



A cross-sectional analysis of factors affecting human development index

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Abstract

Although human development has made significant progress in recent years, especially in developing countries, there are differences in human development between countries. To determine the development level of a country, it is necessary to evaluate the social, cultural, demographic and political factors along with the economic factors. The Human Development Index, which covers three basic components in terms of socio-economic order, such as income, education and health, gains a different dimension in the name of welfare in all of these areas. Therefore, this study aims to determine factors affecting human development which is essential in terms of development goals. A cross-sectional analysis on a global scale is presented to investigate the impact of democracy, economic development, IMF loan use, infant mortality, and urbanization on human development. Quantile regression was estimated for 128 countries using 2019 data. The estimation results show that per capita income, democracy, urbanization, and IMF loan use have positive effects on human development. In contrast, infant mortality reduces human development. Afterward, we discussed the findings obtained from the analysis.

Keywords: Human Development, Democracy, Economic Growth, Quantile Regression

JEL Codes: O15,O50,C31

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1. INTRODUCTION

The concept of human development is essential in terms of economic, social, political and cultural dimensions in the development of countries. Therefore, the Human Development Index (HDI) has been recorded every year since 1990. Moreover, it is published regularly by the United Nations Development Program (UNDP).

The human development index is defined as a vital welfare indicator that reveals societies' social and economic welfare dimensions. Given that defining, the requirements for a productive life have been the central theme of politicians and philosophers from past to present. Therefore, it is crucial to determine which aspects of human development in life can be addressed. There are important reasons why we should reduce poverty and promote human development (Streeten 1994: 232). First of all, promoting human development is a goal. The second reason, it is a tool to increase productivity. A healthy, educated, and equipped workforce is the most important productive asset. The third reason, it is geared toward the reduction of family size. When these factors are considered, human development, which has experienced negativities due to political instability and increased unemployment, has started to gain importance again.

One of the key variables that affect human development is infant mortality. Infant mortality is an important indicator of social inequality and necessary for human development (Alijanzadeh et al. 2016:1). One might think that the increase in the number of family members means more burden to the household. However, this is contradicted as policies reduce infant mortality, improve health standards and lower population growth. The fourth reason is the physical environment. The impact of population on human development is also essential when considered an integral part of the physical environment. However, especially concerning the secure land rights, an increase in the population growth and the high population density can be effective for soil protection and forests, affecting human development (Streeten 1994: 232). In addition, sustainable urbanization policies are essential in the development of countries. Urbanization has a significant impact on economic activity by providing employment opportunities and increasing access to critical services. Thus, determining the effect of the rate of urbanization on human development is crucial to assessing the success of urbanization in a country. In addition, studies examining the effect of urbanization on human development are also limited.

The fifth reason is that improving health care and poverty reduction contributes to a peaceful civil society and democracy. Although democracy is an important mechanism that ensures and protects people's rights and freedoms, its impact on welfare cannot be ignored. Determining the effect of democracy on human development will also guide policies to be developed. Thus, democracy and democratic institutions are essential for human development. This factor is generally based on the idea that public participation in the electoral process strengthens the less advantaged ordinary group in society and mobilizes the political dynamic that suits the needs and interests of this group (Gerring et al. 2012: 1). Particularly in a complex society, this factor is treated as a political system providing regular constitutional opportunities to change the government. Therefore, since it is considered a social mechanism for solving social problems (Leblang 1997: 454), it is integral to human development. Moreover, human development is defined as the ultimate goal of the development process (Ranis 2004: 1). This situation has broadened the definitions and objectives of economic development. As freedom and capabilities develop with a democratic system, human development would significantly impact growth to the extent that it improves financial performance.

Similarly, as socioeconomic conditions improve, governments and households expand the range of choices and capabilities, and economic growth would positively impact human development. At the same time, with economic growth, countries would be able to make improvements in many areas, such as education and health. The possibility of creating suitable conditions for the realization of many social goals would also increase. Therefore, there is mutual interaction. Furthermore, considering that economic growth occurs in a stable macroeconomic environment, the existence of IMF programs is essential. The IMF is critical in effectively using scarce resources, managing exchange rate policies, creating a healthy economic climate, and ensuring price stability and economic growth (Camdessus 2000:5). The IMF cooperates with the World Bank and regional development banks while working with member governments to formulate appropriate social policies and evaluate these policies in a macroeconomic context. Each country's development priorities are different and different items are highlighted in the development plan. The IMF loans or programs aim to create a policy framework that enables sustainable, high-quality growth. As a result, the policy emphasis of IMF support is to reduce unproductive spending.

Human development standards measure the success achieved by implementing the created social policies. Thus, the IMF can be considered an influential factor in human development. Each country's development priorities are different and different items are highlighted in the development plan.

The aim of the study is to examine which factors effect human development socio-economically, politically, and environmentally. The study differs from other studies in the literature with selected variables and analysis methods. It contributes to the literature by including the effect of political factors on human development and analyzing its impact on socioeconomic and environmental factors using the quantile regression method for 2019. For this purpose, a cross-sectional analysis was carried out for 128 countries.

The study is organized as follows; after the introduction, Section 2 presents the relevant literature. The data and the methodology are introduced in Section 3. Section 4 presents the results of the study, and the results are discussed in Section 5.

2. LITERATURE REVIEW

When the literature is examined, one can observe that there are many studies discussing the effects of economic, political, and social factors on human development. Each of those studies reported different findings using varying methods. Microeconomic analysis is limited in studies. It has been observed that the studies are generally concentrated in the panel data area.

Alkire (2002) evaluated the multidimensionality of human development to provide a basis for human development and associated dimensions with Amartya Sen's approach to talent. At this point, the issue of which abilities are essential has been emphasized, and various opinions have been put forward. In addition to the capability approach, the suggested dimensions are based on the metaphysical system. Martha Nussbaums' "basic human abilities," Manfred Max-Neefs' "axiological categories," Deepa Narayan et al.'s "dimensions of well-being," Shalom Schwartz' "universal human values," Robert Cummins' "quality of life domains," Maureen Ramsay's 'universal psychological needs,' Doyal and Gough's 'basic human needs, and within the framework of these views, human development dimensions were evaluated.

Welzer et al. (2003) defined human development as a targeted syndrome and it was emphasized that human choice was the underlying idea of socioeconomic development, emancipatory mass values, and official democracy components. European/World Values Surveys (EVS/WVS), which included 73 countries, were used. The findings showed that the human development syndrome improved the institutional basis of effective Democracy and human choice.

Constantini and Monni (2008) investigated the link between human development, sustainability, and economic growth around the resource curse and environmental protection using the 3-Stage Least Squares (3SLS) method. Their findings suggested that developing countries should develop policies that encourage environmental protection. In addition, it was reported that the necessity of increasing human well-being and human development should be the first objective of development policies to provide a sustainable path.

Reiter and Steensma (2010) examined the link between human development, economic development and foreign direct investment. In the analysis, the panel data method was used for 49 developing countries for the period of 1980 to 2005. The human development index was used as the dependent variable. Life expectancy, restricted sectors for foreign investors, foreign investor discrimination, and corruption are some of the independent variables. Their results stated that foreign direct investments could positively affect countries' economic growth, but this was uncertain. Moreover, their finding suggested that foreign direct investments had a healing effect on human development when limited to the fields requiring foreign investment expertise.

Gerring et al. (2012) investigated the impact of democracy on the quality of life by considering its impact on social welfare. They suggested that infant mortality rates were one of the basic human measures. They explained the history of democracy, development, and human development. The analysis was undertaken for a panel data set consisting of 196 countries between 1960 to 2000. They examined variables such as female illiteracy, instability, GDP per capita, urbanization, and mortality in human development. They argued that the country's stock of democracy was associated with low infant mortality rates and there was no relationship between the country's regime type and human development. It was emphasized that countries should not expect sudden results from the human development levels resulting from democratic transitions and they should be cautious about improving their human development levels.

Spaiser et al. (2014) applied the Bayesian dynamic system approach to defining the human development index in the economy, democracy, and cultural values. The analysis discussed ten different indicators of human development as the leading indicator. According to the findings, countries were reported to become advantageous in terms of economic growth at a high level of democracy and freedom. In addition, it was emphasized that the rise in the level of liberation limited growth.

Annaka and Higashijima (2017) investigated whether democracy led to advances in human development via a panel data analysis for years from 1800 to 2015. Error Correction Models (ECM) with Instrumental Variables (IV) estimation were applied. By demonstrating the dynamic relationship between human development and the democratic process, their results stated that the democratic process could only have a long-term impact on human development.

Mustafa et al. (2017) examined the relationship between human development, trade openness and economic growth in Asian Economies. The data set covers the period 1970-2011. The estimation method includes motivated simultaneous equations. Motivated simultaneous equations framework They stated that trade openness had positive effects on economic growth and human development. However, this effect alone was insufficient for human development in Asian countries. How the increase in infant mortality could be reduced during periods of unequal economic growth was discussed. It was emphasized that the findings obtained could confirm the view that trade liberalization was a viable development strategy for Asian countries once local institutional quality was taken into account.

Özdemir and Salihoğlu (2019) examined the factors affecting human development. Forty countries included in the Human Development Index were analyzed. As the economic factors, the discontent index and the economic freedom index were used. The analysis included political and economic stability and life satisfaction indices as political factors. The robust regression method was used with classical regression analysis in the study. Obtained findings were discussed for all variables. It was emphasized that countries should adopt approaches that would encourage the investments of domestic and foreign capital and should stay away from behaviors that would disturb the market in order to improve or develop their economies.

Korle et al. (2020) examined the impact of economic freedom measures on human development and foreign direct investment for 32 African countries. In the study, the panel data analysis method was used with the data of the period 1996-2017. They found that economic freedom and foreign direct investment had a positive effect on human development. In addition, they stated that this effect was statistically insignificant.

Efeoğlu (2021) examined the economic and political dimensions of human development for 128 countries based on their level of human development. Financial freedom, political stability, misery index, and democracy were considered independent variables in the study. The results suggested that there should be a political recovery in the countries and economic recovery and the regulations would further increase financial freedom whereas political stability would increase human development in countries.

Banday and Koçoğlu (2022) tried to analyze the relationship between the human development index (HDI), energy consumption, economic growth, and carbon dioxide in the context of environmental impact using the panel quantile regression method. A panel dataset was used for emerging economies between 1990 and 2014. They formed their policy recommendations for economic development by taking into account the environmental effects. In the study, it was found that the increase in CO2 emission was caused by energy consumption and the decrease in human development was caused by trade. The effect of the GDP variable on human development was determined to be nonlinear. In line with the findings, the importance of following renewable energy-based and emission-reducing technologies was emphasized.

3. METHODOLOGY

Quantile regression analysis is a statistical technique that gives robust estimators in a regression analysis, especially in the case of extreme values. In analysis, the distribution may differ according to the lower and upper parts of the regression. As in linear regression, modeling only the mean might miss important aspects of the relationship between the outcome and its estimators if the outcome distribution is skewed. Thus, quantile regression allows modeling any quantity of the outcome distribution, including the median, that is, the mean value (Beyerlein 2014: 330).

The quantile regression was defined as the generalized type of median regression for the determined quantiles. The τ -th quantile of the random variable Y for any $\tau \in (0,1)$ is defined as follows:

$$Q(\tau) = \inf\{y: F(y) \geq \tau\} \quad (1)$$

The quantile function, similar to the distribution function F , allows the entire structure of Y to be described. The quantiles provide solutions to the following optimization problem by defining the piecewise linear control function as in Equation (2):

$$\rho_{\tau}(u) = u(\tau - I(u < 0)) \quad (2)$$

where $I(\cdot)$ is the indicator function. The solution to the minimization problem is as follows:

$$\hat{\alpha}(\tau) = \operatorname{argmin} E[\rho_{\tau}(Y - \delta)] \quad (3)$$

$Q(\tau)$, is based on a random sample $\{y_1, \dots, y_n\}$ of Y . τ -th quantile, in accordance with equation (3), is defined as any solution to:

$$\hat{\alpha}(\tau) = \operatorname{argmin} \sum_{i=1}^n \rho_{\tau}(y_i - \delta) \quad (4)$$

Accordingly, the model defined by Koenker and Bassett (1978) is as follows:

$$y_i = x_i' \beta_{\tau} + u_{\tau_i} \quad (5)$$

Here y_i is the i th observation of the continuous dependent variable. Similarly, x_{i1}, \dots, x_{ip} represents independent variables. $\tau \in (0,1)$ represents the quantile level of y given x ($Q_{\tau}(y|x)$). The quantile level τ is the probability expression defined as $\Pr(y \leq Q_{\tau}(y|x) | x)$. The whole conditional distribution is defined with a selected quantile level. The quantile constraint for the error term u_{τ_i} distribution is $Q_{\tau}(u_{\tau_i} | x_i) = 0$.

Using the conditional mean function estimate $\hat{\beta} = \operatorname{argmin} \sum_{i=1}^n (y_i - x_i' \beta)^2$, the quantile function $Q(\tau|X = x) = x_i' \beta_{\tau}$ is estimated as:

$$\hat{\beta}_{\tau} = \operatorname{argmin} \sum_{i=1}^n \rho_{\tau}(y_i - x_i' \beta) \quad (6)$$

The quantile regression estimator takes each quantile of the conditional distribution into account. Thus, given $X=x$, it gives more information about how the conditional distribution of Y depends on x . That is, quantile regression is also concerned with the effects on the shape of the distribution rather than assuming that the variables change the position or scale of the conditional distribution (Buhai 2005: 4).

The main reason for using quantiles instead of simple regression is that the relationship between random variables can be expressed more accurately. Koenker and Bassett (1978) discuss that quantile regression provides more robust and efficient estimations compared to the traditional OLS estimators when the assumption of the normal distribution is not valid. The quantile regression is useful in capturing non-normally distributed and nonlinear relationships with explanatory variables. The quantile regression can estimate the median or any quantile when linear regression assumptions are not valid. In addition, it is used when there are extreme values in the data.

4. DATA AND EMPIRICAL MODEL

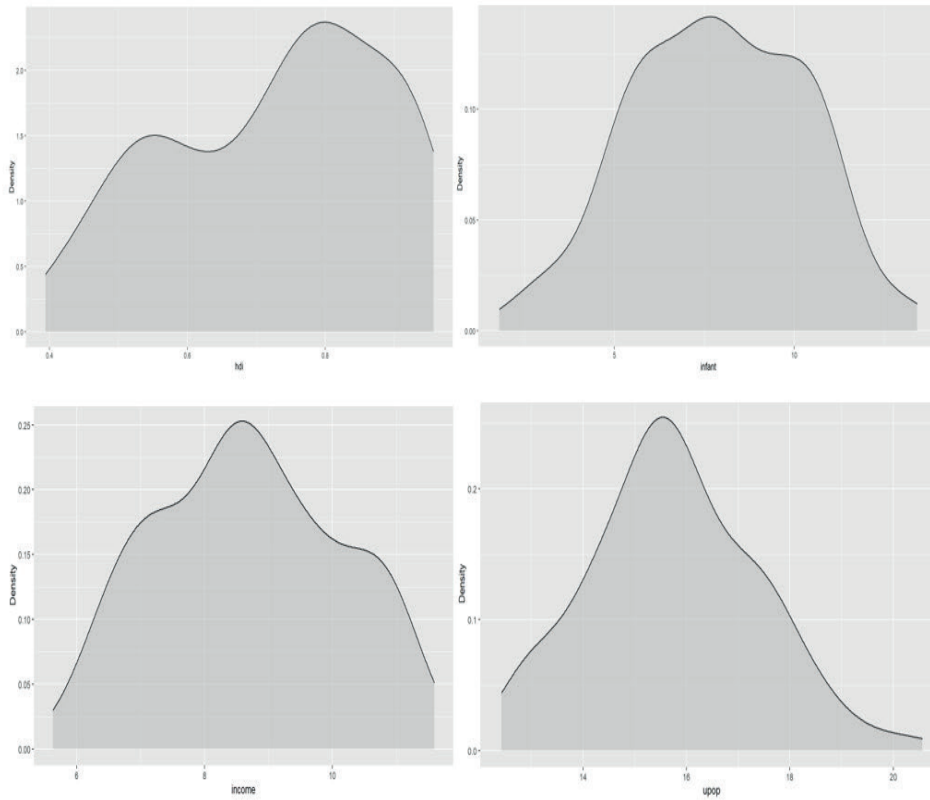
There are many empirical studies examining the factors affecting the human development index of countries. Few studies, however, examine the relationship between human development, democracy and IMF lending. In this respect, it is thought that this study would help fill the empirical research gap in examining the relationship between human development and democracy. The empirical analysis aims to determine the effects of democracy and IMF loan utilization variables on human development. 2019 cross-sectional data were used for 128 countries. Here, a human development model is estimated, including infant mortality and economic factors, especially the democracy index. The model in Equation 7 is based on studies by Saha and Zhang (2012), Tsai (2006) and Welzer etc. (2003).

$$HDI_i = \beta_0 + \beta_1 INCOME_i + \beta_2 INFANT_i + \beta_3 UPOP_i + \beta_4 IMF_i + \beta_5 DEMO_i + \varepsilon_i \quad (7)$$

The study uses the human development index (HDI) as the dependent variable to measure human development. The human development index (HDI) calculated by the United Nations Development Program (UNDP) was used as the dependent variable in the analysis. The independent variables are as follows: income is gross domestic product per capita (real GDP per capita); infant is the number of infants who died before reaching the age of one; demo denotes the democratic nature of countries (1 if full or defective democracy, 0 otherwise); the IMF determines whether the country uses an IMF loan (it takes a value of 1 if it used an IMF loan, 0 otherwise); upop, urban population, represents the number of people living in urban areas.

In this study, the Kernel density function and summary statistics were used to obtain information about the data distribution. Kernel density function and summary statistics are given in Table 1 and in Figure 1, respectively.

Figure 1. Kernel Density Functions



The scale difference in the model was eliminated by taking the natural logarithm of the variables.

Table 1. Summary Statistics

	Mean	Standard Dev.	Min	Max	Skewness	Kurtosis	Jarque-Bera
HDI	0.726	0.156	0.394	0.957	-0.355	1.998	8.609 (0.013)**
INCOME	8.670	1.433	5.628	11.594	0.058	2.085	4.858 (0.085)*
INFANT	7.906	2.400	1.791	13.430	-0.083	2.460	1.818 (0.403)
UPOP	15.770	1.620	12.420	20.559	0.234	2.887	1.327 (0.5149)
IMF	0.669	0.472	0	1	-0.730	1.533	
DEMO	0.453	0.499	0	1	0.161	1.025	

Note: *, **, *** denote 10%, 5%, 1% significance levels respectively.

Table 2 reports that there is no strong correlation between explanatory variables in the model.

Table 2. Pairwise Correlation Matrix for Explanatory Variables in the Model

	INCOME	INFANT	UPOP	IMF	DEMO	u_t
INCOME	1.0000					
INFANT	-0.6984	1.0000				
UPOP	-0.0049	0.6449	1.0000			
IMF	-0.7493	0.5709	0.1054	1.0000		
DEMO	0.6063	-0.4472	-0.0351	-0.4491	1.0000	
u_t	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	1.0000

Looking at the Jarque-Bera statistics of the variables in Table 1 and the Kernel density functions in Figure 1, one can see that HDI and income variables are not normally distributed. In addition, Table 2 shows that there is no strong correlation between explanatory variables in the model. As a result, the quantile regression is employed as it is more resistant to extreme values and allows a more flexible distribution.

5. EMPIRICAL RESULTS

The estimation results are presented in Table 3. In the continuation of the study, the results for the coefficients of this human development model are discussed.

Table 3. The Quantile Regression Model Results

Variables	(Q=0.25)	(Q=0.50)	(Q=0.75)
INCOME	0.0625*** [0.0092]	0.0682*** [0.0072]	0.0576*** [0.0059]
INFANT	-0.0423** [0.0059]	-0.0376*** [0.0046]	-0.0435*** [0.0038]
UPOP	0.0448*** [0.0065]	0.0391*** [0.0051]	0.0437*** [0.0042]
IMF	0.0456*** [0.0153]	0.0382** [0.011]	0.0239*** [0.0098]
DEMO	0.0066** [0.0028]	0.0026** [0.0122]	0.0003 [0.0018]
Constant	-0.2566*** [0.0682]	-1.1491*** [0.0533]	-0.1223** [0.0439]

Note: a) *, **, *** denote 10%, 5% and 1% significance level respectively. Square brackets indicate standard errors. b) Q refers to quantile.

According to the estimation results, the income variable is found to be statistically significant and positive in all models. When per capita income increases, human development increases, and it is seen that countries positively affect the human development index. Moreover, it is seen that the infant variable added to the model only as an indicator of infant mortality has a negative sign. In other words, the increase in infant mortality caused a decrease in the human development index. The urbanization variable has a positive sign by the expectation and is statistically significant in all quantiles.

The IMF variable, which shows the IMF loan use of countries, is statistically significant and positive in all quantiles. It has also been found that the IMF variable has a significant effect on the human development index at a low quantile. In contrast, it has a more negligible effect on human development at other high quantile levels. It found the demo variable included in the model as an indicator of democracy to be significant only at 0.25 and 0.50 low quantiles. The democracy coefficient is positive, indicating that democratic countries with checks and balances help develop their citizens. Thus, from a human development perspective, democracies outperform autocracies in 128 countries. When the results are examined, it has been determined that the variable that most affects human development is income per capita.

5. CONCLUSION

Socioeconomic development, development and democratization ensure consistent social progress. The similarities between the countries provide common evidence of how the countries economic development, democratic structure, and human development values have developed. Moreover, it is accepted that social and ecological sustainability complement each other for sustainable human development. In this context, the factors affecting the human development of countries are examined within the framework of income, environmental and democratic structure.

This study explores the impact of democracy, infant mortality, urban population, IMF loans and economic development on human development in 128 countries for 2019. The results show that per capita income and democracy have significant effects on the human development level of countries. The democracy of countries supports human development. In other words, democratic countries with checks and balances outperform autocratic countries in terms of human development.

It has been determined that the IMF loan use variable has a positive effect on human development. IMF loans or programs it supports aim to create a policy framework that enables sustainable, high-quality growth. Therefore, the policy emphasis of IMF support is to reduce unproductive spending. Another goal of IMF support has been to reallocate spending to activities that are most beneficial to the poor, such as basic health care, housing, education, and other critical investments. Therefore, the positive impact on human development is as expected.

It is known that infant mortality is considered the essential criterion, especially in development goals, due to its effect. It is also used to monitor social inequality and health inequality. According to the results obtained, the impact of infant deaths on human development is negative, and the maximum effect is at the 75th quantile level. To reduce infant mortality, policymakers should focus on socio-economic indicators such as social literacy/education level and family income.

Finally, determining the impact of the rate of urbanization on human development is crucial to assessing the success of urbanization in a country. The urban population was evaluated as an indicator of urbanization. According to the findings obtained from the analysis, the effect of urbanization on human development is positive. The positive impact on human development points to balanced urbanization policies. We also need sustainable urbanization, especially in developing countries, to benefit from urbanization.

Overall, the results show that democracy, urbanization, IMF loan utilization and per capita income positively affect human development. Furthermore, it has been determined that the variable that most affects human development is income per capita. In terms of a policy proposal, governments should focus on developing economic development and democracy processes to enhance human development.

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Conflict of Interest

The authors declare that they have no conflicts of interest.

Submission Declaration Statement

We confirm that this work is original and has not been published elsewhere, nor is it currently under consideration for publication elsewhere.

Endnotes

¹See: Njoh (2003); Moore et. al.(2003); Tripathi (2019); Freeman et. al (2019).

²There are many studies on the impact of democracy on human development. See: Ross (2006); Welzer and Inglehart (2001); Annaka ve Higashima (2017).

³Human development index values have been compiled from (<https://hdr.undp.org/en/data>).

⁴The democracy variable (demo) variable was taken from the official site of The Economist Intelligence Unit, EIU, (www.eiu.com), while it took other variables from the world bank (WDI). It created the dummy variable according to the democracy index value. A value of 1 is given if the index value is 6.02 and above, and 0 if it is less than 6.02.

⁵In the data set; 37th, 51th, 58th, 79th, 82th, 109th, 122nd, and 126th observations are extreme values.

⁶Ramsey-Reset Test result is as follows: $F(3, 130) = 4.74$ Prob>F= 0.0036, $H_0: \beta_1 = \beta_3 = \beta_4 = \beta_5 = 0$

Multicollinearity value: VIF: 5.28.

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity: $\chi^2(1) = 6.7$ Prob> $\chi^2 = 0.0095$.

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