Economics and Finance in Indonesia

Volume 67
Number 2 *Desember 2021*

Article 1

12-19-2021

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Fairuzah Pertiwi Kartasasmita
Faculty of Economics and Business Universitas Gadjah Mada., fairuzah.pertiwi.k@mail.ugm.ac.id

Eny Sulistyaningrum
Faculty of Economics and Business Universitas Gadjah Mada., fairuzah.pertiwi.k@mail.ugm.ac.id

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Recommended Citation
Kartasasmita, Fairuzah Pertiwi and Sulistyaningrum, Eny (2021) "The Impact of School Operational Assistance Program Implementation at School Level on Senior Secondary Education Enrollment by Households: Evidence from Indonesia in 2007 and 2014," *Economics and Finance in Indonesia*: Vol. 67: No. 2, Article 1.
DOI: 10.47291/efi.v67i2.846
Available at: https://scholarhub.ui.ac.id/efi/vol67/iss2/1

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Economics and Finance in Indonesia
Vol. 67 No. 2, December 2021 : 163–182
p-ISSN 0126-155X; e-ISSN 2442-9260

The Impact of School Operational Assistance Program Implementation at School Level on Senior Secondary Education Enrollment by Households: Evidence from Indonesia in 2007 and 2014

Fairuzah Pertiwi Kartasasmita[a,*], and Eny Sulistyaningrum[a]

[a] *Faculty of Economics and Business Universitas Gadjah Mada*

Manuscript Received: 10 November 2020; Revised: 11 May 2021; Accepted: 22 June 2021

Abstract

Education is recognized worldwide as one of the key elements in developing the human capital of a nation for a prosperous future. Given an almost universal enrollment in primary education, many governments have shifted their focus on students' motivation to continue to and finish their secondary education. The government of Indonesia has made extensive efforts in widening participation in education. With a growing budget for educational expenditure, various government programs have been implemented to assist students in their learning. One such program is the School Operational Assistance Program (BOS), which has been running for two decades. This paper reports on a study aimed to investigate the impact of the implementation of BOS at a school level on senior secondary school enrollment by households using data obtained from the Indonesia Family Life Survey (IFLS) recorded in 2007 and 2014. By using Propensity Score Matching (PSM), it was found that students whose schools received BOS during their primary education years were more likely to continue their education to senior secondary education than those whose schools did not receive BOS. This shows that a school subsidy could encourage students to continue their education, particularly for students coming from poorer households.

Keywords: BOS; school subsidy; propensity score matching; enrolment

JEL classifications: H52; I22; I25

1. Introduction

Education is considered a vital element in improving the quality of human resources, giving an opportunity for the people and the country to flourish. Education is especially critical for a developing country in improving its capacity to absorb technology (Todaro 2009). Investment in education enables people to enhance their skills, which could lead to increased productivity. *The Human Development Report 2010* by the UNDP (United Nations Development Program) states that public funding plays a major role in the expansion of schooling around the world as spending on education per GDP increased to an average of 5.1% in 2006, compared to 3.9% in 1970. As a result, historical data has shown a rapid increase to the extent of an almost universal enrollment in primary education.

Indonesia is no exception to such cases. The government of Indonesia has made it compulsory for children aged 7–15 years old to attend school and complete the basic 9 years of education of elementary and junior secondary schooling. One way to stimulate this is through establishing a program called School Operational Assistance Program (BOS), a program allocating a proportion of the national budget towards subsidizing primary and junior secondary schools. BOS was first established in 2005 as a scheme to cope with the surging world oil prices that had caused the government to decrease their oil subsidy. BOS is part of the

*Corresponding Address: Department of Economics Faculty of Economics and Business Universitas Gadjah Mada Jl. Sosio Humaniora no. 1 Bulaksumur, Caturtunggal, Sleman, Yogyakarta 55281. Email: fairuzah.pertiwi.k@mail.ugm.ac.id.

Published by UI Scholars Hub, 2021

Fuel Subsidy Reduction Compensation Program (PKPS-BBM), a program intended to allocate the budget of oil subsidy to four other basic necessities of survival: health, education, rural infrastructure, and cash transfers, particularly given to the poor.

BOS program funds are given to schools by the Indonesian government to assist them in paying the costs of school operations. These funds can be used to finance administration and maintenance costs, purchase necessary learning equipment, and so on. Schools are given freedom on how they choose to allocate the funds based on what they believe are best in order to increase enrollment and improve the quality of education. The amount of funds received by each school also depends on the number of children enrolled at the school as well as its level of education. The financing of school operations helps ease the burden of families to pay for their children's school fees and encourage them to enroll their children in school, particularly for the poor households.

The BOS program has been running for nearly two decades and budget allocation for the program has increased each year. As the enrollment rate in primary education is already close to 100 percent, there is only limited room for further improvement. On the other hand, the enrollment in senior secondary education is not yet as satisfactory over the years. As shown in Figure 1, secondary education enrollment rates in 2007 and 2014 were still below those of primary education. With the exception of the province of Papua, all provinces showed an almost universal enrollment rate in primary education. Moreover, as school children aged and progressed into secondary school age, the participation rate within secondary education tended to decrease in every province as compared to its preceeding primary education enrollment rate shown in the same figure. This trend was observed in both 2007 and 2014 data, showing that as children aged, many of them tended to no longer participate in schooling.

Some have argued that a form of subsidy may have a role in the enrollment of schooling. It is expected that increases in school subsidy potentially increase demand for schooling although only a small effect was observed on primary education as enrollment was already close to universal rate. This does not transpire to secondary education as the elasticity for demand for secondary education is still high. One of the reasons is schooling costs may become higher as children progress through their education. Poor families in developing countries often put their children through labor work to bring extra income to the family. This becomes a trade-off for families to choose between schooling and labor work for their children. Choosing the latter hinders children's education progress and knowledge acquisition needed for their future.

According to the World Bank (2014), the importance of secondary education has become a vital element in the future of the youth. Continuing their education would enable them to leave schooling with a proper minimum set of skills needed for employment or for continuing to higher education. At an aggregate level, studies have shown the contribution of secondary education to growth in a developing country (Loening 2005; Nowak & Dahal 2016). However, a limited subsidy may discourage children from continuing their schooling towards senior secondary education, especially for those from families relying on school subsidies. Dubois, De Janvry & Sadoulet (2012) found that during the last year Progresa educational cash transfer was given to children in the third year of secondary school, there was an increase in dropout and repetition rates. Hence, it could be concluded that school subsidies may have had an influence on children's motivation either to perform better at school or to discourage them as they knew they would no longer be eligible for the subsidy. The government of Indonesia has made great efforts to invest in education with strategies focusing on widening access to education, increasing quality of education, and enhancing governance of the education sector.

With a growing number of young people and the establishment of the BOS program, children today have a better chance of receiving formal education than their peers did years ago. However, this

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DOI: 10.47291/efi.v67i2.846

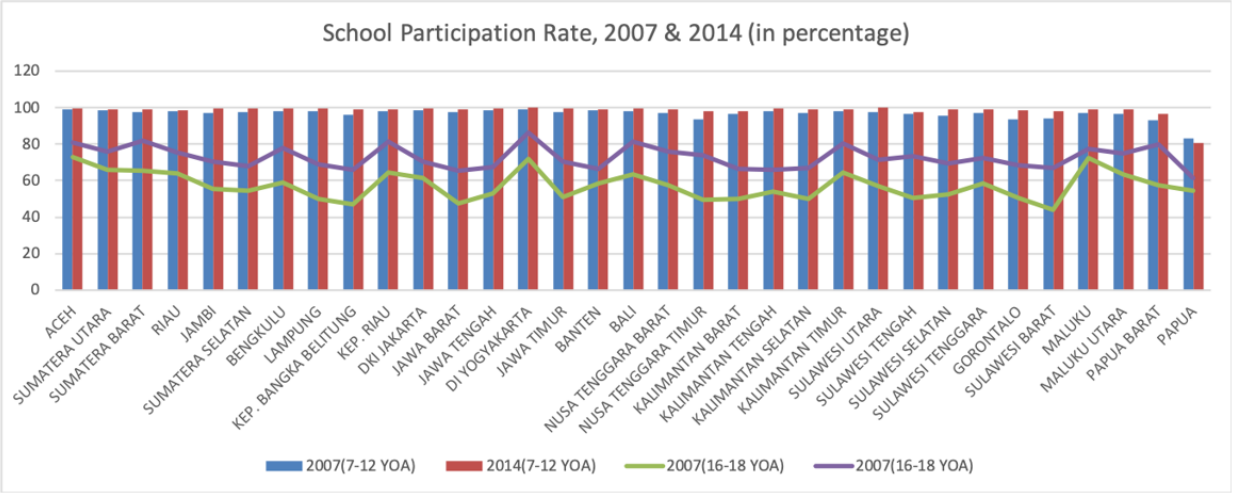

Figure 1. School Participation Rate, Age 7–12 & 16–18, 2007 & 2014 (BPS-Statistics Indonesia, 2019)

may not hold true for children from families living in poverty, including those living in extreme poverty (14.5%) and moderate poverty (48.7%). A report by the World Bank (2014) states that by controlling for other factors, after the program was first introduced and given to schools, household spending on education fell both at an average level and for the poorest households. However, this effect only lasted a while as after a few years, household educational spending began to rise both at primary school and at junior secondary school. This could be burdening especially to poorer households as there are other costs not covered by the BOS program.

Previous studies have explored the impact of an education subsidy at a school level for primary or junior secondary education on the current educational level the targeted students are attending. However, studies on the impact of education subsidy on the potential level of enrollment and tendency for families to have their children continue their studies remain limited. Therefore, this study aims to investigate the impact of school subsidy in the form of School Operational Assistance Program at school level on the enrollment of senior secondary education by households.

2. Literature Review

2.1. Indonesian Educational Programs and Progress

Developing the education sector has become a critical strategy for the government of Indonesia in developing its human capital. Hence, various policies and laws directed towards improving the quality of education have been made and implemented in order to keep up with the moving targets. The government made it mandatory for children aged 7–15 years old to complete the 9-year basic education with 6 years of primary education and 3 years of junior secondary education, as stated in Law No. 20 Year 2003 on National Education System. Two state ministries are responsible for the delivery of the national education system. The Ministry of Education and Culture oversees 84% of schools, and the remaining 16% of schools are under the Ministry of Religious Affairs. Recognizing the importance of education, Indonesia has agreed to adopt the United Nations Millennium Goals (MDGs) declared in 2000 with a deadline in 2015.

Despite the progress it has made, Indonesia has faced some challenges with regards to the development in its education sector. The Asian financial crisis in 1997 had some damaging impact on

the development of Indonesian children's education. Suryahadi, Sumarto & Pritchett (2003) estimated that over 36 million people were pushed to absolute poverty, doubling the poverty rate from 15% to nearly 33% in the span of two years. Overall education expenditure decreased, and many families were no longer able to afford education for their children as they were forced to adapt their consumption pattern as prices of commodities rose and income declined. As a result, school enrollment declined in 1997 and 1998 as spending on education declined, affecting children from every level of income with long-term effects commonly occurring in poorer households (Thomas et al. 2004). Hence, almost an additional 20% of children were no longer in school. This has greatly affected Indonesia's progress on reaching universal primary school enrollment.

To prevent enrollment rates from further decline, the government first launched a social safety net program, called *Jaringan Pengaman Sosial* (JPS), in August 1998 with assistance from the World Bank and the Asian Development Bank. The purpose of this five-year program was to return enrollment rates to the rates before the crisis. Sparrow (2004) found that the program was successful in easing the impact of the crisis on schooling, primarily on the poorer population of children. It was also found to be more effective for children who were more vulnerable to the effects of the crisis.

The program was then succeeded by the Student Special Assistance (BKM) program, a program similar to BOS, established in order to alleviate the effects of the rising fuel prices. Unlike the BOS program, BKM recipients were determined by the poverty index set by the government as the aim of the program was to make education more accessible to poorer students. Only those under the poverty index were eligible to receive BKM. The funds were also directly given to the selected students instead of to the schools. The School Operational Assistance (BOS) program was then established in 2005 as a form of assistance directly given to schools in order to subsidize the cost of schooling for primary and junior secondary schools.

2.2. School Operational Assistance (BOS) Program

According to the Regulation of the Ministry of Education and Culture No. 3 Year 2009, BOS is a program run by the central government with the main aim to provide funding, sourced from the Special Allocation Fund, for personnel and non-personnel operational costs for schools. Furthermore, according to Government Regulations No. 48 Year 2008 on Education Funding, non-personnel operational costs refer to consumable educational materials, insurance, tax, and direct costs, including power, water, telecommunication, maintenance of facilities, infrastructure, and others.

First launched in 2005, the BOS program is a scheme by the government to minimize the burden of the poor exerted by the rise of fuel prices. Due to the rising prices of commodities, it was feared that it would slow down the progress of the 9-year compulsory education and limit access to education particularly to those most vulnerable. Hence, the program was established to alleviate the effects of the rising prices of commodities.

From its establishment in 2005, BOS funds were directly disbursed to schools by the Ministry of Finance up until 2011 when new regulations were issued to decentralize the transfer of funds, giving authority to the local governments first through the local government budget to then disburse the funds to schools within the district, as stated in Law No. 10 Year 2010 on the State Budget Revenue and Expenditure 2011. This allows the local governments to utilize and distribute the funds efficiently along with the regional education budget of the local government. Thus, the program effectiveness also depends on the local governments.

BOS has a different fund transfer mechanism from its predecessor, the Student Special Assistance Program (BKM), which disbursed funds as a scholarship directly to students under the poverty index. Instead, BOS funds are directly given to schools and are allocated based on the number of students attending the schools. The allocation and manage-

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DOI: 10.47291/efi.v67i2.846

ment of the budget for the program are regulated by the Ministry of Education and Culture, whereas the funds are managed under the supervision of the Ministry of Finance. Funds are only given to schools registered for the program. Hence, it becomes the responsibility of the school management to register their schools in order to receive the funds.

Decentralization of authority that started in 2003 has encouraged a school-based management (BSM) method at school levels. This gives more freedom to allocate the funds according to the needs of the students and the school. Some schools even have their own BOS team responsible for the overall BOS funds received and other matters regarding BOS such as reporting to the Ministry of Education and Culture. Through this team, parents and other members of the communities also have an increasing role in their children's education, as they are more involved in their children's educational progress.

2.3. Previous Empirical Studies

Numerous studies have investigated the effectiveness of a school subsidy on educational outcomes such as enrollment rates and attainment among other indicators (e.g., Attanasio, Fitzsimons, & Gómez 2005; Behrman, Sengupta & Todd 2005; Al-Samarrai & Zaman 2007; Borkum 2012; Shi 2016; Bui et al. 2020). The results of these studies have remained inconclusive. The majority of these studies take into account the household income level the children are in, often localizing the effect on children coming from poorer households. Schultz (2004) found that by randomly giving grants targeted for poor families in rural Mexico, post-program enrollment rates in localities where grants were given were higher than localities that did not receive them. This effect was evident in both primary and secondary levels of education. The decision for a household to enroll their children can be affected by the household income level. Grimm (2011) investigated the income elasticity of school enrollment in a rural area in West Africa. His findings suggest that a decrease in income causes a decrease in enrollment rates with the effects greater for girls. Chevalier et al. (2005) found through an instrumental variable estimation that permanent income has stronger effects than parental education in affecting children leaving school early at the age of 16 in Britain. These studies emphasize the importance of household income in deciding whether the children will continue their education.

Other researches have evaluated the impact of a government intervention in education on human capital development. Martinelli & Parker (2008) assessed the impact of a conditional transfer towards household spending allocations on schooling. A school subsidy was found to increase the bargaining power of families to enroll their children in education. Less education can have impact on the human capital development of the future generation. Adewumi & Enebe (2019) also found similar results in 13 West African countries where an increase in government expenditure had a significantly positive impact on the enrollment in primary and secondary schools. They also found that health and education expenditure had a bidirectional causality relationship with enrollment in primary and secondary schools, respectively. This shows that the level of government finance, high or low, could highly affect the level of human capital development. Other studies have tended to focus on the impact of interventions on the level of education the students are attending and the impact they have on student dropouts.

Much fewer research have studied the treatment effect of a school subsidy on school continuation rates. By using the difference-in-differences (DiD) approach with Propensity Score Matching (PSM), Khiem, Linh & Dung (2020) found that a tuition fee policy reform which gave Vietnamese children a certain amount of subsidy and exempted them from paying tuition fees was effective in increasing enrollment for primary and junior secondary levels by 1% to 2% for each level. The results are in line with a study by Barrera-Osorio (2007) which found that the Gratuidad program in Bogota, Columbia had a significant impact on primary school enroll-

ment (about 3%) and an even bigger impact on secondary school enrollment (about 6%) with the effects being larger for at-risk students. Both programs had a positive and significant impact on school enrollment in their respective localities despite the already high enrollment rate in primary school level.

Some studies (e.g., Duryea & Morrison 2004; Hermida 2014) have applied similar methods to ours. Duryea & Morrison (2004), for example, assessed the impact of Superemonos, the conditional transfer program in Costa Rica that provides poor families with a subsidy for the purchase of food conditional upon the children of the families regularly attending school. Using regression analysis and PSM estimation, the study found that the program recipients were more likely to attend school than those who were not recipients although only probit regression analysis detected an increase in the probability that the student would pass the grade. Therefore, students that received the subsidy were just as likely to pass the grade as students who did not receive it.

A similar study investigating a similar cause as this research was done by Hermida (2014) in which they assessed the impact of eliminating enrollment fee in Ecuador using PSM. They found that an elimination of enrollment fee in the previous year of education had positive effects on the probability of continuing education a year after the elimination. Students who did not have to pay for enrollment were found to have a higher continuation rate at around 2% to 4% as opposed to those who had to pay. They found the effects to be greater in secondary education students than in primary school students due to the already high enrollment rate at the primary school level. This further signals the potential that school subsidies given at an earlier school level can increase the probability of students continuing their education.

Several studies have also been conducted to examine the impact of School Operational Assistance Program (BOS) on various outcomes in Indonesia. Sulistyaningrum (2016) investigated the correlation between BOS on children's test score at an early age using PSM to estimate the average treatment effect. They found that BOS was indeed effective in improving student performance; the program was found to increase test scores by 0.26 points. Furthermore, they also found that poorer students tended to have lower average test scores than their counterparts, and that parental education background positively impacted the children's test scores. Another study on the BOS program was done by Kharisma (2016). They evaluated the impact of BOS on school drop-outs during the post-rising fuel prices of 2005 in Indonesia. Using a difference-in-differences approach, they concluded that BOS during the post-rising fuel price in Indonesia was considered to be ineffective in lowering the dropout rates in primary education. They found that for students aged 7–15 years old, dropout rates were lower for those who did receive the assistance as opposed to those who did not receive it although the results were not statistically significant.

Despite these findings, there are still unresolved questions regarding the impact of the School Operational Assistance Program (BOS) in Indonesia. This paper, therefore, explores the effect of the program on children school continuation by examining the impact on senior secondary enrollment.

3. Method

3.1. Approach

After a program or a policy is implemented, it is essential to study and evaluate its implementation and impact to determine the success and the extent to which it has reached its objectives. However, one common issue of impact evaluation studies is the absence of a counterfactual condition; that is, it is impossible to know what would have happened had the participant not received the treatment. Such impact evaluation studies often have to rely on only observational or non-experimental data such as survey or census data (Guo & Fraser, 2015).

According to Caliendo & Kopienig (2008), impact

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DOI: 10.47291/efi.v67i2.846

evaluation studies must overcome the underlying evaluation problem and address the existence of *selection bias*, denoted by (Z, ε)$\neq$0. Estimations with a simple linear equation may lead to selection bias due to several reasons. First, treatments are usually implemented to accommodate the needs of individuals or communities in order to improve their welfare. This extends to the second reason, self-selection, which refers to potential recipients having to enlist themselves, determined by observable as well as unobservable characteristics (World Bank 2014). Given the unobservable characteristics, the error term in the estimation will contain variables that are correlated to the dummy variable of treatment. Selection bias also violates one of the assumptions of Ordinary Least Square (OLS) estimation; there should be no correlation between the independent variable and error term. Violating such an assumption will also lead to a bias in the estimation of other variables; therefore, the impact measurement will also be biased.

One estimation method to address the issue above is the matching method, which will be used in this paper. This method has become widely acceptable in measuring treatment effects (Caliendo & Kopeinig 2008). Matching involves assigning individuals based on their characteristics with the difference being only the treatment they receive. This reflects the basic idea of matching: to create two groups (treatment and control) that are similar except for their treatment status. For our estimation, this would mean to match students who received BOS with those who did not receive BOS based on their set covariates.

However, matching through covariates alone is not an efficient choice due to the curse of dimensionality (Zhao 2004). In reality there are rarely any two individuals in different treatment groups who possess the exact same characteristics. A possible procedure to overcome this problem is through finding a balancing score defined as the function of included covariates X such that the conditional distribution of X given $\mathrm{b(x)}$ is the same for both individuals in the treatment and control groups (Rosenbaum & Rubin 1983). An acceptable form of this balancing score is the propensity score, which accounts for the probability of an individual receiving the treatment given a set of characteristics X. Through the propensity score matching (PSM), the individuals would be grouped to a certain degree of "closeness" in terms of their distribution of covariates. If individuals in two different groups have a similar propensity score, then these individuals become a potential match of the estimation.

To estimate the propensity score, we follow the methodology by Rosenbaum & Rubin (1983) using the probit model for treatment selection:

$$\mathrm{pr(X_i) = P(Z = 1|X_i) = F(\beta_1 + \beta_2 X_i)}$$

where $\mathrm{pr(X_i)}$ is propensity score of individual and $\mathrm{P(Z = 1|X_i)}$ is probability of treatment given the observable covariates (X) from individual.

While Rosenbaum & Rubin (1983) state that all observed characteristics must be pre-treatment, vector X may not include all covariates used to make treatment decisions as this could violate the common support condition, which will be discussed further in this section. In other words, PSM creates a statistical comparison group from a model of the probability of being a participant of the treatment T, by controlling the characteristics observed by X or the propensity score. Matching based on probability, $\mathrm{P(X)}$, is as proficient as matching on X under certain assumptions (Rosenbaum & Rubin 1983).

The PSM method attempts estimate how a set of observed covariates $\mathrm{(X)}$ affects participation within a single propensity score. Afterwards, the outcomes of a non-participating household that has a similar propensity score with a participating household are compared to estimate the program effect. If a sample household does not have a similar propensity score with a household in the other group, the sample will be dropped from the estimation as there is no comparative match.

Random assignment of the program did not take place in BOS implementation. Hence, through using

PSM, this research attempts to create a counterfactual or control group from those who did not receive the treatment given the set of observable characteristics which will be explained further as the model for this research. By comparing the two groups in the evaluation, the purpose is for the control group to mimic the outcome of the treatment group had they not been given the program.

For this study, we utilize the implementation steps of PSM by Caliendo & Kopeinig (2008) and the model at the early stage by using PSM in which the core model consists of outcome of individuals for both the treatment and control groups. To estimate the treatment effect, we refer to the Roy-Rubin-model in evaluation analysis, which can be referred to as the following: if $\mathrm{Z_i}$ denotes the treatment indicator taking the value of 1 if individual i received the treatment (BOS) and 0 otherwise, then $\mathrm{Y_i}$ refers the potential outcome of individual i, and $\mathrm{Y_{1i}}$ is the potential outcome of individual when $\mathrm{Z_i}$ equals to 1 (received BOS treatment) whereas $\mathrm{Y_{0i}}$ refers to the potential outcome individual i when $\mathrm{Z_i}$ equals to 0 (did not receive BOS treatment), the treatment effect on individual i can be expressed as:

$$\begin{aligned}\alpha &= \mathrm{E}[\mathrm{Y_i}(1) - \mathrm{Y_i}(0)] \\ &= \mathrm{E}[\mathrm{Y_i}(1)|\mathrm{Z_i} = 1] - \mathrm{E}[\mathrm{Y_i}(0)|\mathrm{Z_i} = 0] \quad (1)\end{aligned}$$

where:

- E[Y_i(1)|Z_i=1] : average treatment outcome of individual i receiving BOS conditional on being in the treatment group;
- E[Y_i(0)|Z_i=0] : average treatment outcome of individual i who did not receive BOS conditional on being in the control group.

The equation above shows an estimation of the difference in outcomes from being in a program relative to control area for individual i randomly drawn from the population. However, $\mathrm{E}[\mathrm{Y_i}(1)|\mathrm{Z_i} = 1]$ and $\mathrm{E}[\mathrm{Y_i}(0)|\mathrm{Z_i} = 0]$ are the only two possible observable outcomes. Furthermore, this may not be applicable for non-random estimation, where $\mathrm{E}[\mathrm{Y_i}(1)]$ does not always mean $[\mathrm{Y_i}(1)|\mathrm{Z_i} = 1]$ and $\mathrm{E}[\mathrm{Y_i}(0)]$ does not mean $[\mathrm{Y_i}(0)|\mathrm{Z_i} = 0]$.

A measure of treatment effect referred as average treatment effect of the treated (ATT) is expressed as:

$$\begin{aligned}\mathrm{ATT} &= \mathrm{E}[\mathrm{Y_{1i}} - \mathrm{Y_{0i}}|\mathrm{Z_i} = 1] \\ &= \mathrm{E}[\mathrm{Y_i}(1)|\mathrm{Z_i} = 1] - \mathrm{E}[\mathrm{Y_i}(0)|\mathrm{Z_i} = 1] \quad (2)\end{aligned}$$

where $\mathrm{E}[\mathrm{Y_i}(0)|\mathrm{Z_i} = 1]$ refers to the potential outcome of students who did receive BOS on the condition they had not received the treatment. An issue with the equations above is a problem of causal interference in which only one potential outcome of each individual can be observed. Therefore, $\mathrm{E}[\mathrm{Y_i}(0)|\mathrm{Z_i} = 1]$ is not observable or is a counterfactual condition that cannot be measured.

Thus, a replacement to measure the is needed to estimate the missing data. To provide a comparison of counterfactual condition, the potential outcome of the control group had they received BOS treatment, $\mathrm{E}[\mathrm{Y_i}(0)|\mathrm{Z_i} = 1]$ can be added and subtracted to equation (3) hence, expressed as:

$$\begin{aligned}\alpha &= \mathrm{E}[\mathrm{Y_i}(1)|\mathrm{Z_i} = 1] - \mathrm{E}[\mathrm{Y_i}(0)|\mathrm{Z_i} = 0] \\ &\quad + \mathrm{E}[\mathrm{Y_i}(0)|\mathrm{Z_i} = 1] - \mathrm{E}[\mathrm{Y_i}(0)|\mathrm{Z_i} = 1] \quad (3)\end{aligned}$$

$$\begin{aligned}\alpha &= \{\mathrm{E}[\mathrm{Y_i}(1)|\mathrm{Z_i} = 1] - \mathrm{E}[\mathrm{Y_i}(0)|\mathrm{Z_i} = 1]\} \\ &\quad + \{\mathrm{E}[\mathrm{Y_i}(0)|\mathrm{Z_i} = 1] - \mathrm{E}[\mathrm{Y_i}(0)|\mathrm{Z_i} = 0]\} \quad (4)\end{aligned}$$

$$\alpha = \mathrm{ATT} + \{\mathrm{E}[\mathrm{Y_i}(0)|\mathrm{Z_i} = 1] - \mathrm{E}[\mathrm{Y_i}(0)|\mathrm{Z_i} = 0]\} \quad (5)$$

$$\alpha = \mathrm{ATT} + \mathrm{B} \quad (6)$$

The difference between equations (3) and (6) is the rising degree of selection bias (B) from using observations of α to estimate ATT. As $\mathrm{E}[\mathrm{Y_i}(0)|\mathrm{Z_i} = 1]$ is unobservable, the degree of selection bias is unobservable as well, leading to difficulties in estimating an accurate difference in outcome between the treatment group and the control group.

With the problem of counterfactual condition discussed above, the objective of an impact evaluation is then to attempt to remove the selection bias or to find ways to include it in the estimation. In other words, for α to be computable, the selection bias must be zero $(\mathrm{B} = 0)$. However, this is not possible in some cases as already mentioned in

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DOI: 10.47291/efi.v67i2.846

the preceding section. Even in experimental cases some individuals may reject the treatment, leading the estimation to involve bias. Therefore, for non-experimental evaluations such as this paper, the estimation would have to be adjusted for the rising bias.

An attempt that could be made is to assume whether the individuals who received BOS or who did not (conditional on a set of covariates, X) were independent of the outcomes. This assumption is referred to as *conditional independence assumption* (Rosenbaum & Rubin 1983).

The first assumption to be fulfilled is *conditional independence*. In short, matching is based on the identifying assumption that for a set of observable characteristics X excluding the ones affected by the treatment, the outcomes Y are independent from participation in treatment T. Refer to the equation below:

$$(\mathrm{Y}_\mathrm{i}^\mathrm{T}, \mathrm{Y}_\mathrm{i}^\mathrm{C}) \perp \mathrm{T}_\mathrm{i}|\mathrm{X}_\mathrm{i} \tag{7}$$

where $\mathrm{Y}_\mathrm{i}^\mathrm{T}$ refers to outcomes for participants (the individuals who received the BOS treatment) and $\mathrm{Y}_\mathrm{i}^\mathrm{C}$ denotes outcomes for non-participants (individuals who did not receive the BOS treatment). The equation above implies that households that are non-participants of treatment T are included only on the basis of observed characteristics.

The second assumption, *common support*, is interpreted as: $0 < \mathrm{P}(\mathrm{T}_\mathrm{i} = 1|\mathrm{X}_\mathrm{i}) < 1$. This is to ensure that observations of the treatment group will have a comparable observation "nearby" in the propensity score distribution (Heckman, Ichimura & Todd 1997). Hence, the number of participants and non-participants observed also determines the usefulness of PSM, having a large and equal number of observations in both groups is favorable as a substantial region of common support can be found.

Both units of the treatment and non-treatment groups will therefore have to be similar in terms of their observed characteristics that are unaffected by participation. Hence, to ensure comparability, some non-treatment units may have to be dropped from the observation. A non-random group of the treatment sample may sometimes have to be dropped as well if there are no similar units for comparison (Ravallion 2007). Moreover, Heckman, Ichimura & Todd (1997) support the notion to drop treatment observations with weak common support.

If both assumptions are satisfied, the PSM estimator for the ATT can be specified as the mean difference in Y over the common support, weighing the comparison units by the propensity score distribution of participants.

3.2. Data

For this research, secondary data obtained from the Indonesian Family Life Survey waves 4 and 5 were used in order to capture the before and after effects of the BOS program on secondary school enrollment rates. IFLS-4 data were gathered from 2007 to early 2008, whereas IFLS-5 were collected from 2014 to early 2015. IFLS is a longitudinal survey on the socio-economic, and health and well-being conditions collected from individuals and their households, their communities, and the health and educational facilities they use. Up to IFLS-5, a total of 16,204 households and 50,148 individuals had been interviewed (Strauss, Witoelar & Sikoki 2015). The data taken are of cross-sectional characteristics. There were 1,730 samples of teenagers that were included in both waves. This enables the study of the impact of BOS program on secondary education enrollment rate using the propensity score matching (PSM) method.

3.3. Descriptive Statistics

For this research, BOS is set as a dummy variable to determine whether or not an individual received BOS treatment. The dummy variable is 1 if the individual received BOS and 0 if otherwise.

The control variables shown in Table 1 include individual characteristics, school characteristics, parental education background, household characteristics, and household expenditures as a dummy

variable. The selection of these variables is based on the 14 criteria of poverty published by the Central Bureau of Statistics (BPS). The control variables are used to identify the characteristics to match the control group and the treatment group. Those in the control group that have similar characteristics as those in the treatment group will be included in the sample. Of the whole sample (1,727 teenagers), 602 individuals had previously been on the BOS program prior to entering secondary education.

Table 2 shows the cross tabulation between the outcome variable, which is secondary school enrollment, and BOS participation. As shown in this table, 477 individuals enrolled in senior secondary school. Of the 477 individuals who entered senior secondary school, 169 individuals were in the treatment group, whereas the other 308 individuals were in the control group.

The cross tabulation between the dummy control variables and BOS participation is presented in Table 3. Each variable is further broken down into two based on their BOS participation. As can be seen in this table, the total sample is 1,727 individuals, consisting of 1,125 individuals who did not receive BOS and 602 individuals who received BOS; these figures remain constant throughout the table.

Table 3 also shows that each variable has a different proportion of individuals. In some variables, the status of BOS participation outweighs its counterpart, such as the school administration type where 954 individuals are categorized as those who did not receive BOS and went to public school, whereas the rest of the sample are distributed unevenly with the fewest being those who received BOS and attended private school (171 individuals).

The distribution of sample based on household characteristics variables are uneven. Two variables, source of drinking water and fuel for cooking, are shown to have more individuals that are categorized as poor. On the contrary, the other two variables, defecating area and electricity availability, have more individuals that are not categorized as poor since nearly half of the total individuals exceeded the poor benchmark. As for house characteristics, more individuals do not fall under the category of poor household for both variables of major type of flooring and wall. The table shows that the distribution of sample is sufficient for the matching method as the method requires a large sample size.

Apart from the dummy variables, Table 4 shows the average education expenditure spent by households on schooling fees, school supplies, transportation costs, and housing costs. The schooling fees for those in urban areas were three times higher than those in rural areas. Moreover, individuals still needed to pay for their schooling supplies and for transportation and housing if their house was far from the school. When compared to Table 5, the amount given per student did not cover the total expenditure of schooling. Hence, families still had to pay for the remaining cost for their children to attend school. What has been discussed above does not translate to the sample distribution being insufficient for propensity score matching.

4. Result

As discussed in the Methods section, this paper will proceed with estimating the propensity score to evaluate the probability of an individual becoming a participant in the BOS program. This particular method was chosen as the comparison of outcome estimated would be comparable. The propensity score on this paper is calculated based on the variables explained in the preceding section.

Table 6 shows that of the 25 variables, 5 variables are significant in predicting the probability of an individual receiving the BOS program. The variables found to have a significant effect in BOS participation are variables related to the characteristics of individual's household, individual's education, household characteristics, house characteristics, and social programs received by the household.

The variable on individual's household regarding the individual's island of residence was found to

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DOI: 10.47291/efi.v67i2.846

Table 1. Control Variables in the Research

Variable	Question on IFLS4	Question location on IFLS4
Information of individuals' household		**Book K**
(D) Area of residence	Sampling information: area	Section SC
(D) Resides in Java	Sampling information: province of residence	Section SC
Household size	Total number of household members	Section AR
Information on householders		**Book 5**
(D) Sex of individual	Sex of individual	Section COV
Information on household characteristics		**Book 2**
(D) Defecating area: toilet with septic tank	Where do most of the household members defecate?	Section KR
(D) Source of drinking water: mineral water	What is the main source of drinking water used by the household?	Section KR
(D) Source of drinking water: plumbing		Section KR
(D) Type of fuel for cooking: Kerosene	What is the main type of fuel used for cooking by the household?	Section KR
(D) Type of fuel for cooking: Wood		Section KR
(D) Type of fuel for cooking: charcoal		Section KR
(D) Electricity availability	Does the house use electricity?	Section KR
Information on house characteristics		**Book K**
(Log) Area of house	What is the floor area of the house?	Section KRK
(D) Type of wall: wood	Most type of wall on the outside of the house	Section KRK
(D) Type of floor: wood	Widest type of house floor	Section KRK
Information on household consumption		**Book 1**
(Log) Meat and milk consumption	In the past week, what is the total value of meat consumed including beef, poultry, and lamb along with fresh milk, canned milk, milk powder, and the like?	Section KS
(Log) Food consumption	In the past week, what is the total value of prepared food consumed at home or outside that was bought or produced?	Section KS
(Log) Clothing consumption	How much was the total expenditure by all household members for clothing including shoes, hats, shirts, pants, children clothing, and the like?	Section KS
Information on household assets		**Book 2**
(Log)Assets: savings, jewelry, vehicles, cattle	Do you or other household members have savings, jewelry, vehicles (car, boat, motorcycle, bicycle), cattle?	Section HR
Information on educational expenditure		**Book 1**
(Log)Total expenditure for school fees	Approximately how much was the total expenditure for school fees for (child) during the past year?	Section KS
(Log)Total expenditure for schooling needs	Approximately how much was the total expenditure for schooling needs for (child) during the past year?	Section KS
(Log) Total expenditure on transportation and pocket money	Approximately how much was spent on transportation and pocket money, special courses associated with (child's) schooling in the past year?	Section KS
(Log) Total cost of boarding/room rent	Approximately how much was the total cost of boarding/room rent spent for (child) during the past year?	Section KS
Information on individual's education		**Book 5**
(D) School administration type	Under whose administration is/was the school?	Section DLA
Information on social programs received by household		**Book 2**
(D) Participation in the Health Fund	Does this household participate in the Health Fund (*Program Dana Sehat*)?	Section KR
(D) Certificate of low income/indigency	Does this household have or ever utilized certificate of low income/indigency (*Surat Keterangan Tidak Mampu*)?	Section KR
(D) Participation in PKPS BBM BLT	Does this household have PKPS BBM BLT card?	Section KR
Information on social programs received by household		**Book 1**
(D) *Bantuan Langsung Tunai*	Has this household ever received cash transfer from this program?	Section KSR
(D) *Program Keluarga Harapan*	Has this household ever received cash transfer from this program?	Section KSR
Information on head of household		**Book K**
(Log) Monthly income in the last year	How much is the average monthly income from working in the last 12 months?	Section AR
(D) Highest education level completed by father	What is the highest level of education completed by the father?	Section AR
(D) Highest education level completed by mother	What is the highest level of education completed by the mother?	Section AR

Source: IFLS4 Questionnaire

Table 2. Tabulation Between Secondary School Enrollment Status and BOS Program Participation

(D) Senior secondary school enrollment	(D) BOS participation		Total
	=0 (Did not receive BOS)	=1 (Received BOS)	
=0 (Did not enroll in senior secondary school)	817	433	1,25
=1 (Enrolled in senior secondary school)	308	169	477
Total	1,125	602	1,727

Table 3. Tabulation Between Control Variables and BOS Participation Program

Control variables		(D) BOS participation		Total
		=0 (Did not receive BOS) (769 individuals)	=1 (Received BOS) (495 individuals)	
Individual's household				
(D) Area of residence	=0 (Urban)	567	299	866
	=1 (Rural)	558	303	861
(D) Residence in Java	=0 (Resides in Java)	540	256	796
	=1 (Does not reside in Java)	585	346	931
Individual's gender				
(D) Gender of respondent	=0 (Female)	570	304	874
	=1 (Male)	555	298	853
Individual's education				
(D) School administration type	=0 (Private school)	171	56	227
	=1 (Public school)	954	546	1,5
Household characteristics				
(D) Defecating area	=0 (have private toilet with septic tank)	822	457	1,279
	=1 (does not have private toilet with septic tank)	303	145	448
(D) Source of drinking water	=0 (if mineral water)	130	62	192
	=1 (Not mineral water)	995	540	1,535
(D) Fuel for cooking	=0 (if cooking oil)	238	84	322
	=1 (if kerosene, wood, or charcoal)	887	518	1,405
(D) Electricity availability	=0 (if electricity available)	1,095	589	1,684
	=1 (if no electricity available)	30	13	43
House characteristics				
(D) Major type of wall structure	=0 (if permanent wall)	804	461	1,265
	=1 (if wood or no permanent wall)	321	141	462
(D) Major type of flooring	=0 (if permanent floor)	920	514	1,434
	=1 (if dirt or no permanent floor)	205	88	293
Social programs received by household				
(D) Receive Health Fund	=1 (if household received Health Fund)	1,021	542	1,563
	=0 (if household did not receive Health Fund)	104	60	164
(D) Have certificate of low income/indigency	=1 (if household has certificate of low income/indigency)	976	512	1,488
	=0 (if household does not have certificate of low income/indigency)	147	88	235
(D) Have PKPS BLT BBM card	=1 (if household has PKPS BLT BBM card)	857	435	1,292
	=0 (if household does not have PKPS BLT BBM card)	266	163	429
(D) BLT (*Bantuan Langsung Tunai*)	=1 (if household received BLT)	817	427	1,244
	=0 (if household did not receive BLT)	308	175	483
(D) PKH (*Program Keluarga Harapan*)	=1 (if household received PKH)	1,122	598	1,72
	=0 (if household did not receive PKH)	2	4	6
Head of household				
(D) Highest education completed by father	=0 (if graduated primary school)	705	386	1,091
	=1 (if did not graduate primary school)	420	216	636
D) Highest education completed by mother	=0 (if graduated primary school)	859	479	1,338
	=0 (if did not graduate primary school)	266	123	389

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DOI: 10.47291/efi.v67i2.846

Table 4. Average Education Expenditures by Households in 2007 (Rupiah)

Variable	Rural	Urban
Schooling fees	371,07	1,520,397
School supplies costs	315,114	396,623
Transportation costs	1,291,906	1,633,012
Housing costs and food	89,267	88,537
Total	2,067,359	3,638,569

significantly affect the individual's probability of receiving BOS. Individuals who reside outside Java island are 7.6% more likely to receive the program as opposed to individuals who reside on Java. This value is significant at 1% significance level. This result is rather surprising as Java is regarded as the most developed island in Indonesia. A similar result was observed in a study by Suryadarma et al. (2006) where they found that students are more likely to continue their education to junior secondary school if they live outside Java and Bali. This is perplexing as there are more jobs that require higher education qualifications; hence, education is more intensive in Java.

The school administration type is also a significant variable in explaining BOS participation. Individuals who are enrolled in public schools have an 11.5% higher probability of receiving the program than individuals who are enrolled in private schools. This value is significant at 1% significance level.

Two variables indicating the individual's house characteristics were also found to significantly affect the probability of an individual receiving BOS. Individuals who have no private toilet with septic tank have a 7.5% less probability than individuals who do. This value is significant at 5% significance level. Furthermore, individuals whose households use kerosene, wood or charcoal to cook are 14.7% more likely to receive BOS that their counterparts. This value is significant at 5% significance level.

Lastly, whether or not the household received social programs in the form of BLT also affects the probability of their children receiving BOS. Students who come from households that receive BLT have a 12.5% lower probability of receiving BOS. This result is significant at 1% level.

Other variables such as the major type of wall structure denote a negative and insignificant impact on the probability of receiving BOS. This result might be in line with previous findings from Duryea & Morrison (2004) stating that students whose house characteristics are other than concrete or prefab walls are 6.8% less likely to continue their education in the next academic year. Students from households whose heads only graduated primary school or lower have a lower probability of receiving BOS.

The estimation results calculated a total of five blocks or strata of propensity score with Block 1 having the greatest number of observations and Block 5 having the least. Rosenbaum & Rubin (1983) note the advantage of sample that has been matched is the smaller difference in covariance of the control variable between the treatment group and control group as compared to the sample that has not been matched. For that reason, a t-test was done to see the difference in covariance of control variable on the treatment group and control group before and after matching as shown in Table 7.

The comparisons between the propensity score densities can also be done in order to determine whether the matching between the treatment and control groups is comparable. The estimated propensity scores between the two groups are supposed to have a similar density, marked by the overlapping propensity score density curves. Figure 2 shows the propensity score density curves between the treatment group and the control group.

After calculating the propensity score of an individual to receive the BOS treatment, comparable results of the outcome variable, secondary education enrollment, can be compared between those who received BOS and those who enrolled to secondary school but did not receive BOS. Table 8 shows the ATE BOS enrollment in senior secondary education using four methods of matching that have been discussed in the previous section.

The results of the four matching methods show a significant impact of BOS treatment on school enrollment. All the four methods show consistent find-

Table 5. Amount of School Subsidy

Program	Year	Unit	Nominal value (Rupiah)	
			Primary School	Junior Secondary School
BOS	2005–2009	Per student per annum	235	325

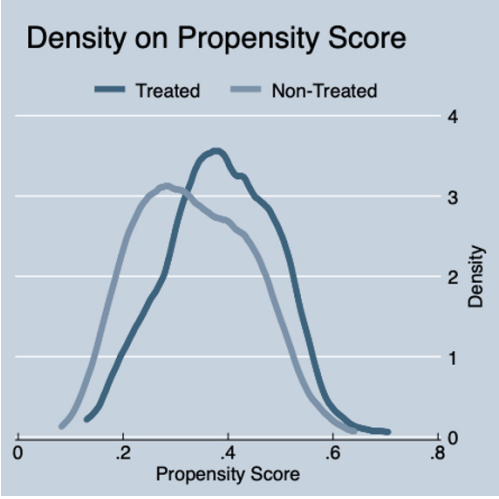

Figure 2. Kernel Density Estimation

ings, a positive impact on the role of BOS on school enrollment. However, NN shows a significant result of ATT, whereas the ATT estimation from the other matching method is insignificant. For the NN matching method, there are 465 individuals in the treatment group and 320 individuals in the control group that are found to be comparable. Note that this particular NN method used in this research allows for replacement to be done for individuals in the control group to different individuals in the treatment group. The average treatment on the treated (ATT) of NN shows an estimate of .086, which means individuals who received BOS are 8.6 percentage points more likely to enroll in secondary school as opposed to individuals who did not receive BOS; the highest amongst the ATT estimation.

Other studies have found a higher probability from similar programs. Duryea & Morrison (2004) found an 8.7% increase in the probability of students continuing education after conditional transfers in the previous education years and not receiving the transfers the following year in Costa Rica. The estimated effect is also comparable although not as high as the 14% higher probability of secondary education students in Ecuador continuing their education where in the previous three years they did not have to pay for their education, as found by Hermida (2014). Though showing a positive impact, the BOS program does not have as great of an effect as other similar programs in Costa Rica and Ecuador. Our estimation, however, is larger than the results found by Duflo (2001) for impact of JPS on senior secondary enrollment in Indonesia. This difference in magnitude of effect may be due to the different targets of the subsidy programs.

There are a number of possible reasons for the subsidy to have a smaller effect than the ones in Costa Rica and Ecuador. Senior secondary education was yet to be subsidized by BOS program. Hence, most of the schooling expenses still have to be covered by household expenditures. Moreover, a report by the ACDP (2013) found that more students living on Java and Nusa Tenggara Timur who chose not to enroll in senior secondary education cited the high cost of schooling to be the reason amongst others. For each child enrolling in senior secondary education, households have to pay twice as much as they do in junior secondary education, increasing the burden of poor households to pay for their children's education. The increase in burden may cause households to be more reluctant to continue enrolling their children to the next school level.

5. Conclusion

This paper reports on a study investigating the impact of School Operational Assistance Program (BOS) on secondary education enrollment in Indonesia and other factors that might influence people to continue their education. This study uses the variable of senior secondary education enrollment to see whether students who previously re-

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DOI: 10.47291/efi.v67i2.846

Table 6. Descriptive Statistics

Variable	Treatment Mean (Standard Deviation)	Control Mean (Standard Deviation)
Information of individual's household		
(D) Area of residence	.503	.496
(=1 rural)	(.5)	(.5)
(D) Resides in Java	.575	.52
(=1 if does not reside in Java)	(.495)	(.5)
Number of household members	6.86	7.01
	(2.81)	(3.15)
Information on individual		
(D) Sex of individual	.495	.493
(=1 female)	(.5)	-5
Information on individual's education		
(D) School administration type (=1 if public school)	.91	.848
	(.291)	(.359)
Information on household characteristics		
(D) Defecating area: no private toilet with septic tank	.241	.269
(=1 if no private toilet with septic tank)	(.428)	(.444)
(D) Source of drinking water: not mineral water	.897	.884
(=1 if not mineral water)	(.304)	(.32)
(D) Fuel for cooking: kerosene, wood, or charcoal	.86	.788
(=1 if kerosene, wood or charcoal)	(.347)	(.409)
(D) Electricity availability: no electricity	.022	.027
(=1 if no electricity)	(.145)	(.161)
Information on house characteristics		
(Log) Area of house	4.17	4.2
	(.629)	(.652)
(D) Major type of wall structure: wood or not permanent	.23	.285
(=1 if wood or not permanent)	(.424)	(.452)
(D) Major type of flooring: wood or dirt	.146	.182
(=1 if wood or dirt)	(.354)	(.386)
Information on household consumption		
(Log) Food consumption	132.44	138.12
	(35.89)	(39.37)
(Log) Meat and milk consumption	6.32	7.07
	(4.8)	(4.76)
(Log) Clothing consumption	12.87	12.1
	(1.75)	(1.91)
(Log) Education expenditure by household	14.19	14.34
	(1.06)	(1.18)
Information on household assets		
(Log) Assets: savings, jewelry, vehicles, cattle	14.61	14.8
	(1.97)	(2.05)
Information on social programs received		
(D) Receive Health Fund	.01	.092
(=1 if household received Health Fund)	(.3)	(.29)
(D) Have certificate of low income/indigency	.147	.131
(=1 if household have certificate of low income/indigency)	(.354)	(.337)
(D) Have PKPS BLT BBM card	.273	.237
(=1 if household have PKPS BLT BBM card)	(.446)	(.425)
(D) BLT (*Bantuan Langsung Tunai*)	.291	.274
(=1 if household received BLT	(.455)	(.446)
(D) PKH (*Program Keluarga Harapan*)	.01	.002
(=1 if household received PKH)	(.081)	(.042)
Information on head of household		
(Log) Income of head of household	15.67	15.85
	(1.01)	(1.09)
Information on parents' education		
(D) Highest education level completed by father	.359	.373
(=1 if father completed primary school or equal)	(.48)	(.484)
(D) Highest education level completed by mother	.204	.236
(=1 if mother completed primary school or equal)	(.4)	(.425)
Outcome Variable		
(D) Enrollment in senior secondary school	.281	.274
(=1 if enrolled in senior secondary school)	(.45)	(.446)
Total observations	602	1125

Table 7. Propensity Score Estimation Results Using Probit Model

Dependent variable: Received BOS (=1 if the individual received BOS in primary/junior secondary school)	Parameter estimation dy/dx (Delta-method Std. Error)
(D) Area of residence	0.121
(=1 if rural)	(0.01)
(D) Resides in Java	0.076***
(=1 if does not reside in Java)	(0.030)
Number of household members	-0.000
	(0.005)
(D) Sex of individual	0.01
(=1 if female)	(0.027)
(D) School administration type	0.115***
(=1 if public school)	(0.042)
(D) Defecating area: no private toilet with septic tank	-0.075**
(=1 if no private toilet with septic tank)	(0.036)
(D) Source of drinking water: not mineral water	-0.011
(=1 if not mineral water)	(0.044)
(D) Fuel for cooking: kerosene, wood, or charcoal	0.147***
(=1 if kerosene, wood, or charcoal)	(0.04)
(D) Electricity availability: no electricity	-0.008
(=1 if no electricity)	(0.095)
(Log) Area of house	0.012
	(0.023)
(D) Major type of wall structure: wood or not permanent	-0.065
(=1 if wood or not permanent)	(0.041)
(D) Major type of flooring: wood or dirt	-0.067
(=1 if wood or dirt)	(0.047)
(Log) Food consumption	-0.001
	(0.000)
(Log) Meat and milk consumption	-0.000
	(0.004)
(Log) Clothing consumption	-0.004
	(0.009)
(Log) Education expenditure of household	-0.02
	(0.014)
(Log) Assets: savings, jewelry, vehicles, cattle value	0.000
	(0.008)
(D) Receive Health Fund	0.022
(=1 if household received Health Fund)	(0.046)
(D) Have certificate of low income/indigency	0.051
(=1 if household have certificate of low income/indigency)	(0.042)
(D) Have PKPS BLT BBM card	0.078
(=1 if household have PKPS BLT BBM card)	(0.058)
(D) BLT (*Bantuan Langsung Tunai*)	-0.125**
(=1 if household received BLT	(0.057)
(D) PKH (*Program Keluarga Harapan*)	0.275
(=1 if household received PKH)	(0.276)
(Log) Income of head of household	-0.019
	(0.016)
(D) Highest education level completed by father	0.009
(=1 if father completed primary school or equal)	(0.03)
(D) Highest education level completed by mother	-0.026
(=1 if mother completed primary school or equal)	(0.033)
Total observation	1,272
Common support area	.13042948, .7050931

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DOI: 10.47291/efi.v67i2.846

Table 8. Difference in Covariance Test (T-Test) Results Between Treatment and Control Groups Before and After Matching

Control variable	p-value from t-test	
	Before	After NN
(D) Area of residence (=1 rural)	.425	.948
(D) Resides in Java (=1 if does not reside in Java)	.004	.262
Number of household members	.320	.760
(D) Sex of individual (=1 female)	.831	.088
(D) School administration type (=1 public school)	.023	.402
(D) Defecating area: no private toilet with septic tank (=1 if no private toilet with septic tank)	.152	.751
(D) Source of drinking water: not mineral water (=1 if not mineral water)	.598	.295
(D) Fuel for cooking: kerosene, wood, or charcoal (=1 if kerosene, wood, or charcoal)	.000	.254
(D) Electricity availability (=1 if no electricity available)	.465	.652
(Log) Area of house	.546	.710
(D) Major type of wall structure: wood or not permanent (=1 if wood or not permanent)	.156	.953
(D) Major type of flooring: wood or dirt (=1 if wood or dirt)	.004	.381
(Log) Food consumption	.009	.158
(Log) Meat and milk consumption	.045	.870
(Log) Clothing consumption	.057	.993
(Log) Total education expenditure by household	.003	.970
(Log) Assets: savings, jewelry, vehicles, cattle value	.115	.658
(D) Receive Health Fund (=1 if household received Health Fund)	.870	.000
(D) Have certificate of low income/indigency (=1 if household have certificate of low income/indigency)	.103	.419
(D) Have PKPS BLT BBM card (=1 if household have PKPS BLT BBM card)	.579	.692
(D) BLT (*Bantuan Langsung Tunai*) (=1 if household received BLT	.517	.247
(D) PKH (*Program Keluarga Harapan*) (=1 if household received PKH)	.254	.654
(Log) Income of head of household	.002	.500
(D) Highest education level completed by father (=1 if father completed primary school or equal)	.705	.501
(D) Highest education level completed by mother (=1 if mother completed primary school or equal)	.113	.588

Source: IFLS 4 & 5, processed
Note: *significant at 10%, ** significant at 5%, *** significant at 1%.

Table 9. BOS ATE Estimation Results to Secondary School Enrollment

Matching estimator	Total unit in treatment	Total unit in control	ATT (*Standard Error*)	t
NN	465	320	.086	2.61**
			(.033)	
Stratification	465	844	.018	0.67
			(.026)	
Radius	439	855	.029	0.97
			(.036)	
Kernel	464	855	.017	0.63
			(.026)	

ceived BOS in an earlier grade would further enroll in senior secondary education. An evaluation on the impact of the program on continuation rates to senior secondary education has not yet been done for the case of Indonesia. The implementation of the program did not allow for an experimental evaluation; therefore, the effects were estimated using propensity score matching.

The results from this study show that BOS program implemented at a school level had to senior secondary school enrollment based on the household and individual characteristics of the sample. Those who received the program during their primary or junior secondary schools had an 8.6 percentage points higher the probability of continuing their education to senior secondary school. This implies that the decision to enroll in senior secondary school is affected by the advantages and incentives given by BOS in their previous years of studies. Further results show that children living outside Java have a greater chance of receiving the program. Household assets were found to have little impact on the probability of students receiving the program. This could happen as BOS subsidizes school fees and tuition fees for students who are already enrolled in school.

Students who are already enrolled in the program may be more encouraged to continue the program with three more years of senior secondary education. However, this impact could be short-lived as BOS only covers a small proportion of the fees needed for a child to attend school. There are other costs that must still be covered by the household. BOS has a smaller impact on encouraging students to continue their education when compared to other programs that subsidize school fees. One of the factors could be that the other programs also subsidize senior secondary education and that BOS was only directed for primary and junior secondary school students in 2007 and 2014.

Reflecting upon the results of this research, we offer several recommendations. According to the Regulation of the Ministry of Education and Culture No. 80 Year 2015, to support the 12-year compulsory education, the government has extended the coverage of BOS to include senior secondary school students eligible for a similar program, BOS SMA. This program shares the same purpose as BOS, which is to help schools fund their non-personnel expenditures, particularly for students coming from poorer households. Thus, the public education expenditure expanded its budget in order to fund this program. The authors recommend a further study investigating the impact of an education expenditure to subsidize senior secondary school students since this program is relatively new and has yet to be scientifically evaluated.

There are several limitations of this study. This research attempts to estimate the impact of a school subsidy in earlier school years on senior secondary school enrollment. However, this research does not take into account the fact whether the students in the sample remained in school or left school without completing their education. The authors are aware that the model may not be the fittest model to analyze the impact of BOS program participation on education enrollment. Finally, there are several other variables not included that may better describe the characteristics of each sample and their education.

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DOI: 10.47291/efi.v67i2.846