The Effect of Gender and Household Education Expenditure in Indonesia

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Abstract

This study empirically examines and analyzes the effect of gender on human capital investment in Indonesia. Using the logistic regression method and data sourced from 315,672 households in Indonesia, this study shows that the number of boys, the number of girls, the working status of the head of the household, and the highest education of the head of the household have a positive and significant impact on human capital investment in Indonesia. The results show that female household heads who work and invest in the cost of children's education are more significant than male household heads who also work. Higher the education level of the head of the household, the higher the income received and also investment for children. This research shows strong evidence of gender inequality in education spending that tends to be more towards girls. Based on the results obtained, development policies can consider gender differences in investment in labor and education. Increasing the school participation rate of women compared to men will increase the differentiation of the workforce by gender but also increase income inequality between men and women. Likewise, investment in education which tends to be more directed to women than men, will reduce income inequality.

Keywords: gender, human capital investment, number of boys, number of girls, female household head

1. Introduction

Education is the primary key to economic growth and national competitiveness. Quality education is closely related to spending made by the government or households. Furthermore, the quality of education determines labor productivity and economic growth. Based on the National Labor Force Survey (Sakernas), the percentage of formal workers by gender (percent) shows that the number of working men (2019=47.19%, 2020=42.71%, 2021=43.39%) is higher than women (2019=39.19%, 2020=34.65%, 2021=36.20%). Data shows that the roles of men compared to women are considered different in the labor market, where the number of men is more than the number of women who work in terms of the dimensions of formal employment. a lower number of women than men will lead to gender inequality in the labor market, even though women have an essential role in the economy (Cameron and Worswick, 2001).

Women's education has a positive effect on increasing human capital and economic growth. Lower education of women lowers the average level of human capital, and thus, has a direct negative impact on income growth (Baliamoune-Lutz and McGillivray, 2015; Rahim et al., 2018; Subanti et al., 2018). Women with higher levels of education have access to higher-paying jobs. Another benefit of women's education is educating and providing better education and health for their children. Therefore, women's education is crucial for economic development because it can build human capital investment in children through mothers (Cooray and Potrafke, 2011; Sanders et al., 2007).

In developing countries, women have significantly lower education, health, and income than men. The explanation for this is gender discrimination in the distribution of resources within the household, and parents will incur more costs for boys than girls, both financially and time allocation (Tosida et al., 2020; Ismail et al., 2020). However, most research on gender discrimination using data on consumption, health, or education spending will be hampered by the general unavailability of data. Meanwhile, there is sufficient data to examine education expenditures available in household data, while individual data are not available.

Only a few studies have analyzed the issue of gender inequality in the allocation of household education expenditures in Indonesia. This study aims to analyze the effect of gender on household decisions in Indonesia to invest in human capital. Identifying gender differences in household allocation for education investment is necessary to understand appropriate policies to address gender inequality. This study identified two main problem formulations.

Is there a gender disparity in the allocation of education spending to Indonesian households? Do the working status and gender of the head of the household influence the household's decision to invest in human capital?

2. Literature Review

Several studies reveal how households make decisions in spending education costs. Chi and Qian (2016) examined the relationship between children's education spending and household income and the factors that influence education spending in China. The results show that household education expenditures increase disproportionately, where households with lower incomes spend more on education than households with higher incomes. Educational expenditures outside of school activities significantly increase education spending while educational assistance programs effectively reduce educational expenditures. Zimmermann (2012) examines education spending between men and women in India. The results show that girls experience discrimination in receiving education expenditure allocations in the household in the 15-19 year age group.

Ogundari and Abdulai (2014) analyzed the pattern of household spending on education and health costs in Nigeria. Household spending on education and health costs is influenced by income, family size, and the education level of the head of the household. In addition, female household heads spend more on education and health than male household heads. Vu (2012) examined the factors that influence household education expenditures for children in Vietnam. These factors are the income and education level of the head of the household have a significant influence on education expenditure. Households with children with primary and secondary education incur higher education costs. Meanwhile, households with children at the kindergarten and tertiary levels spend less on education.

Furthermore, several studies also reveal the existence of gender inequality in the allocation of household education expenditures. Wongmonta and Glewwe (2017) analyzes gender inequality in allocating household education expenditures and the factors that influence it in Thailand. The results show that households allocate more education to girls than boys; because parents consider daughters to be the foundation of old age, girls also provide a more significant portion of their income for parents than boys.

Khajikhan (2021) also analyzes gender inequality in allocating education spending and the factors that influence it in Mongolia. The results show that the main factors that influence gender inequality are the residence and occupation of the head of the household. Households living in rural areas and the head of household in the agricultural sector allocate more education costs to girls than boys. The explanation for this is that people in Mongolia mostly live in rural areas and have a livelihood in the livestock sector so that physical abilities are prioritized, causing wage inequality between men and women. Education is a way out for girls to reduce wage inequality. Pitt et al. (2012) analyzed the effect of gender differences on returns on human capital investment in Bangladesh. The results show that the return on human capital investment is higher at the level of education compared to health. Meanwhile, health has a more significant influence on women's school participation than men's.

3. Materials and Methods

3.1. Empirical Method

This study uses a quantitative approach to analyze the effect of the number of boys, the number of girls, the working status of the head of the household, and the highest education of the head of the household. The dependent variable is the household with education expenditure and in binary form (1 = household has education expenditure, 0 = household without education expenditure). The explanatory variables in this study were the number of boys, the number of girls, the working status of the head of the household, and the highest education of the head of the household. All explanatory variables used are categorical variables.

3.2. Data

This study uses secondary data and in the form of quantitative data. The type of data used is Cross Section data. The data used are households with education expenditure, the number of boys, the number of girls, the working status of the head of the household, and the highest education of the head of the household. The data was the March 2019 Susenas (National Socio-Economic Survey) conducted by BPS (Statistics of Indonesia). The sample households analyzed were 315,672 households in Indonesia.

3.3. Analysis Method

The logistic regression model aims to explain the effect of the number of boys, the number of girls, the working status of the head of the household, and the highest education of the head of the household on human capital investment through household education expenditures. Kuvat and Ayvaz Kizilgol (2020) was previously used this model and this study redeveloped it to analyze household education expenditures in Indonesia. The explanatory variables and variables relationship logit can be seen in Table 1.

In this study, the logit model is based on the logistic distribution:

$$P_i = E\langle Y = 1 | X_i \rangle = F(Z_i) \tag{1}$$

$$Z_i = Ln(\frac{P_i}{1 - P_i}) = \alpha + \sum_{i=1}^{n} \beta_i X_i + \varepsilon_i = L_i \tag{2}$$

Where :

P_i : Probability of $Y_i = 1$, if the family has education expenditure

$1 - P_i$: Probability of $Y_i = 0$, if family without education expenditure

β_i : Coefficient of the explanatory variable

X_i : Explanatory variables describe numbers of boys, number of girls, working status of household head, and household head education level

ε_i : *Error term*

$Ln(\frac{P_i}{1 - P_i})$: L_i Log odds ratio of the Probability of households with education expenditure

Table 1. Explanatory Variables and Variables Relationship Logit Model

Explanatory Variables	Variables Definition	Variables Relationship
Number of Boys	1 = < 1 Child 2 = 1 Child 3 = > 1 Child	(+)
Number of Girls	1 = < 1 Child 2 = 1 Child 3 = > 1 Child	(+)
Working status of household head	1 = Male and Working 2 = Female and Working	(+)
Household Head Education Level	1 = Elementary School 2 = Junior High School 3 = High School 4 = Diploma - Associate Degre 5 = Undergraduate-Postgraduate	(+)

The National Socio-Economic Survey (Susenas) is the primary data source in this study. Susenas get collected from households throughout Indonesia. Susenas data includes individual and household characteristics. The function of the family with education expenditure is as follows:

$$L_i = f(X_i) + \mu_i \tag{3}$$

$$L_i = \beta_0 + \beta_i X_i + \mu_i \tag{4}$$

$$L_i = \beta_0 + \beta_i Jalk_i + \beta_i Japr_i + \beta_i Skrt_i + \beta_i Tpkt_i + \mu_i \tag{5}$$

Where L_i the probability of households with education expenditures. In equation (5), independent variables (X_i) are developed into number of boys ($Jalk_i$), number of girls ($Japr_i$), household head working status ($Skrt_i$), and household head education level ($Prts_i$).

3.3.1. Simultaneous Test

Testing the significance of the parameters in logit model simultaneously using the G Test. alternative hypothesis that one of the parameters is not equal to zero. Test criteria is null hypothesis rejected if $G \geq \chi^2 (\alpha: k)$ indicates that there is one or more parameters (β_i) that have a significant effect on the dependent variable.

3.3.2. Partial Test

Testing the significance of the parameters in the logit model partially by using the Wald Test. alternative hypothesis that one of the parameters is not equal to zero. Test criteria is null hypothesis rejected if $W \geq \chi^2 (\alpha:1)$ indicates there is a parameter (β_i) that has a significant effect on the dependent variable.

3.3.3. Model Specification Test

All Receiver Operating Characteristics (ROC) curve analysis aims to test the suitability of the model which also displays a classification table. The classification table is the result of the classification between the dependent variable and the dichotomous variable whose value is obtained from the estimated probability of the logistic model. To get a dichotomy variable, it must be determined the cut point (c) first.

4. Results and Discussion

4.1. Overview of Household Education Expenditure in Indonesia

Table 2 describes the household education expenditure of the 315,672 sample households. Households based on education expenditure status show 43.72% of households have education expenditures. These results illustrate that households with education expenditures have household members who are still or currently in school. Meanwhile, 56.28 % of households do not have education expenditures, indicating that these households do not incur costs for educational activities, either formally or informally.

Table 2. Descriptive Statistics of Gender Characteristics

Variables	Number of Households	Mean	St. Dev	Min	Max
Households with Education Expenditure	138,015	0.44	0.50	0	1
Household without Education Expenditure	177,657	0.56	0.50	0	1
Number of Boys					
< 1 Child	138,223	0.44	0.50	0	1
1 Child	112,655	0.36	0.48	0	1
> 1 Child	64,794	0.21	0.40	0	1
Number of Girls					
< 1 Child	153,891	0.49	0.50	0	1
1 Child	109,994	0.35	0.48	0	1
> 1 Child	51,787	0.16	0.37	0	1
Household Head Working Status					
Male and working	240,264	0.90	0.30	0	1
Female and working	27,358	0.10	0.30	0	1
Household Head Education Level					
Elementary School	145,419	0.49	0.50	0	1
Junior High School	49,033	0.16	0.37	0	1
High School	75,416	0.25	0.43	0	1
Diploma - Associate Degre	6,292	0.02	0.14	0	1
Undergraduate-Postgraduate	21,423	0.07	0.26	0	1

Table 2 describes number of boys in the sample households. Households do not have a son by 43.79%, having a son by one person by 35.69%, and more than one person by 20.53%. Families with sons are expected to help the family by increasing their income and not continuing their education. Otherwise, Chi and Qian (2016) shows that boys have a significant adverse effect on household education expenditures in China.

Girls in the household are expected to continue their education because they can take care of their parents and become the foundation when the head of the household is no longer working. 48.75% of households do not have daughters, 34.84% have one daughter, and 16.41% have more than one child. Dhanaraj and Mahambare (2019) research show that girls significantly influence human capital investment in India, Ethiopia, and Peru.

The education level of the head of the family dramatically determines the business field and income earned by the household head. The low level of education causes a person to work in the informal sector with irregular income.

Households with household head education level are equal to 48.87% of elementary school, 16.48% of junior high school, 25.34% of senior high school, 2.11% of diploma-associate degree, and 7.20% of undergraduate-postgraduate. The research of Wongmonta and Glewwe (2017) shows that the education level of the head of the household has a positive and significant effect on household education expenses.

The working status of the head of household greatly determines household expenditure, especially education expenditure. Families with a working male household head of 89.78% and 10.22% working female household head. The household head who is working can meet household needs and finance the education of household members. Bayar and Yanik Ilhan (2016) research show that the head of the family who works has a positive and significant effect on household education expenditure.

4.2. Hypothesis Testing

4.2.1. Simultaneous Test

The null hypothesis used is that number of boys, number of girls, working status of household head, and household head education level do not affect household education expenses. Meanwhile, the alternative hypothesis is that there is at least one variable from the four variables that affect education costs. Based on Table 3, the statistical value of the G test is 75,482.49 and the p-value is 0.000. The value of the G test is greater than the value of Chi Square =21.0260. Then the null hypothesis is rejected, so it is concluded with a 95 percent confidence level that there is at least one variable from the characteristics of children, aspects of the head of the household, and household characteristics that affect household education expenses.

Table 3. G Test Logit Model

G Test	Df	$\chi^2_{(0.05,12)}$	p-value
75,482.49	12	21.0260	0.000

4.2.2. Partial Test

The null hypothesis used variables from number of boys, number of girls, working status of household head, and the education level of household head that had no significant effect on household education expenditures. While the alternative hypothesis is that the variables of number of boys, number of girls, working status of household head, and the education level of household head have a significant effect on education costs.

Table 4 shows that eight of the thirteen categories of explanatory variables have a Wald test value (W) greater than Chi Square value (0.05,1) = 3.481 or a p-value of less than 0.05 indicating number of boys, number of girls, working status of household head, and the education level of household head are partially significant to household education expenditure.

Table 4. Wald Test Logit Model

Explanatory Variables	$\widehat{\beta_k}$	$se(\widehat{\beta_k})$	W	p-value
Number of Boys				
1 Child	1.223***	0.011	112.91	0.000
> 1 Child	2.474***	0.014	181.68	0.000
Number of Girls				
1 Child	1.351***	0.011	127.99	0.000
> 1 Child	2.588***	0.015	178.57	0.000
Household Head Working Status				
Female and Working	0.092***	0.017	5.53	0.000
Household Head Education Level				
Junior High School	0.019	0.013	1.45	0.146
High School	0.056***	0.011	4.88	0.000
Diploma - Associate Degre	-0.074***	0.033	-2.23	0.026
Undergraduate-Postgraduate	0.069***	0.018	3.78	0.000

Source: Data processed by Stata 16 (2021), (***) shows significant at the 5% level.

4.2.3. Specification Test of Logit Model

Based on Table 5, the percentage of the total classification accuracy of the model is 73.14%. The result illustrates that the model can classify observations correctly by 73.14%, and the rest are classified incorrectly. These results also obtained the value of sensitivity and specificity. The model's sensitivity is 77.22% of households which shows that 77.22% of households with education expenditures are correctly predicted into the group of households with education expenditures. Meanwhile, the specificity value is 69.56%, which shows that 69.56% of households without education expenditures are correctly predicted into the group of households without education expenditures.

Table 5. Clasification Result

Observation	Prediction		Total
	Invest	Not Invest	
Invest	91,876	41,206	133,082
Not Invest	27,098	94,163	121,261
Total	118,974	135,369	254,343

The model's suitability also can be done by looking at the area under the ROC curve. Based on Figure 1 shows the results of processing the area under the ROC curve. The result illustrates that the model is appropriate because the resulting curve is close to number one. The area also supports this under the ROC curve, which is 0.7904. By the theory argues that the model classification is accepted if the area under the ROC curve is 0.7. So it concluded that the model is quite good at explaining gender effect on household decisions to invest in human capital in the category of fair discrimination.

Table 6. Logit Model ROC Curve Area

ROC			Asymtotic Normal	
Obs	Area	Std.Err	[95% Conf. Interval]	
254,343	0.7904	0.0009	0.78868	0.79213

Based on Table 6, the confidence level of the model is between 0.78868 and 0.79213 with a confidence level that is not wide; it shows that the model is precise in explaining the relationship between number of boys, number of girl, working status of household head, and household head education level on household decisions in carrying out activities human capital investment in Indonesia.
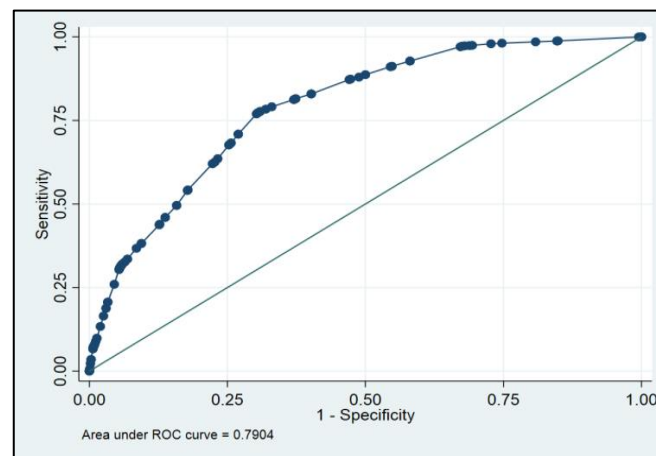
Figure 1. ROC Curve of Logit Model

4.3. Discussion

The results of data processing with Stata 16. The effect of number of boys, number of girls, working status household head, and education level of household head on human capital investment using the logistic regression method is shown in Table 7.

Table 7. Logistics Regression Results

Explanatory Variables	Coef.	OR	W	p-value
Number of Boys				
1 Child	1.223***	3.397	112.91	0.000
> 1 Child	2.474***	11.868	181.68	0.000
Number of Girls				
1 Child	1.351***	3.859	127.99	0.000
> 1 Child	2.588***	13.302	178.57	0.000
Household Head Working Status				
Female and Working	0.092***	1.096	5.53	0.000
Household Head Education Level				
Junior High School	0.019	1.019	1.45	0.146
High School	0.056***	1.057	4.88	0.000
Diploma - Associate Degre	-0.074***	0.928	-2.23	0.026
Undergraduate-Postgraduate	0.069***	1.071	3.78	0.000
Constanta	-2.159	0.115	-180.70	0.000

Source: Data processed by Stata 16 (2021), (***) shows significant at the 5% level.

Based on table logistic regression results, the obtained logit model equation can be shown as follows:

$$Y = -2.159 + 1.223\ Jalk_i(1) + 2.474\ Jalk_i(>1) + 1.351\ Japr_i(1) + 2.588\ Japr_i(>1)$$
$$+ 0.092\ Skrt_i(Female) + 0.019\ Tpkt_i(SMP) + 0.056\ Tpkt_i(SMA) \qquad (6)$$
$$- 0.074\ Tpkt_i(DI\text{-}DIV) + 0.069\ Tpkt_i(S1\text{-}S3)$$

Information:
- $Jalk_i(1)$: Number of Boys (1 child)
- $Jalk_i(>1)$: Number of Boys (more than 1 child)
- $Japr_i(1)$: Number of Girls (1 child)
- $Japr_i(>1)$: Number of Girls (more than 1 child)
- $Skrt_i$: Working Status the Household Head (female and working)
- $Tpkt_i(SMP)$: Household Head Education Level (junior high school)
- $Tpkt_i(SMA)$: Household Head Education Level (high school)
- $Tpkt_i(DI\text{-}DIV)$: Household Head Education Level (diploma)
- $Tpkt_i(S1\text{-}S3)$: Household Head Education Level (collage)

Based on estimates from the logistic regression model, the number of boys, the number of girls, the working status of the head of the household, and the highest education of the head of the household significantly affect human capital investment in Indonesia. These results show the coefficient value and the odds ratio value of each variable, and these results can identify the effect of each variable on human capital investment.

The education level of the head of the household has an essential role in spending on children's education. From the odds ratio value results obtained, the higher the education level of the head of the household, the more excellent the opportunity for the household to invest. Ulusoy and Yolcu (2013) shows that parent's educational level is closely related to a household's decision to invest in their child's education. The parents who have education consider education investment for developing their children's human capital. According to Vu (2012), households whose heads have a junior high school or senior high school education spend more on their children's education compared to heads of households with no education at all. Likewise, households with heads with a secondary school education level or higher are the households that spend the most money on their children's education.

The working status of the head of household positively and significantly affects human capital investment. This result also shows that female and employed household heads invest more in human capital than male household heads who are also employed. According to Wongmonta and Glewwe (2017), gender inequality is more likely for women to be caused by differences in the return education of men and women in the labour market, assuming that return education for adults will determine the allocation of resources from parents for human capital investment.

Wongmonta and Glewwe (2017) also shows that women have higher monthly wages and years of education than men. In particular, women prefer to work in the service sector and professional, while men prefer to work in the agricultural and industrial sectors. After all, women receive more education than men because women choose jobs that require less labour.

The number of sons and the number of daughters in the household positively affects human capital investment. The more the number of boys, the household will spend more on education. Likewise, with the number of girls, households with more than one daughter will incur higher education costs than households without daughters. Based on Susenas data from March 2019, the level of completion of education by education level and gender shows that the percentage of girls (SD = 96.54%, SMP = 87.23%, SMA = 59.75%) is higher than that of boys (SD = 94.46%, SMP = 83.34%, SMA = 57.00%) in completing education. This result is supported by Khajikhan (2021), who showed that men in Mongolia have a more significant opportunity to earn higher wages with lower levels of education than women. Therefore, women in Mongolia use higher education to reduce wage inequality. Due to wage inequality, parents prefer to spend more on education for their daughters.

5. Conclussion

This study empirically examines and analyzes the effect of gender on human capital investment in Indonesia. Using the logistic regression method and data sourced from 315,672 households in Indonesia, this study shows that the number of boys, the number of girls, the working status of the head of the household, and the highest education of the head of the household have a positive and significant impact on human capital investment in Indonesia. The results show that female household heads who work and invest in the cost of children's education are more significant than male household heads who also work. Higher the education level of the head of the household, the higher the income received and the investment for children. This research also shows strong evidence of gender inequality in education spending that tends to be more towards girls.

Based on the results obtained, development policies can consider gender differences in investment in labor and education. Increasing the school participation rate of women compared to men will increase the differentiation of the workforce by gender but also increase income inequality between men and women. Likewise, policies that support the agricultural sector's development where physical ability will generate high income. in this sector will increase the income of men who have a physical advantage over women and increase the sex division of labor in other sectors. On the other hand, policies that support trade and investment openness will change the composition of the labor market to promote a sector that prioritizes skills so that it will increase the income of women compared to men because of differences in skills and education. Likewise, investment in education which tends to be more directed to women than men, will reduce income inequality.

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