Household Size, Education, and Household Wealth in Indonesia: Evidence from Quantile Regression

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Abstract

Households need to have certain characteristics related to the ideal household size and educational attainment that allow them to accumulate wealth as a financial buffer for a period of low income. Investigation to discover those characteristics should be aimed at household classes as different classes may show various responses to the change of factors, hence, this also implies government's interventions should be carefully aimed at different classes. In this paper, I use a quantile regression approach to measure the impact of household size and educational level on household net wealth in Indonesia. The findings show the positive and significant effect of the variable of household size in low deciles but a negative and significant effect in high deciles while the education aspect has a positive and significant effect on household net wealth with a stronger effect found in higher deciles.

Keywords: Indonesia; net wealth; household; quantile regression
JEL Classification: C33; I31; J12; J13

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1. Introduction

Experience from the COVID-19 pandemic show households needs certain characteristics to allow them to have a higher standard of living and ability to maintain it during a period of low income (Caraka et al., 2020; Pitoyo et al.; 2020, Tairas, 2020). Reports by Ali & Tiwari (2020) show the pandemic brings 5.5-8 million Indonesian population into poverty. The pandemic also brings negative impacts in other aspects, for example in food and nutrition insecurity (Rozaki, 2020; Arif et al., 2020), poorer condition of health and nutrition among children (Saputri et al., 2020), and more unequal education quality (Alifia et al., 2020; Bima, 2020). This condition can bring a serious impact to Indonesia which has made significant progress in poverty alleviation over the past two decades shown from the decrease of poverty rate from 19.1% in 2000 to 9.2% in 2019 and achieve an economic growth rate of average 5.5% per year since 2000 and increase its status as a lower-middle-income country (World Bank, 2020).

The above experience should raise awareness for households to have a high wealth level as it provides a buffer for families through savings or assets conversion into cash (Wakita et al., 2000; Fitzsimmons & Leach, 1994). Wealth can also be inherited (Oliver & Shapiro, 1990) and people with high income usually have high wealth but wealthy people do not always have high income (Filmer & Pritchett, 2001; Gibson, 2017).

Wealth also provides a better measurement for a standard of living compared to income as people usually report the income received lower than actual (Birdsall, 2010; Brown & Gray, 2014). Wealth also can overcome biases in the expenditure report where poor households will always have expenses even though they have zero income while for the rich households, expenditure report cannot capture non-market values or collectable assets (Birdsall, 2010; Clementi et al., 2020). Further, the expenditure report contains potential bias as it only reports transactions based on market value and excludes self-made products (Ward, 2013; Brown & Gray, 2014; Clementi et al., 2020).

This paper focuses on the aspects of family formation, shown from household size, and human quality, measured from household head years of education, for some reasons. In the family formation aspect, household expenditure is related to the number of household members, which theoretically, smaller household size will lead to a lower expenditure than households with bigger household size, all else equal. Hence, the ability to keep expenditure low without sacrificing the standard of living will be beneficial for the families to achieve a high wealth level. Previous studies found the link between family formation and household wealth like mentioned above, for example, Menchik (1979), Forrest & Murie (1989), Easterlin et al. (1993), Hao (1996), and Keister (2003).

Related to human quality aspect, as the household wealth is influenced by the stream of income, the focus should be aimed to increase an individual's probability to achieve higher earnings through higher skills and knowledge from education. Hence, the education aspect is an inseparable component in the

households in their effort to achieve a higher standard of living. Some studies that show the relationship between education and household wealth as explained above are, for example, Behrman et al. (2012), Benton & Keister (2017), Filmer & Pritchett (1998), and Hartog & Oosterbeek (1998).

Considering the importance of household size and education aspect to wealth creation, attention should be given to discover the relationship between household size and education the wealth creation. However, households from different classes can give various responses to the change of both aspects on their household wealth. Hence, an appropriate strategy is needed to allow us to discover the relationship of those aspects with respect to the existence of household classes, namely by using quantile regression. This approach outperforms standard panel model which includes the estimation of average values and provides information about the relationship between outcome and regressors at different points in the conditional distribution (Aldieri & Vinci, 2017; Buchinsky, 1998, Cameron & Trivedi, 2009). By using quantile regression, I estimate the relationship between household size and education aspects to household wealth with data from Indonesian Family Life Survey (IFLS). This paper is structured as follows: Section 2 presents the data and methods; Section 3 presents the results and discussion, and Section 4 contains conclusions.

2. Methodology

The quantile regression is used to account for the potential determinants of household net wealth in Indonesia considering the existence of household classes. This approach outperforms the standard panel model that includes observation on average values only, that mathematically: $y_{it} = a + bx_{it} + \varepsilon_{it}$ where y is the dependent variable, x is the independent variable, a and b are coefficients, i and t are indices for individuals and time (Baltagi, 2008).

The quantile regression is represented mathematically (Koenker & Bassett Jr, 1978):

$$y_{it} = x_{it}\beta_\theta + u_{\theta it} \quad \text{with} \quad Quant_\theta\left(\frac{y_{it}}{x_{it}}\right) = x_{it}\beta_\theta \tag{1}$$

where y is the dependent variable, x is a vector of regressors, β is the vector of parameters to be estimated, u is a vector of residuals. $Quant_\theta\left(\frac{y_{it}}{x_{it}}\right)$ identifies the θ^{th} conditional quantile of y given x.

This paper uses data from the Indonesian Family Life Survey (IFLS), an ongoing longitudinal survey that contains rich information on the individual, household, and community characteristics and is representative of approximately 83% of the Indonesian population that live in 13 provinces in Java, Sumatera, Bali, Nusa Tenggara Barat, Kalimantan, and Sulawesi. The IFLS interviews same individuals or households and communities from the first wave of IFLS in 1993 to its last waves in 2014. The first wave of the survey (IFLS 1) was conducted in 1993 and collected information from 7,224 households. The second wave (IFLS2)

in 1997 contains information of 7,698 households, the third wave (IFLS3) in 2000 surveyed 10,574 households, the fourth wave (IFLS4) in 2007 surveyed 13,995 households, and the fifth wave (IFLS5) in 2014 surveyed 16,931 households.

For the regression estimation, this paper uses household size that represents household composition and household head years of schooling that represent education aspect as independent variables. Household net wealth is used for the dependent variable, that obtained from total value of farm assets, non-farm assets, and personal assets deducted by debts. To adjust household wealth with the family size, I use adjustment by dividing wealth by the square root of household size (Clementi et al., 2012; OECD, 2020; Atkinson et al., 1995; Sierminska & Smeeding, 2005). For data transformation, cube root data transformation is used, following Cox (2011) to anticipate the existence of negative values of household net wealth, that is where debt is higher than total wealth.

3. Result and Analysis

Estimation to discover the relationship between household size, education, and household net wealth is achieved through a standard panel model. estimation of Hausman test show a p-value of 0.000 which is smaller than 0.05, thus H0 is rejected. Therefore, a fixed-effect model should be used in the analysis (Table 1).

Table 1: Regression Results for Household Size, Education, and Household Wealth in Indonesia, 1993–2014

	FE	RE
Ln Household Size	28.772***	6.056*
	(4.525)	(3.193)
Ln HH Head's Years of Schooling	31.379***	87.266***
	(5.667)	(4.514)
Constant	225.458***	143.869***
	(13.322)	(10.423)

Note: *p<0.1, **p<0.05, ***p<0.01.

Observation from standard panel model with fixed effect shows both variables positively and significantly affect household net wealth. The positive effect of the variable of household size might be related to the individual life cycle because as the individuals getting older, they are likely to have bigger household size due to marriage. This family formation will merge wealth from both parties (as husband and wife are likely to get wealth from intergenerational transfers and inheritance), increase the flow of income (as there are two income-earners available for the family), and reduce expenses (e.g., in housing and transportation costs). While the positive effect of the variable of education reflects a higher return of education obtained by individuals due to higher skills and better work performance that lead to higher income. Moreover, higher education is usually accompanied by better financial literacy and knowledge to increase productivity, reduce expenses, and maximise investment.

Since the estimations from the standard panel model above are involve average values, there is a possibility of this model cannot capture the outliers and therefore may lead to different estimations for classes. The outliers can be shown in the existence of extreme values in the left and right distribution of household net wealth, which represents poor households that have zero or negative household net wealth and very rich households that own very high household net wealth (Figures 1).

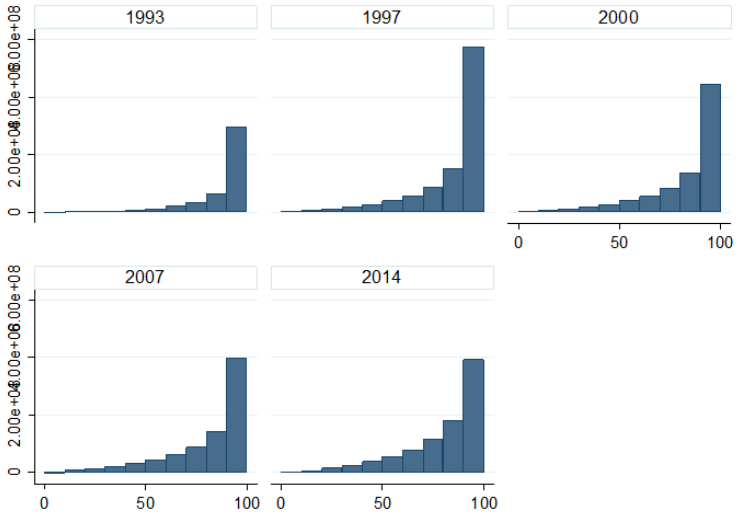

Figure 1: Average Household Net Wealth by Deciles, 1993–2014

Figures 1 show the unequal distribution of the average household net wealth in Indonesia by deciles where during 1993–1997, household net wealth in the low deciles is disappear due to low net wealth while at the same time, there are rich households who own high net wealth located in decile 10. The unequal distribution still occurs in the next years although more low-class households can increase their wealth, shown from more visible household net wealth.

The differences between classes also exist in the household size and education level aspects. Households in higher classes tend to have a smaller household size than households in lower classes. In contrast, households in higher classes tend to have higher educational attainment than their counterparts in lower classes (Figures 2 and 3).

By revealing the information within classes, we then can assume there might be a pattern of correlation between variables with respect to classes. To solve this issue, estimation of quantile regression with a bootstrapped standard error is used and find the two patterns of the relationship between variables. First, the variable of household size has a positive and significant effect in low deciles but a negative

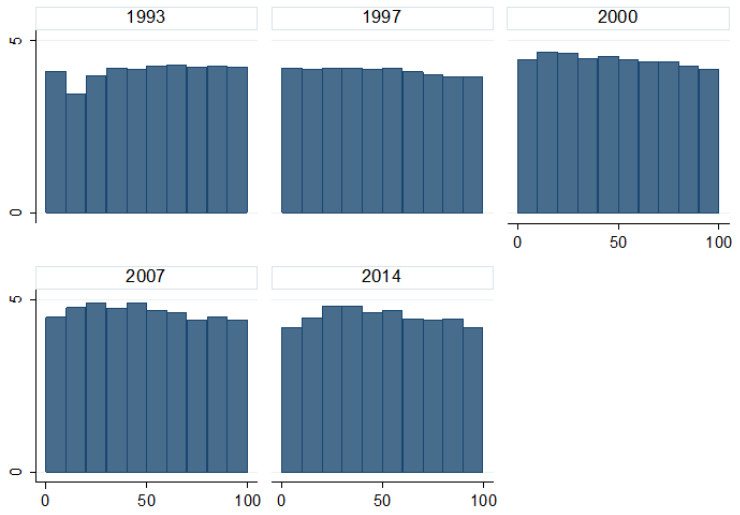

Figure 2: Average Household Size by Deciles, 1993–2014

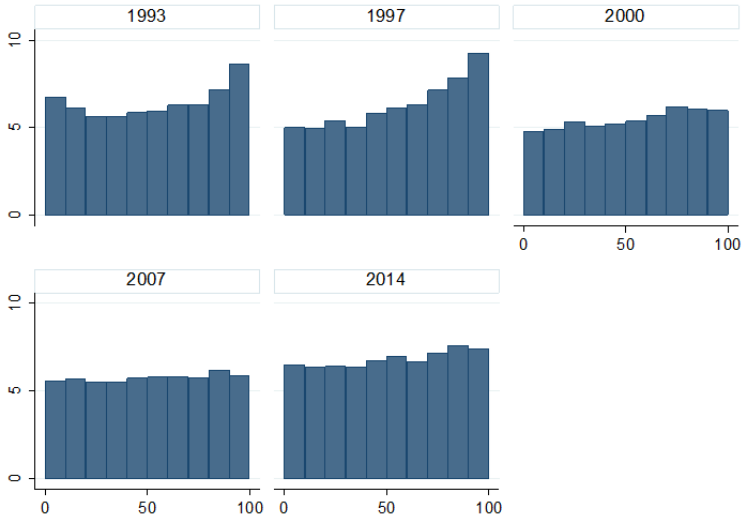

Figure 3: Average Household Head's Years of Schooling by Deciles, 1993–2014

and significant effect in the higher deciles. this condition reflects the positive effect of having additional household members on their household net wealth is only felt by households in the low deciles, in contrast, households in high classes

receive a negative effect of additional household members. This pattern might be explained by the differences in value of household members where households in the low classes put a value on additional household members as the financial supporter for them due to their inability to secure their income and wealth for their period of life. On the other hand, households in the high class see additional household members as financial expenses due to the need to maintain their high standard of living (Table 2).

Table 2: Quantile Regression with Bootstrapped Standard Error Results for Household Size, Education, and Household Wealth in Indonesia, 1993–2014

Deciles	Ln HH Size	Ln HH Head's Years of Schooling	Constant
1	33.093***	21.831***	18.006
	(4.564)	(7.913)	(16.090)
2	25.080***	67.455***	13.649
	(3.101)	(6.778)	(11.209)
3	15.496***	86.284***	40.633***
	(3.738)	(4.806)	(12.528)
4	4.316*	110.342***	48.903***
	(2.613)	(5.184)	(11.161)
5	-4.988*	121.464***	78.392***
	(-2.710)	(4.120)	(9.672)
6	-15.134***	143.197***	91.325***
	(3.226)	(5.777)	(12.810)
7	-23.606***	161.905***	111.212***
	(3.362)	(6.173)	(11.858)
8	-28.778***	190.443***	122.796***
	(4.391)	(8.612)	(18.719)
9	-44.453***	215.076***	192.115***
	(6.740)	(9.307)	(23.083)

Note: *p<0.1, **p<0.05, ***p<0.01.
Estimated by using Koenker (2005) estimator.

The second pattern is the variable of household head's years of schooling that has a positive and significant effect on household net wealth in all classes with higher coefficients found in higher deciles. This condition reflects return of education is higher in higher classes than in lower classes. It might be related to the characteristics of classes that, although they get similar intervention in education, upper classes households can get a higher return in form of higher earnings than lower classes households due to better access to technology and knowledge or a wider network.

Data is then re-estimated by using quantile regression with the robust clustered standard error and show a similar pattern occurs with the estimation from quantile regression with a bootstrapped standard error. Interestingly, estimation of quantile regression with the robust clustered standard error shows no significant effect of the change of variable of household size among middle-class households which indicate they are no longer see the additional household members as a financial supporter as in low classes households but they still not able to achieve financial capacity like in upper classes households (Table 3).

Table 3: Quantile Regression with Robust and Clustered Standard Error Results for Household Size, Education, and Household Wealth in Indonesia, 1993–2014

Deciles	Ln HH Size	Ln HH Head's Years of Schooling	Constant
1	33.093***	21.831***	18.006
	(5.622)	(8.425)	(18.491)
2	25.080***	67.455***	13.649
	(4.216)	(6.559)	(14.320)
3	15.496***	86.284***	40.633***
	(3.814)	(5.929)	(12.874)
4	4.316	110.342***	48.903***
	(3.632)	(5.414)	(11.902)
5	-4.988	121.464***	78.392***
	(3.870)	(5.867)	(13.147)
6	-15.134***	143.197***	91.325***
	(4.075)	(6.331)	(14.199)
7	-23.606***	161.905***	111.212***
	(4.780)	(7.204)	(15.993)
8	-28.778***	190.443***	122.796***
	(5.714)	(8.247)	(17.754)
9	-44.453***	215.076***	192.115***
	(7.646)	(11.810)	(26.717)

Note: *p<0.1, **p<0.05, ***p<0.01.
Estimated by using Machado et al. (2011) estimator.

The pattern of the correlation from variables in the tables above can be shown in graphical form for easier interpretation. Findings show clear evidence of the declining effect of the variable of household size and the increasing effect of variable household head's years of schooling across classes (Figure 4).

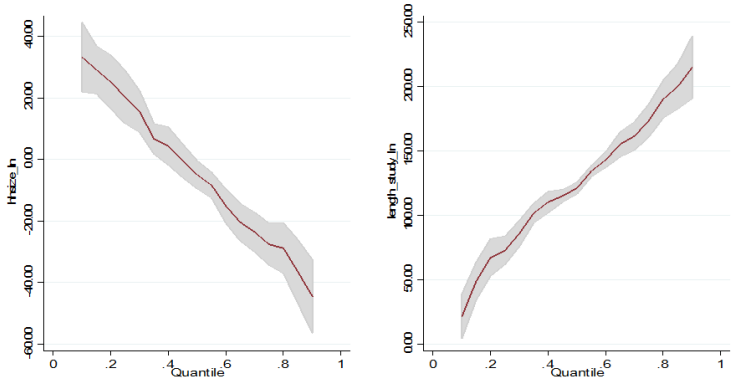

Figure 4: Quantile Regression Estimates for Household Size (Left) and Household Head's Years of Schooling (Right) in Indonesia, 1993–2014
Note: Estimated by using Azevedo (2011) module

Some possible causes that make the two patterns of estimation results of quantile regression for each variable are further explained as follow. The decreasing trend of the effect of household size might be related to an uncertainty reduction assumption. As explained by Friedman et al. (1994), households in higher classes tend to have a better career, higher confidence to accumulate and inherit higher wealth than households in lower classes. Hence, their emphasis on wealth creation tends to lead to a decrease in parenthood need comparing to lower-class households. On the other hand, low-class households reduce financial uncertainty by having more household members to provide income for families and support their parents and family.

This theory is shown by the high prevalence of child marriage in some regions in Indonesia where parents accept child marriage as one way to exit poverty (Apriliani & Nurwati, 2020; Djamilah & Kartikawati, 2014; Badan Pusat Statistik & Kementerian PPN/Bappenas, 2020; Unicef, 2001). Data from Badan Pusat Statistik (2021) show proportion of women aged 20-24 who are married or living together before age 18 in 2020 is on average 10.35% with some provinces in Indonesia are higher than the national average, for example, Bangka Belitung, Kalimantan Barat, and Sulawesi Barat (Table 4).

The condition of a positive relationship between household size and household net wealth for households in the low classes raises cautions for us as this positive relationship does not necessarily lead to a household's ability to maintain a standard of living deal during a period of low income as larger household size will bring higher financial expenditure and therefore higher difficulties than households with smaller household size. Experience from crisis shows the pandemic bring low-income families more vulnerable to food insecurity (Munandar, 2020), increase the practice of child marriage (Rahiem, 2021), widening the gender gap (Gani, 2021), and widening the gap in basic health service, for example, immunisation, maternal and child health services (Kusumaningrum et al., 2021). Further, related to a report by World Bank (2019), the positive relationship between household size and household net wealth in low deciles above also does not necessarily mean the household ability to provide a good education for their children which is shown by a small contribution of the return of education to household net wealth in low deciles comparing to those in higher deciles.

The second pattern that is related to the positive effect of education on household net wealth with increasing effect for higher deciles might be caused by differences in the return of education where children in higher classes are more likely to pursue higher education and earn a higher income than children from lower classes (Kadir & Sukma, 2019; Widyanti, 2018; Anuraga & Arieska, 2016). Even when they have similar education level, upper classes children can get higher earnings due to higher skills and knowledge because of their ability to access technology and a wider network that brings wider job opportunities. This technological gap is relevant with findings by Adiningsih et al. (2019) who show technological gap allows populations with high exposure and ability to pay the technology-related expenditure to gain benefits from technology and able to

Table 4: The Proportion of Women Aged 20-24 Who are Married or Living Together Before Age 18 by Province, 2018–2020

Province	The Proportion of Women Aged 20–24 Who are Married or Living Together Before Age 18		
	2018	2019	2020
Aceh	5.29	6.59	5.43
Sumatera Utara	4.90	6.50	5.95
Sumatera Barat	6.68	5.96	5.03
Riau	7.93	8.30	9.19
Jambi	12.71	14.78	14.03
Sumatera Selatan	12.07	13.53	13.44
Bengkulu	14.33	13.24	10.68
Lampung	10.70	12.10	10.24
Kep. Bangka Belitung	14.22	15.48	18.76
Kep. Riau	4.68	3.82	7.31
DKI Jakarta	4.06	3.12	1.45
Jawa Barat	13.26	12.33	11.96
Jawa Tengah	11.04	10.19	10.05
Di Yogyakarta	6.20	3.06	1.83
Jawa Timur	12.71	11.11	10.67
Banten	6.78	6.00	6.23
Bali	8.55	10.18	8.79
Nusa Tenggara Barat	15.48	16.09	16.61
Nusa Tenggara Timur	8.78	8.51	9.22
Kalimantan Barat	17.46	17.86	17.14
Kalimantan Tengah	19.13	20.16	16.35
Kalimantan Selatan	17.63	21.18	16.24
Kalimantan Timur	11.54	12.36	11.79
Kalimantan Utara	12.42	12.94	12.70
Sulawesi Utara	14.88	13.54	14.01
Sulawesi Tengah	15.84	16.25	14.89
Sulawesi Selatan	14.10	12.11	11.25
Sulawesi Tenggara	18.96	16.56	16.09
Gorontalo	15.29	13.16	14.73
Sulawesi Barat	19.43	19.17	17.12
Maluku	8.94	9.54	6.84
Maluku Utara	13.36	14.36	15.29
Papua Barat	11.16	13.20	12.91
Papua	11.52	11.21	13.78
Indonesia	11.21	10.82	10.35

Source: Badan Pusat Statistik (2021)

increase their well-being.

Another important component that causes the differences in the return of education across classes is different start of wealth career where children from low-class households are unable to access early childhood education, hence make them entering school unprepared to learn (Brinkman et al., 2016; World Bank, 2019). Publication by World Bank (2019) shows approximately 55% of children aged 5–6 years in Indonesia are enrolled in pre-primary, but only 22% of

children 3–4 years old are enrolled in early childhood education. Further, World Bank (2019) found some contributors that limit children's participation in early childhood education are poverty, malnutrition, remoteness, the lack of facilities and qualified teachers for preschool learning, as well as the lack of attention for children with special needs and disabilities. Comparison between countries show relatively poor quality of early childhood education in Indonesia, as found by Brinkman et al. (2016).

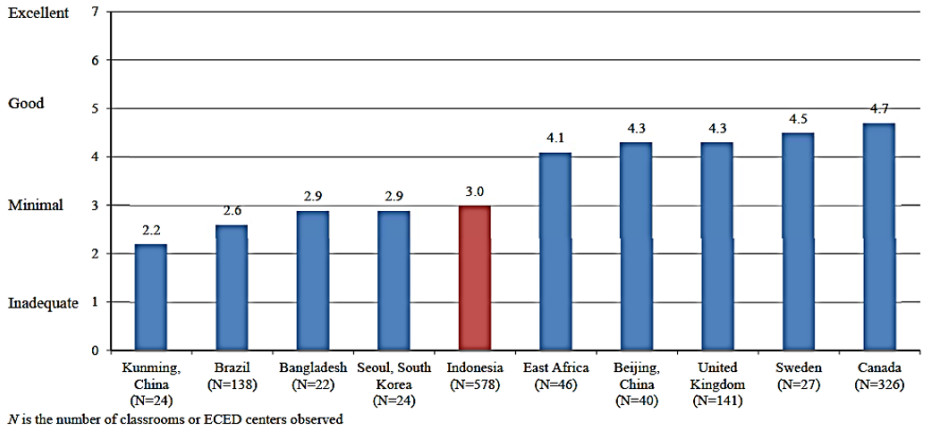

Figure 5: Average ECERS-R across Various Settings

Note: ECERS-R—an observation-based assessment of the learning environment of early childhood centres—contains seven subscales: Space and Furnishings, Personal Care Routines, Language-Reasoning, Activities, Interaction, Program Structure, and Parents and Staff. Source: Brinkman et al. (2016)

Estimation of quantile regression above is then re-tested with the robustness check through comparing whether the additive fixed-effect method gives different results from the non-additive fixed-effect method (Baker et al., 2016). Since the additive fixed-effect method in Tables 2 and 3 above assume that the parameters of interest vary based solely on the time-varying components of the disturbance term, there is one problem usually found in the additive fixed effects quantile regression where the inclusion of individual fixed effects alters the interpretation of the estimated coefficient on the treatment variable (Baker et al., 2016; Powell, 2014,2015). For the reason above, analysis of a method that permits non-additive fixed effects is required as this method maintain the non-separable disturbance term commonly associated with quantile estimation and allow the parameters to vary based on an unknown function of the fixed effect and an observation-specific disturbance term while relaxing the identification assumptions required for quantile regression (Baker et al., 2016).

Table 5 shows the estimation of quantile regression for panel data with non-additive fixed effects, in this case, year. This estimator is consistent for small T

Table 5: Quantile Regression for Panel Data with Non-additive Fixed Effects

Deciles	Ln HH Size	Ln HH Head's Years of Schooling
1	27.025***	19.031**
	(5.300)	(8.066)
2	25.186***	6.121
	(6.927)	(7.270)
3	24.437***	11.918
	(6.896)	(7.565)
4	14.446**	17.386***
	(6.233)	(6.726)
5	7.344	5.632
	(5.879)	(6.596)
6	0.361	-3.705
	(6.410)	(6.386)
7	0.223	-0.019
	(6.350)	(7.086)
8	-8.575	2.273
	(8.885)	(8.450)
9	-21.389	12.346
	(16.561)	(13.016)

Note: *p<0.1, **p<0.05, ***p<0.01.
Estimated by using Powell (2015) estimator

(time) and can be interpreted in the same manner as traditional cross-sectional quantile estimates (Powell, 2015). Table 5 shows the effect of variables when the time fixed-effect is ignored is different from the results when time fixed-effect is put into consideration. Therefore, it is sufficient to verify the robustness of the previous findings in Tables 2 and 3.

Considering the importance of investigating the effect of variables household size and education on household net wealth with respect to household classes, different policy interventions are needed for a specific class to increase household wealth in Indonesia. Government should promote characteristics owned by upper classes households in order to help households achieve a higher level of wealth, that is small household size and a high level of education. Hence, population control is unavoidable as the most feasible way to create a small household size, especially in high-density areas, for example, in Java or urban areas. At the same time, promotion of the importance of education should be conducted by diminishing obstacles faced by households to access education, for example, building more education facilities to overcome remoteness and improving access to information, communication, and technology (ICT).

4. Conclusion

This paper investigates the required characteristics needed for households to achieve higher net wealth, more specifically with its relationship with household size and education aspects. By using quantile regression estimation, this paper shows potential misinterpretation that is caused by estimation results from the

standard panel model that allow observation from average values only. If the standard panel model is applied, household size and education have a positive and significant effect on household net wealth. In contrast, estimates of quantile regression show variables of household size are positive and significant in the lower deciles but negative and significant in the higher deciles while education gives a positive and significant contribution to household net wealth in all classes with an increasing effect for higher classes.

In terms of setting up policies to increase household net wealth, a more specific approach is needed for the low classes households to avoid them trapped in the low condition standard of living, that is by promoting characteristics owned by upper class's agents that is a small household size and high level of education. Hence, population control and widening access to education are needed for policy interventions. This paper is not free from limitations as it is unable to capture the condition at the sub-national level that may bring variations in household's behaviour due to geographical features and socio-economic conditions. The analysis that considering both aspects are still available for future discussion.

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