Causality Test results indicate a 0.009 p-value. It can be inferred that the independent variable women's income contribution Granger-causes the dependent variable Y as this value is smaller than 0.05. Stated differently, alterations in women's income contribution can serve as an indicator of future modifications in human development index (women).

**DISCUSSION**

Compared to previous studies, the novelty of this research lies in its focus on women's income contributions as a direct determinant of women's HDI in Central Java, using a combination of advanced econometric techniques such as the VAR model and Granger causality test. Most previous studies on human

development tend to focus on aggregate economic indicators (e.g., GDP) or broad demographic factors, rather than disaggregating the contribution of women's income. By highlighting the lag effect and predictive power of women's income on HDI, this study offers new insights into gender-specific economic contributions and how they affect long-term human development. Additionally, the integration of the stationarity test identifies the non-stationarity of the dataset, a crucial element often overlooked in time series analyses related to human development. This adds depth to the methodology, encouraging future studies to consider the time-varying nature of development indicators.

## **CONCLUSION AND SUGGESTIONS**

### **Conclusion**

This study concludes that improvements in women's Human Development Index (HDI) significantly influence their economic contributions in Central Java, with 62.38% of the variation in income contributions explained by changes in HDI. The non-stationarity of the data, confirmed by the Augmented Dickey-Fuller (ADF) test, highlights the need for data transformation to ensure analytical accuracy. The Vector Autoregression (VAR) model reveals a lag effect, indicating that improvements in HDI take time to impact

women's income contributions. Furthermore, the Granger causality test establishes a predictive relationship between HDI and income contributions, emphasizing the importance of sustained investment in women's education, healthcare, and living standards to drive long-term economic empowerment. These findings underscore the strategic role of human development in fostering gender equality and regional economic growth, providing essential insights for policymakers.

### **Suggestions**

Based on the conclusions drawn from the study, several important recommendations can be provided to guide future policy development, research methodologies, and monitoring practices.

Policy maker can focus on Policy Development to Enhance Women's Human Development Index (HDI). Technically, the Central Java Provincial Government should prioritize the continuous development and refinement of policies aimed at improving women's HDI, particularly in key areas such as education, healthcare, and economic empowerment. Policies that focus on increasing access to quality education for women, improving healthcare services, and creating more economic opportunities are crucial for enhancing their HDI. Since improvements in these HDI indicators are directly linked to women's economic contributions, increasing

investment in these sectors can yield substantial benefits for both women's welfare and the region's overall economic development. Therefore, policies need to be comprehensive and focused on addressing the specific barriers that women face in accessing these essential services.

### **Monitoring and Addressing Policy Lag Effects**

When designing policies that aim to improve women's HDI, it is essential for policymakers to recognize the existence of lag effects. The study found that the positive outcomes of policy interventions related to women's HDI do not manifest immediately but take time to produce measurable results, particularly in terms of economic contributions. Therefore, policymakers should implement mechanisms for periodic evaluation and monitoring of these policies over the long term. By doing so, they can track progress and make necessary adjustments to ensure that the policies are having the intended positive impact. Regular monitoring will help to sustain the benefits of these interventions and prevent any potential setbacks that could undermine women's economic empowerment in the region.

For future research, it is recommended to take appropriate steps to address the issue of data non-stationarity, which was identified in this study. Non-stationary data can lead to inaccurate analysis and unreliable results, as it

reflects fluctuations over time that may obscure long-term trends. To mitigate this, researchers should apply data transformation techniques, such as differencing, before conducting regression or other statistical analyses. By ensuring that the data is stationary, the accuracy of the models used in research will improve, leading to more reliable predictions and insights. This step is crucial for future studies seeking to examine the relationship between women's HDI and their income contributions or similar variables.

Additional research is highly recommended to gain a deeper understanding of the causal relationship between women's HDI and their income contributions. While this study provided significant insights, future research should expand by using a longer dataset and incorporating more advanced and complex analytical methods, such as structural equation modeling or time-series analysis with higher-order lags. These approaches will allow researchers to explore other potential factors that may influence or moderate the relationship between HDI and income contribution, such as cultural norms, labor market structures, and government policies. By conducting more thorough research, it will be possible to uncover additional layers of the dynamics between women's development and economic participation, ultimately providing a more

comprehensive understanding that can inform more effective policies.

In summary, these recommendations highlight the need for a multi-faceted approach to improving women's HDI and their economic contributions. By developing targeted policies, improving research methodologies, and carefully monitoring the long-term effects of interventions, policymakers and researchers can work together to create a more equitable and sustainable path for women's development in Central Java.

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