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The Impact of Special Autonomy on Education and Health Outcomes

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Abstract

The purpose of the study is to analyze the impact of implementing on special autonomy in Papua on education and health outcomes. The main data are sourced from the 2015 Intercensus Population Survey. Educational outcomes are measured by the highest primary education completed, while the health outcome measure is the level of complaints of sickness. The impact of special autonomy on educational outcomes is analyzed using ordered logistic regression, while the impact of special autonomy on health outcomes is analyzed using ordered logistic regression and instrumental variables. The results of this study comprise two findings. First, the implementation of special autonomy in Papua has not had an impact on basic education in the province, because education spending made by the regional government in implementing special autonomy in Papua has not been able to compensate for the needs of school-age children in households. Second, the implementation of special autonomy in Papua has a direct and indirect impact on household health outcomes. This shows that the health expenditures made by the Regional Government in implementing Special Autonomy, through increasing the coverage of community health centers throughout Papua, bring benefits that are felt by households in the province.

Key words : special autonomy, education outcomes, health outcomes, Papua Province.

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INTRODUCTION

Law No. 21 of 2001 pertaining to Special Autonomy (Otsus) in Papua, provides for Papua Province to be managed under the Otsus model. This model, in the asymmetric decentralization framework, involves the granting of different powers to a region for certain reasons related to avoiding the process of disintegration, and to provide protection to ethnic minority groups to maintain their identity (Hébert & Mincyte, 2014). The implementation of Otsus in Papua has implications for additional fiscal areas in Papua which are significant, which are not found in most regions in Indonesia (Cahyaningsih & Fitrady, 2019; Widodo, 2019).

Through Otsus, the Regional Government in Papua are given the responsibility to provide education at all levels, and pathways and types of education in the province. Improving the quality of education in Papua, which is funded by Otsus, is implemented through providing equipment and school unit buildings, at various levels of education, improving the quality of edu-cation by bringing in competent teachers, and freeing education costs for the nine-year compulsory education program. The con-siderations of the Regional Government in Papua focus on education, due to the low school participation of the nine-year basic education compulsory education program in the province (BPS, 2020).

Similarly, in terms of health, the focus of health spending in the context of implementing Otsus in Papua is directed at supporting the improvement of health services for the local population, preventing and tackling endemic diseases and diseases that endanger the survival of the population, obtaining health services with the lowest possible burden, and improving and improve the nutrition of the population (Katharina, 2018). The main motivation for Regional Governments in Papua is to focus on health services, because the percentage of pregnant women giving birth using health service facilities is relatively low, compared to the national average (Ministry of Health, Republic of Indonesia (*Kementerian Kesehatan Republik Indonesia*), 2019).

The literature on asymmetric fiscal decentralization has shown success in several countries such as Malaysia, Spain, and India. The implementation of asymmetric decentralization in the Sabah and Sarawak regions has helped Malaysia accommodate internal diversity for more than four decades (Shaikhutdinova, 2017). Spain and India are two countries with political backgrounds with an asymmetrical fiscal decentralization system. Studies in both countries show that asymmetrical fiscal decentralization, in general, has a positive impact on public services in Spain and India, especially in the education sector and on the health sector (Carlitz, 2017; Kurnia, 2012). Meanwhile, in Colombia and China, asymmetric fiscal decentralization has a negative correlation with infant mortality (Brock et al., 2015; Soto et al., 2012), and encourages poverty alleviation, especially in rural areas in China (Rogers, 2014).

In Indonesia, studies on asymmetric fiscal transfers to measure the effectiveness of Otsus policies have been conducted before, using macro data at the provincial level (Cahyaningsih & Fitrady, 2019; DJPK, 2018; Nasrullah, 2017; Prabowo et al., 2020; Siddik et al., 2019; Wicaksono, 2018; Widodo, 2019). The general conclusion from the study shows that the implementation of Otsus in Papua Province, West Papua Province, and Nanggroe Aceh Darussalam Province has not had a significant impact on the provision of public services, especially education and health.

However, little is known about the causal impact of Otsus in Papua, on education and health outcomes at the household level. The use of micro data at the household level as a unit of analysis can provide a complete and

accurate picture of the effectiveness of a policy, and this is the main motivation for this research. Thus, the research objectives are, first, to analyze the impact of Otsus in Papua on educational outcomes. Second, analyze the direct and indirect impact of Otsus in Papua on health outcomes.

METHOD

The main data for this research come from the 2015 Inter-Census Population Survey (SUPAS) and focuses on the Papua region. Supas is conducted every 10 years by the Central Bureau of Statistics of the Republic of Indonesia. This show the expli-citly that, SUPAS data 2015 is the most recent data available. It provides a portrait of households in Indonesia with various indi-cators needed at the individual and household level, and is considered appro-priate for analyzing the impact of a policy because it provides detailed information about the presence of individuals in the household. The use of SUPAS data can enable the process of isolating unobserved heterogeneities, as well as overcoming recip-rocal relationships.

In addition to the main data, the researcher also uses regional financial data from the Regional Government in Papua. Likewise, data on household expenditure on health were obtained through the National Socio-Economic Survey conducted in 2015 and focused on households in Papua.

The sample (cohort/ beneficiaries of the Otsus program) in the study was determined by year of birth in order to facilitate analysis of the effectiveness of Otsus implementation in Papua on edu-cational outcomes. Law No. 20 of 2003 concerning the National Education System in Indonesia mandates that every citizen aged 7 to 15 years is required to attend nine years of basic education, and this is the main con-sideration in determining the cohort

in the study. Thus, members of households who were 15 years of age and over in 2001, generally did not benefit from the program, because it was assumed that they had continued their edu-cation to a higher education level, namely senior high school.

The identification of the cohort was carried out based on the year of birth, so that the cohort in the study was the population in Papua who had a birth year between 1992 and 1995. This was because the population with a birth year between 1992 and 1995 is a generation exposed to the nine-year basic education program in the Otsus era, because they were between 6 to 9 years old when Otsus was launched in Papua in 2001, and they reached adulthood (20 to 23 years) when SUPAS was conducted in 2015. Thus, the size of the sample used to analyze the impact of Otsus on edu-cational outcomes was 9,024 people, or covering 2,420 households (14.07%) of the total households in the 2015 SUPAS for the Papua region.

Appendix Table 2 shows the descriptive statistics of the study variables. Generally, the highest formal education completed by households in Papua is elementary school education, and the majority live and settle in rural areas (77%), the remaining 23% are in urban areas. There are no significant differences in educational outcomes between boys and girls in the household. The category of head of household based on gender is 88% male with an average age of 39 years, and generally are of productive age with the main occupations being as farmers and construction workers. The highest education of the head of the household is generally junior high school, with the number of members who are dependents in the household as many as 4 to 5 people.

In terms of the facilities used, 87% of households live in privately owned houses, 28% of which use as their main fuel for daily

cooking kerosene/ gas/ electricity, with the remaining 72% of households using fire-wood. It was found that 38% of the sample households used electricity sourced from the State Electricity Company (PLN) as their main source of lighting. This means that there are 62% of sampled households that have not yet obtained access to PLN for electricity services.

There are 41% of the sampled households using protected water sources as their main source of drinking water, with 55% of defecation facilities being privately owned. The number of elementary schools (SD) in Papua per 1,000 school-age population is 9.4 with a ratio of 25.93 class teachers per student. Meanwhile, the number of junior high schools per 1,000 school-age population is 2.3 with a class teacher ratio of 15.25.

To estimate the impact of Otsus in Papua on educational outcomes, it is necessary to develop an empirical model in the form of a regression framework. The consideration that underlies the empirical model is, if the presence of Otsus in Papua leads to an increase in educational outcomes, then positive results can be obtained with additional education spending for the provision of educational inputs (facilities and infrastructure). The empirical model in the regression framework to estimate the impact of Special Autonomy in Papua on educational outcomes is in equation (1).

$$S_{ijt} = \alpha_1 + \beta_{1t} + \eta_1 (P_j * T_i) + X_{ijt}^{\wedge\prime} . \gamma_1 + Y_{jt}^{\wedge\prime} . \delta_1 + Z_{jt}^{\wedge\prime} . \partial_1 + \varepsilon_{ijt} \qquad (1)$$

Where, the response variable S_{ijt} which indicates the educational outcome of individual i was born in region j, and is in year t. Educational outcomes are measured through the highest education completed in category 1 (no diploma), category 2 (have an elementary school diploma), category 3 (have a junior high school diploma), category 4 (have a high school diploma), and category 5 (have a college diploma). The notation α_1 is defined as the intercept, while β_{1t} is the year of birth, and T_i

represents the dummy variable for the cohort of Otsus beneficiaries. P_j notation is the intensity of the program, which is measured by education spending per total population of school age. The notation (P_j*T_i) is an interaction variable used to explain the magnitude of the impact of Special Autonomy on educational outcomes. While ε_{ijt} describes the error term.

Controlling for observable characteristic differences through individual (X_{ijt}), household (Y_{jt}), and community ($Z_{jt}^{\wedge\prime}$) attributes. Individual attributes include gender and educational status. Meanwhile, household characteristics include the gender of the head of the household, the age of the head of the household, the education level of the head of the household, the number of dependent members in the household, the type of main occupation of the head of the household, as well as the ownership status of the facilities used by the household. Community attributes include the number of school unit buildings and the number of teachers at the basic education level.

The main parameter to be estimated is η_1. Parameter η_1 provides an overview of the impact of the program on household education out-comes. It is expected that the value of the parameter η_1 produced is significant with the direction of the resulting positive relationship, which indicates that the implementation of Otsus in Papua has an impact on educational outcomes.

The educational outcome variable in the study is discrete and ranked by the highest education completed. Thus, the choice of the ordered logistic model (OLM) technique is considered to be much more appropriate to use in making estimates.

It is assumed that the cohort (program beneficiaries) does not benefit from other programs, other than the education program financed by Otsus. This is intended to provide a valid estimate. This assumption can be

violated if the cohort benefits from other programs, such as programs initiated by the central government. For example, the grant program for schools in Indonesia is known as the School Operational Assistance (BOS), which has been distributed through-out Indonesia since 2005. At the same time, the BOS program is correlated with Otsus, so the estimate cannot provide valid results.

To minimize the potential correlation between Otsus and BOS, the variable control was carried out on school participation (μ_{1j}) in Papua in 2002, as in equation (2).

$$S_{ijt} = \alpha_1 + \beta_{1t} + \eta_1 (P_j * T_i) + X_{ijt}{\wedge}' . \gamma_1 + Y_{jt}{\wedge}' . \delta_1 + Z_{jt}{\wedge}' . \partial_1 + \mu_{1j} + \varepsilon_{ijt} \tag{2}$$

Another issue that received attention at the time the analysis was conducted, namely the unique geography of the region with its various challenges, is the reason why many areas in Papua are not easily accessible. Limited access has an impact on the distribution of Regional Government services which often encounter obstacles. As a result, not all communities can access Government programs that are specifically designed to improve the quality of life of the people in Papua. Thus, this study also considers regional characteristics as one of the causes of limited access to public services in the field of education. The aspect of unobserved heterogeneity between regions is controlled by entering the district fixed effect (ϑ_{1j}) into equation (3).

$$S_{ijt} = \alpha_1 + \beta_{1t} + \eta_1 (P_j * T_i) + X_{ijt}{\wedge}' . \gamma_1 + Y_{jt}{\wedge}' . \delta_1 + Z_{jt}{\wedge}' . \partial_1 + \mu_{1j} + \vartheta_{1j} + \varepsilon_{ijt} \tag{3}$$

Including (ϑ_{1j}) and (μ_{1j}) in equation (3) to mitigate unobserved heterogeneity between regions that cannot be controlled, assuming ϑ_{1j} and μ_{1j} have constant charac-teristics over time. By including ϑ_{1j} and μ_{1j} it is assumed that the error is random and the parameter η_1 is no longer biased. The following solution is carried out, namely eliminating unobserved heterogeneity by for-ming a time-demeaned from equation (3), resulting in equation (4).

$$S^{..}_{ijt} = \alpha_1 + \beta^{..}_{1t} + \eta_1 (P^{.}_j * T^{..}_i) + X^{..}_{ijt}{\wedge}' . \gamma_1 + Y^{..}_{jt}{\wedge}' . \delta_1 + Z^{.}_{jt}{\wedge}' . \partial_1 + \varepsilon^{..}_{ijt} \tag{4}$$

Time-demeaned in equation (4), obtained through the difference between the values of each variable minus the average value. As a result, ϑ_{1j} and μ_{1j} have been eliminated through a time-demeaned process.

Analyzing the impact of Otsus in Papua on health outcomes does not use specific criteria, as was the case with education. This is because the 2015 Supas did not provide data on the record of the same population health outcomes as the previous SUPAS (in 2005). Supas is conducted to see changes in household conditions at different time periods, using probability samples.

The determination of the research sample refers to the second objective of the study, which is to analyze the direct and indirect impact of Otsus in Papua on health outcomes. Seeing the indirect impact of Special Autonomy on health outcomes in this study using three instrument variables, and one of them is the incidence of death experienced by households in the last five years. Therefore, households that did not experience death at the time the Supas was conducted in 2015, were excluded and were not used as sample households. Thus, the number of samples in the study to examine the impact of Otsus on health outcomes was 26,499 respondents drawn from 6,131 households.

The population of the sample in this study was, on average, 24 years old, and generally they did not complete nine years of basic education. The average household in the sample has five members, with health outcomes generally in category 2 (medium). Likewise with the domi-cile area, where most of the households live in rural areas (79.3%), with the main livelihoods being as farmers and construction workers (85%).

Heads of household are generally male (79.9%), with the highest education completed generally being 9 years of basic education. On average, the head of the household is 43 years old, with an average household expenditure on health of IDR 1,206,737 per year. Households in Papua, generally live in privately owned houses (87%), and use firewood/ charcoal and kerosene as the main sources of fuel for cooking (72.5%). On average, sample house-holds use a primary source of lighting that is not from the State Electricity Company (62%). Likewise, the main water source used by households for drinking and cooking water generally comes from unprotected sources (59.1%). Meanwhile, the percentage of households using privately owned defecation facilities is more (54.8%) than those using shared defecation facilities.

The presence of Otsus in Papua has direct and indirect consequences for health outcomes. Good health outcomes are generally due to an understanding of a clean and healthy lifestyle as a result of the mani-festation of one's education. This shows that there is an indirect impact through the sacrifice of invested education and this plays an important role on one's health (O'Donnell et al., 2011).

Several previous empirical studies also analyzed the impact of Otsus in Papua on welfare aspects and focused on seeing the impact directly (Cahyaningsih & Fitrady, 2019; Iek & Blesia, 2019; Kartasasmita, 2014; Nasrullah, R., 2017; Prabowo et al., 2020; Siddik et al., 2019; Wicaksono, 2018), thus ignoring the potential for indirect impacts on health outcomes such as the role of edu-cation. Therefore, this study considers the potential indirect impact of Otsus in Papua on health outcomes through the role of education-something that has not been carried out by previous similar studies. Thus, the empirical form in the regression framework to analyze the impact of Special Autonomy on health outcomes is denoted in equation (5).

$$H_{ijt} = \beta_0 + P_j\beta_1 + T_i\beta_2 + \beta_3(P_j * T_i) + V_{ijt}{}^{\wedge\prime}\beta_4 + W_{ijt}{}^{\wedge\prime}\beta_5 + X_{jt}{}^{\wedge\prime}\beta_6 + \varepsilon_{ijt} \tag{5}$$

Where, (H_{ijt}) is the health outcome of individual i who was born in region j, and is in year t. The measure to describe health outcomes is the level of complaints of pain in the last month, experienced when SUPAS was conducted in 2015. β_0 is defined as an intercept, while (T_i) is a dummy variable that indicates educational status which has completed nine years of basic education, and (P_j) describes the intensity of the program as measured by the Special Autonomy expenditure in the health sector per population. Notation (P_j*T_i), is used to determine the impact of Special Autonomy on health outcomes, and (ε_{ijt}) describes the error term.

In fact, changes in health outcomes are not only influenced by the existence of Otsus in Papua, but also by the attributes of individuals, households, and communities. Therefore, in this study the control was carried out on individual attributes (V_{ijt}), household (W_{ijt}), and the environment (X_{jt}). The notation $V_{ijt}{}^{\wedge\prime}$ includes age and gender. Meanwhile, $W_{ijt}{}^{\wedge\prime}$ includes the number of dependents in the household, the age of the head of the household, the gender of the head of the household, the occupation of the head of the household, and household expenses for health, as well as facilities used by the household such as ownership status of residential buildings, materials the main fuel for cooking, the main source of drinking water, and the main source of lighting in the household, as well as defecation facilities. Likewise X_{jt} which includes health facilities and medical personnel.

The main parameter to be estimated is β_3. Parameter β_3 describes the impact of Special Autonomy on health outcomes through the role of education. The expected result of the study is that the parameter β_3 is significant with the direction of the resulting relationship being opposite (negative). The negative and

sig-nificant results suggest that the existence of Otsus in Papua can reduce the level of complaints of people's pain in Papua. On the other hand, if the parameter β_3 is positive and not significant, then the existence of Special Autonomy does not have an impact on household health outcomes in Papua.

Health outcomes were ascertained through individual health information when SUPAS was conducted in 2015. The use of health information can provide two benefits. First, one can obtain a picture of the actual health outcomes, and to be able to dis-tinguish the characteristics inherent in respondents when interviewed. Second, health information is an instrument to stan-dardize health cases used, when assessing unobservable health quality, so as to minimize measurement errors (Das & Hammer, 2005).

Determining the health quality score in the study referred to Rokx et al. (2010), where the quality score is obtained through two stages. First, determine the raw score, and second, normalize the raw score obtained, as in equations (6) and (7).

$$X_i = score_{individu} \times 100 \tag{6}$$

The raw score in equation (6), normalized to obtain a quality score, is generally known as the z-score as in equation (7).

$$Z_{score} = (X_i - \bar{X_i}) / sd_i \tag{7}$$

Where X_i is defined as the raw score, $\bar{X_i}$ is the mean of the individual raw scores, and sd_i is the standard deviation. Meanwhile, Z_{score} is a normalized health outcome value. Health outcomes that have been normalized are classified into three categories (Budi S., 2012). First, category 3 (low) which indicates that the individual has a low level of complaints of sickness and describes his general health condition. A good condition is characterized by minimal deviations in the function of physical, mental, and social struc-tures so that they do not hinder daily activities. Second, category 2

(moderate) which implies that there has been a deviation from the individual's health condition from normal, but does not interfere with daily activities. Third, category 1 (high) which indicates that there has been a deviation from normal regarding the individual's health condition, and has interfered with his normal daily activities. If equation (7) is integrated with equation (5), it results in equation (8).

$$Z_{score} \mid H_{ijt} = \beta_0 + P_j\beta_1 + T_i\beta_2 + \beta_3 (P_j * T_i) + V_{ijt}{}^{\wedge}{}'\beta_4 + W_{ijt}{}^{\wedge}{}'\beta_5 + X_{jt}{}^{\wedge}{}'\beta_6 + \varepsilon_{ijt} \tag{8}$$

The decision of households to use health services provided by the government is generally influenced by the characteristics of their parents. Parental preferences that are potentially correlated with the program, it is difficult to be certain that they will not change. While the factor of congenital health (health endowment) which is one of the considerations for households in making decisions to take advantage of health services provided by the Government, can also affect health outcomes when individuals become adults. Controlling the health endowment variable through initial health and the availability of health facilities has been carried out by (Culyer, 2015; Bergen et al., 2020). Efforts to control health endowment by accommodating initial health elements are deemed inappropriate, because individual health outcomes as adults are affected by them having interacted with the environment, so they have the potential to have a correlation with unobserved ability factors, thus expanding the potential for bias. Therefore, the solution to the potential bias in the main parameters is carried out through the instrumental variable (IV) technique.

Technique IV is used to identify un-observed variables that cause endogenous Problems. The problem of endogeneity is due to education status (T_i) which motivates households to access health care programs, generally not only determined by individuals, but also influenced by internal household

shocks, education of the head of the household, and the availability of edu-cational facilities. Therefore, the estimation of the indirect impact of the presence of Otsus in Papua on health outcomes is instrumented through three variables, namely the shock that occurs in the household due to the incidence of death in the household, the availability of basic education facilities, and the education of the head of the household.

The completion of technique IV is carried out in two stages. First, perform regression on the variable of the existence of Special Autonomy through the instrument variable (z_{ij}) with other control variables as in equation (9).

$$P_j * T_i = \omega_0 + z_{ij} . \omega_1 + V_{ijt}^{\wedge'} . \omega_2 + W_{ijt}^{\wedge'} . \omega_3 + X_{jt}^{\wedge'} . \omega_4 + \varepsilon_{ijt} \tag{9}$$

The second step is to estimate the model equation (8), in which the impact of the program is replaced by the estimation results in equation (9), resulting in equation (10).

$$Z_{score} \mid H_{ijt} = \beta_0 + P_j\beta_1 + T_i\beta_2 + \beta_3 ((P_j{}^*T_i))^{\wedge} + V_{ijt}^{\wedge'}\beta_4 + W_{ijt}^{\wedge'} \beta_5 + X_{jt}^{\wedge'}\beta_6 + \varepsilon_{ijt} \tag{10}$$

Equation (10) is expected to provide consistent and unbiased results. This study also considers regional characteristics as one of the causes of limited public access to health services provided by the government. Aspects of unobserved heterogeneity between regions are controlled through district fixed effects.

RESULTS AND DISCUSSION

Table 1 shows the estimation results of the ordered logistic model to see the observed and unobserved characteristics that have the potential to affect educational outcomes. Column (2) presents the estimated impact of Otsus on educational outcomes, excluding unobserved characteristics. The results are significant, indicating that the presence of Otsus in Papua has an impact on the outcomes of basic education in the province. Meanwhile, Column (3) shows different results after including the heterogeneity of unobserved regional characteristics through the variable district fixed effect and school participation.

In addition to including the unobserved heterogeneity variable, the estimation results in Column (3) are supported by the slightly lower Akaike's informational criteria (AIC) and Bayesian information criteria (BIC) values, compared to the AIC and BIC values in Column (2). The model with the smallest AIC and BIC values is the best model, and can be used as a reference (Domínguez-Almendros et al., 2011). The resulting estimator value implies that education spending made by the Regional Government in Papua through the provision of educational facilities and infrastructure and freeing students' education costs in the basic education program in implementing Otsus in the province, does not have a significant impact on educational outcomes.

Table 1. The Impact of Otsus on Education Outcomes

Variable	Ordered Logistic Regression	
(1)	(2)	(3)
Main predictor variable:		
$P_j * T_j$	0.321 *	0.254
	(0.152)	(0154)
Vector characteristic control variable	Yes	Yes
Unobserved heterogeneity control variable	No	Yes
Statistic		
Observations	9024	9024
Psuedo	0.29	0.30
AIC	18847.482	18609.659

Variable	Ordered Logistic Regression	
(1)	(2)	(3)
BIC	19010.958	18943.719

Note: Dependent variables (educational outcome): the highest education completed with category 1 (does not have a diploma, 2 (has an elementary school diploma), 3 (has a junior high school diploma), 4 (has a high school diploma), 5 (has a college diploma. Column (1): estimation results without including unobserved heterogeneity. Column (2): estimation results after including unobserved heterogeneity variables; Controlling vector variables for individual characteristics: gender and age; household: age of the head of the household, education of the head of the household, gender of the head of the household, number of household members, facilities used by the household, and culture; Community: educational facilities and educators. Control variable for unobserved heterogeneity: school participation rate and district fixed effect. Standard errors are in parentheses, (***), (**), and (*) and show a significance level of 1%, 5%, and 10%, respectively.
Source: The author's calculations

Of note is how big the probability of the impact is that's generated from the program on educational outcomes, in general and in specific areas, using the value of the marginal effect. Marginal effect values are used in an ordered logit regression model to show how much probability the main variables (P_j*T_i) have an impact on each category on a significant outcome variable (Long & Mustillo, 2021).

Table 2 shows the value of the marginal effect of the main variable (P_j*T_i) on the outcomes of nine years of basic education in Papua. The value of the marginal effect is used to indicate how big the probability is that the main variable has an impact on each category on a significant outcome variable. The category of educational outcome variable focuses on nine years of basic education in Papua.

Column (2) shows the results of the estimation of the marginal effect without including the unobserved heterogeneity variable. Meanwhile, Column (3) is after including the unobserved heterogeneity variable. The results did not change significantly. This shows that, after close to two decades of implementing Otsus in Papua, it has not had an impact on the outcomes of nine years of basic education in the province.

Table 2. Marginal Effect of Otsus on Education Outcomes

Variable	Marginal Effect Value (dy/dx)	
(1)	(2)	(3)
Main predictor variable:		
P_j*T_j	0.029	0.024
	(0.015)	(0.012)
Control vector characteristic	Yes	Yes
Control variable unobserved heterogeneity	No	Yes
Observations	9024	9024

Note: educational outcome variable: Have a nine-year basic education diploma. Column (1): estimation results without including the unobserved heterogeneity variable. Column (2): estimation results after including the unobserved heterogeneity variable. Standard errors are in parentheses, (***), (**), and (*) and show a significance level of 1%, 5%, and 10%, respectively.
Source: Authors' calculations

The resulting estimator value implies that education spending made by the Regional Government in Papua through the provision of educational facilities and infrastructure and freeing students' education costs in the basic education program in implementing Otsus in the province, does not have a significant impact on educational outcomes.

Table 3 shows the results of the estimation of the direct and indirect impacts of Otsus in Papua on health outcomes. In Column (2), the variable (P_j) which shows the Special Autonomy expenditure on health per 100.000 population, the result is significant at the 1% level, with the resulting relationship in the opposite direction. However, the estimator obtained has the potential to be endogenous to variables that are not observed and have the opportunity to affect the main estimator produced. To ensure that there is an endogeneity problem in the model, what is done is to include education status (P_j*T_i).

The results in column (3), show the direction of the resulting relationship remains the same, namely opposite and statistically significant. However, it is supported by Akaike's informational criteria (AIC) and Bayesian information criteria (BIC) values which are slightly lower than the AIC and BIC values obtained in column (2). According to Domínguez-Almendros et al., (2011), the model with the smallest AIC and BIC values is the best model and can be used as a reference. These results prove that the program variables are endogenous, so it has the potential to produce bias in the resulting parameters. If the potential bias in the program is not controlled through education status, it can cause the resulting impact parameters to be under estimate.

These results suggest that the implementation of Otsus in Papua provides indirect benefits to household health outcomes in the province through the role of education. Education contributes and influences household decisions to utilize health services provided by the Regional Government. Therefore, individuals who are educated or have at least completed the nine-year compulsory basic education program generally have better health outcomes.

Table 3. Direct and Indirect Impacts of Otsus on Health Outcomes

Variable	Ordered Logistic Regression		IV (2SLS)
(1)	(2)	(3)	(4)
Main variable:			
P_j	-2.119 ***		
	(0.682)		
$P_j * T_j$		-0.133 ***	-0.005 **
		(0.011)	(0.002)
Vector characteristic control variable	Yes	Yes	Yes
District fixed effect control	Yes	Yes	Yes
Statistic			
Number of observations	26499	26499	26499
Pseudo	0.035	0.041	0.013
AIC	21972.954	21818.93	
BIC	22267.609	22113.585	

Note: Dependent variables (health outcome): complaints of sickness in low (3), moderate (2), high (1) categories. Column (2): OLR estimation results of Otsus impact on health outcomes without

including education status. Column (3) results of OLR estimation of the impact of Otsus on health outcomes by including education status. Column (4): estimation results of two stages least square (2SLS) to see the indirect impact of Otsus on health outcomes using instrument variables. Instrument variables: the incidence of death of household members, education of the head of the household, educational facilities. Control of characteristic vector variables include, individual: gender and age; household: age of head of household, education of head of household, gender of head of household, number of household members, occupation of head of household, household expenditure on health, facilities used by household, and culture; community: health facilities and health workers. Fixed effects in district control is carried out on 29 districts/cities in Papua. The values in brackets are robust standard errors, (***), (**), and (*) and show a significance level of 1%, 5%, and 10%, respectively.
Source: the author's calculations.

The educational status that motivates households to access health care programs is generally not only determined by the individual but is also influenced by internal household shocks, the education of the head of the household, and the availability of educational facilities. Therefore, in this study, educational status was instrumented through three variables, namely shocks that occurred in the household due to the death of a member in the household, the availability of basic education facilities, and the education of the head of the household.

Column (4) shows the estimation when the main variable (P_j*T_i) is assumed to be exogenous, after the educational status is instrumented through the incidence of death in the household, the availability of basic education facilities, and the education of the head of the household. The results did not change significantly, where the direction of the resulting relationship remained the same and was statistically significant. This proves that health spending carried out by the Regional Government in implementing Law No.21 of 2001 pertaining to Otsus in Papua, can reduce 0.5 percent of complaints of illness in the province through the role of education.

The direction of the relationship and the resulting level of significance, from the impact of the implementation of Otsus in Papua on health outcomes, are as expected in the study. Thus, the implementation of Law No.21 of 2001 pertaining to Special Autonomy in Papua, has a direct or indirect impact on household health outcomes in the province.

The results of this study indicate two important findings. First, although asymmetric intergovernmental fiscal transfers in several countries show positive results on educational outcomes (Chyi & Zhou, 2014; Hyman, 2017; Kirabo Jackson, Johnson, & Persico, 2016; Lafortune, Rothstein, & Schanzenbach, 2018; Litschig & Morrison, 2013), this study shows a different result for the case in Papua; the asymmetric fiscal transfers received by the Regional Government in Papua in implementing Law No.21 of 2001 pertaining to Special Autonomy in Papua have no impact on the outcomes of basic education in the province.

The Otsus program, which is fully managed by the local governments in Papua through the provision of instrumental educational inputs including free education, has yet to have an impact on the outcomes of basic education. This is because the main focus of the program implementation has been on providing instrumental educational inputs. The program is completely managed by the local governments and is a means of motivating Papuan people to participate in education. Meanwhile, the

environment around a household in Papua is an important determinant of children's education. The head of household will send a child to school if the child's basic needs are met; on the other hand, the household will withdraw the child from school if the basic needs of the child are not fulfilled. This condition requires that the value of subsidies through free education received by the households makes an important contribution to determining children's education.

The provision of instrumental educational inputs and free education provided by local governments can reduce the household burden in terms of children's education, so that children stay in school. To stay in school, additional income is needed to meet the basic needs of children in the household, which is something that the program does not cover through schools. The consideration is that the composition of household expenditure is generally used to meet basic needs, especially when households experience economic shocks. At the very least, the value of the education subsidy, through the free education received, is able to compensate for the basic needs of children in the household. The results of a recent study Siddik et al. (2019), reported that education spending carried out by the Regional Government in Papua in order to implement Otsus in the province, so far, has not been able to compensate for the basic needs of children in the household.

The geography of Papua with varied difficulty of access causes a high index of construction costs in the region Siddik et al. (2019), while this becomes one of the determinants of the inequality of basic education service programs provided by the local governments, which often encounter barriers to implementation. As a result, not all of the people in Papua can access local government programs specifically designed to improve their quality of life. This situation

forces households to incur additional expense in taking advantage of the education services provided by the local governments. However, not all households can cover such expense, thereby generally causing the households in peripheral and remote areas to delay children's education, especially at the primary school level or equivalent.

In terms of culture, generally households in Papua see education as not important in their daily life. This is because education has not been considered special in terms of raising one's social status in the community (Djojosoekarto et al., 2012). The social stratification of society in Papua is still dominated by traditional values, so someone who is considered influential in society does not have to be highly educated (Djojosoekarto et al., 2012). Likewise with the social responsibilities imposed on school-age children in assisting the economic needs of their families, through work to meet the necessities of life, such as farming and/or raising livestock.

Second, the conclusion of previous similar studies related to the asymmetric fiscal transfers received by Papua in implementing Law No.21 of 2001 pertaining to Special Autonomy in Papua, has not produced a significant impact on the accumulation of human capital, especially health outcomes (Cahyaningsih & Fitrady, 2019; Siddik et al., 2019; Prabowo et al., 2020b; Kartasasmita, 2014; Widodo, 2019; Nasrullah, R., 2017; Iek & Blesia, 2019). This study, however, found different results at the household level in Papua. The results of the study show that the implementation of Otsus in Papua, which has been approaching for two decades, has had a direct and indirect impact on the health outcomes of the population in the province.

Geographical areas that are difficult to reach, with limited access and information infrastructure, as well as transportation access which is very expensive and even not available at all, mean that not all development outcomes (health services) sought by the government are reached by households in Papua. Limited access

and the high cost of providing health infrastructure have also resulted in limited services facilities and health personnel. Consequently, to obtain health services, households in Papua must allocate and provide a certain amount of expenditure in order to take advantage of existing health services. However, not all households in Papua can afford to pay for health services. The consideration, the composition of household expenditure in Papua, is generally provided to meet the main basic needs such as food needs.

Lack of knowledge and access to information causes households in Papua to have limited knowledge about the dangers of unhealthy behavior, so they are not motivated to adopt healthy behaviors (Shaw et al., 2014). Having limited knowledge and information can influence household decisions to utilize various health services provided by the Regional Government in Papua.

In Papua, education and culture play an important role in health outcomes. Households in Papua are identical to households in the lower middle social class category. In terms of health, households with upper-middle social status, which generally have good incomes, generally pay attention to their health regularly and conduct health checks at health service facilities, compared to households with lower-middle social status. Likewise, in terms of culture, households in Papua generally choose to use traditional methods of treatment when sick, rather than visiting health workers (Kenangalem et al., 2013). These circumstances are inseparable from the understanding of households in Papua in articulating the concept of health and illness, which is more determined by the supernatural aspect. This is because the health knowledge system in households in Papua is largely influenced by customary factors.

Through education, one can improve professional skills and add specific, relevant knowledge to their general knowledge. Finally, education can shape behavior and foster personality that is more independent, more self-motivated, and more confident about clean and healthy behavior so that households can take preventive measures. Healthy behavior is the behavior that is related to a person's efforts to maintain and improve their health status (Notoatmodjo, 2012).

Households in the peripheral and remote areas of Papua generally work in the agricultural sector as their main source of income, with relatively low levels of labor productivity and control of production assets. This situation causes household incomes to be limited, and causes them to experience problems when utilizing health services provided by the government such as Puskesmas. The presence of the Puskesmas is expected to be able to provide primary services to households, especially in the peripheral and remote areas of Papua. However, so far it has not provided optimal services, due to the limited amount and affordability of services.

Likewise, the geographic area of Papua where the Puskesmas are located makes it difficult for most households in the province to access health services. This situation is due to the relatively small number of households in the peripheral and remote areas, but scattered in small communities far apart from each other. Limited coverage results in high costs for land, sea and air transportation that must be provided by health service providers in Papua. Consequently, the health outcomes of households in rural and remote areas are mostly low, as indicated by a relatively high level of complaints of sickness.

Thus, the health expenditure carried out by the Regional Government in implementing Law No.21 of 2001 pertaining to Otsus in Papua,

through increasing the coverage of Puskesmas throughout the province in providing health services, and providing health workers at health service facilities, to be able to provide health education through a health education approach. promotive and preventive benefits are felt by households in Papua.

CONCLUSION

The results of the study of the causal impact of Otsus on education and health outcomes provide two findings. First, the implementation of Otsus in Papua has not had an impact on the outcomes of basic education in the province. This is because the provision of educational facilities and infrastructure, which is fully managed by the Regional Government in Papua, and subsidies for free education at the basic education level in the context of implementing Otsus in Papua, have not been able to address the needs of children in the household when the household experiences economic and social shocks. In addition, generally, households in Papua see education as not important in their daily lives. This is because education has not been perceived as special in terms of raising one's social status in society.

The policy implications of the findings of this study are that Regional Government and schools, as managers, need to document and take into account the condition of school-age children in the households and the conditions in the area where the households live. The consideration is that each household and each region has different characteristics. Schools, as program managers, should include the household characteristics of students and the characteristics of the area where the households in the school work program are located, so that the approach used by the Regional Government through the schools is adjusted to the circumstances of each student.

Second, the results of the study show that the implementation of Otsus in Papua, which has been running for almost two decades, has had direct and indirect impacts on household health outcomes in the province. The limited coverage results in high costs of land, sea and air transportation that must be borne by health service providers in Papua. Thus, health expenditures made by the Regional Government in implementing Law No.21 of 2001 pertaining to Otsus in Papua, through increasing the coverage of Puskesmas throughout the province in providing health services, and providing health workers at health facilities to improve services and provide health education, through the promotive and preventive approaches that are felt to be beneficial by households in Papua.

This study has limitations including the fact that it only examines the impact of Otsus in Papua on education and health outcomes in general. This is because the 2015 SUPAS data did not describe the types of social protection assistance programs that is to say those regarding education and health received by households in Papua. It would be much better if the education and health assistance programs received by households could be separated into types so that the results of the study could reflect the impact of Otsus in detail. Therefore, studies on the impact of Special Autonomy on education and health outcomes at the household level could be carried out in the future by controlling the social security programs received. This would be intended so that the results of the study could provide more detailed information, in order to minimize the cause and effect of the existence of a policy optimally.

REFERENCES

Bergen, N., Zhu, G., Yedenekal, S., Mamo, A., Abebe, G., Morankar, S., & Labonté, R. (2020). Promoting Equity In Maternal, Newborn And Child Health–How Does Gender Factor In? Perceptions Of Public

Servants In The Ethiopian Health Sector. *Global Health Action, 13*(1). https://doi.org/10.1080/16549716.2019.17 04530

BPS. (2020). Papua Province Education Indicators in 2019 [*Indikator Pendidikan Provinsi Papua Tahun 2019*] (B. Susilo & E. F. Moko (eds.)). Papua Province Central Statistics Agency [*Badan Pusat Statistik Provinsi Papua*].

Brock, G., Jin, Y., & Zeng, T. (2015). Fiscal Decentralization And China's Regional Infant Mortality. *Journal Of Policy Modeling, 37*(2). https://doi.org/10.1016/j.jpolmod.2015.0 3.001

Setyawan, F. (2012). Healthy Paradigm [*Paradigma Sehat*]. *Saintika Medika.* https://doi.org/10.22219/sm.v6i1.1012

Cahyaningsih, A., & Fitrady, A. (2019). The Impact Of Asymmetric Fiscal Decentralization On Education And Health Outcomes: Evidence From Papua Province, Indonesia. *Economics And Sociology, 12*(2), 48-63. https://doi.org/10.14254/2071-789X.2019/12-2/3

Carlitz, R. (2017). Money Flows, Water Trickles: Understanding Patterns Of Decentralized Water Provision In Tanzania. *World Development,* 93. https://doi.org/10.1016/j.worlddev.2016.1 1.019

Chyi, H., & Zhou, B. (2014). The Effects Of Tuition Reforms On School Enrollment In Rural China. *Economics of Education Review,* 38, 104-123. https://doi.org/10.1016/j.econedurev.201 3.11.003

Culyer, A. (2015). Efficiency, Equity And Equality In Health And Health Care. *CHE Research Paper 120, January 2015.*

Das, J., & Hammer, J. (2005). Which Doctor? Combining Vignettes And Item Response To Measure Clinical Competence. *Journal Of Development Economics,* 72(8), 348–383. https://doi.org/10.1016/j.jdeveco.2004.11.00 4

Djojosoekarto, A., Ahmad, Q., Achmad, M., Miftah, A., Cucu, S., & W, B. (2012). The Basic Values Of The Papuan People In Managing Governance (Governance): A Reflexive Study Of Anthropologycal [*Nilai-Nilai Dasar Orang Papua Dalam Mengelola Tata Pemerintahan (Governance): Studi Refleksif Antropologis*]. *Centre For Learning And Advancing Experimental Democracy And Indonesia Forestry And Governance Institute.*

DJPK. (2018). Studi Of The Special Autonomy Fund Od West Papua Province [*Kajian Dana Otonomi Khusus Provinsi Papua Barat*].

Domínguez-Almendros, S., Benítez-Parejo, N., & Gonzalez-Ramirez, A. R. (2011). Logistic Regression Models. *Allergologia et Immunopathologia,* 39(5), 295-305. https://doi.org/10.1016/j.aller.2011.05.002

Hébert, K., & Mincyte, D. (2014). Self-Reliance Beyond Neoliberalism: Rethinking Autonomy At The Edges Of Empire. *Environment And Planning D: Society And Space,* 32(2). https://doi.org/10.1068/d6312

Hyman, J. (2017). Does Money Matter In The Long Run? Effects Of School Spending On Educational Attainment. *American Economic Journal: Economic Policy,* 9(4), 256-280. https://doi.org/10.1257/pol.20150249

Iek, M., & Blesia, J. (2019). Development Inequalities In Autonomous Regions: A Study Pre-And Post- Special Autonomy In Indonesia's Most Eastern Provinces. *Journal Of Asian Finance, Economics And*

Business, 6(1), 303. https://doi.org/10.13106/jafeb.2019.

Kartasasmita, P. (2014). Decentralization And Community Welfare: Lesson Learnt From Indonesia And The Case Of Special Autonomy Of Papua. *Public Administation Journal* [*Jurnal Administrasi Publik*].

Katharina, R. (2018). Measuring The Achievements Of Papua's Special Autonomy [*Menakar Capaian Otonomi Khusus Papua*] (I). Indonesian Torch Foundation [*Yayasan Obor Indonesia*].

Ministry Of Health, Republic of Indonesia [*Kementerian Kesehatan Republik Indonesia*]. (2019). Indonesia's Health Profile In 2019 [*Profil Kesehatan Indonesia Tahun 2019*] (B. Hardhana, F. Sibuea, & W. Widiantini (eds.)). *Ministri Of Healthy RI* [*Kementerian Kesehatan RI*].

Kenangalem, E., Waramori, G., Pontororing, G., Sandjaja, Tjitra, E., Maguire, G., Kelly, P., Anstey, N., & Ralph, A. (2013). Tuberculosis Outcomes In Papua, Indonesia: The Relationship With Different Body Mass Index Characteristics Between Papuan And Non-Papuan Ethnic Groups. *PLoS ONE, 8*(9). https://doi.org/10.1371/journal.pone.0076077

Jackson, C., Johnson, R., & Persico, C. (2016). The Effects Of School Spending On Educational And Economic Outcomes: Evidence From School Finance Reforms. *Quarterly Journal Of Economics, 131*(1), 157-218. https://doi.org/10.1093/qje/qjv036

Kurnia, A. (2012). Public Sector Efficiency Of Decentralized Local Government In Indonesia : A Political And Institutional Analysis. *Curtin Business School, May*.

Lafortune, J., Rothstein, J., & Schanzenbach, D. (2018). School Finance Reform And The Distribution Of Student Achievement. *American Economic Journal: Applied Economics, 10*(2), 1-26. https://doi.org/10.1257/app.20160567

Litschig, S., & Morrison, K. (2013). The Impact Of Intergovernmental Transfers On Education Outcomes And Poverty Reduction. *American Economic Journal: Applied Economics, 5*(4), 206-240. https://doi.org/10.1257/app.5.4.206

Long, J., & Mustillo, S. (2021). Using Predictions And Marginal Effects To Compare Groups In Regression Models For Binary Outcomes. *Sociological Methods and Research, 50*(3). https://doi.org/10.1177/0049124118799374

Nasrullah, R., et al. (2017). Study Of West Papua's Special Autonomy And Uts Impact On Imrpoving Welfare [*Kajian Otonomi Khusus Papua Barat Dan Dampaknya Terhadap Peningkatan Kesejahteraan*].

O'Donnell, O., Rosati, F., & Van Doorslaer, E. (2011). Health Effects Of Child Work: Evidence From Rural Vietnam. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.528003

Prabowo, P., Supriyono, B., Noor, I., & Muluk, M. (2020). The Influence Of The Special Autonomy Policy Of The Papua Province On The Welfare Of Its People. *International Journal Of Innovation, Creativity And Change*.

Rogers, S. (2014). Betting On The Strong: Local Government Resource Allocation In China's Poverty Counties. *Journal Of Rural Studies, 36*. https://doi.org/10.1016/j.jrurstud.2014.08.001

Rokx, C., Giles, J., Satriawan, E., Marzoeki, P., Harimurti, P., & Yavuz, E. (2010). New Insights Into The Provision Of Health Services in Indonesia. *In World Bank*.

Shaikhutdinova, G. (2017). Enhanced Cooperation In Federal States: Democracy Through Asymmetry. *Public*

Administration Issues, 5. https://doi.org/10.17323/1999-5431-2017-0-5-72-82

Siddik, M., Suratman, E., Tuerah, N., Kholis, N., Sumule, A., Reba, W., Bauw, L., & Suhirman. (2019). Study Of The Use Of Papua And West Papua Special Autonomy Funds [*Kajian Pemanfaatan Dana Otonomi Khusus Papua Dan Papua Barat*].

Soto, V., Farfan, M., & Lorant, V. (2012). Fiscal Decentralisation And Infant Mortality Rate: The Colombian Case. *Social Science And Medicine*, 74(9). https://doi.org/10.1016/j.socscimed.2011.12.051

Wicaksono. (2018). Study Of The Effectiveness And Formulation Of The Transitional Policy Strategy For Papua's Special Autonomi Post-Law Number 21 Of 2001 [*Kajian Efektivitas dan Rumusan Strategi Kebijakan Transisional Otonomi Khusus Papua Paska Undang-Undang Nomor 21 Tahun 2001*].

Widodo, B. (2019). Dynamic Evaluation Of The Fiscal Impact Of Special Autonomy On The Efficiency Of Public Services And Economic Growth In The Province Of Papua, West Papua, And Aceh In 2011-2017 [*Evaluasi Dinamis Dampak Fiskal Otonomi Khusus terhadap Efisiensi Layanan Publik Dan Pertumbuhan Ekonomi di Provinsi Papua, Papua Barat dan Aceh Tahun 2011-2017*]. *Financial Economics Study* [*Kajian Ekonomi Keuangan*], 3(1). https://doi.org/10.31685/kek.v3i1.463

Apendix

A. Educational Variables

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Table 1. Definitions of Variables

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Variable (1)	Description (2)	Source (3)
educ	Education outcome: measured by the highest education completed.	Supas, 2015
T_i	young cohort: with birth years between 1992 and 1995	Supas, 2015
P_j	Program intensity showing Otsus expenditure on education per school-age population	Papua Province, 2015; BPS Papua, 2015
$P_j * T_i$	The variable that shows the magnitude of the impact of the Otsus program	
Rural	Rural areas	Supas, 2015
dsmale	Boys dummy variable = 1 | other = 0	Supas, 2015
mhead	Male head of household dummy variable = 1 | other = 0	Supas, 2015
agehead	Age of head of household: years	Supas, 2015
educhead	The highest education level completed by the head of the household	Supas, 2015
numhh	The number of members in the household	Supas, 2015
Headjob	The occupational dummy variable of the head of the household, farmer/laborer = 1 | other = 0	Supas, 2015
Culture	Indigenous Papuan household = 1 | other = 0	Supas, 2015
House	Dummy variable of own house's ownership status = 1 | other = 0	Supas, 2015
Cook	Dummy variable of cooking fuel electricity/gas/oil = 1 | others = 0)	Supas, 2015
Electric	The dummy variable of PLN's electric lighting energy source = 1 | other = 0	Supas, 2015
Water	Dummy variable of protected drinking water source = 1 | other = 0	Supas, 2015
Bab	Dummy variable of own toilet facilities =1 | other=0	Supas, 2015
Aps	Control variable: APS 2001 * cohort birth year	BPS Papua
sd	The number of primary schools built in 2015 per 1,000 primary school age population	BPS Papua
smp	Number of junior high schools built in 2015 per 1,000 junior high school age population	BPS Papua
Gsd	The ratio of the number of primary school students to the number of primary school teachers in 2015	BPS Papua
Gsmp	The ratio of the number of junior high school students to the number of junior high school teachers in 2015	BPS Papua

Table 2. Descriptive Statistics

Variable (1)	Mean (2)	Std. Dev (3)
sample size = 9024		
educ	2.516	1.346
Ti	0.459	0.498
Pj	5.938	0.272
Rural	0.772	0.419
dsmale	0.499	0.500
mhead	0.880	0.324
agehead	38.677	12.496
educhead	2.323	2.092
numhh	4.722	2.405
Headjob	0.831	0.374
Culture	0.070	0.255
House	0.870	0.336
Cook	0.725	0.446
Electric	0.620	0.485
Water	0.409	0.491
Bab	0.548	0497
Aps	122580.9	84336.21
sd	0.094	0.047
smp	0.023	0.014
Gsd	25.937	20.159
Gsmp	12.255	12.176

Table 3. Results of Estimation with Ordered Logistic Regression of Overall Effect of Predictor Variables on Basic Education Outcome Variables

Variable (1)	Ordered Logistic Regression	
	(2)	(3)
Outcome variable:		
Educ		
Predictor variable:		
Ti	-1.665 *	-1.242
	(0.916)	(0.928)
Pj	0.406 ***	-2.778 ***
	(0.151)	(0.988)
Pj * Ti	0.321 *	0.254
	(0.153)	(0.155)
Dsmale	0.759 ***	0.765 ***
	(0.043)	(0.043)
Agehead	0.041 ***	0.038 ***
	(0.002)	(0.002)
Educhead	0.769 ***	0.735 ***

Variable	Ordered Logistic Regression	
(1)	(2)	(3)
	(0.022)	(0.021)
Numhh	-0.025 **	-0.0375 ***
	(0.011)	(0.011)
Mhead	-0.807 ***	-0.784 ***
	(0.073)	(0.074)
Headjob	-0.029	-0.079
	(0.078)	(0.077)
Culture	-0.016	-0.064
	(0.096)	(0.095)
Sd	-2.250 ***	-35.797 ***
	(0.721)	(11.360)
Smp	7.196 ***	179.535***
	(3.399)	(59.138)
Gsd	0.007 ***	0.006
	(0.002)	(0.026)
Gsmp	0.004	-0.090
	(0.004)	(0.058)
House	-0.175 **	-0.161 **
	(0.069)	(0.071)
Cook	0.444 ***	0.472 ***
	(0.079)	(0.081)
Electric	0.782 ***	0.607 ***
	(0.073)	(0.078)
Water	0.205 ***	0.138 **
	(0.205)	(0.057)
Bab	0.185 ***	0.267 ***
	(0.046)	(0.052)
Unobserved heterogenity:		
aps*YOB	No	Yes
fixed effects in district	No	Yes
Statistics		
Observations	9024	9024
Pseudo	0.29	0.30
AIC	18847.482	18609.659
BIC	19010.958	18943.719

*Note: Standard errors are in parentheses, (** *), (**), and (*) and show a significance level of 1%, 5%, and 10%, respectively.*

Table 4. Results of Estimation of Value of Overall Marginal Effect of Predictor Variables on Outcomes of Nine Years of Basic Education (Junior High School).

Variable (1)	Marginal Effect (2)
Outcome variable: Educ	
Predictor variable:	
Ti	-0.014 **
	(0.052)
Pj	0.023
	(0.012)
Pj * Ti	0.024
	(0.012)
dsmale*	0.057 ***
	(0.004)
Agehead	0.003 ***
	(0.000)
Educhead	0.060 ***
	(0.003)
Numhh	-0.002 ***
	(0.000)
Mhead	-0.034 ***
	(0.002)
headjob	-0.001
	(0.006)
culture	-0.001
	(0.007)
sd2015	-0.386 ***
	(0.016)
smp2015	1.239 ***
	(0.283)
gsd2015	0.000
	(0.000)
gsmp2015	-0.000
	(0.000)
house	-0.011 **
	(0.004)
cook	0.030 ***
	(0.004)
electric	0.049 ***
	(0.005)
water	0.011 **
	(0.004)
bab	0.018 ***
	(0.004)
Control Variable	Yes

Note: Column (2): estimation results marginal effect of program impact on nine-year basic education. Column (3): estimation results marginal effect of program impact on nine-year basic education in specific regions. Control Variable: unobserved heterogenity: aps and fixed effects in the kabupaten. Standard errors are in parentheses, (** *), (**), and (*) and show a significance level of 1%, 5%, and 10%, respectively.

B. Health variables:

Table 5. Definition of Variables and Sources of Data

Variable (1)	Description (2)	Source (3)
H_{ijt}	Health score is categorized as low (3) medium category (2) | high category (1).	Supas, 2015
$P_j * T_j$	Variables showing the impact of the program on health outcomes.	BPS, 2015
P_j	Program intensity: total Otsus expenditure in health per total population	Papua Provincial, 2015
T_j	Educational status: completed basic education=1 | did not complete basic education=0	Supas, 2015
age	Age: years	Supas, 2015
dsmale	Gender: male=1 | female=0	Supas, 2015
headage	Age of household head: years	Supas, 2015
headeduc	Highest education level completed by the head of household: category	Supas, 2015
headmale	Gender of household head: male=1 | female=0	Supas, 2015
headjob	Main occupation of the head of the household a week previously: farmer/laborer=1|ASN =0	Supas, 2015
culture	Culture: Papuan tribe=1 | non-Papuan=0	Supas, 2015
numhh	Number of dependents in the household: number of people	Supas, 2015
house	Housing facilities: private property=1 | rent, etc.=0	Supas, 2015
electric	The main source of lighting in the household: PLN=1 | other=0	Supas, 2015
cook	Main source of cooking fuel: electricity/gas=1 | other=0	Supas, 2015
water	The main source of household drinking water: protected water source=1 | other=0	Supas, 2015
bab	Toilet facilities: private property=1 | other=0	Supas, 2015
rural	Village/rural	Supas, 2015
urban	City/town	Supas, 2015
healthspend	Household expenses for health in a month: IDR in logaritma natural	Susenas, 2015
fakes	Health facilities	Papua Provincial Health Office, 2015
nakes	Health workers	Papua Provincial Health Office, 2015

Variable	Description	Source
(1)	(2)	(3)
sd	Number of SDs	BPS, 2015
smp	Number of SMPs	BPS, 2015
died	Occurrences of death that occurred in household during the previous five years	Supas, 2015

Table 6. Descriptive Statistics

Variable	Mean	Standard Deviation
(1)	(2)	(3)
Sample Size = 26499		
Healthscore	2.034	0.335
P_j	5.203	0.041
T_j	0238	0.426
Age	23.665	17.131
Dsmale	0.512	0.410
Headage	43.635	11.082
Headeduc	2.107	2.036
Headmale	0.799	0.401
Headjob	0.850	0.357
Culture	0.060	0.238
Numhh	5.414	2.501
House	0.923	0.266
Electric	0.370	0.481
Cook	0.229	0.420
Water	0.411	0.492
Bab	0.530	0.499
Rural	0.793	0.404
Urban	0.206	0.404
Kapita	5.895	0.197
Fakes	0.333	0.181
Nake	0.426	0461
Sd	0.092	0.049
Smp	0.023	0.015
Died	4.166	5.471

Tabel 7. Direct Impact and Indirect Impact of the Otsus on Health Outcomes

Variable	Ordered Logistic Regression		IV (2SLS)
(1)	(2)	(3)	(4)
Health outcome variable:			
H_{ijt}			
Independent variable (predictors):			
P_j	-2.119 ***		
	(0.682)		
$P_j * T_j$		-0.133 ***	-0.005 **
		(0.011)	(0.002)
Dsmale	-0.019	0.009	0.004
	(0.048)	(0.048)	(0.004)
Age	-0.000	0.001	0.002 ***
	(0.001)	(0.001)	(0.000
Headage	0.019 ***	0.019 ***	0.002 ***
	(0.010)	(0.002)	(0.000)
Numhh	-0.025 **	-0.020 *	-0.003 ***
	(0.010)	(0.010)	(0.001)
Headmale	0.096	0.082	0.014 **
	(0.062)	(0.062)	(0.005)
Headjob	0.238 ***	0.155 *	0.018 **
	(0.082)	(0.083)	(0.007)
Culture	-0.642 ***	-0.593 ***	0.039 ***
	(0.134)	(0.134)	(0.011)
House	-0.244 ***	-0.256 ***	0.002
	(0.092)	(0.092)	(0.008)
Rural	0.043	0.000	-0.029 ***
	(0.088)	(0.088)	(0.008)
Cook	-0.182 **	-0,128	-0.021 ***
	(0.089)	(0.090)	(0.009)
Electric	-0.081	0.026	-0.014 **
	(0.078)	(0.077)	(0.007)
Water	0.295 ***	0.321 ***	0.024 ***
	(0.059)	(0.059)	(0.005)
Bab	-0.038	0.000	-0.003
	(0.056)	(0.056)	(0.005)
Healthspen	-0.012	-0.005	-0.000
	(0.026)	(0.026)	(0.002)
Fakes	-0.715 ***	-0,779 ***	-0.028 **
	(0.149)	(0.148)	(0.013)
Nakes	0.158 **	0.234 ***	0.007
	(0.069)	(0.068)	(0.007)
Control fixed effect			
Constanta	7.723 **	-3.060 ***	
	(3.605)	(0.424)	

Variable	Ordered Logistic Regression		IV (2SLS)
(1)	(2)	(3)	(4)
Statistic			
Sample Size	26499	26499	
Pseudo	0.035	0.041	
AIC	21972.954	21818.93	
BIC	22267.609	22113.585	

Note: Dependent variables (health outcome variables): complaints of sickness in low (3), moderate (2), high (1) categories. Column (2): OLR estimation of the direct impact of the program without including education status. Column (3): OLR estimation of the direct impact of the program by including education status. Column (3): estimation results of two stages least square (2SLS) to see the indirect impact of Otsus on health outcomes using instrument variables. Instrument variables: the incidence of death of household members, education of the head of the household, educational facilities. Fixed effects in district control is carried out on 29 districts/cities in Papua. Robust standard errors are in parentheses. Signs (***), (**), and (*) indicate significance at 1%, 5%, and 10%, respectively. Robust standard errors are in parentheses. Signs (***), (**), and (*) indicate significance at 1%, 5%, and 10%, respectively.

Source: Author's calculations