

# **DOES THE NUMBER OF SIBLINGS AFFECT ADULT INCOME? AN INDONESIAN CASE STUDY**

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## **ABSTRACT**

This study examines the effect of family size in childhood on the level of welfare achieved in adulthood. We used the Mincer earnings function, a multiple linear ordinary least squares (OLS) regression model with the logarithm of income as a dependent variable. The results show that the number of siblings does not have a significant direct impact on income. However, it has a significant, indirect, and negative impact on education, which in turn has a significant positive impact on income. A smaller family size with fewer siblings is a favorable option for parents who want to maximize human capital development, higher income levels, and higher welfare for their children in the future. Because such research is rare in developing countries like Indonesia, the study contributes to our understanding of the relationship between the number of siblings in childhood and the income level in adulthood.

**Keywords:** Number of siblings; Income; Human capital; Parent's education; Education.

## **1. INTRODUCTION**

Indonesia is a developing country that has succeeded in lowering fertility rates in a short period of time (Barnwal, 2004). In just 30 years, Indonesia's total fertility rate (TFR) fell from 5.6 children per woman in 1971 to 2.6 children per woman in 2002 and 2.3 children per woman by 2015 (BPS, 2015b). TFR measured at the macro level (country or province) is the average of the fertility rate at the micro (family) level. Within a family, parents are faced with a trade-off between quality (child outcomes) and quantity (number of children) and the availability of time and cost-related consequences (Becker & Lewis, 1973; Becker, 1981). More recent modifications of the child quality and quantity theory emphasize the nature of parental altruism. Namely, parents' aspirations of the future success of their children in educational attainment, income, and wealth are believed to be a determinant of fertility rates (Becker & Barro, 1988).

Research may help determine if the size of the family of origin relates to socioeconomic outcomes in later life, which could be important in explaining a country's fertility rate. Economically, parents are not mistaken when, for the sake of a child's future good, they believe in having fewer children

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or limiting the number of siblings. Based on the dilution model theory, parents have limited material and nonmaterial resources, and the presence of additional siblings can minimize the resources directed to each child (Downey, 1995). In this case, additional siblings may lower the resources available for investment or development in a child's human capital (e.g., education, skills, or experience). On the other hand, human capital investments are built over time from childhood. A person can choose professions, occupations, or other activities in order to improve the welfare of his or her life (Schultz, 1971).

Studies on the effect of the fertility rate of parents on future childhood outcomes show that the number of siblings to a child has a significant impact on income and accumulated wealth in adulthood (Rainer & Siedler, 2009; Parr, 2006; Keister, 2003). In another study, the number of siblings in childhood was found to have a significant impact in adult life on various achievements. These include: educational outcomes (Blake 1989; Knodel & Wongsith, 1991; Butcher & Case, 1994; Downey, 1995, Parr, 2006); personality traits (Blake, Richardson, & Bhattacharya, 1991; Kramer & Conger, 2009; Szobiova, 2008; Cicirelli, 1967); cognitive abilities (Hodges & Balow, 1961; Koch, 1954; Schoonover, 1959; Rosenberg & Sutton-Smith, 1964); and health outcomes (Wagner, Schubert, & Schubert, 1979). Our study examines the impact of the number of siblings in childhood (representing the fertility rate of parents) on adult income, which is used as a proxy for a child's welfare in adulthood.

If there are more siblings in childhood, the child receives a smaller proportion of resources from parents that could be used for human capital growth. This study analyzes the direct and indirect impact of siblings (through different educational outcomes) on welfare outcomes in adulthood as measured by income levels. Our research makes a contribution to the literature by highlighting relationships between the number of siblings in childhood and income levels in adulthood. Such an investigation has not been widely conducted in developing countries, especially in Indonesia. The impact of the number of siblings on adult income could also be relevant in a discussion about the reduction of the fertility rate in Indonesia.

The Indonesian Family Life Survey 2014 (IFLS5) is a large-scale survey that provides background information on the number of siblings a person has in childhood and income earned in adulthood. Therefore, the IFLS5 data were used in this study to determine the effects of the number of siblings in childhood on individual income in adulthood.

## **2. RESEARCH METHOD**

### **2.1. Data**

In general, the unit of analysis used in this study was an individual aged 25–54 years in 2014 and was employed in the previous week and earned income from the work. Respondents aged 25 years and older were selected because after this age, a person's years of educational attainment (the main control variable in this study) is relatively unchanged (Barro & Lee, 2013). From the IFLS5 2014 data, 22,076 individual sample units were obtained. Where respondents did not complete the questions, the IFLS5 data needed to be set as a variable (missing value). There were also outliers, especially in income variables, so a data cleaning process was used. Subsequently, the number of samples used in the processing and data analysis totaled 9,747 individuals.

## 2.2. *Theoretical Model*

The purpose of this study is to determine the effect of the number of siblings on adult income. As it involves human capital elements, such as education and work experience, the appropriate model for analysis is the Mincer earnings function (Mincer, 1974). The Mincer earnings function is essentially a multiple linear ordinary least squares (OLS) regression model with the logarithm of income as a dependent variable. The general equation of the Mincer earnings function is as follows:

$$\text{Log } w_i = as + bt - ct^2 + \text{other variables} \quad (1)$$

where  $w$  is the wage rate of the worker,  $s$  is the number of school years,  $t$  is the number of years of experience in the labor market, and  $t^2$  is the experience squared that captures the diminishing return nature of the quality of human resources (Mincer, 1974; Borjas & Van Ours, 2013; Pasay & Quarina, 2010). The development of the Mincer earnings function used in this research is as follows:

$$\text{Ln } Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \dots + \beta_j X_{ji} + \dots + \beta_k X_{ki} + \varepsilon_i \quad (2)$$

where,

$i$  = 1, 2, 3... $n$  is the number of observations.

$j$  = 1, 2... $k$  is the number of independent variables.

$\text{Ln } Y_i$  = Logarithm of income per month.

$X_{1i}$  = Number of siblings.

$X_{ji}$  = Other independent variables used as a control including gender, monthly hours of work, working status, working experiences, respondent education, father's education, mother's education, marital status, urban/rural resident, and regional place of living.

In this study, a quadratic model on the work experience variables was not used because it showed multicollinearity between the potential work experience and the quadratic potential work experience. The use of the quadratic model exacerbated the bias in calculating the return from potential work experience (Braga, 2013).

## 2.3. *Direct Impact of the Number of Siblings on Income*

Some scholars suggest that the number of siblings directly affects income because of the resource dilution of parents' time, material resources, and energy. The increasing number of children may impact the parents' level of communication of their aspirations about their children's success in the labor market, the parents' own knowledge about how to succeed, and their provision of resources that can facilitate the parents' aspirations (Parr, 2006). However, unlike Parr (2006), this study does not include non-labor income in forming income variables, because one of the largest non-labor income components, inheritance, is not available in IFLS5. The model regression used in this stage follows equation (2) above.

## 2.4. *Indirect Impact of Siblings on Income*

A regression model is first used to examine the impact of the number of siblings on individual educational outcomes. This is done because the impact of the number of siblings on the level of

welfare achieved in adulthood is believed to be an indirect impact. The number of siblings may have an impact on the achievements of human capital (in this case, the level of education) that individuals may achieve. This human capital in turn affects the achievements of individual welfare levels (Blake, 1989; Knodel & Wongsith, 1991; Butcher & Case, 1994; Downey, 1995). Testing is done by the following regression model:

$$Education = \beta_0 + \beta_1 X_1 + \dots + \beta_j X_{ji} \dots + \beta_k X_{ki} + \varepsilon_i \quad (3)$$

where,

$X_1$  = Number of siblings.

$X_{ji}$  = Other independent variables as controls, including gender, monthly hours of work, working status, working experiences, respondent education, father's education, mother's education, marital status, urban/rural resident, and regional place of living.

In order to examine the impact of the number of siblings on educational outcomes (years of schooling), we require other control variables that influence the educational of children. Parental education is used as a control variable because it is a good predictor of educational attainment and child behavior (Davis-Kean, 2005; Dearing, McCartney, & Taylor, 2001; Haveman & Wolfe, 1995; Nagin & Tremblay, 2001; Smith, Brooks-Gunn, & Klebanov, 1997).

The state of wealth or the well-being of a household also has an impact on a child's educational outcomes (Filmer & Pritchett, 1999; Bacolod & Ranjan, 2008). Nevertheless, household welfare data from the years when respondents were children or adolescents is not available. This study instead uses the available variables that capture living standards, such as the main source of household income, electricity availability, drinking water sources, number of rooms, and sanitation. These are selected as control variables because infrastructure and housing characteristics (such as water sources and sanitation facilities) are reliable and sometimes more reliable than income and expenditures in assessing welfare (Vyas & Kumaranayake, 2006).

The result of the  $\beta$  coefficient obtained from equation (3), which was used to get the predicted value, shows the result of education achievement of the respondent with respect to the number of siblings. The predicted outcomes in the above-mentioned regression model are then used to examine the impact of education (years of schooling) on the difference in outcomes. The regression model is as follows:

$$LnInc_i = \beta_0 + \beta_1 \widehat{education} + \beta_j X_{ji} \dots + \beta_k X_{ki} + \varepsilon_i \quad (4)$$

where,

$LnInc$  = Logarithm of income per month.

$(Education)$  = Predicted education  $n$ .

$X_{ji}$  = Other independent variables as a control including gender, monthly hours of work, working status, working experiences, respondent education, father's education, mother's education, marital status, urban/rural resident, and regional place of living.

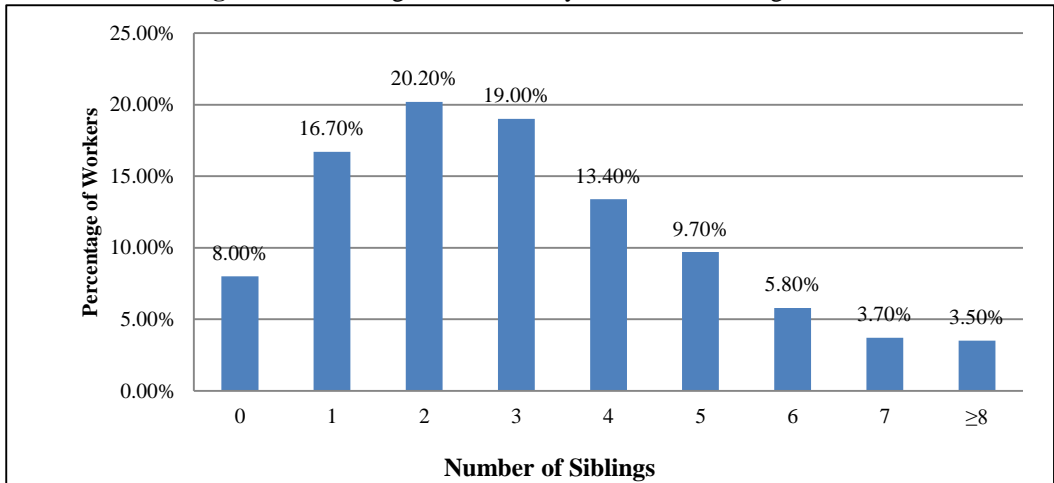
In contrast to education (years of schooling) used in testing the direct impact of number of siblings on income in adulthood, this predicted school duration shows the estimated years of schooling that the respondent may have achieved with respect to the number of siblings he or she has.

### 3. RESULTS AND DISCUSSION

#### 3.1. Descriptive

The distribution of workers by the number of siblings as shown in Figure 1 indicates that most workers (62.3%) have two to five siblings, which means that most workers come from families with three to six children. This agrees with the known background of the units of analysis used in this study, people aged 25–54 years, who were born between 1960 and 1989. At that time, the TFR in Indonesia ranged between 5.7 and 3.3 children per woman.

**Figure 1:** Percentage of Workers by Number of Siblings, 2014



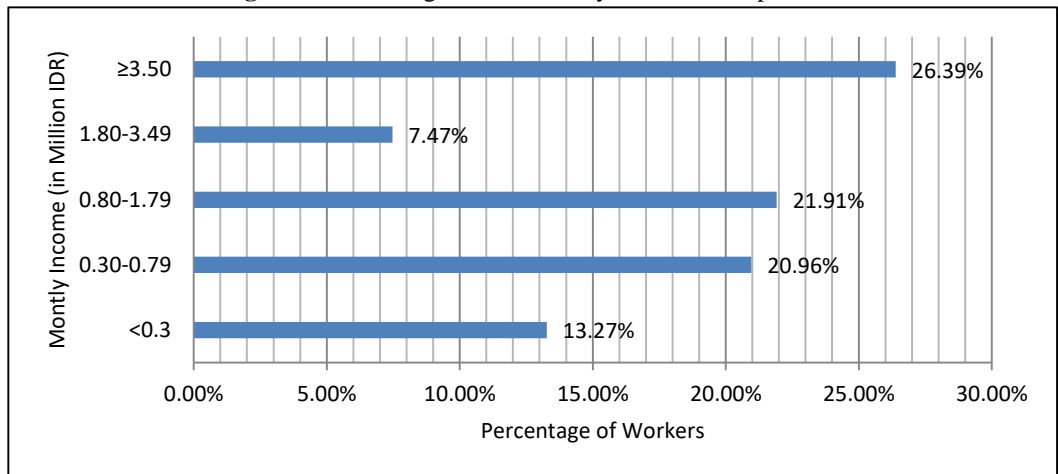
*Source:* IFLS5 (2014)

The income level distribution presented in Figure 2 shows that 61.61% of workers earn less than Rp 300,000. Meanwhile, the national poverty line in 2014 was Rp 312,328 (BPS, 2015a). Therefore, only about a quarter of workers are able to generate enough income to meet the minimum consumption of a decent living requirement for one person.

The distribution of workers, according to the number of siblings and educational outcomes presented in Figure 3, shows that with more siblings, there is lower educational attainment. This is reflected in the declining average length of schooling. However, there are exceptions in workers who do not have siblings. Workers who do not have siblings are at the lowest point of average school achievement compared with workers with siblings.

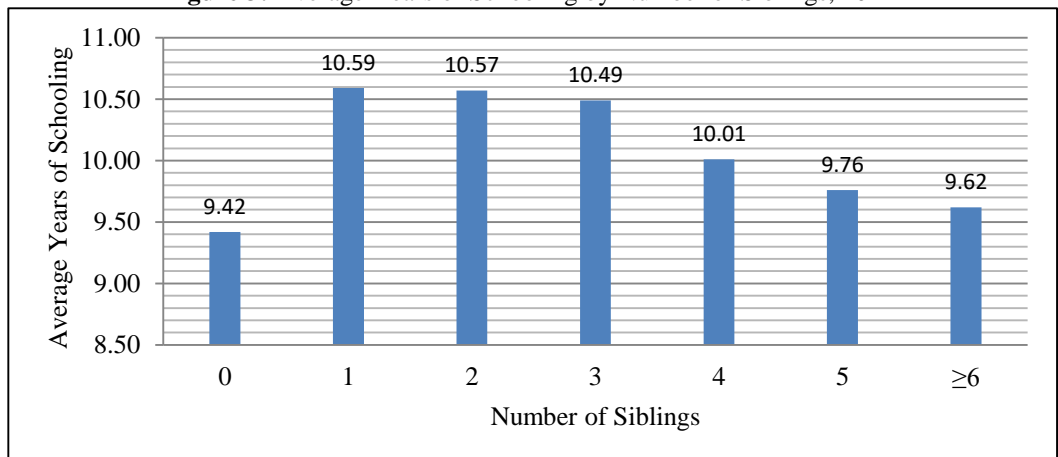
Research suggests that one child is generally not a choice in developing countries. Instead, it is related to secondary infertility incidents, which are more likely to occur in families with poor socioeconomic conditions (Ali, Islam, & Momin, 2012). However, further investigation is required in order to test this assumption. It's conceivable that a worker who is an only child comes from a family with socioeconomic conditions that are not profitable for the development of educational achievement.

**Figure 2:** Percentage of Workers by Income Group, 2014



Source: IFLS5 (2014)

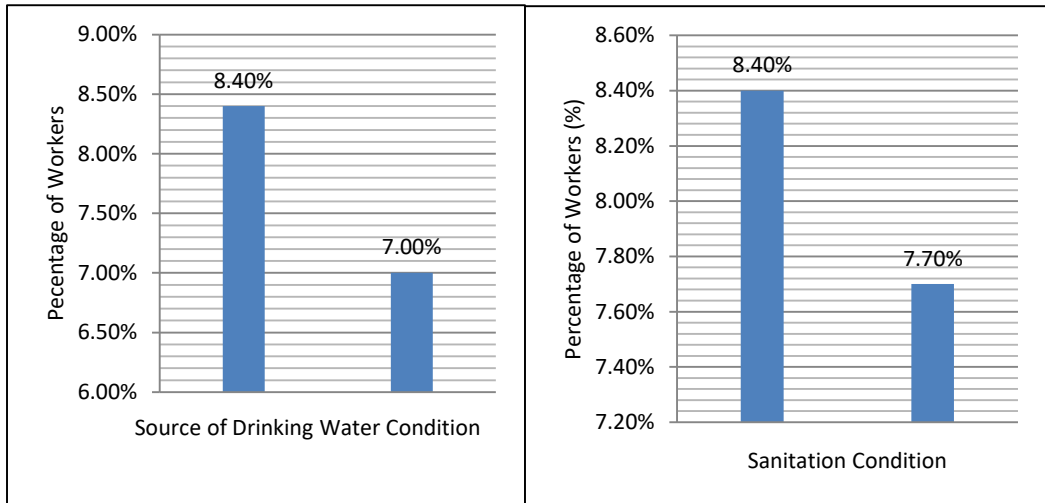
**Figure 3:** Average Years of Schooling by Number of Siblings, 2014



Source: IFLS5 (2014)

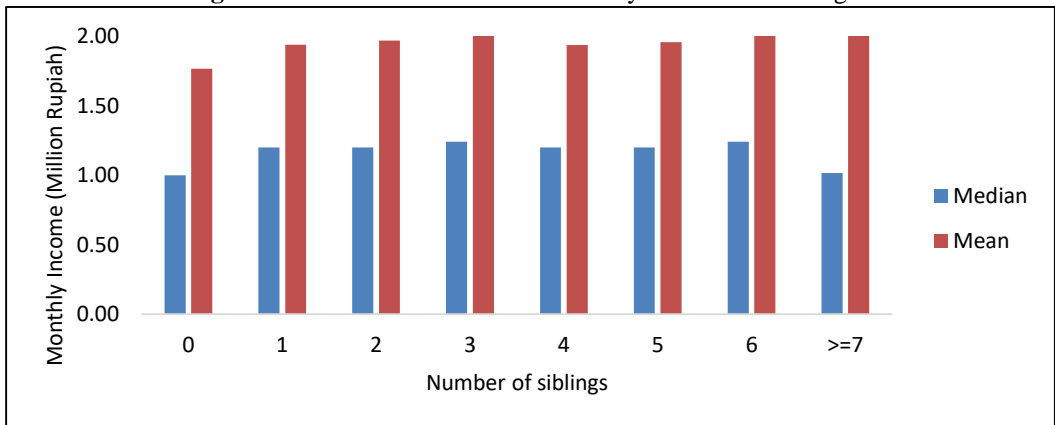
As shown in Figure 4, workers who do not have siblings tend to come from socioeconomic backgrounds that are less profitable. Overall, only 8% of workers have no siblings. However, that percentage is always higher in lower socioeconomic conditions (e.g., poor availability of electricity, lack of sanitation, poor sources of drinking water, and low household income). In Indonesia, 8.4% of workers lack decent drinking water or healthy sanitation conditions.

**Figure 4:** Percentage of Workers Who Have No Siblings by Housing Conditions



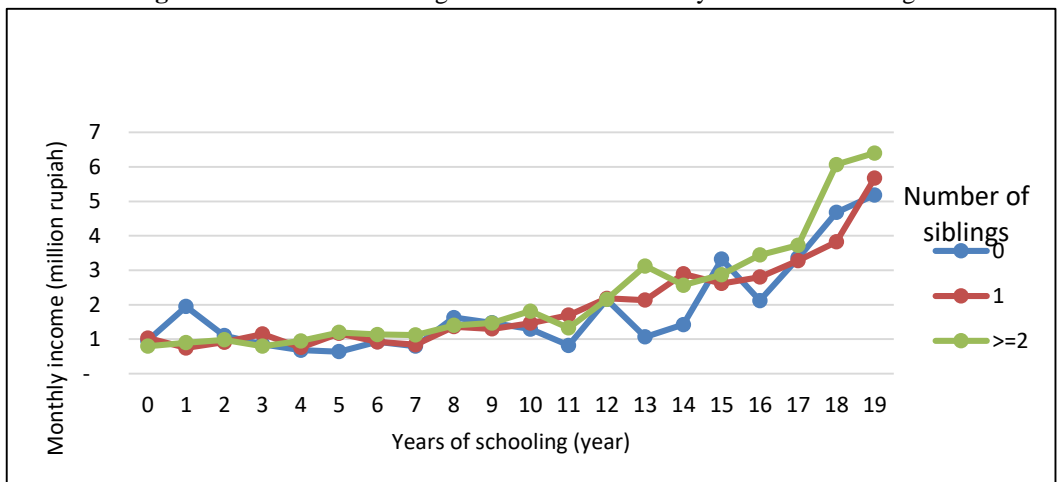
Source: IFLS5 (2014)

Figure 5 shows the mean and median income in groups of workers with different numbers of siblings. We observed no particular pattern in the relationship between the number of siblings and income. Nevertheless, the figure indicates that an employee who is an only child has a relatively lower average (mean) income than any other group of workers. The lower average income in the unemployed worker group may be due to a relatively lower average educational outcome rather than the workers' number of siblings, as shown in Figure 3.

**Figure 5: Median and Mean of Income by Number of Siblings**

Source: IFLS5 (2014)

Educational achievement, represented in various studies by a variable for years of schooling, always has a significant and consistent positive impact on higher income levels. The same is shown in Figure 6, which illustrates the increase in income patterns as school years increase. Figure 6 shows no pattern indicating differences in years of schooling between workers with respect to different numbers of siblings. However, workers without siblings appear to be in a relatively lower mean position of income than those in the other groups. This shows that in average income situations for the same schooling duration, workers without siblings are more often at the bottom of the chart.

**Figure 6: Years of Schooling and Mean of Income by Number of Siblings**

Source: IFLS-5 2014



From the descriptive patterns revealed in Figures 3, 5, and 6, we argue that the number of siblings is more closely associated with lower educational outcomes, albeit with the exception of unemployed persons. Dilution of parental resources may occur and have an impact on child education outcomes. A descriptive analysis could not illustrate a particular pattern of direct relationship between the number of siblings in childhood and the achievement of income levels in adulthood.

**Table 1:** Parameter Estimation of Linear Regression: Number of Siblings on Income

Variables	Coefficient		t	Sig.
	B	Standard Error		
(1)	(2)	(3)	(5)	(6)
Constant	10.549	0.069	151.960	0.000
Number of siblings	0.004	0.005	0.683	0.494
Gender	0.617	0.023	26.951	0.000
Working hours/month	0.004	0.000	37.063	0.000
Status of main job	0.595	0.024	24.293	0.000
Working experience	0.020	0.001	13.290	0.000
Own education	0.097	0.004	25.956	0.000
Father education	0.011	0.004	3.155	0.002
Mother education	0.013	0.004	3.356	0.001
Marital status	0.211	0.034	6.237	0.000
Place of living (Urban)	0.185	0.025	7.410	0.000
Island of residence	0.098	0.024	4.110	0.000
N = 9,747				
R <sup>2</sup> = 0.356				

**Table 2:** Parameter Estimation of Linear Regression: Number of Siblings on Education

Variables	Coefficient		t	Sig.
	B	Std. error		
(1)	(2)	(3)	(5)	(6)
Constant	5.557	0.133	41.916	0.000
Number of siblings	-0.078	0.018	-4.426	0.000
Gender	0.188	0.070	2.694	0.007
Main source of income	0.591	0.079	7.445	0.000
Number of rooms	0.258	0.023	11.123	0.000
Electricity	1.186	0.088	13.412	0.000
Drinking water	0.138	0.053	2.599	0.009
Toilet	0.986	0.084	11.705	0.000
Years of schooling Father	0.228	0.012	18.926	0.000
Years of schooling Mother	0.182	0.013	14.044	0.000
N = 7,849				
R <sup>2</sup> = 0.323				

**Table 3:** Parameter Estimation of Linear Regression: Education on Income

Variables	Coefficient		t	Sig.
	B	Std. error		
(1)	(2)	(3)	(5)	(6)
Constant	10.771	0.083	129.647	0.000
Education	0.107	0.005	19.446	0.000
Gender	0.610	0.024	25.857	0.000
Working hours/month	0.004	0.000	36.437	0.000
Status of work	0.704	0.025	28.352	0.000
Working Experience	0.005	0.001	3.348	0.001
Marital Status	0.257	0.035	7.379	0.000
Place of living (urban)	0.221	0.026	8.518	0.000
Island of residence	0.153	0.024	6.309	0.000
N = 9,747				
R <sup>2</sup> = 0.315				

### 3.2. *Direct Impact of Number of Siblings on Income*

Based on the results of the regression from equation (5) in Table 1, all significant control variables in all models are used. This indicates that the variables of sex, working hours, employment status, work experience, education, parental education, marital status, residential status, and residential island as control variables have a significant impact on income.

The variable number of siblings itself does not prove to have a significant direct effect on income. This contrasts with the findings of Parr (2006), who found that the number of siblings negatively impacted income levels in adulthood. One reason for the discrepancy in results may be the differences in the determination of income values. Parr (2006) includes non-labor income such as inheritance and transfers from other households, while this study includes only income from employment. Another reason why sibling variables do not have a significant impact on income: the number of siblings may not have a direct impact on income. Rather, sibling impacts occur indirectly through their influence on other control variables in the model, such as educational variables.

### 3.3. *Impact of Number of Sibling on Education Achievements*

The regression equation of siblings on education achievement shows that the number of siblings has a significant and negative impact on education. This is in accordance with the findings of previous studies such as Knodel & Wongsith (1991), Butcher & Case (1994), and Downey (1995).

The Resource Dilution Model Theory (Blake, 1989) is still a relevant explanation for the results of this study. It shows a negative relationship between the number of siblings and educational outcomes. The limited resources parents must divide among their children greatly reduces the allocation of resources gained per child, including both the allocation of resources in the form of monetary costs, such as school fees, and non-monetary costs (e.g., the allocation of parental concerns or feeling).

Although sibling effects continue even after controlling for the socioeconomic conditions of the household, the number of siblings has a relatively small impact on educational attainment ( $-0.078$ ). The relatively small impact of the number of siblings is expressed in the regression model equation, where the coefficients of the variable for sibling number are relatively small compared with the coefficients of household socioeconomic background variables.

Variations in educational outcomes are largely due to family background variables and other unmeasured sources of influence in the model. This is demonstrated by the coefficient of determination of the regression model of 32.3%. Thus, the background of a family's socioeconomic conditions plays a greater role than the number of siblings in influencing educational attainment versus the role of educational outcomes. However, the role of the number of siblings cannot be ignored.

The effect of the number siblings on educational attainment is best seen as a risk factor. That is, growing up with more siblings during childhood increases the risk that individuals will stop their education earlier than they should. In short, the number of siblings is not the most important factor in determining educational attainment, but it has significant and measurable consequences.

### **3.4. Impact of Education on Income**

Using the coefficient of the regression equation in Table 2, the study found that the respondent's expected years of schooling serves as a function of the number of childhood siblings and other socioeconomic conditions. Furthermore, this educational variable predictor can be used to examine the impact of education on income. The results shown in Table 3 indicate that education has a significant positive impact on income levels. The coefficient of education variables in the regression model reaches even 0.107, indicating that the addition of one year of education (a year of schooling) increases income by 10.7%. Based on the value of coefficient  $\beta$  of education variables in Tables 1 and 3, the rate of return of investment for workers is quite high, ranging from 9% to 11%. These results confirm the findings of previous studies that show the rate of return of education at around 9% (Borjas & Van Ours, 2013).

## **4. CONCLUSIONS**

In this study, the number of siblings was found to have an insignificant direct impact on income but a significant negative indirect impact on income because of its negative impact on educational outcomes. For parents who want to maximize the human capital development of their primary children in higher education outcomes, the most favorable option is a smaller family size with fewer siblings for children. Families with fewer siblings provide more resources for the child and support the development of better educational outcomes (Blake, 1981). Higher educational levels for children support higher income and higher welfare outcomes for children in their adult life.

This study uses only one wave of IFLS data. Therefore, the findings are limited and explain only the indirect effect of the number of siblings on future income through education level. To explain the role of siblings in more detail, we need to follow sibling characteristics over time and measure sibling health and childhood conditions in relation to the human capital process from childhood through adulthood. The findings also did not consider unemployed siblings. The labor market participation among siblings might play a significant role in human capital (i.e., education) decisions

within households. This is especially true if there is a parental allocation of resources, which decides who should go to school in the midst of household income constraints.

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