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The Effect of School Operational Assistance Program on Investment in Education by Households: Evidence from Indonesia

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Abstract

The School Operational Assistance Program, referred to as BOS, is a demand intervention program indirectly provided by the government of Indonesia to students through schools, started in July 2005. This paper examines the impact of BOS on educational investment by households and other expenditure such as food and non-food consumption. Using the observations of 1,161 households with at least one member studying in public school from the fourth wave of the Indonesian Family Life Survey (IFLS 4), we discover that BOS is effective in relaxing household's budget constraint, thus increasing educational investment by households. We also discover that households with low income benefit significantly from BOS relative to those with high income. Additionally, we discover that BOS assists households, regardless of their income level, in increasing their spending on food and non-food items.

Keywords: School Operational Assistance; government program; investment in education

JEL classifications: I220; I280; H520

1. Introduction

Human capital plays a central role in economic growth. This phenomenon surfaces when the production function with only traditional factors cannot explain the post-World War II fast economic growth period of the United States. The unexplained portion is observed by numerous researchers, including Schultz (1961). He claims that the quality of labor or human capital greatly explains the missing puzzle. Subsequently, Romer (1986) and Lucas (1988) emphasize the importance of human capital in the economy. They state that human capital is one of the factors that explain the difference in economic performance between developed and developing countries.

Human capital is formed through investment. Un-

derstanding the importance of human capital, governments in developed and developing countries have been spending substantial amounts of money to boost human capital through investment in education. Generally, the ultimate goal of intervention in education is to alleviate poverty by enhancing human capital (Behrman, Sengupta, & Todd 2005). The intervention takes many forms such as universal compulsory education, cash transfers for specific groups of people (Khandker, Pitt, & Fuwa 2003; Sparrow 2007; Battistin et al. 2004; Attanasio, Fitzsimons, & Gomez 2005; Behrman, Sengupta, & Todd 2005; Behrman, Parker, & Todd 2007), school construction (Duflo 2001), subsidies provided to schools (Kim, Alderman, & Orazem 1999), private-school vouchers (Angrist et al. 2001), and others.

Emphasizing the importance of education as one of the keys for economic growth, the government of Indonesia has made it mandatory for every cit-

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izen aged between 7 to 15 years old to complete a minimum 9-year formal basic education from elementary to junior high school level. Even though it is mandatory, the data have not yet shown a 100% enrollment rate for both elementary and junior high schools. Hence, the government has been intervening in order to achieve this objective through Presidential Instruction (INPRES) from 1973 to 1978, Social Safety Net (JPS) Scholarship Program from 1998, Special Assistance for Students (BKM) Scholarship Program from 2001 to 2004, and the School Operational Assistance Program (BOS) launched in July 2005.

These policy interventions are intended to reduce schooling cost incurred by households when sending their children to schools by constructing schools (INPRES), providing scholarship to students (JPS and BKM), and providing subsidies to schools (BOS). Should these interventions are effective to relax household financial constraint, these interventions can affect the households regarding the decision to not only school their children, but also invest in education and consumption. Hence, it is important to fully understand the effectiveness of these educational interventions to evaluate its impact on the expenditure of households who benefit significantly by BOS on investment in education, as well as the impact of BOS on household's health, food, and non-food expenditures.

This paper examines the impact of BOS on household's educational investment and other expenditure such as food and non-food consumption. We first reveal the determinants of BOS receipt by associating observing variables that lead a student to obtain the benefit from BOS. Then, we estimate the effects of BOS on the expenditure of households on investment in education and other expenditure such as household's health, food, and non-food consumptions conditional on the determinants of BOS receipt. We estimate these models with the observations of 1,161 households with at least one

member studying in public school from the fourth wave of the Indonesian Family Life Survey 4 (IFLS 4).

We discover that BOS is effective in relaxing household's budget constraint, thus increasing educational investment by household. We also discover that households with low income benefit significantly from BOS relative to those with high income. Additionally, we discover that BOS assists households, regardless of their income level, in increasing their spending on food and non-food items.

The following sections discuss both overview of BOS and previous researches on investment in education and BOS. Then, econometric model is implemented to estimate the impact of BOS on investment in education, health, food, and non-food expenditure. Finally, conclusions are drawn from the study, followed by policy recommendation, limitations and proposals for future work.

2. Literature Review

2.1. Intervention in Education and Investment in Education

Large bodies of research have empirically evaluated the impact of intervention programs in education on student's achievement (Kim, Alderman, & Orazem 1999; Angrist et al. 2001; Khandker, Pitt, & Fuwa 2003; Attanasio, Fitzsimons, & Gomez 2005; Anand, Mizala, & Repetto 2009; Behrman, Parker, & Todd 2007). Several researches also focus the discussion on the long-term impacts and consequences of the intervention on labor markets (Duflo 2001; Behrman, Parker, & Todd 2005). However, only a few studies have estimated the impact of intervention programs in education on household's investment in education. Investigating this impact is not trivial. Should an intervention program in education positively affects household's investment

in education, then the program can be said to be effective in enhancing human capital.

Using Vietnamese data, Glewwe and Jacoby (2004) investigate the impact of increased household's financial resources during economic reforms period on household's demand for education. They reveal that any economic policy raising households' real income will increase households' demand for education. Adding the importance, the increase in expenditure on education may serve as an essential signal to increase school enrollment and improve learning outcomes (Glewwe & Lambert 2010; Glewwe & Jacoby 2004).

Investigations on expenditure on education in Indonesia have been mainly conducted during economic crisis. Frankenberg, Smith, and Thomas (2003) argue that expenditure on education declines significantly during the crisis, especially among the poorest, leading to the decline in enrollment rates for young children from poor households. A study by Wu (2013) reveals that households face monetary constraint in expenditure on education, preventing students from finishing their ongoing education. Therefore, scholarships provided directly to students play a key role to loosen the constraint and eventually help these students to graduate.

Most importantly, the aforementioned previous studies have focused on the evaluation of INPRES and JPS/BKM programs (Duflo 2001; Frankenberg, Smith, & Thomas 2003; Sparrow 2007; Suharyo et al. 2009). However, there is still a lack of empirical studies on the evaluation of BOS.

2.2. Institutional Background

2.2.1. Education System in Indonesia

Education in Indonesia is regulated by Law No 20 of 2003 on the National Education System. In general, the objective of national education in Indonesia is to extend the potency of the nation, to shape the char-

acter, and to form a dignified civilization. Education in Indonesia takes many forms, such as non-formal, informal, and formal education. Non-formal education is usually conducted in a classroom provided to people who are in need of substitutional, additional, or supplementary education service. Informal education is mainly conducted independently by family and the surrounding environment.

Formal education conducted in schools (from this point forward we use "education" for simplicity) in Indonesia is under the responsibility of the Ministry of Education and Culture and the Ministry of Religious Affairs. Education is divided into early education from 0 to 6 years old; primary education from 7 to 15 years old; secondary education from 16 to 18 years old; and higher education at various ages. Based on the specificity of the educational purposes, education can be categorized as general education, vocational education, academic education, professional education, religious-based education, and education for the disabled. The educational system in Indonesia allows parents to choose which school they want to send their children to. However, at the junior high school level and above, the children have to pass entry examination conducted by the school.

2.2.2. Intervention Programs

The earliest intervention program in education in Indonesia took place in 1973 – 1978. During that period, the government of Indonesia constructed over 61,000 elementary schools in all regions of Indonesia as a result of substantial gains from increasing oil prices. This school construction program is called Presidential Instruction (INPRES). In 1998, the second educational intervention was initiated. The government launched Social Safety Net (JPS), the first scholarship program directly provided by the government to students in order to ensure school participation of students from poor households during economic crisis. In 2001, the

government extended the scholarship program under the name of Special Assistance for Students (BKM) until 2004. The School Operational Assistance Program (BOS) was launched by the government of Indonesia in July 2005 as a consequence of the reduction of fuel price subsidies. In order to reduce the economic burden of poor households as well as to achieve the 9-year compulsory basic education objective, the government distributed IDR 5.14 trillion or approximately USD 530 million from the 2005 National Budget of Indonesia to public and private elementary and junior high schools in all provinces of Indonesia.

2.2.3. Overview of School Operational Assistance Program (BOS)

According to BOS Operational Guidelines 2006, the detailed objectives of BOS are as follow:

- To waive all elementary and junior high school students from school operational fees;
- To waive all students from poor households in public and private elementary and junior high schools from any fees;
- To reduce school operational fees for private elementary and junior high school students.

A distinctive feature of BOS from other scholarship programs in Indonesia is that BOS funds are not directly provided to students, but provided to and managed by schools instead. The amount of the subsidy per school is conditional on the number of students and increases with student enrollment rate. Table 1 lists the characteristics of scholarship programs that has been provided by the government of Indonesia.

Even though all elementary and junior high schools are eligible under this program, there are cases where a number of schools refuse to participate in because of the complicated reporting process or their assumption that most of their students do not have difficulty in paying school fees. In most of

the cases, the rejection comes from private schools including Islamic boarding schools (SMERU 2006).

Following the decentralized education function in Indonesia, BOS funds are allocated through three phases. First, the central government through the Ministry of Education and Culture and the Ministry of Religious Affairs annually announces the program, determines the subsidy rate, and builds coordination with the local governments to collect data on schools willing to participate in the program. Secondly, the local governments at the district level require schools to provide documents containing the number of students eligible for the program. Subsequent to receiving the documents, the local governments forward these documents to the central government. Finally, the BOS funds are distributed by the central government to the schools' bank accounts through the local governments.

Schools receiving the subsidy have to manage the fund to finance their operational activities other than personnel expenses or salary of non-honorary teachers during one year, as determined by the central government. Eventually, depending on the schools' operational costs, BOS allows schools to either reduce or eliminate fees collected from students which, the central government uses as the basis for calculation. Should the amount of BOS allocated is less than the school's operational cost, then the school reduces tuition fees. However, should the amount of BOS received by the school is more than its operational cost, then the school eliminates tuition fees and even provides direct cash transfer to the students for covering transportation costs.

The decision whether to participate or not in BOS is generally made by the school without consulting with school committees (i.e. a group of people consisting of teacher councils, public figures, and parents of students which formation has to be undertaken openly and be known to the public) (SMERU 2006). Schools also have discretion in determining

Table 1: Scholarship Programs from the Government of Indonesia

No	Program	Year	Unit	Amount of Assistance	
				Elementary School	Junior High School
1	JPS Scholarship*	1998-2003	per poor student per annum	US\$6	US\$12
2	BKM Scholarship*	2001-2004	per poor student per annum	US\$6	US\$12
3	BOS Scholarship**	2005	per student per annum	US\$12	US\$32

Source: SMERU (2006)

Note: * Provided to students, ** Provided to schools on the basis of the number of students

students eligible for the program (i.e. students to be used as the basis of the allocation of funds). Several schools assume that only students from poor families eligible to be the beneficiaries of the program. Others consider that all students, regardless of the economic condition of their families, should enjoy the benefits. Moreover, the set of criteria used to distinguish students from poor families with students from non-poor families are not centrally determined, but varied across schools. As a result, BOS has a larger student-coverage compared to the previous scholarship programs; however, the target may not be well focused. These prevalent problems are due to weak program dissemination and the absence of verification in the administration process (SMERU 2006).

Another source of ambiguity comes from inconsistency in the program guidelines provided by the government. BOS Operational Guidelines 2005 mentioned that "the BOS aims to provide assistance to schools in order that they can exempt students from their school tuition. This exemption, however, will not result in decreased quality of education service provided for the community" (SMERU 2006). Meanwhile, BOS Operational Guidelines 2006 said "the BOS is aimed at releasing poor students from education cost and reducing costs for other students, so they obtain a better-quality basic education until the completion of 9 years of basic education in order to achieve the goal of the 9-year compulsory basic education program" (SMERU 2006). Eventually, there are several students, although not many, who have been excluded from the program even though their schools participate in BOS. In this case, they have

to pay full tuition and other school fees.

3. Method

The main objective of this study is to estimate the average impact of BOS on investment in education or expenditure on education of the households in Indonesia. We consider that there is a fraction of households in the sample whose members do not receive BOS. Therefore, we first need to gain better understanding on the characteristics of BOS recipients in our sample by observing variables that lead a student to obtain the benefit from BOS prior to estimating the impact of BOS. For these purposes, three different equations are estimated and descriptive statistics are presented. We employ a probit model in examining factors affecting the distribution of BOS to students. We also employ an ordinary least square (OLS) method on the extensive margin. To check for the robustness of the results, we employ OLS method on the intensive margin.

3.1. Probit Equation on Determinants of BOS

Probit regression is a nonlinear regression used only for binary dependent variables. The general equation for probit regression with multiple regressors is as follows:

$$\Pr(Y = 1|X_1, X_2) = \Phi(\beta_0 + \beta_1 X_1 + \beta_2 X_2) \quad (1)$$

where Y is a binary dependent variable, X_1 and X_2 are independent variables that might cause $Y = 1$,

β_0 is the constant term, while β_1 and β_2 are coefficients of X_1 and X_2 , respectively. This probit model is estimated by the maximum likelihood that holds strong distributional assumptions. Provided that this distributional assumption is correct, Verbeek (2012) suggests that the maximum likelihood estimator is a consistent estimator. Moreover, it produces efficient (i.e. minimum variance) estimators in many applications, including in probit models (Stock & Watson 2012).

Our probit model accounts for observable characteristics of the students, households, and schools as suggested by Behrman, Parker, and Todd (2007) as well as Anand, Mizala, and Repetto (2009). However, due to the availability of variables that can be constructed from the questionnaire, we cannot exactly follow those studies. Following the general equation, determinants of BOS is estimated using the following equation:

$$\begin{aligned} \Pr(\text{BOS} = 1 | \text{male}_i, \text{age}_i, \text{yeducpa}_h, \text{yeducma}_h, \\ \text{hs_main}_h, \text{land}_h, \text{bank}_h, \text{hhincome}_h, \text{numchild}_h, \\ \text{class_size}_s, \text{min_school}_s, \text{islamic}_s) = \Phi(\beta_0 + \beta_1 \text{male}_i \\ + \beta_2 \text{age}_i + \beta_3 \text{yeducpa}_h + \beta_4 \text{yeducma}_h + \beta_5 \text{hs_main}_h \\ + \beta_6 \text{land}_h + \beta_7 \text{bank}_h + \beta_8 \text{hhincome}_h + \beta_9 \text{numchild}_h \\ + \text{class_size}_s + \text{min_school}_s + \text{islamic}_s) \end{aligned} \quad (2)$$

where BOS is the dependent variable of students receiving BOS. The independent variables of male_i and age_i , are student's characteristics indicating student's gender and age. yeducpa_h , yeducma_h , hs_main_h , land_h , bank_h , hhincome_h , numchild_h are household's characteristics in which the student belongs indicating years of education of student's father, mother, house, land, bank account ownership, total household income, and number of children. The characteristics of the school where the student is studying are presented by class_size_s , min_school_s , islamic_s indicating class size, minutes needed for one-way trip to school, and whether or not the school is an Islamic school. Islamic school

dummy is not included in the two previous studies, yet included in our estimation mainly because private Islamic boarding schools have a tendency to reject BOS (SMERU 2006); thus, we want to see should similar thing happens in the case of public Islamic non-boarding school.

3.2. OLS Estimation on the Effects of BOS

We employ ordinary least square (OLS) method to estimate the impacts of BOS on household's expenditure on education. In addition, we also apply OLS method in the extension of our study to estimate the impacts of BOS on other types of expenditure (i.e. food, non-food, and health expenditure).

Subsequent to running probit estimation, we run OLS estimation using extensive margin by including a dummy and several household-level variables. The equation to estimate the impact of BOS on education and other types of expenditure is as follows:

$$\begin{aligned} Y_h = \alpha_0 + \alpha_1 \text{bos}_h + \alpha_2 \text{bos_income}_h + \alpha_3 \text{hhincome}_h \\ + \alpha_4 \text{hhsz}_h + \alpha_5 \text{numwork}_h + \alpha_6 \text{numinschool}_h \\ + \alpha_7 \text{numfemale}_h + \alpha_8 \text{numpublic}_h \\ + \alpha_9 \text{hs_main}_h + \alpha_{10} \text{urban}_h + \alpha_{11} \text{age_head}_h \\ + \alpha_{12} \text{yeduc_head}_h + \alpha_{13} \text{age_wife}_h \\ + \alpha_{14} \text{yeduc_wife}_h + \alpha_{15} \text{provdum}_h + \varepsilon_h \end{aligned} \quad (3)$$

where Y_h is expenditure on either education, food, non-food, or health by household. In this study, expenditure on education, food, non-food and health are defined as out-of-pocket spending in rupiah on each type of expenditure. For example, expenditure on education includes school tuitions, books, uniforms, school kits, cram school fees, daily allowances, and transportation costs. Focusing on the impact of the household's status as BOS recipient, we use bos_h as a dummy variable indicating the status for receiving BOS and bos_income_h as

an interaction between bos_h and $hhincome_h$. The error term is represented by ε_h .

Equation 4 is used to check the robustness of the results by estimating the impact of the amount of cash transfer by BOS on expenditure on education. Different from Equation 3, instead of using a binary variable for BOS, we use the actual amount of cash received by each household from BOS program in intensive margin. Therefore, we use $cbos_h$ indicating the cash amount of BOS received and $cbos_income_h$ indicating the interaction between $cbos_h$ and $hhincome_h$.

$$\begin{aligned}
 Y_h = & \alpha_0 + \alpha_1 cbos_h + \alpha_2 cbos_income_h \\
 & + \alpha_3 hhincome_h + \alpha_4 hhsz_h + \alpha_5 numwork_h \\
 & + \alpha_6 numinschool_h + \alpha_7 numfemale_h \\
 & + \alpha_8 numpublic_h + \alpha_9 hs_main_h \\
 & + \alpha_{10} urban_h + \alpha_{11} age_head_h \\
 & + \alpha_{12} yeduc_head_h + \alpha_{13} age_wife_h \\
 & + \alpha_{14} yeduc_wife_h + \alpha_{15} provdum_h + \varepsilon_h
 \end{aligned}
 \tag{4}$$

As stated by Miles (1997), conditional on income and wealth, the inclusion of demographic characteristics of household in the estimation of consumption will produce a better result. Therefore, in Equation 3 and 4, we include $hhsz_h$, $numwork_h$, $numinschool_h$, $numfemale_h$, and $numpublic_h$ that represent the number of household members, the number of members who are currently working, the number of female members, and the number of members currently studying in public schools, respectively. Among independent variables in Equation 3 and 4, we expect a positive sign on the coefficients of household income, house possession dummy, the number of members in higher education, the number of members in public schools, urban dummy, years of education of the household head, and years of education of the household head's wife.

Assuming that education is normal goods, an increase in household income will result in an in-

crease in demand for education or expenditure on education. This argument is supported by Miles (1997), Banerjee (2004), and Glewwe and Jacoby (2004). Similar to the explanation for household income, house possession can be regarded as a proxy of wealth; thus, the expected impact on expenditure on education is positive. As the number of members in school increases, and further as the schooling level increases, then the amount the household spends on education increases; thus, we expect that the number of members in higher education and the number of members in public schools will have positive coefficients. Residing in urban areas is associated with a higher cost of living. Even though the school tuition may not vary across schools in urban and rural areas, the costs of education other than tuition may be higher in urban areas; thus, we expect a positive sign on living in an urban area dummy. This argument is supported by Kochar (2004), that students in rural areas are likely to have lower years of education and thus lower expenditure on education. Banerjee (2004), Chevalier (2004), and Kochar (2004) observe a statistically significant positive relationship between parent's and child's education, hence we expect positive coefficients on years of education of both the household head and the household head's wife.

Conversely, we expect a negative sign on the coefficients of the number of workers and household size. In our study, we define the number of workers as the number of household members who has already left school and are currently working or looking for a job. Therefore, in our opinion, as the number of workers in a household increases, the expenditure on education decreases. We expect a negative coefficient of household size because in our sample, the number of workers increases as the household size gets bigger.

A number of caveats have the potential to limit the validity of the impacts of BOS in our identification

strategy. Even though we include as many control variables as possible and that BOS is exogenous from the household's point of view, there is the possibility of existence of household fixed characteristics that affect expenditure on education, yet unobservable in the data set, such as the households' preferences, tastes, culture, etc. Moreover, there is also a possibility of endogeneity in BOS. In order to address these problems, there are two possible options. The first option is to utilize panel data in order to control household and time fixed effects. In the data set applied in this study, however, the sample size of the panel unit is significantly limited that we cannot obtain a precise estimation. The second option is to apply instrumental variable (IV) regression. In order to perform the IV regression, we have to find variables that can affect expenditure on education and other types of expenditure through BOS. This situation is tricky knowing that the condition upon which BOS is awarded is generally linked to the household's economic resources that may have a causal impact on the household's expenditure. The lack of previous studies on BOS also renders it difficult to identify instrumental variables. In spite of these obstacles, we attempt to run two-stage linear regression on several variables¹, although it seems the variables do not satisfy the over-identification test.

3.3. Data Description

In this study, we use cross sectional data from the Indonesian Family Life Survey Wave 4 (IFLS 4) fielded in 2007. The IFLS is an ongoing survey conducted by RAND, a US-based non-profit organization, in collaboration with a number of prominent survey and academic institutions in Indonesia. The IFLS is a comprehensive survey that covers socioeconomic topics such as education, income,

¹Variables that we tried include religion of household head dummy, disaster, community participation, minutes required for one-way trip to school, and class size.

detailed expenditure, labor, health, fertility, marriage history, criminality, disaster, risk perception, migration, etc. Containing information of 30,000 individuals in 13,000 households, the sample of the survey represents approximately 83% of the total Indonesian population. Almost every person in the household was directly interviewed, although the survey collected information by proxy, when necessary. This study relies primarily on detailed information on household expenditures, demographics, schooling, and regional characteristics.

Our study consists of two parts: the first part is the analysis of the determinants of BOS and the second part is the analysis of the effect of BOS on education and other expenditure. Considering that private schools have a bigger tendency to refuse to participate in BOS (SMERU 2006) and that BOS is provided to elementary and junior high schools, in analyzing determinants of BOS, the sample is restricted to individuals studying in public elementary or junior high schools in the academic year 2006-2007. To analyze the impact of BOS on education and other expenditure, the sample is restricted to households having at least one member studying in public elementary or junior high school in the academic year 2006-2007. By restricting our sample, we are able to limit school choice bias between private and public schools.

3.4. Variables Used in Estimating the Determinants of BOS

We construct several variables from the questionnaire of the survey that may serve as determinants for a student to receive BOS.² Our dependent variable is *bos*, a binary variable with the value of 1 should there is at least one member receiving BOS

²In choosing the independent variables, we follow studies by Anand, Mizala, & Repetto (2009) and Behrman, Parker, & Todd (2007) with several necessary adjustments to fit BOS and Indonesian contexts.

in a household during 2006–2007 or 0 otherwise. We have 1,176 students in the sample, approximately 94% of which receives BOS. The independent variables are comprised of individual, household, and school characteristics as listed in Table 2.

3.5. Variables Used in Estimating the Effects of BOS on Education and Other Expenditure

The second step is to analyze the impact of BOS on four types of household expenditure, namely education, health, food, and nonfood expenditure. We separately regress BOS on each of these dependent variables in order to observe the impact of BOS on each type of expenditure. Our key dependent variable is *educons* that explains the total expenditure on education by all household members in school during 2006–2007.

The *educons* is a continuous variable measured in 2006–2007 rupiah price, including expenditure on school tuition, extracurricular activity, uniform, books, school kits, transportation, cram school, and daily allowance. In constructing this variable, we follow Oseni et al. (2018), stating that individual educational expenditure must include the entire expenditure incurred by members of a household on formal education (i.e. tuition and other required fees, textbooks, learning materials, uniforms, etc).

The second dependent variable is *healthcons* that captures annual expenditure on health of all household members in rupiah. The third is *foodcons* that represents annual expenditure on food of all household members in rupiah. Meanwhile, the questions used to create *educons* inquire how much expenditure on education incurred by households during one year. The questions used to create *foodcons* inquire how much expenditure on food items incurred for one week. In order to change it into annual ex-

penditure, we multiply this weekly expenditure by 52. Lastly, annual expenditure on nonfood items in rupiah is represented by *nonfood* containing expenditure on electricity, water, taxes, transportation, recreation and entertainment, phone, daily necessities, household equipment, and clothes for all household members.

In this study, we examine both extensive margin and intensive margin of the effect of BOS. In extensive margin, our variables of interests are *bos* and *bos_income*. *Bos_income* is an interaction between BOS and household income. Household income is an annual labor income of all household members during 2006–2007 presented by *hhincome* variable. Subsequent to creating *bos* and *hhincome*, we construct *bos_income*. The reason we include *bos_income* in our regression is that we would like to examine the impact of BOS on each type of expenditure of households with different income levels.

In intensive margin, we examine the impact of cash transfer from BOS provided by schools to students in order to cover their transportation expenses. Therefore, we use the amount of cash transferred, represented by *cbos*, to observe the marginal impact of providing one rupiah more of cash. Another dependent variable is *cbos_income* that is an interaction between cash transferred and household income used to examine marginal impact of BOS on expenditure on education of households with different income.

We include as many control variables as possible in the regressions to obtain more accurate results on the impacts of BOS on expenditure.³ The control variables comprise of household and regional characteristics as listed in Table 4.

There are 1,161 households that satisfy our sampling conditions and report whether or not they have

³We follow Miles (1997) in the selection of control variables that may affect expenditure with several adjustments to fit Indonesian context.

Table 2: Definition of Control Variables Used in Estimating the Determinants of BOS

No	Name	Definition
Student Characteristics		
1	male	gender dummy: 1 for male and 0 for female
2	age	age of student as of 2007
Household Characteristics		
3	yeducma	years of education of mother as of 2007
4	yeducpa	years of education of father as of 2007
5	islam	household head's religion dummy: 1 for Islam and 0 for others
6	hs_main	main house possession dummy in 2007: 1 should the household owns the house they are currently living in and 0 otherwise
7	land	land house possession dummy in 2007: 1 should the household owns land and 0 otherwise
8	bank	bank account ownership dummy in 2007: 1 should the household owns bank account and 0 otherwise
9	hhincome	annual total income of household members in 2006–2007
10	numchild	number of children in the household
11	numinschool	number of household members currently studying in higher education level (i.e. senior high school and university)
School Characteristics		
12	islamic	Islamic school dummy: 1 for Islamic school and 0 for others
13	class_size	number of student in one class
14	min_school	minutes for one-way trip to school

Note: Author's construction based on IFLS 4

Table 3: Summary Statistics of Variables Used in Estimating the Determinants of BOS

Variable	Mean	Std. Dev.	Min	Max
bos	0.939	0.240	0	1
male	0.529	0.499	0	1
age	9.870	2.229	6	14
yeducma	7.734	3.849	0	16
yeducpa	8.543	4.139	0	18
numchild	2.255	1.090	1	7
hs_main	0.807	0.395	0	1
land	0	0.341	0	1
bank	0.275	0.446	0	1
hhincome	17,900,000	21,900,000	0	420,000,000

Note: Constructed by the author based on IFLS 4. N=1,176

a member receiving BOS in 2006–2007. Among these households, 95% of which receive BOS and the remaining 5% do not receive BOS during the academic year of 2006–2007. Due to a number of households not reporting the amount of cash transfer obtained from BOS, our sample size in intensive margin is 669 households. Table 5 summarizes the basic statistics of variables used in extensive and intensive margin.

4. Results

The main objective of this section is to present the effect of BOS on investment by households in education. In order to check the robustness of our

results, we compare our estimates using the extensive and the intensive margins. However, prior to presenting the main regression results, we first briefly explain the determinants of BOS using the probit model. Subsequent to estimating the impact of BOS on households' expenditure on education, we extend our study to estimate the impact of BOS on other types of households' expenditure i.e. food, non-food, and health expenditure.

4.1. The Determinants of BOS

Table 6 presents the probit regression results of the characteristics of the students benefiting from BOS as compared to those who do not receive the benefits. In columns (1) and (2), we only include

Table 4: Definition of Control Variables Used in Estimating the Effects of BOS on Education and Other Expenditure

No	Name	Definition
Household Characteristics		
1	hhincome	total annual income of household members in rupiah in 2006–2007
2	hs_main	main house possession dummy; 1 should the household owns the house they are currently living in and 0 otherwise
3	hhszise	number of household members
4	numwork	number of worker in the household
5	numfemale	number of female members
6	numinschool	number of household members currently studying in higher education level (i.e. senior high school and university)
7	numpublic	number of household members currently studying in public elementary or junior high school
8	age_head	age of household head
9	yeduc_head	years of education of household head
10	age_wife	age of household head's wife
11	yeduc_wife	years of education of household head's wife
Regional Characteristics		
12	urban	living in urban dummy: 1 should the household lives in urban area and 0 otherwise
13	provdum	province dummies where the household lives (total of 22 dummies)

Note: Constructed by the author based on IFLS 4

Table 5: Summary Statistics for Variables Used in Estimating the Effects of BOS on Education and Other Expenditure

Variable	Extensive Margin (n=1161)		Intensive Margin (n=669)	
	Mean	Std. Dev.	Mean	Std. Dev.
educons	2,653,265	9,055,061	2,336,777	4,813,337
foodcons	11,100,000	8,439,086	n.a	n.a
nonfoodcons	26,400,000	183,000,000	n.a	n.a
healthcons	584,435.5	4,346,971	n.a	n.a
bos	0.953	0.211	n.a	n.a
bos_income	16,000,000	21,500,000	n.a	n.a
cbos	n.a	n.a	301,023.7	3,866,313
cbos_income (in million rupiah)	n.a	n.a	5,020,000	43,300,000
hhincome	16,900,000	21,600,000	17,700,000	24,600,000
hs_main	0.818	0.386	0.818	0.386
hhszise	6.438	2.672	6.458	2.703
numwork	2.761	16.238	2.748	1.629
numfemale	3.072	16.198	3.054	1.625
numinschool	0.252	0.508	0.278	0.534
numpublic	1.389	0.637	1.411	0.636
age_head	43.366	10.271	43.746	10.374
yeduc_head	6.662	3.689	6.686	3.622
age_wife	38.546	9.124	38.857	9.080
yeduc_wife	6.855	4.184	6.897	4.146
urban	0.491	0.500	0.481	0.500
provdum (1–22)	0	0	0	0

Note: Constructed by the author based on IFLS 4

students' characteristics and households' assets as explanatory variables. However, we do not discover that these variables are the determinants of receiving BOS. This finding might suggest that BOS generally benefits all students regardless of their household's economic condition.

We further include parental education and demo-

graphic characteristics of the household as presented in column (3). We discover that years of education of mother has a negative association on the probability of receiving BOS, meaning that the more educated the mother, the lower the probability for a student to receive BOS. We also discover a negative association of the number of children and

a positive association of bank account ownership dummy and household's head religion dummy on the probability of receiving BOS.

In column (4), we finally include school characteristics, i.e. Islamic school dummy, minutes needed for one-way trip to school, and class size. However, we discover that none of these characteristics is a determinant for receiving BOS. Years of education of mother consistently has a negative coefficient and is statistically significant. Adding more variables does not make household asset variables, particularly household income, significant, thus we may say that BOS is provided to almost every student regardless of income. However, the negative and statistically significant coefficient of mother's years of education may indicate that BOS is provided to students with relatively lower educational resources and thus are more likely to have lower achievements. The positive effect of maternal education on children's achievements through educational resources is observed by Chevalier (2004).

Our findings in probit regression confirm the results of a qualitative study conducted by SMERU (2006) stating that BOS generally benefits all students, especially those studying in public schools, due to poor program dissemination and guidelines.

4.2. The Effects of BOS on Expenditure on Education

Table 7 summarizes the estimates of extensive margin from different specifications of the model. The regression results reported in column (1) only include BOS dummy, household income and house possession status dummy as proxy for households' wealth, and household size as explanatory variables. The results show that the coefficient of BOS dummy is negative and not statistically significant. The only variable with a statistically significant impact on educational expenditure is household income, indicating that household with high income

spends more on education.

The regression results reported in column (2) include the interaction between BOS dummy and household income as an additional explanatory variable. Subsequent to including this interaction variable, the coefficient of BOS dummy becomes positive and statistically significant. This result implies that the negative association between BOS dummy and household's educational expenditure is, in part, the result of differences on the impact of BOS on expenditure on education of the households with different income. However, based on this result, we do not observe a statistically significant impact on the interaction variable.

In column (3), we add to our regression model demographic characteristics of household consisting of the number of household members studying at the higher education level (i.e. senior high school or university), the number of working members, the number of female members, and the number of members studying in public elementary or junior high school. Among these household demographic variables, only the number of household members studying at the higher education level shows a statistically significant impact on expenditure on education. Importantly, the coefficient of BOS dummy increases and is statistically significant. Moreover, we observe a statistically significant negative impact of the interaction variable on educational expenditure, implying a decreasing marginal impact of BOS on expenditure on education with respect to household income.

We further add parental education and age to our regression model whose results are shown by column (4). Although parental education and age, to some extent, do not seem to have a statistically significant impact on expenditure on education, we obtain a stronger estimation result by including them. The coefficient of BOS dummy becomes higher and remains statistically significant. The coefficient of

Table 6: Probit Regression Results of the Determinants of BOS

Dependent variable: BOS dummy				
	(1)	(2)	(3)	(4)
Male dummy	-0.034 (0.116)	-0.034 (0.117)	-0.056 (0.124)	-0.063 (0.124)
Age	-0.020 (0.0257)	-0.015 (0.026)	-0.021 (0.0277)	-0.019 (0.029)
House possession dummy		-0.098 (0.157)	-0.151 (0.165)	-0.137 (0.165)
Land possession dummy		-0.179 (0.160)	-0.169 (0.172)	-0.160 (0.174)
Bank account ownership dummy		0.229 (0.144)	0.265 (0.156)	0.271 (0.157)
Household income		0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Years of education of mother			-0.075 (0.022)	-0.075 (0.022)
Years of education of father			0.024 (0.020)	0.024 (0.020)
Number of children			-0.191 (0.052)	-0.191 (0.052)
Number of members in higher education			-0.006 (0.117)	-0.016 (0.118)
Household's head religion dummy			0.586 (0.165)	0.554 (0.168)
Islamic school dummy				0.167 (0.330)
Minutes to school				-0.006 (0.004)
Class size				0.001 (0.007)
Constant	1.764 (0.273)	1.82 (0.300)	2.286 (0.434)	2.707 (0.521)
Observations	1,176	1,176	1,176	1,176

Note: Robust standard errors are in parentheses

the interaction variable between BOS dummy and household income also remains statistically significant.

We finally add urban dummy and province dummies to control for heterogeneity across place where households live. As column (5) suggests, the coefficients of BOS dummy and interaction variable between BOS dummy and household income become considerably larger and remain statistically significant. In general, these results indicate that by receiving the benefits of BOS, households can improve their investment in education whose proxy is expenditure on education and this ability decreases as households' income increases.

4.3. Analysis on the Effects of BOS on Expenditure on Education

The coefficients of BOS dummy reported in column (2) to (5) in Table 7 suggest that households whose members benefiting from BOS tend to increase their expenditure on education. These results are intuitive assuming that education is normal goods and other variables are constant. Benefits received from BOS lead to an increase in households' real income and eventually result in higher demand or expenditure on education, as supported by a study using Vietnamese data by Glewwe and Jacoby (2004) where the authors concluded that a policy which increased households' real income would increase households' demand for education.

In the case of Indonesia, as BOS allows schools to

Table 7: OLS Regression Results of the Effects of BOS on Expenditure on Education – Extensive Margin

Dependent variable: educational expenditure of the household					
	(1)	(2)	(3)	(4)	(5)
BOS dummy	-85,680 (544,566)	925,261 (465,553)	1,015,000 (480,819)	1,127,000 -488,437	4,422,000 -2,68E+09
Household income	0.033 (0.011)	0.084 (0.030)	0.083 (0.028)	0.074 (0.0273)	0.095 (0.0419)
Household size	72,486 (50,274)	71,297 (50,095)	-51,513 (114,124)	-80,651 -106,923	-56,204 -90,721
House possession dummy	-1,101,000 (1,119,000)	-1,099,000 (1,119,000)	-1,163,000 (1,056,000)	-1,217,000 (1,101,000)	-986,850 (1,135,000)
BOS*household income		-0.052 (0.032)	-0.057 (0.029)	-0.053 (0.029)	-0.077 (0.042)
Number of members in higher education			2,672,000 (660,295)	2,542,000 (716,581)	2,518,000 (733,958)
Number of working members			-384,141 (251,087)	-266,370 (236,546)	-299,392 (236,496)
Number of female members			274,640 (187,597)	244,980 (185,951)	253,399 (198,602)
Number of members in public school			593,207 (392,431)	644,692 (411,072)	301,131 (344,734)
Parental education and age	No	No	No	Yes	Yes
Urban dummy	No	No	No	No	Yes
Province dummies	No	No	No	No	Yes
Constant	2,608,000 (1,201,000)	1,634,000 (1,217,000)	877,610 (711,049)	-1,768,000 (1,851,000)	-4,606,000 (3,970,000)
Observations	1,161	1,161	1,161	1,161	1,161
Adjusted R-squared	0.006	0.006	0.029	0.029	0.039
R-squared	0.009	0.010	0.037	0.040	0.064

Note: Robust standard errors are in parentheses

collect lower or eliminate tuition paid by students, it causes households' budgets to expand, leading to an increase in spending on education. The budget expansion induces household to increase their demand for education. Although it may not be necessarily true, but for example, BOS allows households to provide a better educational environment by purchasing more books, enrolling other children in senior high school or university, or sending them to cram schools, etc. The coefficient also suggests that by receiving the benefits of BOS, households are able to increase their annual expenditure on education by IDR 4,422,000 or around US\$400. The increase in expenditure on education may serve as an essential signal to increase school enrollment and improve learning outcomes (Glewwe & Lambert 2010; Glewwe & Jacoby 2004).

4.4. Analysis on the Effects of BOS on Households with Different Income

In analyzing the impact of BOS on households with different levels of income, we move our focus to the interaction between BOS dummy and households' income. Even though our results in Table 7 suggest that BOS dummy and households' income have positive and statistically significant impacts on expenditure on education, yet their interaction has a negative, statistically significant impact. This evidence implies that the marginal impact of BOS dummy on expenditure on education decreases as households' income increases. Observed from our sample, this effect still persists until the highest five percent income bracket as shown in Table 8.

Another implication of this finding is that households with lower income are the group that benefit the most. These findings are intuitive in a sense that education is highly important for lower-income

Table 8: Difference in Expenditure on Education Based on the Percentiles of Annual Household Income

Percentiles of Annual Income	Median of Annual Income (IDR)	Difference Educational Expenditure between Beneficiaries and Non-beneficiaries (IDR)
1%	720	4,366,920
5%	1,950,000	4,272,825
10%	2,800,000	4,207,800
25%	5,400,000	4,008,900
50%	11,400,000	3,549,900
75%	21,900,000	2,746,650
90%	36,000,000	1,668,000
95%	48,500,000	711,750
99%	88,000,000	(2,310,000)

Source: Calculated by author based on OLS regression results

households as they need to be skillful and educated to be able to sell their main productive asset, namely labor, on the job market. Therefore, the amount they spend on education from every rupiah of extra income resulted from BOS is higher compared to that of households with higher income.

4.5. Robustness Check

We employ intensive margin to check for the robustness of our results by replacing BOS dummy and its interaction with households' income with the amount of BOS reported by households and its interaction with households' income into our regression.

Table 9 summarizes the estimates of the intensive margin analysis from different specifications of the model. The regression reported in column (1) includes only the BOS amount, household income, household size, and house possession dummy as explanatory variables. Similar to the results reported in column (1) Table 7, the coefficient of the BOS amount is negative, yet in here we find that it is statistically significant. Adding interaction between the BOS amount and household income produces a better estimate as reported in column (2). The coefficient of the BOS amount becomes positive and remains statistically significant, similar to the results reported in column (2) Table 7. Despite its low magnitude, the coefficient of interaction between the

BOS amount and household income is negative and statistically significant.

Subsequent to adding demographic characteristics of household in column (3) and parental education and age in column (4), we still observe positive and statistically significant impact of the amount of BOS on expenditure on education. We also still observe a negative and statistically significant impact of the interaction between the BOS amount and household income on expenditure on education. Similar to the results reported in column (3) and (4) in Table 7, the number of members studying in higher education has a positive and statistically significant impact on expenditure on education while parental education and age do not seem to have a significant impact on expenditure on education.

Finally, the regression results presented in column (5) show consistent significance and sign of the coefficients of BOS dummy, the interaction between BOS dummy and household income, household income, and the number of household members studying in higher education with the result presented in column (5) in Table 7. This consistency proves robustness of our estimates. The results suggest that an increase by one rupiah in the amount of BOS results in an increase by 0.6 rupiah in expenditure on education. However, as household income increases, providing one more rupiah of BOS is not effective.

Table 9: OLS Regression Results of the Effects of BOS on Expenditure on Education – Intensive Margin

Dependent variable: household educational expenditure					
	(1)	(2)	(3)	(4)	(5)
BOS amount	-0.013 (0.004)	0.600 (0.236)	0.628 (0.255)	0.593 (0.240)	0.612 (0.283)
Household income	0.032 (0.011)	0.047 (0.015)	0.042 (0.015)	0.035 (0.013)	0.032 (0.0112)
House possession dummy	212,557 (308,568)	208,453 (308,972)	1,656 (238,882)	75,392 (236,987)	434,666 (314,148)
Household size	87,980 (43,918)	83,437 (43,578)	-113,379 (111,211)	-135,947 (107,298)	-114,525 (84,052)
BOS amount*household income		-5.58e-08 (2.17e-08)	-5.85e-08 (2.34e-08)	-5.53e-08 (2.20e-08)	-5.69e-08 (2.60e-08)
Number of members in higher education			2,196,000 (324,154)	2,128,000 (326,151)	2,085,000 (378,523)
Number of working members			164,378 (313,990)	206,574 (255,977)	181,961 (217,046)
Number of female members			44,299 (153,780)	38,469 (171,661)	31,715 (177,984)
Number of members in public school			482,353 (174,601)	462,475 (166,709)	319,286 (251,723)
Parental education and age	No	No	No	Yes	Yes
Urban dummy	No	No	No	No	Yes
Province dummies	No	No	No	No	Yes
Constant	1,036,000 (309,553)	899,644 (319,968)	548,497 (415,151)	-1,311,000 (801,079)	-980,353 (1,781,000)
Observations	669	669	669	669	669
Adjusted R-squared	0.026	0.030	0.084	0.088	0.122
R-squared	0.032	0.037	0.096	0.106	0.161

Note: Robust standard errors are in parentheses

4.6. Study Extension: The Effects of BOS on Food, Non-food, and Health Expenditure

We briefly examine the effects of BOS on other types of expenditure, i.e. food, non-food, and health expenditure. We separate health expenditure from non-food expenditure to obtain a better understanding on the impact of BOS on overall human capital investment comprising investment in education and health.

Table 10 presents our regression results. We observe a positive and statistically significant impact of BOS on food and non-food expenditure. This finding is intuitive in a sense that BOS increases households' real income, resulting in a budget expansion and eventually leading to an increase in households' demand on normal goods, including food and non-food items. Attanasio and Mesnard (2006) support this evidence and conclude that con-

ditional cash transfer program in Colombia is effective in increasing food consumption. However, we do not observe a statistically significant impact of BOS on health expenditure. This may be due to the fact that the demand for health items is relatively income inelastic compared to the other type of consumption. Moreover, the health sector in Indonesia is heavily subsidized by the government.

We do not discover statistically significant evidence of the difference in the magnitude of the impact on households based on their income. Therefore, we can say that BOS also assists households, regardless of their income, in increasing their spending on food and non-food items.

4.7. Discussion

We further discuss potential issues that may arise from our study. One apparent question may be concerning the endogeneity problem of BOS since

Table 10: OLS Regression Results of the Effects of BOS on Food, Non-food, and Health Expenditure

	Food Expenditure	Non-food Expenditure	Health Expenditure
BOS dummy	3,349,000 (1,659,000)	116,000,000 (55,620,000)	297,992 (405,507)
Household income	0.102 (0.046)	0.755 (0.509)	-0.004 (0.011)
Household size	303,699 (145,513)	2,048,000 (2,824,000)	221,662 (139,516)
House possession dummy	704,977 (605,546)	9,717,000 (15,460,000)	403,893 (318,901)
BOS dummy*household income	-0.017 (0.0505)	-0.201 (0.499)	0.003 (0.010)
Number of members studying in higher education	1,978,000 (570,774)	-9,823,000 (11,690,000)	-209,457 (267,976)
Number of working members	968.3 (229,062)	-1,1190,000 (5,605,000)	-230,686 (166,253)
Number of female members	42,989 (249,482)	3,164,000 (5,864,000)	28,370 (58,390)
Number of members studying in public school	-421,037 (351,318)	8,445,000 (15,470,000)	333,062 (308,715)
Parental education and age	Yes	Yes	Yes
Urban dummy	Yes	Yes	Yes
Province dummies	Yes	Yes	Yes
Constant	10,080,000 (7,082,000)	-1,519,000,000 (73,260,000)	-1,113,000 (1,581,000)
Observations	1,161	1,161	1,161
Adjusted R-Squared	0.22	0.04	0.02
R-squared	0.24	0.06	0.04

Note: Robust standard errors are in parentheses

household can decide whether or not they will receive benefits from BOS. Our response regarding this issue is that the decision whether or not to participate in BOS comes from school instead of from households. However, one may argue that the endogeneity problem may still exist through the school choice. As mentioned in the institutional background section, private schools tend to refuse to participate in BOS, and given the fact that Indonesian households choose to send their children in public or private school in any region, one may think that parents prefer to send their children to public school in order to obtain the benefits from BOS. Our response to this issue is we limit our sample to households having at least one member studying in public school. By doing so, we can say that to great extent BOS is exogenous from the households' point of view.

Even though we already limit our sample to avoid public-private school choice bias, we can still think

about another potential endogeneity problem of BOS. Observing its possible impact on our estimation results, the potential endogeneity may cause either downward bias or upward bias. The biases may come from uncontrolled school characteristics such as number of administration staff, number of teachers, teachers' education and experience, etc. Moreover, it is also possible to imagine the bias resulting from unobservable household characteristics, such as how important parents value education for their children that determines their attitude when searching for schools, scholarship opportunities, and other educational resources.

The potential downward bias may come from the variables that correlate negatively with BOS, but correlate positively with expenditure on education. For example, public school may refuse to participate in BOS due to an insufficient number of teachers or staff to be in charge of the administration of BOS. Eventually, students who will have benefited from

BOS and are already enrolled in school should pay more for their education. As a result, the coefficient of BOS dummy in Table 7 is downward-biased.

On the other hand, the potential upward bias may come from the unobservable characteristics that correlate positively both with BOS and expenditure on education. For example, parents who are concerned about their children's education have a good set of information about the benefits of receiving BOS and about the public schools that are likely to provide them with the benefits, thus they will send their children to those schools. At the same time, as they are aware of the importance of education, they spend more on expenditure on education. As a result, the coefficient of BOS dummy in Table 7 is upward-biased. However, this is unlikely to be the case in this context because the effect of public school choice among public schools is significantly limited. Therefore, we may say that our estimation results of the impact of BOS on educational expenditure are robust, or may be downward-biased. Should the potential endogeneity problem biases our results downwardly, we shall expect a greater impact of BOS on educational investment by household.

5. Conclusion

School Operational Assistance or BOS is a demand intervention program indirectly provided by the government of Indonesia to students through schools. The lack of empirical studies on BOS provides the importance to empirically evaluate the effectiveness of the program by examining its impact on households' educational investment. Using data on economic as well as demographic characteristics of households with at least one member studying in public school, we discover that BOS is effective in inducing households to invest more on education. Even though BOS fund is distributed to school,

eliminating or reducing school tuition assists households in relaxing their budget constraints, thus encouraging them to improve their educational expenditure. In the extension, we also observe positive impacts of BOS on food and non-food expenditure that strengthen our argument that BOS relaxing households' budget constraints leads to an increase in all types of expenditure but health expenditure. Thus, we can say that our findings are in favor of the policy.

Based on our findings, we provide the following policy implications. The government needs to prioritize low-income households as the primary target for BOS, shown by the largest impact of BOS experienced by this group. Providing a clear BOS program guideline may be one of numerous ways to accomplish it. As the government provides subsidy on direct cost of schooling, these households will be able to send more children to school. Moreover, BOS also will enable children from this group to continue to higher educational institutions, as indicated by Weiss, Hall, and Dong (1980).

All in all, our findings presented in this paper provide valuable information on evaluation of BOS. Nevertheless, this study may have limitations. In particular, the potential endogeneity of BOS may still exist. Although we suspect that this issue may produce a downward-biased estimate on the magnitude of the impact of BOS on households' expenditure on education, household-specific unobserved heterogeneity may still play a role. Therefore, conducting a separate study using panel data controlling for household fixed effects is important. Moreover, it is highly important to understand the medium and long-term impact of BOS on various relevant aspects, i.e. educational attainments and school achievements. In order to do this, we need a longer period of data set that enable us to conduct a further research.

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