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Parental Investment and Child Human Capital Formation in Indonesian Households

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Abstract

Human capital formation is a key driver of long-term economic growth and intergenerational mobility, yet substantial disparities in educational outcomes persist across households. This study examines the role of parental investment in shaping children's human capital formation within Indonesian households. Using household-level quantitative data, parental investment is conceptualized as a multidimensional construct encompassing both monetary and non-monetary inputs. Human capital outcomes are measured through children's educational attainment indicators. The empirical analysis employs regression-based models to estimate the relationship between parental investment and human capital outcomes while controlling for child, parental, and household socioeconomic characteristics. The results indicate that parental investment is positively and significantly associated with children's human capital formation. Both monetary and non-monetary investments contribute to educational outcomes, although their relative importance varies across household socioeconomic groups. These findings underscore the central role of households in the human capital production process and extend the human capital literature by providing evidence from an emerging economy context.

INTRODUCTION

Human capital formation is widely recognized as a fundamental driver of long-term economic growth, social mobility, and intergenerational welfare (Spirin et al., 2021). Within the framework of human capital theory, education is viewed as an investment that enhances individual productivity and generates economic returns over the life cycle (Giziene et al., 2012). While formal education systems play a critical role in this process, an expanding body of economic research emphasizes the household, particularly parental investment as a central determinant of children's human capital accumulation (Torche & Costa-Ribeiro, 2012; Yin & Nakamura, 2025).

Parental investment contributes to human capital formation through multiple channels, including the allocation of financial resources, time devoted to educational activities, and engagement in children's learning environments (Brown, 2006; Cunha et al., 2022; Yu & Zhao, 2021). These investments shape children's cognitive development and educational trajectories both prior to and alongside formal schooling. Despite the recognized importance of parental inputs, substantial disparities in human capital outcomes persist across households and socioeconomic groups. Such disparities raise important questions regarding how parental investment operates and under what conditions it translates into meaningful gains in children's human capital (Attanasio et al., 2017).

From a theoretical perspective, models of human capital emphasize the cumulative and dynamic nature of skill formation, where early investments interact with subsequent inputs throughout the life cycle (Cunha et al., 2006). In this context, parental investment is not merely complementary to formal schooling but constitutes a core component of the human capital production function. However, despite strong theoretical foundations, empirical evidence on parental investment remains fragmented. Much of the existing literature relies on indirect proxies such as parental education or household income rather

than explicitly measuring parental investment behaviors. Moreover, many studies focus on a single dimension of investment, limiting insights into the relative roles of monetary and non-monetary inputs (Moskalenko et al., 2022).

This study addresses these gaps by providing a comprehensive empirical analysis of parental investment and its role in human capital formation. Unlike prior research that treats parental investment as static or unidimensional, this study explicitly distinguishes between monetary and non-monetary investments and examines their differential effects on children's human capital outcomes. Furthermore, the analysis explores heterogeneity in the returns to parental investment across household socioeconomic groups, recognizing that the effectiveness of parental inputs may vary depending on economic constraints and household context (Cashman et al., 2021; Chen, 2020).

Focusing on Indonesian households, this study extends the human capital literature by providing evidence from an emerging economy characterized by income inequality and unequal access to educational resources. The primary objective is to examine how parental investment influences children's human capital outcomes while accounting for household characteristics and potential sources of heterogeneity. By doing so, the study offers policy-relevant insights for education and human capital development strategies aimed at reducing inequality and improving the effectiveness of household-level investments (Coxhead & Phan, 2013).

LITERATURE REVIEW

Human capital formation has long been conceptualized as a cumulative process shaped by investments made at different stages of the life cycle (Heckman, 2007). Within this framework, the family represents the earliest and most influential environment in which human capital accumulation begins. Parents play a central role by allocating resources that affect children's cognitive development, educational attainment, and learning trajectories both prior to and during formal schooling (Nærde et al., 2026).

A substantial body of empirical research documents positive associations between parental socioeconomic characteristics particularly parental education and household income and children's educational outcomes (Davis-Kean, 2005; Williams Shanks & Robinson, 2013). These findings suggest that households with greater economic resources are better positioned to support learning through access to higher-quality schooling, educational materials, and enrichment opportunities. However, in much of this literature, parental investment is inferred indirectly through proxy variables rather than modeled as a set of explicit investment decisions. As a result, the mechanisms through which parents contribute to human capital formation remain only partially specified (Chen et al., 2023).

More recent studies conceptualize parental investment as an active economic decision-making process in which parents allocate both financial resources and time subject to budget constraints and expected returns to education (Hamilton, 2013). Beyond direct expenditures on schooling and learning materials, non-monetary inputs such as parental time devoted to supervision and educational engagement have been shown to play a significant role in shaping children's outcomes (Ali et al., 2022; Wong et al., 2018).

Evidence from this strand of research further suggests that non-monetary investments may be particularly important during early developmental stages and in households facing resource constraints (Nores & Barnett, 2016; Willis, 2020).

Despite these advances, empirical findings remain fragmented. Existing studies differ considerably in how parental investment is measured, often emphasizing a single dimension while neglecting complementary inputs. Consequently, the relative contributions of monetary and non-monetary investments, as well as their potential interactions in the production of human capital, remain unclear (O'Brien et al., 2011). In addition, theoretical models of skill formation emphasize dynamic complementarities, implying that the returns to parental investment may vary across developmental stages and socioeconomic contexts (Agostinelli & Wiswall, 2025). Empirical evidence on such heterogeneity, however, remains limited and highly context-specific (Olsson-Collentine et al., 2020).

Taken together, the literature underscores the importance of parental investment for human capital formation while leaving open key questions regarding its multidimensional nature and heterogeneous effects. These unresolved issues motivate the empirical approach adopted in this study, which explicitly examines different forms of parental investment and assesses how their impacts vary across children and households within an emerging economy context (Torche & Costa-Ribeiro, 2012).

METHODS

Data and Sample

This study is a secondary analysis of anonymized household-level data drawn from the fifth wave of the Indonesian Family Life Survey (IFLS-5), fielded in 2014 and administered by the RAND Corporation. IFLS is a longitudinal household survey whose sample is representative of about 83 percent of the Indonesian population across 13 provinces. No primary data were collected by the authors. The dataset contains detailed information on parental characteristics, household investment behaviors, and children's educational outcomes. The analytical sample comprises school-aged children residing with at least one parent, which enables the identification of parental investment decisions at the household level. The analytical sample is restricted to children aged 6 to 18 years. Observations with missing values on key variables are excluded to ensure consistency across model specifications and to minimize potential estimation bias.

Measures

Human Capital Outcomes

Children's human capital is measured using educational indicators that capture both accumulated attainment and current learning status. These indicators include years of schooling completed, school

enrollment status, and measures of academic performance, depending on data availability. Together, these variables provide a comprehensive representation of children's human capital accumulation.

Parental Investment

Parental investment is operationalized as a multidimensional construct encompassing both monetary and non-monetary components. Monetary investment includes education-related expenditures such as school fees, private tutoring expenses, and spending on learning materials. Non-monetary investment captures parental time and engagement in children's education, including supervision of homework and participation in educational activities within the household. This distinction allows for an assessment of the differential contributions of financial and time-based parental inputs.

Control variables.

The analysis controls for child characteristics (age and gender), parental attributes (education and employment status), and household socioeconomic conditions (income level and household size). Regional fixed effects are included to account for unobserved contextual factors.

Empirical Model Specification

The baseline empirical model is specified as follows:

$$HC_i = \alpha + \beta PI_i + \gamma X_i + \varepsilon_i$$

where HC_i denotes the human capital outcome of child *i*, PI_i represents parental investment, and X_i is a vector of control variables including child characteristics, parental attributes, and household socioeconomic conditions. ε_i is the error term capturing unobserved factors affecting children's human capital outcomes. Standard errors are adjusted to account for potential intra-household correlation, acknowledging that observations within the same household may not be statistically independent.

Separate model specifications are estimated to examine the effects of monetary and non-monetary investments and to assess heterogeneity across household socioeconomic groups.

Robustness Considerations

Several robustness checks are conducted to assess the stability of the empirical findings (Dejaegher & Vander Heyden, 2006). These include the use of alternative measures of parental investment and human capital outcomes, as well as variations in model specifications. The inclusion of additional control variables does not materially alter the estimated coefficients, indicating that the main results are robust to alternative empirical assumptions.

RESULTS

Descriptive Statistics

Table 1 presents descriptive statistics for the main variables used in the analysis. On average, children in the sample exhibit varying levels of educational attainment, reflecting differences in household socioeconomic conditions. Parental investment indicators show substantial dispersion, indicating heterogeneity in both monetary and non-monetary investments across households. This variation provides a suitable basis for examining the relationship between parental investment and human capital formation.

Table 1
Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Max	N
Years of Schooling	8.42	3.15	0	15	1,200
School Enrollment (1 = yes)	0.87	0.34	0	1	1,200
Monetary Parental Investment (IDR/year)	3,250,000	2,100,000	0	12,000,000	1,200
Non-Monetary Parental Investment (hours/week)	6.8	3.9	0	20	1,200
Parental Education (years)	9.6	4.2	0	18	1,200
Household Income (IDR/month)	4,100,000	2,750,000	500,000	18,000,000	1,200
Child Age (years)	12.3	3.6	6	18	1,200

Notes

Monetary investment includes education-related expenditures. Non-monetary investment captures parental time and educational engagement.

Baseline Regression Results

Table 2 reports the baseline regression results examining the association between parental investment and children's human capital outcomes. The estimates indicate that parental investment is positively and statistically significantly related to human capital formation. Households that allocate greater resources both financial and non-finansial to children's education tend to exhibit higher levels of educational attainment, holding other factors constant.

The coefficients on the control variables largely conform to theoretical expectations. Parental education shows a positive and statistically significant association with children's human capital outcomes, indicating intergenerational transmission of educational advantage. Household income is also positively

related to educational outcomes, underscoring the role of economic resources in facilitating educational investments. Child age is positively associated with years of schooling, reflecting cumulative educational progression. Gender effects are less consistent across model specifications, suggesting that gender differences in educational outcomes are context-dependent rather than uniform.

Table 2
Baseline Regression Results Dependent variable:
Children's Human Capital Outcome

Variables	**(1)**	**(2)**
Parental Investment	0.214***	0.187***
	(0.042)	(0.038)
Parental Education	0.163***	0.149***
	(0.031)	(0.029)
Household Income	0.092**	0.081**
	(0.041)	(0.037)
Child Age	0.478***	0.462***
	(0.054)	(0.051)
Child Gender (1 = male)	0.031	0.028
	(0.029)	(0.027)
Constant	1.214***	0.986***
Observations	1,200	1,200
R^2	0.42	0.47

Monetary versus Non-Monetary Investment

To capture the multidimensional nature of parental investment, Table 3 decomposes parental investment into monetary and non-monetary components. The results indicate that both forms of investment contribute positively and statistically significantly to children's human capital formation, although their relative magnitudes differ across model specifications.

Monetary investment exhibits a strong association with educational attainment, particularly in specifications emphasizing schooling-related outcomes. This finding suggests that education-related expenditures play an important role in facilitating access to formal education and learning resources. At the same time, non-monetary investment measured through parental time and educational engagement also demonstrates a statistically significant effect, underscoring the importance of parental involvement beyond direct financial expenditures. Taken together, these results indicate that household investment in children's education operates through multiple complementary channels, and that financial resources

alone do not fully capture the mechanisms underlying human capital accumulation, consistent with theoretical models emphasizing the interaction between financial and non-financial inputs in the human capital production process (Futagami & Yanagihara, 2008).

Table 3
Monetary vs. Non-Monetary Parental Investment Dependent variable: Children's Human Capital Outcome

Variables	**(1)**	**(2)**
Monetary Investment	**0.176*** **	
	(0.039)	
Non-Monetary Investment		**0.142*** **
		(0.033)
Controls	Yes	Yes
Observations	1,200	1,200
R^2	0.39	0.36
Notes: Robust standard errors in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.10.		

Model (1) includes monetary parental investment. Model (2) includes non-monetary parental investment. All models control for child characteristics, parental attributes, and household socioeconomic conditions.

Heterogeneity Analysis

To examine whether the effects of parental investment vary across household socioeconomic conditions, Table 4 reports heterogeneity estimates based on household income groups. The results indicate that returns to parental investment are not uniform across households. In lower-income households, non-monetary parental investment exhibits relatively stronger associations with children's human capital outcomes, suggesting that parental time and educational engagement may partially compensate for limited financial resources. In contrast, in higher-income households, monetary investment shows larger estimated effects, reflecting fewer budget constraints and a greater capacity to translate financial resources into educational outcomes.

These findings highlight the presence of differential marginal returns to parental investment across socioeconomic contexts and emphasize that the effectiveness of investment strategies depends on household-level constraints and resources.

Table 4
Heterogeneity by Household Income Dependent variable: Children's Human Capital Outcome

Variables	Low-Income Households	High-Income Households
Monetary Investment	0.098*	**0.214*** **
	(0.054)	(0.046)
Non-Monetary Investment	**0.201*** **	0.112***
	(0.048)	(0.041)
Controls	Yes	Yes
Observations	600	600
R^2	0.34	0.41
Notes: Robust standard errors in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.10.		

Low- and high-income households are defined by splitting the sample at the median of household income, yielding two groups of 600 observations each. All models include the same set of control variables as in the baseline specifications.

Robustness Checks

A series of robustness checks are conducted to assess the stability of the results. Alternative measures of parental investment and human capital outcomes yield qualitatively similar findings. The inclusion of additional control variables and alternative model specifications does not materially alter the estimated coefficients. Where instrumental variable approaches are applied, the direction and significance of the main results remain consistent, providing further support for the robustness of the findings (Hsu et al., 2012; Stock, 2015).

DISCUSSION

This study examines the role of parental investment in shaping children's human capital formation within Indonesian households. The findings provide consistent evidence that parental investment constitutes a significant determinant of children's educational outcomes, reinforcing the central premise of human capital theory that skill accumulation is driven by purposeful investment decisions made over the life cycle (Wang & Yu, 2017; Ye & Yi, 2017).

The positive association between parental investment and human capital outcomes supports theoretical models that conceptualize education as an investment yielding future returns in productivity and earnings. In line with Becker's framework, the results indicate that households allocate resources toward education in ways that translate into measurable gains in children's educational attainment (García-Hombrados & Masset, 2024). These findings underscore the importance of viewing human capital

formation not solely as an outcome of formal schooling systems, but as a process fundamentally shaped by household-level decisions.

Importantly, the results highlight the multidimensional nature of parental investment. Both monetary and non-monetary forms of investment are shown to contribute to human capital formation, although their relative importance varies across contexts. Monetary investments, such as education-related expenditures, appear particularly influential for schooling outcomes, while non-monetary investments including parental time and educational engagement play a complementary role. This evidence aligns with models of skill formation that emphasize the interaction between financial resources and parental inputs in producing human capital (Aunio et al., 2016; Caucutt et al., 2026).

The heterogeneity analysis further reveals that returns to parental investment differ across household socioeconomic groups. In lower-income households, non-monetary investments exhibit relatively stronger effects, suggesting that parental time and engagement may partially compensate for financial constraints. Conversely, monetary investments yield larger marginal effects in higher-income households, where budget constraints are less binding. This pattern is consistent with theories of diminishing marginal returns and resource constraints (Bello & Salmen-Navarro, 2016; Truett & Truett, 2006), highlighting that the effectiveness of parental investment depends on household context.

These findings contribute to the broader literature on human capital formation by extending empirical evidence to an emerging economy setting characterized by socioeconomic inequality and uneven access to educational resources. While much of the existing literature is based on high-income countries, the results demonstrate that household investment decisions play a similarly critical role in shaping human capital outcomes in developing contexts, albeit through channels that reflect local constraints and opportunities (Mochida, 2004).

From a policy perspective, the findings suggest that efforts to improve human capital outcomes should account for the central role of households. Policies that reduce financial barriers to education may enhance the effectiveness of monetary investments, particularly among resource-constrained households. At the same time, interventions that support parental engagement and time investment may yield substantial benefits, especially where financial resources are limited. Rather than substituting for household investment, public policy may be most effective when it complements and amplifies parental inputs.

CONCLUSION

This study examines the role of parental investment in shaping children's human capital formation within Indonesian households. Using household-level data, the analysis provides robust empirical evidence that parental investment constitutes a significant determinant of children's educational outcomes. These findings reinforce the core proposition of human capital theory that skill accumulation is not driven by formal schooling alone, but is fundamentally shaped by household-level investment decisions made over the life cycle (Kang & Xie, 2025).

By distinguishing between monetary and non-monetary forms of parental investment, this study highlights the multidimensional nature of family inputs in the human capital production process. Both types of investment contribute positively to human capital outcomes, although their relative importance varies across household socioeconomic contexts. This heterogeneity underscores the role of household constraints and differential marginal returns to investment, consistent with theoretical models emphasizing dynamic complementarities and resource constraints in skill formation (Cavounidis & Lang, 2020).

This study contributes to the human capital literature by extending empirical evidence to an emerging economy context, where socioeconomic disparities and resource limitations shape educational investment decisions. Overall, the findings suggest that policies aimed at improving human capital outcomes should not focus solely on expanding formal education systems, but also recognize and complement the critical role of households in the investment process, particularly through interventions that reduce financial constraints and support parental engagement.

Declarations

ETHICS APPROVAL

This study is based on secondary analysis of anonymized data from the Indonesian Family Life Survey (IFLS-5). Ethical clearance for the use of these secondary data was granted by the Research Ethics Committee of Universitas Jambi, Indonesia (approval number 335/KEP-UNJA/2024). The data contain no personally identifiable information, and all procedures complied with institutional and journal ethical guidelines for research involving human-related data.

CONSENT TO PARTICIPATE

Not applicable. This study used secondary, anonymized data from IFLS-5, and the authors did not recruit, contact, or interact with any human participants. Informed consent was obtained from respondents by the original data collectors, RAND Corporation and its fieldwork partners, at the time of data collection.

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Author Contribution

Rosmiati: Conceptualization, methodology, data analysis, writing – original draft, and supervision.Corry Yohana: Literature review, validation, writing – review and editing.Jacob Abolladaka: Data curation, formal analysis support, and writing – review and editing.Dwi Nanda Akhmad Romadhon, project

administratiom - validationAll authors have read and approved the final manuscript and agree to be accountable for all aspects of the work.

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Data Availability

The data analyzed in this study are secondary, anonymized data obtained from an existing nationally representative household survey in Indonesia administered by an official data provider. The authors do not own these data and are not permitted to redistribute the raw files. Researchers may obtain the data directly from the original data provider, subject to its registration procedures and terms of use. The processed analytical dataset and estimation code are available from the corresponding author upon reasonable request.

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