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Opportunities in education: are factors outside individual responsibility really persistent? Evidence from Indonesia, 1997-2007*

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Abstract

Education is a strong predictor for economic performance. Therefore, educational inequality particularly in opportunity could make significant contribution to earning disparities. Following Ferreira and Gignoux (2014) parametric method, we construct aggregate indices of inequality of educational opportunities for fourteen Indonesian provinces in the years 1997, 2000 and 2007. Our particular and original contribution is to define individual indices of the power of circumstances which measure the strength of the influence that the accumulation of factors outside individual responsibility has in the short and in the long run on individual educational achievements and on earnings. We found that-along the period considered- there has been a declining trend in inequality of educational opportunities but not in all the provinces. Our findings also suggest that parental educational background is the most significant factor for school survival and that the effect that circumstances exert on future individual educational achievements and on early earnings perspectives tend to persist over time, but only to a very small extent. Moreover, our causal model which relates educational budget policy to equality of opportunity shows a negative impact of educational budget for the youngest cohorts, questioning therefore the effectiveness of the allocation of resources to primary and intermediate schools.

Keywords: Education, Intergenerational Mobility, Inequality of Opportunity, Indonesia.

JEL Classification: D39, D63, I29, O53.

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1. Introduction

It has been well recognized that a person's educational achievement is not only a key dimension of her human development in its own right but it also represents a fundamental input for the realization of other human development goals, such as wealth, health, employment and political participation. More recently, a number of studies has also shown that both within and across countries, inequalities in education are likely to be reflected into disparities in other dimensions. The existence of such correlations has raised policy and academic interest in the inequality of education and, in particular, two questions have emerged: what are the factors which are driving these inequalities? Are they all "unfair"?

The theory of inequality of opportunity can provide an answer to these questions as it finds its main rationale in the idea that inequality itself can have different sources but not all of these can be equally objectionable. As theoretically conceptualized by Roemer (1998), differences on certain socio-economic outcomes may be partly attributed to individual choices, innate ability, talents and *efforts* and partly to factors or *circumstances* which are economically exogenous to the person, such as gender, sex, and socio-economic background.

While inequalities in education that are due to personally responsibility are fair and don't necessarily need to be suppressed, disparities in educational achievements which result from factors beyond individual's control are, without doubt, inequitable, and should be amenable to equal-opportunity policy interventions that, as suggested by Roemer, will equalize advantages for each centiles of the *efforts* distribution, across groups of people which shares the set of *circumstances*.

Empirical evidence regarding this issue is still less explored. However, OECD (2012) suggests the positive relationship between educational opportunities and labour income. Therefore, educational policies with strong attention on equity could be used a strategic tool to improve economic performance in a long term.

Equality of opportunity could only be achieved when predetermined *circumstances* have no correlation with success in life (de Barros et al, 2008). In the case of education, predetermined *circumstances* should not affect the chance for children to go to school or to achieve identical educational performance.

Among developing countries, evidence using PISA score 2006 placed Indonesia in the lower half of cross-country distribution of inequality of educational opportunity (Ferreira and Gignoux, 2014). Nevertheless, the increase trend of Indonesian GINI index from 31.3 in 1996 to 33 in 2004 and 38.1 in 2011 (World Bank, 2014) signs that educational policies might have not strategically targeted equity.

In this paper, we therefore focus on country level evidence by using household data from the Indonesian Family Life Survey (IFLS), in order to quantify the role played by the accumulation of pre-determined *circumstances* in influencing future socio-economic outcomes and generating inequality in educational opportunities among the Indonesian population over the period 1997-2007.

We originally contribute to previous literature, by devising an individual index of the power of circumstances which explains-at the individual level- the influence carried by the accumulation of predetermined *circumstances* on individual educational achievements. This allows us to see how much persistent can these *circumstances* be over the individual life's course and, therefore, how sticky can current levels of inequality of opportunities be.

Next, by evaluating the association between our index of the power of circumstances and educational budgeting at provincial level, we seek to identify if the educational budgeting policy had any influence (and in which direction) on inequality of opportunity in education.

The remainder of this paper is organized as follows. Section 2 is devoted to providing a review of the literature in this field and Section 3 discusses methodological issues involved in measuring inequality of educational opportunity and the specific choices we have made. In Section 4 we report descriptive statistics in Section 4 and discuss our empirical findings in Section 5. Section 6 concludes.

2. Inequality of opportunity: conceptual underpinnings and empirical applications.

The concept of inequality of opportunity in education finds its roots in the mid-60s when the Coleman Report (Coleman et al., 1966) started the debate on what is meant by equality of opportunity and on how to achieve it. This report questioned the effectiveness (in terms of a fairer distribution of outputs or educational achievements) of policies aimed at equalizing benefits between students or granting full access to education and argued that socioeconomic conditions and family background are important factors that drive most of the variation in students' achievements.

The debate on the meaning of equality of opportunity in various income and wealth related outcomes has been then enriched by the contributions of important philosophers and economists (such as Rawls, 1971; Nozick, 1974; Sen, 1980, 1985 and Dworkin, 1981a, 1981b) who posited the importance of compensating individual's different situations especially in cases outside individual's personal responsibility. However, it was only at the end of the Nineties that this concept was explicitly addressed, described and translated into a mathematical formulation in John Roemer's seminal book on equality of opportunity (1998). The main argument of Roemer was based on the distinction between unchosen and predetermined *circumstances* and individual *efforts*. While these latter are attributable to the personal responsibility of the individual, the former are inherited by the individual and are beyond of his or her control. Hence, differences in individual outcomes which are attributable to *circumstances* are not only morally objectionable but can also lead to an inefficient allocation of resources (Ferreira and Gignoux; 2014; Fernández and Galí, 1999) and should be therefore compensated by public policies. On the other hand, outcome differences that are due to individual

choices and personal responsibility can be ethically accepted because they represent the natural reward of individual *effort* (see Fleurbaey, 2008).

Measuring inequality of opportunity therefore requires two fundamental preliminary steps: first, the search of a set of factors which can well represent those *circumstances* and second, the partition of a society into groups (or *types*) of individuals sharing the same set of *circumstances* and into groups (or *tranches*) of individuals characterized by the same degree of *effort* (Checchi and Peragine, 2010).

Next, two methodological approaches have been suggested in order to quantify the extent to which a given society is unequal. Either one can adopt an utilitarian "ex-ante" perspective (Van der Gaer, 1993) by considering outcome differences between *types*, prior to the realization of their *effort* level or one can follow an "ex-post" approach by looking at the opportunity set granted to individuals who exert the same degree of *effort* (Roemer, 1998; Checchi and Peragine, 2010). While in the first approach equality of opportunity is achieved when opportunities are equalized *between types (*Ferreira and Gignoux, 2011, 2014), in the ex-post approach outcomes should be equalized *within tranches* or groups of people who, independently of their inherited *circumstances*, are featured by the same degree of *effort* (Checchi and Peragine, 2010). As noted in Fleurbaey (2008) and Checchi and Peragine (2010) these two approaches do not necessarily generate same rankings of distributions, as compensation mechanisms within *types* will affect opportunity inequality only when adopting the ex-post approach (Checchi and Peragine, 2010). On the other hand, the ex-ante approach can generate a distribution that fully satisfies the utilitarian or reward principle according to which inequality of a given outcome within groups of individuals sharing the same *circumstances* can be fair, as long as these individuals are rewarded according to the amount of *effort* put in order to achieve a certain outcome (Li Donni et al., 2014).

The vast majority of the applied studies on the measurement of inequality of opportunity has focused on the opportunities for the acquisition of income (see, among others, Peragine, 2002, 2004a, 2004b; Bourguignon et al., 2007; Peragine and Serlenga, 2008; Lefranc et al., 2008, 2009; Aaberge et al., 2011; Björklund et al., 2011; Peragine et al., 2013; Andreoli et al.., 2014) whereas relatively fewer empirical studies appear in the domain of education. In this field, three main strands of research have emerged so far: a first strand of the empirical literature has applied the "education production function" framework to directly estimate the effect of specific socio-economic variables on educational outcomes (Fertig, 2003; Hanushek, 1979; Wößmann, 2003; Filmer and Pritchett, 1998) and to directly or indirectly consider intergenerational mobility in educational achievements outcomes (Behrman et al., 2001; Dahan and Gaviria, 2001; Lam and Schoeni, 1993).

A second, more recent strand of the literature has addressed more explicitly the Roemer's theory and attempted to operationalize that concept of inequality of opportunity theory in the domain of education. Some notable contributions include the study by Ferreira and Gignoux (2014) who

propose and compute an ex-ante, parametric measure of inequality of educational opportunity for PISA scores in 57 countries; the article by Asadullah and Yalonetzky (2013) who construct several indices of inequality of educational opportunity across Indian states and the analysis conducted by Gamboa and Waltenberg (2012) that following an ex-ante non-parametric approach, considers inequality of educational opportunity in PISA scores for Latin American students.

Lastly, a third strand of the literature (Mongan et al., 2011; Waltenberg and Vandenberghe, 2007; Iatarola and Stiefel, 2003) have instead focused more on policy-oriented research objectives and have evaluated the opportunity-equalizing effects of education policies.

This paper encloses these three strands by considering the distribution of educational opportunities across provinces and over time, assessing the importance of both circumstances and individual responsibility in influencing in the short and in the long run education and earning outcomes and last evaluating the role exerted by educational budgeting policy on inequality of opportunity.

3. Method

3.1 Measuring inequality of opportunity in education

To measure the educational inequality of opportunity, we seek to privilege Roemer's utilitarian principle according to which inequality between individuals featured by different degrees of *effort* is fair (Li Donni et al., 2014) and therefore pursue the ex-ante approach that considers inequality of opportunity as a between-type inequality[1]. As the main educational outcome variable we focus on completed years of schooling which are defined by the last grade the individual achieved in order to avoid measurement error (i.e. the same real year of schooling could reflect different educational levels).

Following Bourguignon et al. (2007) and Ferreira and Gignoux (2014), we apply a parametric methodology to the construction of our aggregate indices of the inequality of opportunity in education (measured by the completed year of schooling):

$$\hat{\theta}_{IOp} = \frac{Var\,(C_i, \widehat{\beta})}{Var\,(y_i)} \qquad (1)$$

which is simply the R-squared of an Ordinary Least Squares (OLS) regression of the individual's educational achievement (y) on a vector C of individual *circumstances*.

[1] The ex-ante approach is indeed well represented in the related empirical literature and it has been adopted by Bourguignon et al. (2007); Checchi and Peragine (2010); Ferreira and Gignoux (2011, 2014), Li Donni et al. (2014)

As also argued in Dardanoni et al. (2005), the exact content of these *circumstances* is a contentious issue which is largely related to the outcome on which the research is focused. For example, one can reasonably assume to have one set of *circumstances* defining *types* when examining inequality of opportunity for educational attainments (where parental wealth and education may play a central role) and another set when the outcome variable is represented by earnings or other labor market achievements (where gender becomes a key variable).

Among the predetermined *circumstances* available, we therefore stick only with variables that were also proposed by precedent literature on this field, that are truly "pre-determined" and exogenous and that have small rate of missing values to keep the attrition rate low. Those are parental education represented by mother and father completed year of schooling, sex, rural or urban residence and dummies of household wealth such as ownership of the house, other buildings, farm land, livestock, vehicles, household appliances, savings, receivables, jewelry, furniture, electricity, television and other assets. Contrary to Ferreira and Gignoux (2014), we don't include access to books as this variable might actually be endogenous, i.e. parents observing *efforts* and school achievements of their kids might by motivated to buy more books and learning tools to satisfy the increasing needs of their keenest children.

It is important to note that since all the variables included in this analysis are not all the possible predetermined *circumstances*, the R-squared should be interpreted as the lower bound of educational inequality of opportunity[2].

Further, we don't include age as one the explanatory variables of educational attainments. We argue indeed that whether age is truly exogenous and predetermined, it makes very small sense to consider it as a *circumstance* that may drive inequality of opportunity and, in the case of completed years of schooling, the inclusion of age as one of the regressors will considerably inflate the R-squared. Therefore, in our approach we consider as the main dependent variable the adjusted years of completed educations which result from the residual obtained from two sets of zero-truncated Poisson regressions of years of schooling against age runned separately for two cohorts of individuals. In this way, we make sure that the effect of age is somehow controlled for, but we avoid the risk of obtaining a blurred measure of inequality of opportunity.

Primary education in Indonesia normally starts at the age of 6 and the adequate supply of primary schools implies the assumption that age 6-10 years old have the similar level of opportunity in education. Consequently, we define our youngest cohort as 11-14 years old and the next cohort is 15-18 years old[3].

[2] A formal proof is provided in Ferreira and Gignoux (2011). In practise, it is also crucial to check the adjusted R-squared when selecting the circumstances. The arbitrarily large disparity between R-squared and adjusted R-squared indicates some of the explanatory variables do not significantly explain the outcomes.

[3] Basic descriptive statistics are reported in Table A1 in the Appendix.

Once having obtained our aggregate indices of inequality of opportunity for all the Indonesian provinces sampled in IFLS and for three different time periods (i.e. 1997, 2000 and 2007), we are able to analyze time trends and differences among provinces in inequality of opportunity of education.

Lastly, by applying the Shapley value method (Shorrocks, 1999; 2013), we can decompose our index of educational inequality of opportunity and find the contribution of each of the *circumstances*[4].

3.2 Measuring the power of individual circumstances

While the R-squared is able to measure at the aggregate level the extent to which educational opportunities are distributed among a given, there is one important question left. To what extent do we, as the researchers, use this measure? Ferreira and Gignoux (2014) have shown that the R-squared of pre-determined *circumstances* explaining PISA score in each country is significantly associated with two educational policy variables. While the approach is definitely promising, it has the drawback that this aggregate measure cannot work to explain the effect of inequality of opportunity at individual level. Instead, it might be of crucial importance to explain if and how the "burden" of unequal opportunities in education carried by each person will affect her future life achievements such as the completed years of schooling, wage, occupation, income, productivity or non-cognitive ability to name a few. Therefore, we rely on the longitudinal dimension of the dataset and find an alternative measure that is able to capture the inequality of opportunity in that sense.

Our attention comes to the fitted values of a regression model that are comparable to the R-squared to grasp the idea of the inequality of opportunity at individual level. In a simple linear regression setting where the dependent variable is the adjusted years of education observed for individual i at time t and a vector of circumstances X such as:

$$Y_{it} = \alpha + \beta X_{it} + \delta_2 Z_2 + \ldots + \delta_n Z_n + \gamma_t + u_{it} \quad (2)$$

and $E(u_{it}) = 0$, the fitted values of each individual i, i=1,...,n at time t, t=1,…,T excluding the common constant and time effect as well as individual effects are simply given by:

$$\widehat{Y}_{it} = \hat{\beta} x_{it}. \quad (3)$$

The R-squared of this model informs the extent the variation of X explains the variation of Y for all

[4] In the Shapley decomposition, the contribution of each factor is determined as average marginal contribution taken over all possible ways in which factors may be removed in sequence.

individuals *i* over time. The fitted value $\widehat{Y}_{it}$ explains, instead, the predicted value at response variable *Y* of individual *i* that is specifically influenced by the *X* circumstances experienced by individual *i*, at time *t*, with $\hat{\beta}$ governing the average magnitude of the relationship over time and across individuals. Because it comes from the same process to gain the R-squared, we argue that it possesses the similar attitudes as the R-squared to qualify as the representation the level of inequality of opportunity discussed by Ferreira and Gignoux (2014) in their paper.

The interpretation of this measure is also quite straightforward. Fitted values are the accumulation of power carried by pre-determined *circumstances* on educational attainment. The more pre-determined *circumstances* get involved in the model, i.e. the individual has higher value of x, the higher fitted values $\hat{y}$ is gained, which means the stronger the accumulation of the pre-determined *circumstances*, as the source of inequality of opportunity at individual level, contributes to the years of education. This one to one relationship is more understandable when the fitted values are tailored to the standardized range [0,100]. Standardized fitted values zero represent the individuals with the lowest power of pre-determined *circumstances*, while the largest values map the ones with the highest power of pre-determined *circumstances*[5].

Furthermore, equation (2) can be seen as two-way fixed-effects regression by replacing individual dummies Z with individual time invariant effect ε_i for a more compact estimation procedure, such that

$$Y_{it} = \alpha + \beta X_{it} + \gamma_t + \varepsilon_i + u_{it} \tag{4}$$

The two-way fixed-effect estimator of equation (4) is defined based on

$$(Y_{it} - \bar{Y}_i) = \beta(X_{it} - \bar{X}_i) + (\gamma_t - \bar{\gamma}) + (u_{it} - \bar{u}_i) \tag{5}$$

that removes time invariant variables[6]. The coefficient estimates and standard errors of equation 2

[5] It is however important to note that unlike R-squared, fitted values cannot be adjusted. Instead, it purely relies on the coefficients of pre-determined circumstances for the significance assessment of explanatory variables. If $\hat{\beta}$ is large, fitted values will be large too. If $\hat{\beta}$ is close to zero or practically insignificant, it translates into the fitted values as a very small number. Nevertheless, this measure will potentially suffer from imprecision if $\hat{\beta}$ is large but the standard error is also large that makes it statistically insignificant. Therefore, we need to keep an eye on the statistical assessment of individual coefficients such as t-test and VIF before making decision to move forward using fitted values, or even to refine the model until the empirical assessments are more convincing.

Another issue with fitted values is related to the modelling strategy. Ordinary least square that implicitly assumes normal distribution naturally produces unrestricted fitted values. However, in many cases educational outcomes are bounded and particularly for our case it should have the lowest value zero. Negative fitted values, when this is the case, will violate the nature of completed year of schooling. Therefore, generally speaking it is very important to investigate if the fitted values go beyond their innate boundaries and when it is there, one may have to look at various strategies to overcome this issue prior further analysis.

[6] Some source of complete derivation is i.e. by Allison (2009)

and equation 4 (as well as equation 5) are identical[7]. Nevertheless, in equation 5 the estimates have a stronger causal interpretation, such that for each individual *i*, the predicted values are translated as the joint influence of pre-determined circumstances deviation at time point *t* from its mean on the deviation of educational attainment at time point *t* from its mean[8]. This interpretation employs within variation to acquire the power accumulation of circumstances in time *t* relative to the ones at every time point via averaging procedure. This privilege is not found for models with cross-section information or longitudinal data set with pooled approach.

As for the term time dimension deviation from its mean in the second part of the right hand side equation 5 exists for each predicted value. Therefore, this does not affect the within variation attached to index of circumstances deviation[9].

Moreover, we exploit the assumption that in the individual fixed effect model such as the one specified in equation 5, ε_i is the zero-mean time-invariant part of the error term. We interpret this part as an upper-bound estimate of the fixed element of unobserved effort or innate ability. The possibility that effort or innate ability varies over time so that it has time-variant element is an interesting case, yet beyond the scope of the study. We encourage the readers to peruse the extent of this topic.

3.3 Assessing the long-term effect of the circumstances

Once model (4) is estimated in order to extract the individual indexes of the power of current circumstances deviation ($\Delta\widehat{Y}_i$) –or can simply be referred as the individual index of power of circumstances - and of innate ability ($\hat{\varepsilon}_i$), we turn into the third-stage of our analysis which will focus on the cohorts of students who stopped schooling by the last survey available (i.e. 2007) and use these measures to explain long-term educational and earning outcomes in order to assess whether and to what extent the educational gains obtained during school-age through the beneficial effect of circumstances persist over time and contribute to long term achievements such as final number of years of schooling completed, enrolment in tertiary education and wage earned as young adults.

These long term effects are given by the estimated coefficients $\hat{\beta}$ and $\hat{\varepsilon}$ obtained from the following three sets of regressions (we ignore the constant and error terms for simplification):

[7] Clustered standard errors.

[8] The deviation implies the magnitude of pre-determined circumstances affecting the outcomes, i.e. the **small** deviation of *X* from its mean at time *t* leads to a **small** impact on the deviation of *Y* from its mean at time *t*. In addition, deviation has two directions, negative and positive. Pursuing predetermined circumstances that affect the outcomes direction might utilize this approach

[9] It is important to notice, however, that STATA routine for estimating the fixed-effect through xtreg,fe command has a bit different method to produce the predicted values in order to introduce back the constant. Under the constraint that $\bar{\varepsilon}$=0, the fixed-effects model reformulation from Gould (2013) is modified into two-way fixed-effect version so that $\left(Y_{it} - \bar{Y}_i + \bar{\bar{Y}}\right) = \alpha + \beta\left(X_{it} - X_i + \bar{\bar{X}}\right) + \gamma_t + (u_{it} - \bar{u}_i + \bar{\bar{u}})$. The reformulation does not affect the within variation of index of circumstances since the additional terms do not contain individual subscript *i*.

$$\textit{Completed years of education}_{i,2007} = \theta^{E}(\hat{Y}_{i,2007} - \hat{\bar{Y}}_{i}) + \tau\hat{\varepsilon}_{i}^{E} \quad (6)$$

which are estimated with a zero truncated Poisson model by maximum likelihood estimation;

$$\textit{Enrolment in university}_{i,2007} = \theta^{U}(\hat{Y}_{i,2007} - \hat{\bar{Y}}_{i}) + \tau\hat{\varepsilon}_{i}^{U} \quad (7)$$

where the dependent variable is a dummy which equals 1 if the individual is enrolled in university and the effects are estimated with a maximum likelihood probit model;

$$\textit{Log wage per day}_{i,2007} = \theta^{W}(\hat{Y}_{i,2007} - \hat{\bar{Y}}_{i}) + \tau\hat{\varepsilon}_{i}^{W} \quad (8)$$

that is estimated with a Heckman selection model where selection is predicted by using age, years of education, and dummies for female gender, being married, and for enrolment in university.

Last, we consider the relationship between inequality of opportunity and educational budgeting policy. In doing so, we aim to see whether allocating more resources to the education sector had any effect on the equalization of opportunities among students and therefore mitigated the influence of circumstances on individual educational achievements.

We therefore model our indexes of the power of circumstances as a function of lagged educational budget spending and the lagged values of the dependent variable. Our regression of interest takes the following form:

$$\Delta\hat{Y}_{i,p,t} = \varphi + \theta\Delta\hat{Y}_{i,p,t-s} + \delta budget_{p,t-x} + \gamma_{t} + v_{i,p,t} \quad (9)$$

where $\Delta\hat{Y}_{i,p,t}$ is the individual index of the power of circumstances measured in time t for individual i, living in province p; $\Delta\hat{Y}_{i,p,t-s}$ is the lagged value of the index as measured in the previous survey available, $budget_{p,t-x}$ is the share of the budget devoted to education in province p at time t-x, where x is two, three or five years depending on whether the dependent variable is observed in 1997, 2000 or 2007 and γ_{t} are the time fixed effects. $v_{i,p,t}$ is the idiosyncratic error term with zero expectation.

There is a concern that the standard errors in equation (6), (7), (8) and (9) are downward biased. In the second stage analysis, the age adjusted years of schooling is an estimated variable from the first stage analysis and there is no effort pursued to include this kind of uncertainty in the estimation. The complication of parametric inference gets bigger when turning into the third stage analysis. Therefore, we rely on bootstrapping to estimate the final standard errors. By this fashion, the implicit

assumption is that the sets of observations independent and identically distributed. We expect that this assumption holds true, as we have included the sampling weights in the first stage analysis to correct the probability of being selected into the survey.

4. Data and Descriptive Analysis

4.1 Data

Our main data comes from the 1997, 2000 and 2007 waves of the Indonesia Family Life Survey (IFLS) which is a longitudinal individual and household survey data conducted in 13 Indonesian provinces spread out in the islands of Sumatra, Java, Kalimantan, Sulawesi, Bali and West Nusa Tenggarra.

There are interesting features in the IFLS which make this data particularly suited to our research needs. First, the data is featured by high recontact rates (Frankenberg and Thomas 2000) that contribute significantly to data quality by lowering the bias due to non-random attrition. Second, in addition to basic demographic and socio-economic characteristics of all the household's members, the IFLS collected detailed information on various educational aspects (e.g., current schooling grade; age at which the child first enrolled at school; number of correct answers given in a cognitive test) as well as on earnings which are necessary to analyze inequality of opportunity in educational outcomes and intergenerational mobility.

To scrutinize the educational budget policy, we extracted lagged annual provincial revenue data ("Anggaran Pendapatan dan Belanja Daerah"-APBD) from The Indonesian Ministry of Finance[10]. The data are available for public, but the formats are different. Data for 1994/1995 and 1996/1997 combine the budget of education, youth, sport and faith under the same umbrella, while data in 2002 has specific section for educational budget. Even though the correlation established for 2007 and other waves are not head-to-head comparable, they still could give some benefits regarding the general description of the relationship between educational policies and educational inequality of opportunity.

4.1. Levels and trends of inequality of opportunity in education in Indonesia

Table 1 shows our estimates of the inequality of educational opportunity measured as the R-squared of a set of several regressions run separately for each province, year and cohort.

On average these figures suggests that pre-determined *circumstances* account for a relatively low portion of the total variance of completed years of schooling, but there are remarkable differences among provinces, between cohorts and over time.

[10] The provincial revenue in our model is not the budget dedicated for province administration. Instead, we use the sum of district revenues in each province as the development budget is concentrated at district level, particularly after decentralization.

Table 1 Aggregate index of inequality of educational opportunities

	1997				2000				2007			
	Cohort 11-14		Cohort 15-18		Cohort 11-14		Cohort 15-18		Cohort 11-14		Cohort 15-18	
	Obs.	R^2	Obs.	R^2	Obs.	R^2	Obs.	R^2	Obs.	R^2	Obs.	R^2
North Sumatera	172	0.237	102	0.171	180	0.279	102	0.244	156	0.218	90	0.205
West Sumatera	120	0.451	75	0.418	117	0.343	77	0.464	65	0.301	50	0.332
South Sumatera	116	0.246	45	0.277	139	0.405	54	0.455	47	0.487	38	0.444
Lampung	99	0.377	36	0.513	108	0.249	45	0.495	76	0.433	40	0.285
DKI Jakarta	179	0.236	130	0.291	137	0.333	127	0.191	88	0.293	48	0.365
West Java	263	0.319	128	0.343	283	0.227	142	0.319	201	0.236	129	0.124
Central Java	230	0.234	122	0.235	221	0.185	121	0.215	147	0.232	113	0.120
DI Yogyakarta	77	0.320	62	0.356	82	0.141	60	0.358	54	0.268	58	0.296
East Java	243	0.151	114	0.268	219	0.314	162	0.255	168	0.247	128	0.223
Bali	100	0.372	53	0.541	94	0.289	58	0.319	79	0.298	64	0.249
West Nusa Tanggara	140	0.241	47	0.436	156	0.213	71	0.358	112	0.297	98	0.123
South Kalimantan	74	0.177	31	0.374	73	0.444	29	0.629	63	0.650	34	0.533
South Sulawesi	104	0.382	39	0.443	98	0.266	46	0.453	90	0.263	58	0.384

We see that –in most of the cases- inequality of opportunity measure seems to be relatively higher for the oldest cohorts, a finding, this one, which goes against our initial expectations given that one would reasonably assume that while young kids are very much dependent on their family choices, as a person gets older, his achievements and choices tend to be less "dependent" on her parents' choices.

It can also be observed, however, that inequality of opportunity has decreased in almost all the Indonesian provinces analyzed in this paper. Some notable exceptions are South Sumatra, where the portion of overall inequality in educational attainments accounted by inherited *circumstances* grew for the older cohort from 27% in 1997 to 44% in 2007 or in South Kalimantan, where, for the youngest cohort it shows an increase of almost 50 percentage points.

In Table 2 we report the decomposition of inequality of opportunity into partial shares by individual *circumstances*. These estimates, which are based on the cross section dataset from 1997, suggest that mother's and father's education are associated with the largest share of inequality in educational achievements. In some provinces, however, the relative contribution of inherited wealth status

measured by ownership of the house and of several assets is particularly prominent. This is for the example the case of Central Java, where ownership of the house and TV counts relatively much more than parental education as together they account for almost 40 percentage points of the overall share of explained inequality of opportunity in the oldest cohort. Another interesting example is Lampung, where ownership of farm land accounts for about 21 percentage points of overall inequality in the cohort 11-14 years.

4.2. Educational mobility and the role of pre-determined circumstances in driving educational achievements.

This section aims at examining the influence of pre-determined *circumstances* in the educational attainments of the two cohorts of Indonesian students here analyzed and so at getting a first glimpse on the extent to which the effect of these *circumstances* is sticky across generations of the same household.

As a first explorative step we cover adults or individuals who graduated or dropped out since the first period of observation and apply a sequential response model (Maddala, 1983; Mare, 1981) in order to assess the association of predetermined *circumstances* with the decision of an individual to continue or to exit school at each level.

More specifically, we use a sequential logit model that considers the sequence of binary response variable. It allows the explanatory variables to unequally influence the probability to stay in one level or move on to the next level. Moreover, the probability to be in one level takes into account the probability to be in the previous level. Educational levels fit into this modeling strategy as, in order to graduate from primary school, one needs to be enrolled in primary school. Then the decision to be made is either to stay in that level and never graduate (i.e. drop out/exit) or to complete primary school (graduate)[11].

We therefore exploit the longitudinal dimension of our data by following individuals who either left of graduated from each school level by the last wave of the survey in order to assess the extent to which pre-determined, inherited *circumstances* (such as the socio-economic status of the family observed in the first wave) affect individual probability to proceed towards further levels of schooling.

[11] See Figure A1 reported in the Appendix:

Table 2: Decomposing inequality of educational opportunity into individual circumstances shares

PANEL A: Cohort 11-14	Total	Gender	Mother's Education	Father's Education	Rural	TV	House	Farm Land	Household Appliances	Electricity
North Sumatra	0.150	0.002	0.053	0.042	0.007	0.007	0.008	0.016	0.014	0.002
West Sumatra	0.379	0.049	0.072	0.019	0.025	0.054	0.004	0.032	0.066	0.034
South Sumatra	0.202	0.004	0.043	0.087	0.013	0.009	0.013	0.017	0.014	0.008
Lampung	0.330	0.011	0.044	0.038	0.103	0.006	0.017	0.067	0.019	0.022
Jakarta	0.157	0.003	0.064	0.061	-	0.008	0.011	0.002	0.003	0.004
West Java	0.284	0.003	0.057	0.117	0.052	0.022	0.001	0.011	0.022	0.001
Central Java	0.239	0.025	0.054	0.063	0.022	0.032	0.008	0.002	0.031	0.003
Yogyakarta	0.275	0.037	0.075	0.102	0.001	0.046	0.004	0.003	0.005	0.026
East Java	0.146	0.023	0.027	0.029	0.011	0.019	0.001	0.001	0.002	0.035
Bali	0.315	0.012	0.091	0.073	0.003	0.081	0.007	0.009	0.012	0.016
W. Nusa Tenggara	0.189	0.007	0.057	0.050	0.001	-0.023	0.008	0.001	0.015	0.028
South Kalimantan	0.072	0.002	0.005	0.024	0.002	0.015	0.001	0.007	0.006	0.002
South Sulawesi	0.315	0.043	0.051	0.117	0.003	0.016	0.005	0.010	0.061	0.010
PANEL B: Cohort 15-18										
North Sumatra	0.102	0.000	0.038	0.024	0.001	0.002	0.001	0.005	0.017	0.012
West Sumatra	0.279	0.030	0.091	0.012	0.046	0.009	0.004	0.008	0.032	0.024
South Sumatra	0.250	0.030	0.121	0.032	0.013	0.024	0.002	0.005	0.011	0.006
Lampung	0.449	0.004	0.229	0.031	0.057	0.047	-	0.027	0.013	0.026
Jakarta	0.236	0.038	0.054	0.080	-	0.011	0.050	0.002	-	-
West Java	0.240	0.006	0.084	0.082	0.022	0.011	0.001	0.009	0.006	0.014
Central Java	0.130	0.019	0.011	0.005	0.017	0.035	0.017	0.001	0.003	0.009
Yogyakarta	0.228	0.004	0.018	0.063	0.003	0.001	0.033	0.001	0.004	0.040
East Java	0.300	0.021	0.044	0.044	0.021	0.101	0.001	0.010	0.020	0.029
Bali	0.360	0.018	0.119	0.062	0.059	0.041	0.011	0.001	0.047	-
W. Nusa Tenggara	0.280	0.009	0.011	0.027	0.019	0.011	0.033	0.052	0.006	0.106
South Kalimantan	0.306	0.017	0.021	0.003	0.107	0.016	0.003	0.005	0.008	0.028
South Sulawesi	0.332	0.043	0.030	0.048	0.016	0.077	0.027	0.022	0.008	0.004

Note: Based on cross-sectional data from IFLS 1997.

We code the sequential steps from entering primary school to entering higher education as an ordinal variable which ranges from 1 (lowest level) to 7 (highest level)[12] and run separate sets of regressions for the two five-years cohorts of individuals sampled. Results are reported in Tables 3 and 4.

Table 3: Sequential Logit model for educational levels. Results for Cohort 11-14

	1 vs 2-7	2 vs 3-7	3 vs 4-7	4 vs 5-7	5 vs 6-7	6 vs 7
Father's Educ.	0.248	0.097	0.155	0.126	-0.111	0.187
	(3.13)	(2.14)	(1.59)	(3.25)	(1.13)	(3.00)
Mother's Educ.	0.061	0.180	0.018	0.162	0.185	0.141
	(0.74)	(3.53)	(0.16)	(3.49)	(2.00)	(2.32)
Female	-0.212	-0.039	1.088	-0.223	-0.108	0.456
	(0.59)	(0.15)	(2.25)	(0.95)	(0.22)	(1.61)
Rural	0.174	-0.021	0.127	-0.949	0.799	-0.316
	(0.36)	(0.07)	(0.25)	(3.41)	(1.22)	(0.88)
TV	0.311	0.486	0.206	0.679	1.260	-0.766
	(0.65)	(1.51)	(0.39)	(2.29)	(1.80)	(1.44)
House	1.032	-0.153	1.562	-0.066	-0.263	0.967
	(1.81)	(0.28)	(2.31)	(0.15)	(0.35)	(2.29)
Other buildings	0.936	0.466	2.045	0.687	1.545	0.368
	(1.13)	(0.75)	(1.97)	(1.61)	(1.34)	(0.94)
Farm Land	0.180	0.709	0.031	-0.125	0.190	0.687
	(0.49)	(2.42)	(0.07)	(0.51)	(0.29)	(2.29)
Livestock	0.445	-0.563	-0.440	-0.113	-0.033	-0.846
	(1.19)	(2.21)	(0.90)	(0.47)	(0.05)	(2.49)
Vehicles	1.057	0.781	0.584	0.023	0.293	0.120
	(2.80)	(3.02)	(1.35)	(0.10)	(0.49)	(0.35)
HH Appliances	0.112	0.980	0.103	-0.344	-2.720	1.020
	(0.24)	(2.77)	(0.15)	(0.87)	(2.37)	(1.32)
Receivables	-0.003	-0.545	0.962	0.007	1.352	-0.701
	(0.01)	(1.33)	(1.15)	(0.02)	(1.09)	(1.44)
Jewelry	0.541	0.080	-0.386	0.576	1.376	0.188
	(1.45)	(0.30)	(0.86)	(2.38)	(2.45)	(0.61)
Electricity	0.493	-0.110	1.072	-0.038	0.253	0.912
	(1.17)	(0.32)	(1.75)	(0.10)	(0.24)	(1.04)
Age	0.134	-0.126	0.280	-0.126	-0.032	0.451
	(1.28)	(1.38)	(1.51)	(1.50)	(0.17)	(4.07)
Constant	-3.991	2.310	-6.938	2.655	4.016	-16.441
	(1.69)	(1.11)	(1.62)	(1.42)	(0.97)	(5.82)
Observations			812			

Note: Sample is delimited to individuals who stopped schooling by 2007 or graduated from senior high school by 2007. Robust standard errors are in parentheses. The estimation includes age as the control variable and sampling weight. Education levels are enter Primary School (1), graduate Primary School (2), enter Junior High School (3), graduate Junior High School (4), enter Senior High School (5), graduate Senior High School (6), enter higher education (7). Stata module for sequential logit model is seqlogit (Buis, 2007).

[12] See Table A2 reported in the Appendix

Our findings show that parental education positively influences school survival across most of the levels of education. Among both cohorts of students, we observe that maternal education positively affects the probability of being enrolled in senior high school and, for the oldest cohort, it is also significantly associated (and with a relatively larger coefficient) with higher odds of proceeding towards higher levels of education after graduation from senior high school. Father's education instead seems to positively affect the probability for both generations of graduating from primary school. It can be observed that the magnitude of these probabilities is always larger for the youngest generations, which may imply that the importance of such *circumstance* in driving educational choices has grown over time.

Table 4: Sequential Logit model for educational levels. Results for Cohort 11-15

	1 vs 2-7	2 vs 3-7	3 vs 4-7	4 vs 5-7	5 vs 6-7	6 vs 7
Father's Educ.	-0.009	0.179	-0.129	0.125	-0.128	0.114
	(0.12)	(3.03)	(0.72)	(2.40)	(1.23)	(2.06)
Mother's Educ.	0.286	0.137	0.273	0.163	0.032	0.186
	(3.12)	(2.13)	(1.35)	(2.58)	(0.30)	(3.39)
Female	-0.203	0.134	0.461	0.307	1.814	0.587
	(0.47)	(0.43)	(0.53)	(0.97)	(1.65)	(1.93)
Rural	0.290	0.020	-1.914	-0.706	-0.314	0.469
	(0.50)	(0.05)	(2.44)	(1.93)	(0.42)	(1.33)
TV	0.328	0.615	0.308	1.396	2.325	0.288
	(0.65)	(1.70)	(0.38)	(3.73)	(3.32)	(0.58)
Farm Land	0.632	0.103	1.224	0.410	0.391	-0.003
	(1.30)	(0.29)	(1.36)	(1.07)	(0.39)	(0.01)
Livestock	-0.524	-0.024	-0.565	-0.679	0.252	-1.226
	(1.05)	(0.08)	(0.64)	(1.94)	(0.27)	(3.58)
Vehicles	-0.016	0.755	0.341	-0.473	0.492	0.853
	(0.03)	(2.55)	(0.43)	(1.30)	(0.61)	(2.24)
HH Appliances	0.893	0.236	-1.269	0.267	-0.134	0.885
	(1.81)	(0.58)	(0.99)	(0.58)	(0.11)	(0.83)
Jewelry	0.751	0.118	2.440	0.497	-2.036	-0.371
	(1.71)	(0.38)	(2.47)	(1.52)	(1.72)	(1.01)
Age	-0.165	-0.208	-0.260	0.036	0.016	0.290
	(1.18)	(2.30)	(0.87)	(0.30)	(0.06)	(2.43)
Constant	4.985	4.705	11.217	-1.919	3.053	-12.006
	(1.26)	(1.95)	(1.36)	(0.61)	(0.43)	(3.66)
Observations			512			

Note: Sample is delimited to individuals who stopped schooling by 2007 or graduated from senior high school by 2007. Robust standard errors are in parentheses. The estimation includes age as the control variable and sampling weight. Education levels are enter Primary School (1), graduate Primary School (2), enter Junior High School (3), graduate Junior High School (4), enter Senior High School (5), graduate Senior High School (6), enter higher education (7). Stata module for sequential logit model is seqlogit (Buis, 2007).

Moreover, we can observe the presence of a gender gap (in favour of girls) in higher education levels. However, it also seems that the gap has been closing as for the youngest generation the difference has lost statistical significance or in case of the probability of enrolling in tertiary education its magnitude has shrunk.

5. Findings

5.1 Persistence of unequal educational opportunities

We now turn into the inferential part of our analysis aimed at unravelling the consequences that the burden of unequal opportunities in education because of exogenous pre-determined circumstances has on a person's future life outcomes. Considering the distribution of young students' rewards according to *efforts* and *circumstances* is a very meaningful exercise in such it can tell by how much the role of pre-determined *circumstances* in influencing schooling opportunities (that, given limited responsibility of children, might be tolerated in the past) persist over the individual life's course.

By doing this, we can also get a clearer picture of the persistence or "stickiness" of the effects of inherited *circumstances* and therefore their repercussions for intergenerational mobility. In particular, we look at the effects in terms of future education achievement and of earnings on four different cohorts of students ranging from the oldest ones, aged 15-18 in 1997 and aged 15-18 in 2000 to the youngest ones aged 11-14 in 1997 and aged 11-14 in 2000.

Panel A in Table 5 shows the results for the effects that inequality of educational opportunity experienced in the past has on future school achievements (i.e. on years of school completed in 2007).

As discussed in Section 3, we measure the deviation of current pre-determined circumstances from its average over the periods of observation by the fitted values of the educational achievement equation and, for the sake of interpretation we normalize these fitted values in order to get an index which goes from 0 to 100. The larger is the value of this index, the stronger is the way current circumstances have influenced educational achievement relatively than the past circumstances, the more unevenly so were the opportunities distributed among students.

Table 5: Persistence in inequality of opportunity and future educational achievements.

Panel A Dep. Var.: Final Years of Education	**(1)** **Cohort 11-14 2000**	**(2)** **Cohort 11-14 1997**	**(3)** **Cohort 15-18 2000**	**(4)** **Cohort 15-18 1997**
Power of Circumstances	0.014 (49.09)	0.006 (32.97)	0.002 (14.35)	0.002 (11.06)
Innate Ability	0.022 (50.48)	0.018 (44.64)	0.008 (21.47)	0.013 (26.84)
Panel B Dep. Var.: Tertiary Education				
Power of Circumstances	0.044 (2.38)	0.030 (4.34)	0.002 (0.37)	0.005 (1.06)
Innate Ability	0.065 (2.18)	0.008 (4.52)	0.038 (3.18)	0.048 (2.49)

Note: T ratios in parentheses. Circumstances and Innate Ability are measured respectively by the normalized fitted values and the time-invariant residual obtained from panel, fixed effects estimation.
Col 1 and 3: Samples are students from cohorts 11-14 and 15-18 years old in 2000 who stopped schooling by 2007. Panel A: Obs.: 1188 (cohort 11-14). Obs.: 600 (cohort 15-18). Panel B: Obs.: 394 (cohort 11-14). Obs.: 312 (cohort 15-18).
Col 2 and 4: Samples are students from cohorts 11-14 and 15-18 years old in 1997 who stopped schooling by 2007. Panel A: Obs.: 986 (cohort 11-14). Obs.: 408 (cohort 15-18). Panel B: Obs.: 367 (cohort 11-14). Obs.: 193 (cohort 15-18).

As these results suggest, there seems to exist a significant cumulated and persistent effect of pre-determined *circumstances*. The more educational opportunities are granted to a person on the basis of her inherited *circumstances*, the larger will be her educational reward also in the near future.

The coefficient on the power of circumstances index indicates that the increase of years of schooling from the observations who got the least pre-determined *circumstances* compared to those of the previous periods in their early ages (the standardized index of fitted values is 0) to the observations with the highest ones (the standardized index of fitted values is 100) ranges from around 1.4 years for youngest cohort aged 11-14 in 2000 to around 0.2 years for the oldest cohort (aged 15-18 in 1997).

On possible interpretation of the difference in the magnitude of the effect between the youngest cohorts 11-14 and the oldest ones aged 15-18 is related to the fact that by reason of their young age and therefore lower maturity- young adolescents are much more dependent on the choices made by their parents. Nevertheless, when comparing the coefficients for the youngest cohort measured

in 2000 and the one in the same age-range measured in 1997, our results also show that the current influence of circumstances is stronger for the youngest generations, possibly implying that the distribution of educational opportunities have become more concentrated over time.

On the other hand, for each of the cohorts under investigations the role of innate ability is relatively larger than the power of circumstances and-when comparing the effect for the two youngest cohorts- it has also grown over time.

Moreover, when considering the results in Panel B for the probability of enrolling in Tertiary Education we see that the indirect effect of current circumstances via education achievements is not statistically significant at all for the two oldest cohorts. On the other hand, among the youngest generations we observe a positive and significant independent effect. Nevertheless, the effect of innate ability is not only larger but –as implied by the difference in the coefficients- it has also grown relatively faster than the power of circumstances.

When looking at the results obtained from a simple Heckman model estimating the association between earnings and the power of circumstances index (see Table 6), one can also see there is a close and positive relationship between the role that current *circumstances* played in the allocation of educational rewards during adolescence and future earnings perspectives.

Table 6: Persistence in inequality of opportunity. Wage equations.

	(1)	(2)	(3)	(4)
	Cohort 11-14 2000	**Cohort 11-14 1997**	**Cohort 15-18 2000**	**Cohort 15-18 1997**
Power of Circumstances	0.004	0.011	0.007	0.004
	(0.23)	(2.07)	(1.45)	(1.19)
Innate Ability	0.013	0.023	0.017	0.037
	(0.60)	(2.06)	(1.54)	(2.32)

Note: T ratios in parentheses. MLE estimation with bootstrapped standard errors. Dep. Var. is log wage per day in 2007. Variables included: years of education in 2007, age in 2007, sex, married, tertiary education, wealth index.

Circumstances and Innate Ability are measured respectively by the normalized fitted values and the time-invariant residual obtained from panel, fixed effects estimation.

Col 1 and 3: Samples are students from cohorts 11-14 and 15-18 years old in 1997 who stopped schooling by 2007. Obs.: 639. Cens. Obs.: 329 (cohort 11-14). Obs.: 245. Cens. Obs.: 101 (cohort 15-18).

Col 2 and 4: Samples are students from cohorts 11-14 and 15-18 years old in 2000 who stopped schooling by 2007. Obs.: 684. Cens. Obs.: 404 (cohort 11-14). Obs: 377. Cens.Obs: 168 (cohort 15-18).

However, we see that in most of the cases the effect of current circumstances is not statistically different from zero and relatively small in magnitude if compared to the effect of innate ability.

These results –that echo back to our previous results on tertiary education as well as our aggregate figures on inequality of opportunity- imply that in our sample any "unfair" reward mechanisms at school did not tend to persist and were not reflected in future earning perspectives.

5.2 Educational inequality of opportunity and public policy

Our next research question is whether educational budgeting policy has played any role in favoring a more even allocation of opportunities among the Indonesian students. We has so far seen, that equality of opportunity in education (as measured by the aggregate index at the province level as well as proxied by the individual index of power of the circumstances) has slightly tended to improve over time. Was this improvement associated with an increase in the budget devoted to education?

In order to answer this question, we exploit the panel dimension of our data and estimate a fixed-effects model relating the between-provinces variation in the budget share devoted to the education sector to the between-province variation in inequality of opportunity as measured by our power of circumstances indices obtained for the cohorts 11-14 and 15-18

Results, which are reported in Table 7 show that while one of the oldest cohort has experienced a better pro equality policies, there is a more stable, positive and significant relationship between inequality of opportunity and spending in education when considering the results obtained for the youngest cohort.

These findings may be interpreted in the light of the differences in the way financial resources have been spent over time.

The oldest cohort of students aged 15-18 in 2000 seems to have benefited extensively from various supply side interventions, targeting especially secondary school (such as the realignment of the education system and the creation of new vocational schools) that were realized in the aftermath of the 1997 crisis. By simply increasing and diversifying the supply of education, these policies created more opportunities for secondary school students to achieve higher education levels. At the same time, the campaign concerning the benefits of studying at

vocational schools to increase the demand side has been actively taking place. Students or households that have no intention for tertiary education were directed to consider the choice of vocational schools since this schooling type has a lower opportunity cost through more skillful fresh graduates who are ready to enter the job market, compared to the traditional high school graduates.

On the other hand, the effectiveness of the allocation of provincial budget to primary and junior high school has been more ambiguous: more resources were devoted to hire a greater number of teachers, assigning each teacher to teach one subject and therefore decreasing the students/teachers ratios. Yet –as remarked in various reports (Suryadarma and Jones,2013; OECD/Asian Development Bank, 2015) - this mechanism has been highly inefficient especially for small schools, that are mostly located in remote and disadvantaged areas where problems related to teachers' lack of motivation and absenteeism were more frequently observed.

Table 7: Inequality of opportunity in education and public policy

Dep. Var.: Power of Circumstances Index	**(1)**	**(2)**	**(3)**	**(4)**
	Cohort 11-14 2000	**Cohort 11-14 1997**	**Cohort 15-18 2000**	**Cohort 15-18 1997**
Lag Educational Budget Share	1.33 (11.49)	1.28 (5.23)	-3.35 (5.47)	0.24 (0.39)
Lag Power of Circumstances Index	-0.36 (3.26)	-0.12 (2.24)	-0.48 (3.83)	-0.14 (2.13)
Time Fixed Effects	yes	yes	yes	yes
Observations	2584	2561	1465	1129
Sample observed in:	2000-2007	1997-2000-2007	2000-2007	1997-2000-2007

Note: The lags for the educational budget share are of two, three and five years depending on whether the dependent variable is observed in 1997, 2000 or 2007. T ratios in parentheses.

6. Concluding remarks

Educational outcomes are important means for achieving a wide array of important personal goals. Of course, having the opportunity of being well educated has also its intrinsic value; regardless of the effect education can have on other, contemporaneous or future, outcomes. Every person should be able to exert her fundamental right of being educated, but-of course- this doesn't imply

necessarily that everybody should achieve the same level of education. However, according to both ethical and efficiency-related arguments, the only source of inequality in educational achievements should be related to the heterogeneity in *effort* committed in studying, and not on inherited factors which are simply outside the scope of individual responsibility.

This simple consideration has motivated the present study which contributes to previous literature first, by accruing current knowledge on inequality of educational opportunities in a country, such as Indonesia, which has experienced remarkable high rates of economic growth as well as reductions in economic poverty and stands out pretty well when considering average national figures on education which largely benefited from massive supply side interventions which boosted school enrolment rates (Duflo, 2001). Yet, despite these gains, there are still two important challenges that the country needs to face: the first one is the increasing trend of income inequality and of inequality of opportunity along the health dimension (World Bank, 2014) and the other one related to large disparities within and between provinces and regions in many quantitative and qualitative indicators of school achievement (World Bank, 2011; OECD/Asian Development Bank, 2015).

Second, we identified the factors (or "*circumstances*") that account most for overall inequality of educational opportunity and found that parental educational background is one of the most important predetermined *circumstances* that affect educational inequality of opportunity.

We particularly contribute to previous literature on this field, by devising an "individual" index of the power of circumstances, which is given by the fitted values representing the importance that, for each individual, the deviation of current *circumstances* from its average have on her educational achievement. By using this index we were able to show how much persistent are these *circumstances* over the individual life's course and therefore how much sticky are current levels of inequality of opportunities.

We also observe for the youngest cohorts a positive trend between inequality indices and educational budget share. This small evidence may suggest that the increase in the educational budget share has not been efficient and lead to an increase in inequality.

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Appendix

Table A1: Descriptive Statistics

Panel A: 1997	**Cohort 11-14**		**Cohort 15-18**	
Variable	Obs	Mean/proportion	Obs	Mean/proportion
Years of schooling	2341	5,575	2145	8,288
Father's years of schooling	2171	5,886	1938	6,056
Mother's years of schooling	2281	4,864	2086	4,821
Residence (rural dummy)	2339	0,545	2145	0,501
Age	2341	12,586	2145	16,456
Panel B: 2000	**Cohort 11-14**		**Cohort 15-18**	
Variable	Obs	Mean/proportion	Obs	Mean/proportion
Years of schooling	2619	5,715	2690	8,589
Father's years of schooling	2401	6,142	2395	6,195
Mother's years of schooling	2544	5,222	2594	5,053
Residence (rural dummy)	2619	0,576	2690	0,494
Age	2619	12,539	2690	16,482

Source: own elaboration on IFLS data

Fig. A1 Educational transition

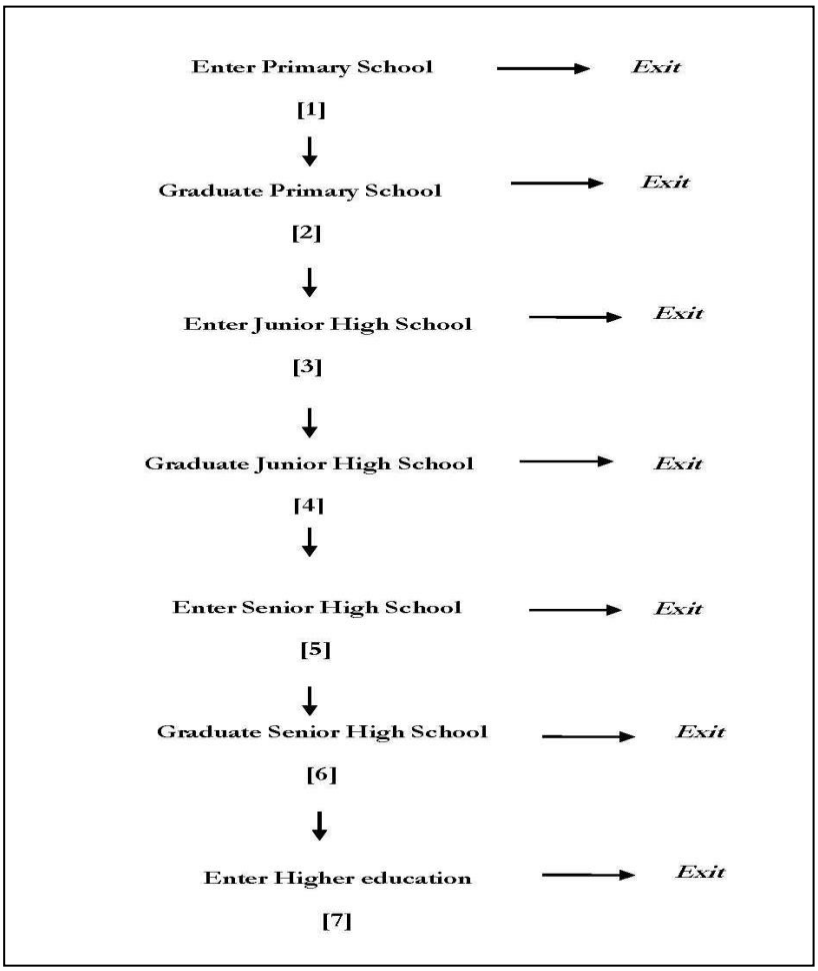

Table A2: Coding educational steps

Level	Value
Enter Primary School	1
Graduate Primary School	2
Enter Junior High School	3
Graduate Junior High School	4
Enter Senior High School	5
Graduate Senior High School	6
Enter Higher Education	7