The Economics of Islamic Education:

Evidence from Indonesia

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"Verily, in the creation of the heavens and of the earth, and in the alternation of night and day, there are indeed signs for men of understanding."

The Qur'an surah Al-Imran (The Family of Imran) verse 190

ABSTRACT

This thesis is about the economics of Islamic education in Indonesia. It consists of three core chapters that examine impacts of Islamic education at different levels: individual, regional and local community levels. These chapters cover the relative disparity of educational quality across Islamic schools and its impact on regional income per capita growth, the impact of government intervention in Islamic schools on graduates' earnings and schooling, and the positive externalities that might arise from the presence of Islamic boarding schools. This work adds to our understanding on how Islamic schools function as well as how Islamic education could be improved in the future.

The first academic contribution of this thesis lies in its methodology in dealing with limited samples. In the absence of access to data from a survey, to a randomization project that is specifically designed to capture the research objective or to long time series data from the statistics office, this study applies some novel methods. It conducts a Monte Carlo simulation to predict the magnitude of small sample bias from a very short panel analysis. In another chapter, due to unavailability of relevant time series data, the study exploits information from cross-sectional data to implement the difference-in-difference estimator. In another chapter, a series of robustness tests and econometrics strategies are implemented to control for selection bias.

The thesis also contributes to long-debated issues such as determinants of religiosity, determinants of economic growth and school completion factors by providing empirical results and showing that different samples can produce uncommon findings contradicting expectations. It also offers empirical evidence of the significance of variables that have never been considered before in the literature, such as the effect of religious education on income growth; the effect of the characteristics of religious leaders and the institutions they lead on socio-economic behaviour; and the formation of social capital of the surrounding community.

More specifically, the first core chapter attempts to analyse the relationship between religious education, the quality of education and regional income per capita across provinces in Indonesia. Using nationally comparable examination scores based on 2003-2005 provincial data, the picture of Islamic education in Indonesia at junior

secondary schools is education with not only low academic achievement but also unequal performance. In contrast, non-Islamic schools including public non-religious schools have shown significant improvement in equality of performance across provinces, most likely due to low performers being supported by increased involvement of local governments in this decentralisation era. The overall empirical results showed that quality-inclusive growth model specification is preferred to avoid upward bias. I find that the social marginal effect of years of schooling is only two-thirds of the estimate using standard analysis. Nevertheless, the relative importance of the quantity of education is still evident. Classifying education into two types – Islamic and non-Islamic education—suggests that while there is no difference between rates of return to the *quantity* of new human capital stock from Islamic education and non-Islamic education background, the quality-augmented new labour stock from non-Islamic education background is more significant than new stock from Islamic education background for regional income per capita growth. However, once we take into account inequality, the difference disappears. This implies that the different contribution of quality-adjusted new stock between human capital with religious and non-religious education background might be largely due to different inequalities across provinces.

The second core chapter attempts to oversee the impacts of government intervention in religious education on schooling and individual earnings. In 1975, the Indonesian government regulated the primary to secondary curricula of Islamic schools or *Madrasah* in Indonesia. The regulation required 70% standard education and 30% religious education. But the position of *Madrasah* as regular schools with Islamic characteristics (*sekolah umum berciri khas agama Islam*) was not integrated into the Indonesian education system until 1989. While the regulation was meant to standardise the quality of *Madrasah* it was perceived by some Islamic education practitioners as secularism within Islamic education. It has been questioned whether this has brought positive impacts on schooling and on the Islamic school graduates' competitiveness in the labour market relative to graduates from other types of schools including public and non-Muslim private schools. Using data from the 2000 Indonesian Family Life Survey (IFLS), eleven years after its introduction the reform has not improved either educational outcomes nor individual earnings of *Madrasah* graduates. But it has contributed to the promotion of nine year basic education in rural areas.

The third core chapter examines the socio-economic significance of religious boarding schools (*Pesantren*) in communities in Indonesia. More specifically, I look at the role of *Pesantren* leaders or *Kyai* and various institutional aspects of the *Pesantren* on three variables of interests: religiosity, earnings and demand for religious education. Using data from a survey of around 500 heads of households across nine *Pesantren* in Indonesia, it finds local community benefits from more intense interaction with the local religious leaders of Islamic boarding schools (*Pesantren*) than does the external community. But the direct benefit of living close to *Pesantren* only matters for religious participation, not for earnings or demand for religious education. However, the study finds that religiosity is more positively significant for earnings of the community surrounding the *Pesantren*, probably due to networking effects. Hence, community involvement of religious leaders can indirectly and positively affect earnings of the surrounding community and affect demand for religious education. The overall results suggest that *Pesantren* contribute to the formation of social capital, particularly in the form of religiosity, which contribute to the improved welfare of the surrounding community.

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THESIS DECLARATIONS

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1 INTRODUCTION

In the 1920s, A.C. Pigou published a journal from which human capital term has been well-known: "There is such a thing as investment in human capital as well as investment in material capital. So as soon as this is recognised, the distinction between economy in consumption and economy in investment becomes blurred" (Pigou 1928, p.29). His argument notes one big question: should economies invest in education?

There have been a long array of studies dedicated to answer this question, most of which are looking at the relationship between education attainment and economic growth (Hanushek and Kimko 2000; Easterly and Levine 2001; Bosworth and Collins 2003). But taking religious education into account may significantly change the results. The fact that religious education is being supplied or received at the expense of 'secular education' such as science has been empirically evidenced as having a positive association with economic growth (Hanushek and Kimko 2000). This raises a question on effects of inclusion of religious education in the curriculum. This study is therefore projected to analyse various aspects of religious education and, ultimately, to answer the above key question: should economies invest in religious education? While it focuses on Islamic education in Indonesia, it is expected that this study can stimulate research with similar topics in other countries.

One effective way to answer whether economies should invest in religious education is to see whether this type of education provides positive impacts to other parties. The objective of this dissertation is therefore to analyse the impacts of Islamic education in Indonesia on individual, regional and local community well being. The well being is broadly defined to include various socio-economic aspects from religiosity, earnings, and schooling. The issues covered by this study can be grouped into three major categories: (i) the relative inequality of educational quality of Islamic schools and its association with regional income per capita; (ii) the impacts of government intervention on Islamic schools' earnings and schooling of students in Islamic schools; (iii) positive externalities that might arise from the presence of Islamic boarding schools known as *Pesantren*. Each will be thoroughly discussed in a chapter.

The present study would not exist if there were no difference between what is commonly defined as secular and religious education. Nowadays, religious education is narrowly restricted as a system to relay religious doctrines and worship ethics (Zborovskii and Kostina 2004). Indeed, the product of religious education, ie religious human capital, is perceived as "knowledge, skill, experience and memories that enhance productivity in religious activities but have *no* effect on the productivity of resources allocated to other types of output" (Chiswick 2005, p.1). Traditionally, such separation between secular and religious education was not true in Islam. Chapter 2 therefore reviews this claim by examining how Islamic teachings define the role of education and how Islamic schools implement this concept. It also reviews existing literature on various aspects of religious schools from an economics point of view, motivated by the competition between secular and religious education. A review of the Indonesian economy and the education sector in Indonesia is also presented in Chapter 2.

There are differences between religious and secular education as defined by contemporary educational sectors. Chapter 3 attempts to contrast the relationship between regional economic growth and the relative importance of Islamic education to the secular education-economic growth relationship. The use of average years of schooling as a measure of education has been long criticized since it assumes homogenous rates of return across *types* of education (Mulligan and Sala-i-Martin 1997). In the Indonesian context, there is an indication that workers graduating from non-religious schools earn higher wages in Indonesia. Thus, it is essential to impose a procedure allowing different rates of return between religious and non-religious education in establishing the relationship with the income growth. Chapter 3 also aims to investigate whether quantity, quality or inequality of education play a more significant role in regional economic growth.

The role of the government in the provision of public education has been one of the most debated topics in empirical works. But when it comes to the issue of the government's role in religious education, little is known. Large variations also exist across countries. In most western countries, for example Australia, religious education is seen as a private good. Governments normally have no control over the delivery of religious education in public schools. Parents who want to equip their children with religious education must send their children to private schools owned by religious organizations. The contrary happens in Indonesia and other countries such as Malaysia and England

where religion is a compulsory course in public schools. Although issues related to ways to improve education in religious public schools can be learned from the literature, for example school competition (Hoxby 1994; Hanushek and Rivkin 2003), school finance (Hoxby 2001) and determinants of schooling (Behrman 1999), one critical issue on religious education in public schools that has not received the attention it deserves is the allocation of schooling hours to religious education. In Indonesia, for those who attend Islamic schools (*Madrasah*), religious courses take 30% of their schooling hours. A significant proportion of time is dedicated to religious courses at the expense of schooling hours for regular subjects, making it extremely challenging for *Madrasah* to compete with other types of schools in terms of academic attainments and future earnings.

Chapter 4 therefore analyses the effectiveness of government intervention in religious schools or *Madrasah*s on earnings and schooling of their graduates. It centres on the reduction of religious education schooling hours to 30%. Despite abundant newspaper articles on this topic indicating the importance of the issue, none of them is supported by thorough empirical analyses. Also, no empirical analysis has addressed this issue.

Looking at the effect of Islamic education at a different level, Chapter 5 examines the socio-economic impacts of Islamic boarding schools (*Pesantren*) on religiosity, earnings and demand for religious education of the surrounding community. In the education sector, *Pesantren's* role has been well known especially in providing education for low-income families. For the past four years, the number of *Pesantren* has increased from 14,067 in the academic year 2002/2003 to 17,506 in the academic year 2006/2007. The schools provide education to over 3 million students. While impacts of an educational institution are usually examined based on the performances of its current students or graduates, its impact on the surrounding community are rarely explored. The *Pesantren* is a unique case study because while the formal structure of the organisation of *Pesantren* is as an educational institution, *Pesantren* in Indonesia also act as centres of Islamic teachings aiming to develop the human capital of their students as well as the surrounding community. An underlying concern in the study is whether the religious institution contributes to the formation of social capital in communities and whether this intangible form of capital matters in the economic welfare of the community.

In Chapter 5, I use data from a recent survey of communities surrounding *Pesantren* across three provinces in Indonesia. I use the fixed effect model and the Oaxaca

decomposition method. In an ideal research design, comparison between religiosity and other community characteristics of the same individuals before and after the establishment of *Pesantren* could predict the impacts of *Pesantren* better.[1] But given most *Pesantren* were established decades ago, such data are unfortunately not available. Hence, this study compares religiosity between the "within" and "outside" communities. The former refers to the internal community located within walking distance to a *Pesantren*, while the later is located between 5 and 10 kilometres from a *Pesantren*. A hypothesis to be tested is whether living close to a *Pesantren* compound, which must have a mosque and other religious support, benefits the person in terms of social networks, access to religious services and education which in turn might affect the community's religiosity, earnings and demand for religious education.

Chapter 6 concludes this thesis. It presents a summary of findings. I also summarise implications of the study for literature on relevant areas. More specifically, I compare results from this thesis to earlier works to see whether using a different set of samples indicating different characteristics of how the stakeholders involved yield similar findings. I also discuss implications for education development in Indonesia. In addition to discussing direct implications from empirical findings, I thoroughly describe a new framework for sustainable school finance based on a microfinance system. The basic idea is to search for more income-generating activities so that Islamic schools can better manage their finance and therefore provide better resources to students. Results from earlier chapters suggest that school resources are positively associated with academic performance. Finally, Chapter 6 also presents the direction of future work motivated by some limitations of this thesis.

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[1] Assuming the community characteristics between the within and outside area would have been the same had no *Pesantren* been established.

2 BACKGROUND AND RELATED LITERATURE[*]

The scope of this thesis falls within the area of the economics of education and the economics of religion, with particular reference to Islamic education. As is widely known, the economics of education and the economics of religion have been interests of many scholars. But little has been done to look at the association between the two, especially within the non-western (non-Catholic, non-Christian) context. In this literature survey, I therefore discuss the elements that motivate the later analytical and empirical chapters.

First, I review briefly the existing studies on the economics of education and the economics of religion. I show that the synthesis of these two economics sub-disciplines, ie the economics of religious education, unfortunately has not received the adequate attention it deserves.

Second, I review the difference between secular and Islamic education. To describe Islamic education, I contrast between Islamic teachings and what the contemporary Muslim schools implement. The key issue I aim to bring up is the nature of religious education relative to secular education: complements or substitutes? As a follow up, Chapter 3 looks at the relationship between academic outcomes of two types of schools, ie religious versus non-religious schools, and income per capita growth using provincial-level data. The literature survey also briefly reviews the development of Islamic economics and identifies whether issues in the educational sector have been well addressed in Islamic economics literature.

In the final section, I provide descriptive statistics of the Indonesian economy. I also define why the theme of this thesis is relevant to the current stage of the Indonesian economy. A brief review of education with particular reference to religious education in Indonesia is also presented.

2.1 Economics of Religious Education

2.1.1 Economics of Education

2.1.1.1 Key themes in the literature

Literature in economics has clearly pictured the importance of education. Recent research on economic growth has focused on the role of human capital. The concept of human capital is not new. Early classical writers such as Adam Smith, Heinrich Von Thunen, Alfred Marshall and many others, had some notion of the concept of human capital.[2] However, while the concept was recognised, its importance in economic growth, and indeed the term 'human capital', was not yet identified.

The searching process of links between education and economic growth has motivated the development of the economics of education sub-disciplines. As defined by Prof Cohn (Cohn 1975), the economics of education is defined as: "… the study of how men and society choose, with or without the use of money, to employ scarce productive resources to produce various types of training, the development of knowledge, skill, mind, character, etc – especially by formal schooling – over time and distribute them, now and in the future, among various people and groups in the society." (Cohn 1975, p.2). The definition has clearly indicated at least three important issues in the economics of education: the education production function, the distribution process, and decisions on investment in the education sector.

The first issue, education production function, has been one of the most discussed in education economics literature. Studies generally attempt to see empirical evidence of the significance of each input in the theoretical model of the academic outcomes. Let us define the academic outcomes of an individual i who attends school j as:

$$O_{ij} = f(I_{ij}, F_{ij}, T_j, S_j, C_{ij}, R_j) \qquad\qquad \textbf{2-1}$$

Where O_{ij} is the academic outcomes of individual i who attends school j commonly measured by the exam scores, I_{ij} individual i's characteristics, F_{ij} individual i's family background (parental educational background, incomes, number of siblings etc), T_j school

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[2] See Cohn (1975:18–23) for a comprehensive review of writings on the subject by the classical economists.

j's teacher's characteristics (experience, educational background, gender, attendance rates etc), S_j school j's characteristics (class size, average student's exam scores, facilities, textbooks, the allocation of expenditures etc), C_{ij} the community surrounding individual i's residence's characteristics (the presence of NGO schools, involvement of community leader etc), R_j the region (where school j is located)-specific effect (competition effect etc). There have been some important theoretical works on this issue (Pritchett and Filmer 1999; Lazear 2001). But most studies are empirical.

Empirical studies suggest different results on how education institutions are exactly functioning and which school inputs matter. Reviewing all debated topics in education economics will most likely require hundreds of pages of literature review. So here I only review studies on (internal) school inputs. On the debate of the class size effect for example, using data from 11,600 students and teachers, a randomization project shows the test score is negatively significantly affected by the class size (Krueger 2006). In a similar manner, Eide and Showalter (1998) also find that student-teacher ratio, which indicates the class size, has an insignificant effect on test score gains. But study using longitudinal data from 649 elementary schools finds no positive effect of class size on student achievement (Hoxby 2000).

Another topical issue is the role of teachers. Interestingly, there seems to be more studies finding statistically insignificant effects of teachers. From his randomization project, Krueger (2006) finds that aides and teacher characteristics have little effect. Similarly, using Quantile Regression, literature finds that the student–teacher ratio and the fraction of teachers with advanced degrees tend to have little effect on test score gains (Eide and Showalter 1998). Supporting the minor effect of teachers, a theoretical work further suggests that inputs, such as teacher wages, which provide direct benefits to educators are over-used relative to inputs that contribute directly to educational output, ie provision of textbooks (Pritchett and Filmer 1999). A study by Hoxby (1996) on the teachers union seems to support this notion by exploring that the unions might be the reason why the allocation of resources to teachers wages is ineffective and fails to improve student outcomes. It finds that the unions increase school inputs but reduce productivity sufficiently to have a negative overall effect on student performance (Hoxby 1996). In regard to teacher quality, literature suggests that public school competition increases teacher quality (Hanushek and Rivkin 2003). The public school competition itself can be

increased by the introduction of school vouchers as suggested by a more recent study using spatial statistics (Brasington 2007).[3] Over the years, the list of works on this topic expands continuously.

On the second and third major topics in education economics, namely the distribution and decisions on investment in the education sector, most studies approach the theme using aggregate production function. One of the most debated topics is the link between education and economic growth. The significance of education in economic growth usually becomes the main reason to investment in education.

The association between education and economic growth has been at the centre of attention for economists working on economic growth since the introduction of endogenous growth models. In the 1950s, the Solow–Swan growth model included labour as an additional production factor, and exogenous time-varying technological progress as determinants of long-run growth (Solow 1957). Technological progress was introduced as it was believed that there should be a factor explaining how an economy can produce more output with a given volume of inputs. A given number of workers can produce more if they have better technological knowledge and are equipped with more technologically advanced machines. Still, endogeneity remained a problem as this model did not explain how technological progress occurs. There were attempts to revise the Swan–Solow model. One such attempt was to include the role of human capital, as it was argued that increases in human capital can increase productivity, leading to higher earnings (Schultz 1961).[4] It is claimed by some economists that the birth of human capital theory was due to Schultz (Blaug 1976).

Human capital was generally classified into five categories: health status, on-the-job-training, formal education, adult study programs, and migration to find better job opportunities (Schultz 1961). It was argued that education was the most important factor in increases in the stock of human capital (Goode 1959; Schultz 1961). Later in the 1960s, the concept of *effective* labour was introduced, in which the educational level of workers was assigned as a weighting of the number of workers (Nelson and Phelps 1966). This concept

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[3] Studies under the broad theme of competition also include Brasington (2000), Fraja and Landeras (2004), Hoxby (2004), Maurer-Fazio and Dinh (2004), Millimet and Rangaprasad (2004), Adnett and Davies (2005).

[4] Other significant contributions were by Ramsey, Koopmans, and Cass, whose writings attempted to endogenise the savings rate. See Ramsey (1928), Koopmans (1963), Cass (1965).

defined more precisely a channel through which education could affect the production process.

Since the 1960s, the role of human capital in economic growth has enjoyed popularity among economists as it is believed to give better insights into differences in economic growth. The human capital theory revisits and expands Ricardian theory in treating labour as a factor production and disregards the simplistic assumption of homogenous labour; it also takes basic social institutions, such as schooling and family values, into account (Bowles and Gintis 1975). But in the 1970s, research on the role of education in economic growth was mostly qualitative in nature.

In the 1980s, endogenous growth theory was introduced by Romer to overcome the perceived shortcomings of the neoclassical Swan–Solow growth model (Romer 1986). This theoretical framework highlights the importance of research and human resource development, including education, as mechanisms for accumulating technological knowledge. Since then, there have been many empirical works which attempt to provide experimental evidence of the significance of education on economic growth.

Some studies argue in favour of a significant impact from the stock of education in economic growth on the basis of theory and empirical evidence (Romer 1986; Romer 1990; Dougherty and Jorgenson 1996). But others find no supporting evidence. Focusing on data from 58 lower-income countries over the period 1985–93, (Brist and Caplan 1999) conclude that schooling enrolments were unable to explain cross-country variation in the growth rates of real GDP per capita, life expectancy, and fertility. Using data from up to 100 countries for the period 1960–90, another study finds that labour force quality has a consistent, stable, and strong causal relationship with economic growth but that labour quality is not related to investment in formal schooling (Hanushek and Kimko 2000). Using data from 84 countries covering the 1960–2000 period, another study observes that the 2.3 per cent world growth of output per worker is contributed by one per cent increases in physical capital per worker and technological progress, and only 0.3 per cent by increased human capital, as measured by education (Bosworth and Collins 2003).

2.1.1.2 Empirical and Econometric Issues

So far, we have seen a large range of issues covered by literature in an attempt to see which inputs matter on educational outcomes, or at the macro level, whether education is a significant growth factor. But given the variation in their results, the question being left is: why are their results different? I propose some of the basic reasons which lead to how I develop the methodology in the next chapters.

(i) Micro-level studies

The first obvious reason of difference in empirical results from various micro-level studies is their difference in methods. In general, studies can be classified into two types: non-experimental and experimental studies which include the randomised experiment. The non-experimental usually exploits data from the national survey. The researchers deliberately choose relevant inputs from the available data and choose proxies for the outcomes. The randomised experiment, in contrast, is specifically designed to uncover a 'policy effect' of interest. Let us take an example of a study looking at the impacts of the increasing number of books in the library on student reading scores. In a population, we may find the expected average effect of an increased number of books on student reading scores:

$$E\left[S_i^T - S_i^C\right] \qquad \textbf{2-2}$$

But in the non-experimental study, we can only capture:

$$D = E\left[S_i^T | T\right] - E\left[S_i^C | C\right] \qquad \textbf{2-3}$$

In a large sample, the above equation gives the average reading scores of both groups (the control and the treatment groups) and examines the difference between reading scores in a school which receives book donations and a school which does not receive additional books. Subtracting and adding $E\left[S_i^C | T\right]$ is needed to decompose my results to the treatment effect and selection bias. The term $E\left[S_i^C | T\right]$ is the expected reading score of a student in the school which receives book donations (the treatment group) had he not been treated. This is an unobservable outcome but actually needs to be observed. The difference in reading scores can then be rewritten as follows:

$$D = E\left[S_i^T | T\right] - E\left[S_i^C | T\right] + E\left[S_i^C | T\right] - E\left[S_i^C | C\right] = \underbrace{E\left[S_i^T - S_i^C | T\right]}_{The\ treatment\ effect} + \underbrace{E\left[S_i^C | T\right] - E\left[S_i^C | C\right]}_{Selection\ bias} \textbf{2-4}$$

The above equation suggests that the unbiasedness of the non-experimental study would heavily rely on zero selection bias. This requires:

$$E\left[S_i^C|T\right] = E\left[S_i^C|C\right] \qquad \text{2-5}$$

Or, the expected reading score of a student in the treated and control school would have been equal if no additional books had been given to the school. This implies that selection to attend the treated school has to be random. This is a strong assumption to meet. Parents who highly value education might send their children to schools with an adequate library. In a non-experimental study, this in turn can "create" a spurious association between schools with more books in the library and student academic outcomes, whereas the actual correlation is between parent's taste of education and student outcomes. The benefit from a randomized project is that the design can ensure that only the treatment affects the changes in the outcomes given the treatment is given randomly to samples.

But, in practice, not all studies attempt to see the policy effect. Some only attempt to see the determinants of student performance. This obviously requires variation in inputs of interests to see how changes in the input yield changes in the output, holding other factors constant. Literature argues that experimental evidence cannot generally be used to understand the *ceteris paribus* effect of a change in some variables such as class size which is normally held constant over the experiment (Todd and Wolpin 2003). Effects of other variables such as student-teacher ratio and competition with other schools cannot normally be observed. In addition, Todd and Wolpin (2003) argue that other individual, school and family inputs might also change because of the experiment. In regard to the previous example, with new books coming to the library, teachers might also gain more knowledge positively affecting student performance; parents might reduce the compulsory night studying hour at home because their children argue they spend more time in the school library in the daytime – this can offset the positive effect of having more books at school etc.

Additionally, although the usefulness of the growing body of literature on education economics using randomized experiments is surely acknowledged, not everyone has privileges to conduct such experiments, especially researchers from developing countries. Consequently, the dilemma between conducting non-experimental study and conducting no research at all does exist for those who have no access to such experiments. This can impede researchers from working on a new topic on which no survey has been conducted.

This is the major problem that the present study faces. The fact that there are many aspects of Islamic education which need to be investigated is not balanced by the availability of data from experimental studies. I take an approach to optimally use some statistical methods to control bias that might be caused from the sample selection.

One particular method I use in this thesis is the application of the Heckman Selection Criterion Term. Let us define that the outcome of individual i (y_i) and its determinants (x_i) can only be observed if the sample is non-randomly selected. For example y_i exam scores of students attending religious schools.

$$y_i = x_i^{'}\beta + O_i\alpha + u_i \text{ [The outcome equation]} \qquad \text{2-6}$$

Variable O_i equals to one if the person is selected as a respondent. Hence, the dependent variable is only observed if $O_i = 1$. The selection is based on the following selection model:

$$p_i^{*} = z_i^{'}\gamma + v_i \text{ [The selection equation]} \qquad \text{2-7}$$

Note that the error term follow bivariate normal distribution.

$$(v_i, u_i) \sim \text{bivariate normal } [0,0,1,\sigma_u,\rho]$$

p_i^{*} is the latent index (unobservable). The respondent is selected as a sample if p_i^{*} is positive. It shows the net benefit of attending religious schools. Students from religious families might tend to have higher value of p_i^{*}. This is a function of a series of exogenous variables included in z_i.

Given the above setting, the expected value of the dependent variable conditional on sample selection can be written as:

$$E(y_i \mid d_i = 1, x_i, z_i) = x_i^{'}\beta + \rho\sigma_u\lambda(z_i^{'}\gamma) \qquad \text{2-8}$$

Parameter λ is defined as the inverse Mills ratio: $\lambda = \phi(z_i^{'}\gamma)/\Phi(z_i^{'}\gamma)$. Parameter ρ denotes the correlation between the error terms in the selection and outcome variable, while σ_u is simply the standard deviation of the error term in the

outcome equation. These parameters can be estimated by two-step Heckman selection criterion term (Heckman 1979).

(ii) Macro-level studies

At the macro-level, studies on education economics, especially the ones using growth models, are not free from econometric problems either. The following are some of the possible problems with recent studies. I focus on studies on economic growth and its link with education.

(1) Types of models

There are two ways of estimating sources of growth: growth accounting and growth regressions. Both have criticisms. While growth accounting often fails to explain the fundamental sources of growth, growth regression estimation often suffers from problems with simultaneity, multicollinearity, and limited degrees of freedom. As well, it requires careful choices about the underlying theoretical model (Collins, Bosworth et al. 1996). Even comparisons across results from growth regressions are often difficult because of the different specifications of the regressions. There are three basic types of growth regressions: (i) a reduced form specification where average GDP growth rates are regressed on initial conditions and other level and change variables that are expected to influence growth; (ii) a growth decomposition of the Cobb-Douglas production function where GDP growth is regressed on growth rates of factor inputs; and (iii) an extension of the Swan–Solow model's predictions about steady-state growth (Judson 1996). Estimation of the first two types has typically yielded implausibly low, statistically insignificant, or negative coefficients on human capital variables; while the third type yields a high, positive, and statistically significant coefficient for human capital (Judson 1996). Table 2-1 displays the comparison.

Table 2-1. Human Capital Coefficients

> NOTE:
> This table is included on page 16
> of the print copy of the thesis held in
> the University of Adelaide Library.

Source: (Judson 1996)

(2) Specification errors

From a statistical perspective, a specification error (omitted variable bias) due to a blurred concept of TFP can cause biased estimators unless TFP is uncorrelated with labour and human and physical capital. Imposing this restriction—that is, TFP is uncorrelated with labour, human capital, and physical capital—is not realistic considering the potential roles of technology in increasing the productivity of these inputs.[5]

(3) Aggregate production function

As most empirical research using the growth regressions approach has been focused on large cross-country datasets (Romer 1986; Romer 1990; Sachs and Warner 1997; Bosworth and Collins 2003), a common problem is the assumption of an identical aggregate production function for all countries, which leads to potential omitted variable bias.[6] To solve this problem, the *unobservable* 'country effects', which allow for differences in production functions across countries, can be modelled in a panel data framework.[7]

The benefits of panel data also include the provision of more informative data, more variability, less collinearity among the variables, more degrees of freedom, and more efficiency (Baltagi 1995). Panel analysis is also more suitable than ordinary least squares (OLS) regression, which potentially suffers from multicollinearity problems in addition to problems with correlation between explanatory variables and the error term.[8]

But the problem is that the inclusion of panel unit-specific effect will substantially reduce the degree of freedom. This can be a serious problem especially in short and wide panel (long time period, large number of panel units). This is the problem dealt by this present thesis. Analysis to identify the goodness of fit between OLS and variants of panel analysis is therefore needed.

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[5] For example, Sarel (1995) found that the contribution of TFP to economic growth is highly dependent on physical capital shares. Revoredo and Morisset (1999) found an association between human capital and savings, which is inversely proportional to investment, especially in the long run.

[6] Most single-country studies use time series analysis of national data. See, for example, Chou (1995) on Taiwan and Pyo (1995) on Korea. However, the application of ordinary least-squares regression in sub-national data analysis is not uncommon, for example, Bayhaqi (2001).

[7] See examples of panel data analysis of OECD countries in Lee, Longmire, Matyas and Harris (1998), the US in Evans and Karras (1996), and multi-country data in Islam (1995).

[8] However, panel data analysis also has some problems, such as the short time series dimension and confusing assumptions over whether the country effects are 'fixed' or 'random'. It is recommended to apply fixed-effect estimators rather than random-effect estimators, given the 'country' effect is likely to be correlated with the exogenous variables included in the model.

Table 2-2. Criticisms of Educational Indicators

	Measures	Criticism
1	Enrolment ratio	The use of an enrolment rate is statistically valid, but the variable is irrelevant to the analysis of human capital because in the available data both primary and secondary enrolment rates are negatively associated with the human capital growth rate (Pritchett 1996). It cannot capture the quality aspect of education. Enrolment ratio represents investment level in human capital best but it is not a stock variable (a flow) (Benhabib and Spiegel 1994). It has little theoretical reliability as it relates largely to people who are not in the labour force and therefore provides almost no contribution to current GDP. Indeed it is not even the flow in the desired stock (Stroombergen, Rose et al. 2002).
2	Literacy rate	While literacy is a stock variable, it has some empirical problems such as differences in quality across countries, biases introduced by the skewness of sampling towards urban areas, and the fact developed countries typically have literacy rates that are close to unity (Benhabib and Spiegel 1994). While it is an undeniable component of human capital, the literacy rate ignores the level of literacy, the type of literacy, and the contribution of additional skills in numeracy, analytics, technical knowledge etc. Also, literacy levels often do not correspond to educational levels (Stroombergen, Rose et al. 2002).
3	Average of formal schooling years	It ignores the quality aspect of education. For example, a year of schooling in Papua New Guinea is assumed to create the same increase in productive human capital as a year of schooling in Japan (Hanushek and Woessmann 2007, p.21). Furthermore, one person with 12 years of schooling is treated the same as two people with six years (Stroombergen, Rose et al. 2002). It also overstates growth in human capital from low initial levels of education (Collins, Bosworth et al. 1996). This argument is also supported by a study on OECD countries, with high initial levels of education, which finds no evidence for a relationship between initial schooling level and economic growth (Krueger and Lindahl 2001).

Source: Compiled by author.

(4) Choices of the human capital variable

Different input variables may provide different results. It is widely accepted that human capital is not confined to formal education and training, it is also generated by informal learning mechanisms. The human capital variable has been commonly proxied by formal schooling measures, such as enrolment ratios, schooling year, and literacy rate—but all attract criticisms. Some criticisms of these measures are provided in Table 2-2.

Nevertheless, most empirical research on education uses the average of formal-schooling years as a proxy due to limited data availability (Benhabib and Spiegel 1994; Islam 1995).[9] This can be seen from the types of data provided by one of the most referred education variable databases, the Barro and Lee database, although there has been an attempt to capture the quality of schooling (Barro and Lee 1996). This variable is not free from trouble as seen in Table 2-2. Therefore, additional variables are needed to take quality into account—for example, the student–teacher ratio and shares of government spending on education—although these variables do not adequately capture the roles of training, practical learning, and curriculum design in human capital accumulation (Lee 2000).[10]

The drawback from using years of schooling focused on by this study is its ignorance to quality aspect and homogenous rates of return to education at all levels. Chapter 3 therefore proposes the decomposition method based on available data to allow different rates of return to education between different types of schools, i.e. religious versus secular schools.

(5) The form of the variables

It is argued that to capture long-run effects, studies should focus on the *levels* of income and human capital rather than their *rate of change* (Bloom, Canning et al. 2000). This

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[9] There are also studies using other human capital proxies, such as life expectancy in Sachs and Warner (1997), Bloom, Canning and Malaney (2000), the youth dependency ratio in Bloom, Canning and Malaney (2000), fertility rates in Bloom, Canning and Malaney (2000), and the age structure in Kwack and Lee (2006). But these variables are not as frequently used as schooling variables.

[10] Alternatively, Kyriacou (1991) proposes a method to extrapolate human capital indexes based upon estimation of the association between average years of schooling in labour force and enrolment ratios. However, as the stock variable resulting from this method is derived from previously reviewed variables, it still potentially suffers from some of the problems noted previously. Pritchett (1996) proposes an alternative way to measure the stock of educational capital as the discounted value of the wage premium due to education. But to apply this method, one must undertake a prior micro study to estimate the increment in wages due to an additional year's schooling. This may cause a problem if the association between wage and schooling years is insignificant.

recommendation is supported by evidence of the positive effect of educational levels but not of changes in education (Benhabib and Spiegel 1994).

(6) Weights

Assigned weights on the human capital variable also matter significantly to the estimation results. The weights should be associated with the economic stage of the economy and the level of education (Bayhaqi 2001). This conclusion is motivated by stylised facts that the effects of human capital on growth are most evident at the primary and secondary levels in middle-to-lower income developing countries and at the tertiary level in developed countries (Richardson 1997; Revoredo and Morisset 1999). Similarly, it is argued that the form of human capital is significantly associated with the level of industrial development (Lall 1998).[11]

Table 2-3. Estimates of Variable Coefficients for East Asian and Other Country Groups

Dependent variable: ln y_t	East Asia[a]		Comparative studies[b]		
			International	Non-oil countries	OECD countries
Data period	1965-85	1965-2000	1960-85	1960-85	1960-85
Estimation method	IV-FE[c]	IV-FE	LSDV[d]	LSDV	LSDV
Elasticity of output with respect to human capital (β)	-0.067	0.201	-0.0069	-0.1990	- 0.045
Elasticity of output with respect to capital (α)	0.342	0.058	0.4947	0.5224	0.2074
Rate of convergence (λ)	0.053	0.039	0.0440	0.0375	0.0913

[a] Permani (2008).
[b] Islam (1995).
[c] Instrumental variable in fixed-effects method.
[d] Least Square Dummy Variable.

(7) Sample selection

Country and period selection can also affect the estimation results. One study has found that the inclusion of the period of the East Asian financial crisis and its aftermath suggests a positive contribution from human capital and, indeed, that it makes a bigger contribution than investment (Permani 2008). The reverse is true for the period 1965–85, during which

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[11] But the magnitude of suitable weights is a topic in itself. Most studies only apply *assumed* weights.

human capital makes a negative contribution. The study also finds that, based on 1965–85 data, the investment shares (α) for East Asian countries are higher than for OECD countries but lower than the average of all countries, as concluded by Islam (1995). This result reflects differences due to country selection (see Table 2-3).

In addition to seven potential econometric and empirical issues mentioned above, this present study deals with a small sample due to bureaucracy and unavailability of data. This can possibly affect the results. A study finds that a panel with finite T and number of observations $N \rightarrow \infty$ is best predicted by the Least Square Dummy Variable (LSDV) method with corrected error component in a $N = 100; T = 3,6$ setting (Kiviet 1995). The study is particularly to contest the Generalized Method of Moment (GMM) or two-stage instrumental variable estimators from a previous Monte Carlo study $((N = 100; T = 7)$ with the LSDV (Arellano and Bond 1991). Considering different time dimension $(N = 100; T = 5,10,20,30)$, another study finds that LSDV produces bias in as much as 20% of the true value of the parameter even with a time dimension as large as 30 (Judson and Owen 1999). But using an RMSE criterion, however, the LSDV performs better or equal than the GMM and the Anderson-Hsiao estimator. Supporting the superiority of the LSDV, another Monte Carlo study concludes that with $N = 20; T = 5$ the LSDV outperforms the AH and GMM (Buddelmeyer, Jensen et al. 2008).

But assuming the LSDV is the best estimator for the present dataset requires further investigation. To begin, the time dimension that will be used in the present study $(N = 30; T = 2)$ is lower than the one tested by previous studies (Judson and Owen 1999; Buddelmeyer, Jensen et al. 2008). Judson (1999) suggests that LSDV does not dominate the alternatives with a time dimension smaller than 30. Also, the LSDV underperforms the OLS if the coefficient of lagged dependent variable is high (Buddelmeyer, Jensen et al. 2008). This seems to be the case in this study. But opting OLS as the best method seems to contradict the economic theories given the correlation between the error term and the explanatory variables in the absence of province-specific effect. In addition, the dependent variable in this present study is the growth rate of income per capita instead of the level of income per capita as used in Judson (1999). Hence, it is not clear whether the same conclusions from previous studies are also

derived using the setting required in this study. I therefore conduct Monte Carlo simulation to estimate how severe bias resulted from the small sample in this study.

2.1.2 Economics of Religion

In an attempt to search the nexus between the economics of education and the role of religious aspects, this section reviews existing literature on the economics of religion. The economics of religion has been a growing interest among economists. Many studies have been conducted since the early 1910s, for example (Holmes 1912), while the issue had been spread out since the 1700s by Adam Smith.[12] Most research in this area is motivated by an argument that states the capitalistic system, in which current world economy is situated, is not aligned with religious values. Some research argue that the mismatch is due to the private ownership system in this capitalistic world which is not only inefficient but also inhumane (Holmes 1912). Furthermore, in an early work in the 1940s, a Canadian sociologist, Prof. Samuel Delbert Clark, introduced one possible way to interpret the role of religion in economic development as evidenced in Canada. He argued that the religion or church had a 'monopoly control', for example to direct the movement of population and to rule out any forms of economic activities which may not be aligned with the religious principles, but it also impeded economic enterprise (Clark 1947). Indeed, he continued that:

> "The promotion of the religious interest in itself has involved a weakening of the economic interest because of the fundamental antagonism of the one to the other" (Clark 1947).

Again, his argument reflects mismatch between economics and religion. Others argue that the issue has been generated by "stylised facts", such as:

> "(i) religion must inevitably decline as science and technology advance; (ii) individuals become less religious and more skeptical of faith-based claims as they acquire more education, particularly familiarity with science; and (iii) membership in deviant religions is usually the consequence of indoctrination (leading to aberrant values) or abnormal psychology (due to trauma, neurosis, or unmet needs)." (Stark, Iannaccone et al. 1996, p.433).

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[12] See Iannaccone (1998) for recent survey of literature on the economics of religion.

This argument indicated a negative association between formal schooling and individual religiosity.

Similarly, theoretical models introduced by Azzi and Ehrenberg (1975) forecast the nature of substitution between economic and religious activities. They predicted household members with lower wages would dedicate more time to religious activities. Let us consider an individual utility function of the following form:

$$U = U(C_1, C_2, ..., C_t ..., C_n; S_1, S_2, ..., S_t ..., S_n) \qquad \textbf{2-9}$$

C_t are individual consumption bundles (including all non-religious commodities) at time t and S_t are religious services bundles for time t. The date of death is n. The arguments of the utility function may be decomposed as follows:

$$C_t = C_t(x_t, h_t) \qquad \textbf{2-10}$$

Where x_t is composite consumption goods and services and h_t the individual's allocation of time to leisure. Next, let us define a set of religious services bundles as a function of religious services goods y_t and the individual's allocation of time to religious activities r_t.

$$S_t = S_t(y_t, r_t) \qquad \textbf{2-11}$$

The religious services goods may be thought of as regular services of worship and services of worship for weddings, funerals, circumcision (in Islam) etc.

The individual's utility function is subject to time and lifetime discounted income constraints. The time constraint for individuals can be expressed:

$$T = h_t + r_t + l_t \qquad \text{for } t = 1, 2, ..., n \qquad \textbf{2-12}$$

Where l_t denotes the individual's number of working hours and T total number of hours available in each period. I assume all h_t, r_t, l_t are positive. The lifetime discounted income constraint can be written as follows:

$$\sum_{i=1}^{n} \left(\frac{p_t x_t + q_t y_t}{(1+i)^{t-1}} \right) = \sum_{i=1}^{n} \left(\frac{v_t + w_t(T - h_t - r_t)}{(1+i)^{t-1}} \right) \qquad \textbf{2-13}$$

The individual maximizes his utility by solving a Lagrangian function of the following form:

$$L = U[C(x_t, h_t), S(y_t, r_t)] + \lambda \left[\sum_{i=1}^{n} \left(\frac{px_t + qy_t}{(1+i)^{t-1}} \right) - \sum_{i=1}^{n} \left(\frac{v_t + w_t(T - h_t - r_t)}{(1+i)^{t-1}} \right) \right] \qquad \text{2-14}$$

The basic life-cycle results are derived from first-order conditions:

$$\frac{(\partial U / \partial S_t)(\partial S_t / \partial r_t)}{(\partial U / \partial S_{t-1})(\partial S_{t-1} / \partial r_{t-1})} = \frac{w_t}{w_{t-1}(1+i)} \qquad \text{2-15}$$

The above equation implies that with a conventional inversed U-shape age-wage relationship, the time spent in religious activities (r_t) initially fall due to increases in opportunity costs i.e. earnings. r_t then rise with age. More specifically, Sullivan (1985) summarizes that the increase in the left-hand side of the equation as age-specific death rates rise can be due to two reasons: (i) an increase in marginal utility of religious services $(\partial U / \partial S_t)$; (ii) an increase in the productivity of the time input because of experience factor $(\partial St / \partial r_t)$. Empirical studies transform the above theoretical model into the reduced form model to find determinants of religiosity. Variables such as gender, age, marital status and educational background have long been considered as religiosity factors. Results using individual data provide mixed results. Chapter 5 therefore observes this aspect by introducing new variables which are rarely considered as religiosity factors, namely location of residence relative to large religious institutions. At the national level, the above theoretical baseline may lead us to a conclusion that religion impedes economic growth. However, empirical evidence varies across studies. Using cross-national datasets, Barro and McCleary (2003) found that economic growth had positive association with religious beliefs (specifically beliefs in hell and heaven) but negative association with church attendance. Other studies find no evidence that religious background or denomination affect earnings (Tomes 1984).

On the other hand, a large number of studies on economics of religion has been projected to look at the impacts of religiosity on socio-economic behaviours. Armed with

a broader definition of "economics behaviours", contemporary studies find that an individual's decisions on marriage, fertility, abortion, political attitudes, happiness and many other aspects of life are linked to religiosity (Rosenhouse-Persson and Sabagh 1983; Tamney and Johnson 1985; Nakonezny, Shull et al. 1995; Greene and Bong Joon 2004; Lehrer 2004; Brañas-Garza and Neuman 2007).

2.1.3 The Nexus: Economics of Religious Education

The previous section has shown that there has been a relatively vast literature on economics of education and economics of religion. Literature on economics of religion has brought significant effect to the academics and the society as a whole on understanding the "religious market" in which religious bodies produce religious commodities, and individuals as the consumers "purchase" the religious commodities at the expense of secular commodities. On the other hand, literature on economics of education has provided policy implication on how to improve education and identified impacts of improved education. This section focuses on the nexus between economics of education and economics of religion, namely economics of religious education.

There have been some studies addressing the relationship between religiosity and education. Most of them are on education in the US and focusing on Catholic schools (Nam, Rhodes et al. 1968; West and Palsson 1988; Evans and Schwab 1995; Neal 1997; Altonji, Elder et al. 2002). Most of these studies find the so called "Catholic advantage". West and Palsson (1988) find significant and positive impacts of religiosity, proxied by the Catholic proportion of the population, on probability of choosing private schools in the US in 1970-1971 and 1977-1978 using cross-state data. Supporting positive effect of being Catholic in the US, using 1965 survey data a study finds non-Catholic religious identification is closely related to school retention, in addition to low socio-economic level and residence in the South (Nam, Rhodes et al. 1968). Similarly, other studies find that attending a Catholic high school raises the probability of finishing high school or entering college (Evans and Schwab 1995) and increases educational attainment, significantly among urban minorities (Neal 1997). Indeed, a study found positive effects of Catholic religion on educational outcomes based on data from public eighth graders who almost never attended Catholic schools (Altonji, Elder et al. 2002). There are also studies looking at the link between parental religiosity and children's educational attainment and school choice. A study found that parental religiosity was linked with kindergarteners and first

graders' pro-social behaviour (Bartkowski, Xu et al. 2008). Parental religiosity is also important on the demand for private school (Cohen-Zada and Sander 2008). In a different vein of the literature, studies focused on testing the "secularization thesis". The thesis implied that the most educated are the least religious. Empirical evidence for the thesis were found by some studies (Albrecht and Heaton 1984), but other studies find the opposite (Branas-Garza and Neuman 2003; Lehrer 2004).

But, for Muslim schools or students or schools in Muslim countries, little has been written. Some address issues such as gender discrimination, effects of the presence of Islamic schools and their academic outcomes (Asadullah and Chaudhury 2006; Asadullah, Chaudhury et al. 2007; Asadullah and Chaudhury 2008; Hajj and Panizza 2009). On the gender discrimination issue, using data from Lebanon, (Hajj and Panizza 2009) find no support for the hypothesis that Muslims discriminate against female education (Hajj and Panizza 2009). On the academic outcomes issue, (Asadullah and Chaudhury 2008) find the presence of *Madrasah* positively associated with secondary enrolment growth exposure to female (Asadullah and Chaudhury 2006) and younger teachers leads to more favorable attitudes among female graduates. The shortcomings of Islamic schools are observed in some studies. Using data from Bangladesh, (Asadullah, Chaudhury et al. 2007) find girls and graduates of primary *Madrasah* have significantly lower test scores in the selection into secondary schooling.

The theoretical baseline of the above literature, in general, defines the effect of "religious aspects" on academic outcomes. The religious aspects are defined in those studies as being Catholic (or being Muslim in studies on Muslim students), percentage of Catholic schools in a study using state-level data, attending religious schools, having religious parents, living in the area where religious schools exist etc. This adds the religious aspect $(\mathrm{Re}\,ligion_{ij})$ to our previous academic outcome function:

$$O_{ij} = f(I_{ij}, F_{ij}, T_j, S_j, C_{ij}, R_j, \mathrm{Re}\,ligion_{ij}) \hspace{3cm} \textbf{2-16}$$

The focus of empirical studies is whether coefficient for $\mathrm{Re}\,ligion_{ij}$ is statistically positive. While existing studies provide useful insights to various aspects of Islamic schools, many aspects remain hidden. One aspect which has not received much attention is the competing nature between religious courses and secular courses *within* the school. In Indonesia, students in so-called secular schools receive religious courses 2 hours per week,

while students in Islamic schools receive religious education for 30% of their schooling hours (approximately 10 hours per week). The intensity of religious education also means, between the two types of schools, a reduction in secular courses with the same total schooling hours. This may affect students' academic outcomes.

The competing nature between provision of religious education and secular education within a school can be defined in a simple theoretical model. Let use define the average academic outcomes of school j as CES (constant elasticity of substitution) function of number of teachers per student allocated to religious and non-religious education. The proxy for the academic outcome is determined by exam scores of regular courses such as mathematics, science and English. CES is chosen because our interest is to look at the extent of elasticity of substitution between these two types of education.

$$O_j(T_{Rj}, T_{Nj}) = Z_j[\delta T_{Rj}{}^\rho + (1-\delta)T_{Nj}{}^\rho]^{1/\rho} \qquad \textbf{2-17}$$

Where $0<\delta<1$, $0<\rho<1$, T_{Rj} is the number of teachers allocated to deliver religious education per student and T_{Nj} is the number of teachers allocated to deliver non-religious education per student. These teacher-student ratios therefore indicate the class size. The educational production function is also characterised by other variables and parameters. Variable Z_j represents other characteristics contributing to *both* types of education for example parental educational backgrounds, teacher's quality, etc. Parameter δ is the distribution parameter. Religious schools most likely have a higher δ than non-religious or regular schools. Parameter ρ is the substitution parameter. In the practical level, the substitution parameter would depend on the nature of both types of education. In an extreme case, two types of education can be either perfect substitutes–religious education has no contribution to the academic achievements—or they both are complements; religious education can develop good ethics and disciplines to support the academic teaching-learning process.

Educational costs are simply given by the marginal productivity of each type of education. We can then obtain the religious-secular education costs ratio:

$$\frac{p_{Rj}}{p_{Nj}} = \frac{(1-\delta)}{\delta}\left(\frac{T_{Rj}}{T_{Nj}}\right)^{(1-\rho)} \qquad \textbf{2-18}$$

Where P_{Rj} and P_{Nj} are costs (wages of teachers) of providing religious and non-religious education respectively. Hence, the optimum ratio of allocated teachers to religious-secular education is:

$$\left(\frac{T_{Rj}^{*}}{T_{Nj}^{*}}\right) = C\left(\frac{p_{Nj}}{p_{Rj}}\right)^{\frac{1}{1-\rho}}$$

2-19

Where C is a constant, $C = (\delta/1-\delta)^{\frac{1}{1-\rho}}$

Taking the first derivative of T_{Rj} with respect to T_{Nj}, and the ratio of marginal productivity of each factor, the elasticity of substitution is:

$$\sigma = \frac{1}{1-\rho}$$

2-20

The above equation shows that σ is a constant whose magnitude depends on the value of parameter ρ, the substitution parameter. As we all know, CES function is a more general case of other production functions such as Cobb-Douglas, the Leontief function and linear model. A linear production function with $\rho=1$ has σ close to infinity. This is the case when two types of education are perfect substitutes. The optimum schooling time distribution as indicated by the parameter ratio, $\left(\delta/_{1-\delta}\right)$, would solely depend on the price ratio. In the opposite case, the Leontief production function with $\rho \rightarrow -\infty$ has zero elasticity of substitution. Furthermore, a Cobb-Douglas production function is a special case of CES with $\rho \rightarrow 0$ giving a constant and unitary elasticity of substitution.

Direct estimates of the CES production function can be obtained through use of an approximation suggested by Jan Kmenta (Kmenta 1967):

$$\ln O_j = \ln Z_j + \delta \ln\left(\frac{T_{Rj}}{T_{Nj}}\right) + \ln T_{Nj} + \frac{\rho\delta(1-\delta)}{2}\left[\ln\left(\frac{T_{Rj}}{T_{Nj}}\right)\right]^2$$

2-21

The above approximation implies that the distribution parameter (δ) shows how many percentage units increase in academic outcomes (O_j) is associated with one percentage

unit increase in religious-non religious teacher ratio $\left(T_{Rj}\big/T_{Nj}\right)$. Different teacher allocation in religious and non-religious schools would most likely yield different effect of religious-non religious teacher ratio on academic outcomes.

Unfortunately, the present thesis could not collect school-level data on the proportion of religious teachers. Hence, to estimate how this difference in teacher allocation (and possibly other school inputs such as number of classrooms for religious courses, textbooks etc) might affect the academic outcome, it uses type of school as the proxy. The school dummy (e.g. equals to one if the school is a religious school) captures differences in all school inputs that differ between religious and non-religious schools controlling other variables. These differences become the centre of this thesis. In Chapter 3, I observe the effect of type of school on regional income per capita. Chapter 4 further analyses the effect of the change in proportion of religious courses in the religious schools using difference-in difference estimators.

2.2 Islamic Versus Secular Education

This present study is particularly interested in exploring the link between education and religiosity and its impacts on economic behaviours using data from a specific religious group, namely Muslims (believers in Islam). Most studies on Islamic education focus on students of Islamic schools and how the Islamic schools function. But little has been done to find the impacts of Islamic education on the regional and local community's socio-economic performance. But to pursue the objectives, it is important to shed light on what Islamic education actually is.

Islamic education is a God-centred system.[13] It is mainly due to the fact that Muslims believe their main obligation as human kind is to worship Allah (hereinafter, the author pronounces "God" as *Allah*). This interpretation is based on the Qur'an surah Adh Dhariyat verse 56,

> "And I (Allah) created not the jinn and mankind except that they should worship Me (Alone)" (Khan and Al-Hilali 1996, p.749).

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[13] See Douglass and Shaikh (2004) for further discussions on the difference between *Islamic* education and *Muslim* education.

The major consequence is every Muslim activity should *only* be dedicated to the creator, including pursuing education. This interpretation is apparently different from what has been widely believed: Islam teachings only cover how to pray. It is in contrast to what is stated in the Qur'an surah At-Talaq (28) verse 12:

> "It is Allah who has created seven heavens and of the earth the like theoref (i.e. seven). His Command descends between them (heavens and earth), that you may know that Allah has power over all things, and that Allah surrounds all things in (His) knowledge." (Khan and Al-Hilali 1996, p.805).

More specifically, all Muslims are obliged to pursue education. As a reward, Allah nobles those educated people as stated in the Qur'an surah Al-Mujadilah verse 11,

> "… Allah will exalt in degree those of you who believe, and those who have been granted knowledge. And Allah is well-acquainted with what you do" (Khan and Al-Hilali 1996, p. 783).

It should be pointed out that the term *knowledge* in the Qur'an not only implies religious teachings but also all knowledge which has often been termed "scientific knowledge from the western culture" such as mathematics, physics, biology, medicine, etc.[14]

Indeed, history has proven that it was the role of Islamic Spain during the early Middle Ages which brought science to Europe (Hewer 2001). It is interesting to encounter at the time the Qur'an was introduced by the prophet Muhammad in 600s CE, many non-believers accused that the book was written by the prophet, who was illiterate. Indeed, the first version delivered to the Prophet was "Iqra" means "Read!" (QS 96:1). In that era, such quoted knowledge had not been found or researched.

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[14] There have been many quotes found in the Qur'an in relation to science, for example QS 40:67 about the creation of humans, QS 21:33 on astronomy, QS 25:53 on the partition between palatable and salt water, QS 6:99 and 141 on agriculture, QS 2:164 on geography, QS 4:59 on the hierarchy of power (i.e. Allah, Rasul and leaders), an enormous number of verses on economics and many other disciplines. The format ie QS 40:67 refers to the 40th surah and the 67th verse in the Qur'an.

Table 2-4. Differences Between Kauniyah and Kauliyah

Aspects	Ayat Kauniyah	Ayat Kauliyah
Receivers	All human beings	Allah's Messengers, who then delivered to Muslims.
The nature	This type of Allah knowledge is general. All humankind, not only Muslims, may receive this knowledge if they are willing to research on His creation, such as the earth and all elements contained in it.	This type of Allah knowledge is special. It is the Qur'an. It was delivered by the Prophet Muhammad (pbuh) who was sent by Allah to give warnings and the true guidance to Muslims (QS 4:165 and 170, QS 2:119). The Qur'an is not only the main source of knowledge for Muslims but also a guide to live in this world and in the afterlife.
Related Quranic quotes	The Qur'an surah Al-Imran (The Family of Imran) verse 190: "Verily, in the creation of the heavens and of the earth, and in the alternation of night and day, there are indeed signs for men of understanding."	The Qur'an surah Ar-Rahman (The Most Gracious) verse 1-2: "The Most Gracious (Allah)! He has taught (you mankind) the Qur'an (by his Mercy).
The degree of truthfulness	Relative; based on empirical evidence.	Absolute; based on the Qur'an surah Al-Baqarah (female cow) verse 147: " (This is) the truth from your Lord. So be you not one of those who doubt.

Table 2-5. Summary of Differences Between Secular and Islamic Education

Aspects	Secular Education	Islamic Education
Orientation	Religion is a private concern; hence the segregation between secular and religious subjects should take place (Cook 1999; Hewer 2001).	No separation between religious and secular subjects. All curricula should be aligned with what has been stated in the Qur'an and Hadith (QS 66:12, QS 2: 151, QS 4:80).
The discovery of truth	"Reality is restricted to sensual experience, scientific procedure or process of logic." (Cook 1999, p.347)	The absolute truth is only God (QS 2:147), anything else can be revised critically. Hence, the Qur'an is placed as the main reference of all disciplines.
Parental involvement	Children are treated by their parents as free agents who may choose religions which align with their rational principles (Cook 1999, p.350).	Parents are obliged to bring up their children to be good Muslims (QS 66:6).

As technology progresses, scientific research provides evidence of the truth of those Qur'anic contents. It presents the significant role of pursuing knowledge as part of religious life in Islam: God has provided guidance in the Qur'an and humans are responsible for discovering and practising what has been stated in it. Having the above arguments, the segregation between western and Islamic sciences is actually questionable, especially an argument that defines western science as 'rational' whilst Islamic education is traditional and not up-to-date. This requires analyses on what substantial differences there are between these two perspectives of education.

In Islam, there are two types of knowledge: *Kauniyah* and *Kauliyah*.[15] While the Ayat Kauniyah (nature-based knowledge) is empirical or based on sensible evidence on nature, the Ayah Kauliyah is the Qur'anic knowledge (or knowledge based on the Qur'an) (Table 2-4). The substantial difference between these two types of knowledge lies in the degree of truthfulness, in which the *Kauliyah* is superior to the *Kauniyah*. This implies that in any discipline, the Qur'an must be the main reference.

However, in a discovery process to find the 'truth', it is likely that an empirical research leads to the validation of what was stated in the Qur'an. Hence, what was traditionally believed by Muslims during the initial era of Islam as a 'doctrine' was then confirmed by the development of scientific research and technological progress. This backward approach seems to be widely used by Muslim scholars nowadays. With the spirit of enforcing Islamic laws as the only rule for Muslims, Muslim scholars believe that some western theories cannot be applied to Muslim and are unlawfully based on the Qur'an.

Some examples of those theories are the use of interest rates in conventional economics which violates the prohibition of riba in Islam and the exclusion that the Qur'an has the absolute truth. Therefore, Muslim scholars try to find ways to validate the truth mostly by conducting empirical research. Muslims believe at the end of this world only the Qur'an will consistently be the only truth.

From the above classification, it can be seen that Islamic and western education share similarities in nature-based knowledge, the *ayat Kauniyah*. Or, the substantial difference between these two education perspectives is the *ayat Kauliyah*, more specifically how they utilise the Qur'an as the source of knowledge. From western perspectives, science and

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[15] I am indebted to Mrs. Siti Marsiyah Muttaqien who has given me a good understanding on this matter and other Islamic teachings.

knowledge have been evolving throughout time. What was considered as the truth in the past might be scientifically untrue nowadays. The great aspect of this concept is scholars are actively challenged to engage in scientific research as there is no absolute truth. On the other hand, Islam also values the importance of scientific researchers. But in Islam, human senses can perceive evidence of truth, but not necessarily the (absolute) truth itself (Cook 1999). Unfortunately, this has often been interpreted as a passive concept in which the holy book Qur'an is stated as the best guide for religious activities but is seldom used as a scientific baseline, especially in the era when Muslim nations are still struggling to compete with western countries.

In a broader context, the absence of absolute truth reflects on how the education curriculum is delivered to students. It reflects the absence of religious discussion on schools. Teachers are not responsible to direct students to choose "proper" religion. The role of teachers in the secular education system has been defined as "neutral facilitators", while in Islam teachers are obliged to provide understanding to students to take the prophet Muhammad as the exemplar (Hewer 2001).

Having the above differences, many educators seem to find it a relief to be able to accommodate students' or parents' demands for both secular and religious education by inserting religious subjects in secular schools, and vice versa. As a consequence, there has been some evolution on how religious education is defined. Focusing back on Islamic education, Islamic education should actually not be interpreted as a system in which Islam is taught as a separate subject called "religious education", but more as a faith-centred-system (Hewer 2001).

But with the passage of time, the segregation between secular and religious education seems to be commonplace. Nowadays, religious education is narrowly restricted as a system to relay religious doctrines and worship ethics (Zborovskii and Kostina 2004). Indeed, the product of religious education, ie religious human capital is perceived as "knowledge, skill, experience and memories that enhance productivity in religious activities but have *no* effect on the productivity of resources allocated to other types of output" (Chiswick 2005, p.1). Islamisation in education is only interpreted as using Islamic perspectives to sort between acceptable and unacceptable secular subjects (Dangor 2005). It seems that religious education has little to do with the development of science and technology in order to produce professional human capital. More particularly, it seems that Islam has been claimed to have no contribution in the development of knowledge.

In general, there are two main arguments on defining the relationship between religious and secular subjects: (1) Religious subjects negatively affect secular subjects, or they are both substitute goods. Therefore, governments, as policy makers, need to specialise in one of them; (2) Religious subjects positively affect secular subjects, or they are both complement goods. Therefore, governments need to balance development of both types of education. These arguments are applicable to most studies on religious education which are not confined to Islamic education.

Most literatures which support the first argument point out two reasons: (1) how secular subjects corrupt religious values which sequentially cause a loss of Muslim identity, and (2) the economics implication of this dualism. One example is a case study on Islamic education in Nigeria. It claims that many Islamic educators in Nigeria are against westernisation in education because it brings secularism in public education and causes Muslims leave traditional Islamic teachings such as alms-giving (*zakat*) (Winters 1987). Focusing on the American Jewry, another study finds the economic implication of this dualism by interpreting that there have been *negative* externalities between religious and secular education and both these types of education compete for investment resources, primarily time and money (Chiswick 2005).

On the other hand, supporting the second argument and taking a lesson from the education system in Sudan, a religiously mixed country in which Muslims make up 65% of the population, awareness of various religions is needed as a constituting factor in national development, but it must acknowledge differences among existing religions at the same time (Breidlid 2005). This implies the positive effect of education on economics. Similarly, another study on Islamic education in Egypt argues that compiling religious education and regular education, which has often been associated with "modern" subjects, is actually impossible, but the best solution is to impose a "balance policy" as it sees Islamic education as a means to rouse moral awareness (Cook 1999).

There are also some studies on religious education which are likely to be "in-between" the two main arguments explained above. In addition to specialisation and balanced policy, an alternative solution to face the dilemma between them is to organise religious subjects as *elective* subjects in addition to compulsory secular subjects, which consequently *changes* organisational forms and methods of religious education (Zborovskii and Kostina 2004). But there has not been any empirical evidence that by conducting this policy, secular subjects change religious subjects in a positive manner. That study only suggests an

alternative method to modify the form of religious education by adjusting the form based on the needs at the school-level rather than the national-level through conducting surveys to students and parents (Zborovskii and Kostina 2004).

As the second alternative, based on a study in Britain, religious education should be viewed as an important part of curriculum but it should be directed to guide students to review the fundamental questions of religious claims rather than be placed as an independent subject (White 2004). This implies that to be religious human capital, students are even challenged to learn "fundamental religious teachings" through secular subjects which are usually given as doctrines. They are questioned to examine some basic questions of the existence of religion such as the existence of God, the afterlife, rewards and sins etc. But this option is probably not the best solution especially for young students. For these students, it is likely that they will become atheists in the future given their limited understanding of interpreting the nature in relation to God as well as their confusion being "offered" by various religious bodies. For most religious educators who see religion as an important part of individual identity, this alternative solution can be perceived negatively.

Indeed, issues such educating students about pluralism have not been widely accepted by religious educators due to the tendency of most religions to teach doctrine about the superiority of their religion compared to others. Again, this is due to their worries about young students' unreadiness to decide which religion is "true". In Indonesia, this occurrence is indicated by little literatures on comparative religion, especially the ones with empirical approaches (Steenbrink 1990). Apparently, this argument is in contrast to a study of the relationship between Catholics and Jews which suggests that religious education should be aimed to honor pluralism as it is prerequisite for the existence of religious identity (Veverka 2004). Of course, each country has different policies to face this dilemma.

In dealing with the above dilemma between secular and religious education as well as education on pluralism, government policies issued by a nation can somehow reflect the orthodoxy of the country. In Sudan, educational reform has been organised to amend education systems on all levels based on Islamic laws since 1990. Obviously, in this type of country, Islamic education is seen as superior to other types of education systems. Some consequences of having specialisation policy are: (1) many examples on textbooks are Qur'anic in nature, including mathematics; (2) all knowledge which is not proportionate to the Islamic teachings is abolished.

On the other hand, there are also some countries where Muslims do not make up the majority of the population but still tolerate the existence of Islamic education. Generally, this is due to two reasons: economic reasons and political reasons including national safety and stability. Based on a case study on Islamic education in China, a communist country where religion is seen as "spiritual pollution", Islamic education is surprisingly allowed mainly based on China's interest in increasing its market power in the oil industry in the Middle East and boosting economic development of Muslim-majority areas (Winters 1984). Having similar consequences, but with a wider scope than the relationship between Islamic education and its impact on the country, religious education in Canada has been recommended as a primary means of political unity and the integration of society (D'Souza 2000).

Interestingly, literature on Islamic education has never been part of Islamic economics literature. Islamic economics has become a popular stream in economics, especially among Muslim scholars; but the development of Islamic *education* economics itself has not shown considerable progress. As shown by Table 2-6, since the 1950s, the development of Islamic economics has been projected to provide alternative Shariah-compliant financial instruments rather than to build a wholly Shariah-compliant economics system which should also include the 'Shariah-compliant education system' and educational financing system. Given that the majority of the Indonesian population are Muslims, there is great potential for the role of Islamic education in its economic performance. This accentuates the need for observing the impacts of religious schools on regional economic growth, the surrounding community and of course on their graduates by taking into account unique characteristics of Islamic schools in Indonesia. A bigger question I want to address is "why do we need to invest in religious education?"

Table 2-6. Development of Islamic Economics and Finance in Modern History

Pre-1950s	Barclays Bank opens its Cairo branch in the 1890s to process the financial transactions related to the construction of the Suez Canal. Islamic scholars challenge the operation of the bank, in relation to its dealings with interest. This critique also spreads to other Arab regions and to the Indian sub-continent where there was a sizeable Muslim community. Majority of *Shariah* scholars declare that interest in all its forms amounts to the prohibited element of Riba.
1950s-1960s	Initial theoretical work in Islamic economics begins. By 1953, Islamic economics offer the first description of an interest-free bank based either on two-tier *Mudaraba* or *Wakala* basis. Mitghamir Bank in Egypt and Pilgrimage Fund in Malaysia are established.
1970s	First Islamic commercial bank, Dubai Islamic Bank opens in 1974. Islamic Development Bank (IsDB) is established in 1975. Accumulation of oil revenues and Petro-dollars increases demand for *Shariah*-compliant products.
1980s	Islamization of economies in Islamic Republics of Iran, Pakistan, and Sudan where banking systems are converted to interest-free banking systems. Increased demand attracts Western intermediation and institutions. Islamic Research and Training Institute (IRTI) established by the Islamic Development Bank in 1981. Countries like Bahrain and Malaysia promote Islamic banking parallel to the conventional banking system.
1990s	Attention is paid to the need for accounting standards and regulatory frameworks. Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI) is established. Islamic insurance (*Takaful*) is introduced. Islamic Equity Funds are established. Dow Jones Islamic Index and FTSE Index of *Shariah*-compliant stocks are developed.
2000-recent	Islamic Financial Services Board (IFSB) is established to deal with regulatory, supervisory and corporate governance issues of the Islamic financial industry. *Sukuks* (Islamic bonds) are launched.

Source: Khan (1996) and IDB (2005) cited in (Iqbal and Mirakhor 2007).

2.3 The Indonesian Economy

Indonesia is an ideal case study to look at how education can affect the welfare of its population and how government can contribute to this process. The massive size of this country compromising 17,500 islands with over 200 million people in 370 municipalities, 370 districts, 6,131 sub-districts and 73,408 villages (based on 2007 statistics) clearly indicates that controlling the quality of the national education system is problematic. The biggest challenge faced by the central government is to ensure equality of education across regions. Belief in the importance of education in economic growth, poverty reduction and improvement in welfare normally become the main reason why the quality of education must be improved. In the process of achieving better education, issues such as income inequality cannot be separated as the focus of studies on links between education and economic growth. Such issues have been increasingly important especially after Indonesia was hit by the 1997 Asian financial crisis.

Prior to the 1997 Asian financial crisis, Indonesia was one of the East Asian countries with impressive economic growth. From the mid 1980s, Indonesia had been consistently showing a positive GDP per capita growth turning US$1000 income per capita in 1960 into US$4000 in the mid 1990s. During this period, Indonesians were also enjoying stable macroeconomic performance. Inflation moderately increased over the years. The monetary authority Bank Indonesia was consistently able to control the IDR exchange rate to the US dollar at a very low rate of less than IDR 2000 per US$. Not surprisingly, Indonesia was part of the "Asian miracle".

The Indonesian high economic growth has been argued by a World Bank study because of "getting the basics right" (World Bank 1993, p.5). The eight East Asian countries – Hong Kong, The Republic of Korea, Singapore, Taiwan, Indonesia, Thailand, China and Malaysia – experienced high growth but they had also been successfully "sharing the fruits of growth" or lowering income inequality as measured by the Gini coefficient (World Bank 1993, p.2).

Moreover, education seems to be an important part of the remarkable growth in 1990s. Under leadership of President Suharto from 1967-1998, the so called 'New Order', Indonesia reached outstanding education development. In 1973, the Presidential instruction (INPRES) program was conducted to attain universal primary education. The goal was completed in 1983, followed by the introduction of a universal nine year basic

education program in 1993. Rapid expansion in education in the 1990s was balanced by its significance on economic growth. As evidenced in other countries, education was empirically evidenced as a significant income determinant. Using 1995 inter-censal data, a study concludes that each primary school per 1000 children led to an average increase of 0.12-0.19 years of education as well as 1.5-2.7 percent increases in wages, which implies 6.8-10.6 percent economic returns to education (Duflo 2001).

Visible signs of rapid education development in Indonesia and other countries in East Asia in the 1990s were universal primary education and rapid increases in secondary and tertiary school enrolment rates. This success was partly contributed to by the role of government. In Indonesia and most East Asian countries, education systems were traditionally centralised, especially primary and secondary education. Centralisation ensured the central government successfully imposed equal standards of formal education including curriculum, administrative and finance systems. Interestingly, this was done by using relatively small public spending compared to the total GDP. Between 1985 and 2006, the average Indonesian government financial support was recorded by the World Bank as about 1% of total GDP.

Given the importance of education in economic growth, progress in education was contributing to the country's improved economic development in past years. A falling share of unemployed as percentages of total unemployment with a degree from 9.3% in 1985-2006 to 5.8% in 2001-2006 clearly indicates educated workers were in demand. But many problems were then identified.

First, the World Bank's claim on low income inequality is interesting in itself. Despite its rapid economic growth in 1990s, a more recent study finds that between 1960 and 1990 the Gini coefficient measuring income inequality had indeed been relatively constant in the range of 0.32-0.38 (Asra 2000). This persistent income imbalance has the potential to bring snowball effects onto the economy. The effects can be serious for children who were born into severe poverty. In the absence of a mechanism to allow poor students to complete education or to allow parents to access credit to finance their children's educational expenditure, a poverty trap might be created. This can lead to inequality in education which can then widen the income gap.

Secondly, in contrast to its impressive quantitative expansion, the quality of schooling in Indonesia is far from satisfactory due to an overloaded and un-integrated curriculum and

insufficient resources (Jones and Hagul 2001). It is also argued that the assessment mechanism called EBTANAS (National Final Study Evaluation) provides little or no control over the quality of graduates (Oey-Gardiner 2000). Further reductions in education quality were more evident after the Asian crisis as Indonesia was the most severely impacted country (Jones and Hagul 2001). Statistics showed that income per capita growth dropped to -12% in 1998. Inflation jumped significantly. Indonesia then had a new level of the exchange rate with substantial IDR depreciation. The domestic economy collapsed as a result of borrowing a lot of foreign currency. The crisis which initially affected the financial market quickly spread to other sectors. In particular, the impacts of the crisis were more evident on private schools than public schools (Jones and Hagul 2001). The crisis also set back the universal nine-year education program's target from 2004 to 2009 (Jones and Hagul 2001). Persistent income inequality and low quality of education do not promise a high level of welfare in the coming years.

There have been many works analysing the impact of the 1997 Asian financial crisis on the macroeconomic performance of the East Asian region, with Indonesia as one of the focused countries, and also how to improve the future monetary policy (Mishkin 1999; Soesastro 2000; Athukorala 2003; McLeod 2003). Some other works look closely atits social impacts. The biggest concern is that the crisis has increased the poverty rates with geographical variation in the rates. Using 10 large national surveys spanning 1993–2002, a study finds that in the aggregate, a large share—possibly half—of the poverty count in 2002 is attributed to the 1998 crisis (Ravallion and Lokshin 2007).

Here I focus the impacts of the crisis on the education sector. Most studies analyse to what extent the Asian financial crisis affects educational outcomes and which sub-groups of the population were most affected by the crisis. A study finds that household spending on education declines especially among poor families and on education costs of young children (Thomas, Beegle et al. 2004). A more evident crisis effect on poor families is also supported by a World Bank study. The study finds that while primary and junior secondary school enrolment rates fell by 1.6% on average, primary school enrolment for boys in poorer areas in Jakarta fell by 8.3% (Filmer, Sayed et al. 1998). The study also finds that girls were more affected by the crisis than boys, with enrolment for girls entering junior secondary school declining by 19% (Filmer, Sayed et al. 1998).

In addition, to look at the impact of crisis on education outcomes, existing studies also evaluate the role of a social safety net in reducing school dropout rates. A World Bank

study finds that the percentage of junior secondary students who received scholarships has increased, especially in urban areas (Filmer, Sayed et al. 1998). But the level is still low, 3.8% overall compared to the 17% target (Filmer, Sayed et al. 1998). A study finds that scholarships have been effective in reducing dropouts at junior secondary school (Cameron 2009). At this level dropouts were reduced by about 3.0% points (or 38%) and costs were recovered (Cameron 2009).

Comparison before and after the crisis should be carefully interpreted. Another study argues that before the economic crisis broke, 30% of children were still failing to complete primary education despite significant education expansion (Jones and Hagul 2001). Furthermore, using data from 100 villages, a study concludes that impacts of the crisis on children including on their health, attendance rates and labour force participation, were not as dramatic as they were previously thought to be (Cameron 2009).

As evidenced in China, major economic shocks lead the Indonesian government to decentralise its education system, marked by the introduction of Laws No. 22 and 23 of 1999 on regional autonomy and regional finance. Descriptive statistics, so far, show that there has not been any significant deviation in the average macroeconomic and demographic indicators from common trends since 2001. The percentage of population in the labour force is still about 48% while the unemployed population is constant at around 5%. Statistics also show a slight reduction in the number of poor people in the population, from 18.4% in 2001 to 16.6 % in 2007. We can also observe positive trends in gross enrolment rates at junior and secondary education and stable universal primary education. But the trends only follow existing trends and do not seem to be largely contributed to by the decentralisation reform. Moreover, despite improved enrolment rates, the Indonesian labour force is still dominated by low-educated workers. The majority of workers (32%) only completed primary school and almost 30% of workers never completed primary education. Only 23% of workers have completed senior secondary education and above. This indicates that there is still much room for improvement in the educational sector in Indonesia.

Decentralisation is commonly seen as a good option to improve the aggregate academic performance. Topics on decentralised education have been the interest of some studies. Analysing education in Chile, a study finds that decentralisation improves administrative efficiency and productivity (Parry 1997). But it increases the government size as

measured by the number of government officials working in the education sector and, unfortunately, magnifies the inequality in expenditures and academic performance of students from different income groups (Parry 1997). Also focusing on education in Chile, another study finds that decentralisation brings inconclusive effects on the quality of education. It is therefore imperative for the central government to improve monitoring and continuously provide financial support to the local governments so that equity and the quality of education can increase (Parry 1997). Yet, country differences might affect the success of such reform.

The decentralisation reform is supported by most scholars conducting research on Indonesian education (Oey-Gardiner 2000; Jones and Hagul 2001; Bangay 2005). But some point out concerns over the implementation of decentralisation in the Indonesian context. First, a study argues that decentralisation is vulnerable to economic downturn (Jones and Hagul 2001). This argument is reasonable as decentralisation requires higher parental contributions. When a crisis hits the economy, declines in parent's real income may lead to massive school dropouts. As a consequence, the government must provide adequate public funding through various mechanisms. The funding was commonly directed to individuals to avoid 'leakage' in the distribution process. But this mechanism cannot ensure equal rights to all students who are in need. Students attending schools close to big cities have relatively better access to scholarships.

Secondly, decentralisation also involves problems in controlling the quality given different resources across provinces. Studies observe that provinces in Java attract more attention from the central government resulting in more educational facilities built on this island. This is partly logical. The fact that the capital city is located on Java island and nearly 60% of the Indonesian population live in Java (compared to for example 2.2% in Maluku and Papua, or 7.2% in Sulawesi) suggests that these provinces deserve to get more attention. More specifically, a study emphasises a number of problems that could be associated with inequality of quality of education: (i) the implementation gap between the province and district level might be evident; (ii) the lack of appropriate teacher training; (iii) the teacher's passive attitudes toward the policy; and (iv) the scarcity of resources and funding (Yeom, Acedo et al. 2002).

Variation in educational quality across provinces might be one reason why income inequality still exists. While education has been developed to cater to students from isolated areas, educated workers with higher incomes are still concentrated in big cities. It

is therefore important to have a good understanding on how significant the overall aspects of education including quantity, quality and inequality affect economic growth.

Table 2-7. School Enrolment (% Gross)

Country	Primary			Secondary			Tertiary		
	1985-1996	1997-2000	2001-2006	1985-1996	1997-2000	2001-2006	1985-1996	1997-2000	2001-2006
Brunei Darussalam	113.8	112.7	108.1	76.5	84.1	91.6	...	11.4	14.4
Cambodia	86.7	99.5	131.1	29.0	16.9	23.8	0.7	2.2	2.8
China	125.2	...	116.6	48.7	62.3	68.8	3.0	7.0	14.2
Hong Kong	102.4	103.9	108.4	79.6	...	83.5	...	...	30.7
Indonesia	114.2	110.9	115.4	45.5	54.9	60.4	9.2	...	15.6
Japan	99.7	101.3	100.6	97.1	101.9	102.2	29.6	45.4	51.4
Lao PDR	104.9	95.8	103.2	89.8	99.9	91.9	38.6	69.0	85.4
Malaysia	98.6	101.3	104.7	65.1	77.3	91.0	25.4	27.0	63.9
Myanmar	95.4	98.3	94.0	57.1	69.3	71.9	8.2	24.0	29.1
Philippines	107.2	88.6	93.2	22.3	36.0	38.9	4.3	8.4	11.3
Singapore	109.5	112.7	112.4	70.7	75.8	82.2	27.1	28.0	29.8
Thailand	103.4	...	...	67.1	...	...	20.5	...	...
Vietnam	98.1	93.1	97.9	30.7	...	79.4	...	33.4	40.2
Average	104.55	101.65	107.13	59.94	67.84	73.80	16.66	25.58	32.40
Standard deviation	9.77	7.93	10.78	23.63	26.70	23.10	13.21	20.38	24.31

Source: World Development Indicators Online (2007); averaged by author.
Notes: Enrolments may be over 100% of the age group because of repeating and over age students.

Table 2-8. GDP, GDP Growth and Public Spending on Education

Country	GDP (Constant 2000 US$; '000 000)			GDP Growth per Capita (%)			Public Spending on Education (% GDP)		
	1985-1996	1997-2000	2001-2006	1985-1996	1997-2000	2001-2006	1985-1996	1997-2000	2001-2006
Brunei Darussalam	3817	4217	4650	-1.9	-1.2	0.5	3.5	4.4	...
Cambodia	2469	3219	4661	4.1	5.5	7.0	...	1.3	1.8
China	528460	1071195	1575324	8.9	7.3	8.8	2.2	1.9	...
Hong Kong	114178	156470	184605	4.2	2.5	3.5	2.8	...	4.2
Indonesia	117316	164494	188384	5.4	-2.0	3.3	1.0	1.4	1.1
Japan	3997790	4575273	4791428	2.9	0.4	1.3	...	3.5	3.6
Korea, Rep.	300337	469133	587422	7.4	3.1	4.0	3.8	3.8	4.4
Lao PDR	997	1593	2076	2.8	3.5	3.8	...	1.2	2.3
Malaysia	50383	83961	100822	4.8	1.3	2.5	5.1	5.9	8.0
Myanmar	...	...	...	0.6	6.6	7.8	...	0.6	1.3
Philippines	54545	71145	84792	0.4	1.4	2.6	3.0	3.9	3.2
Singapore	48035	83835	99918	5.1	3.7	2.4	3.1	...	3.7
Thailand	83954	119350	141120	7.3	-1.7	4.1	3.1	5.0	4.6
Vietnam	16520	28642	38653	4.3	4.9	6.3	1.8	...	...
Average	409139	525579	600297	4.0	2.5	4.1	2.9	3.0	3.5
Standard deviation	1088486	1251513	1329731	2.9	3.0	2.5	1.1	1.8	1.9

Source: World Development Indicators Online (2007), averaged by author.

Table 2-9. Unemployment by Level of Education[a] (% Total Unemployment)

Country	Primary			Secondary			Tertiary		
	(1) 1985 - 1996	(2) 1997 - 2000	(3) 2001 - 2006	(4) 1985 - 1996	(5) 1997 - 2000	(6) 2001 - 2006	(7) 1985 - 1996	(8) 1997 - 2000	(9) 2001 - 2006
Brunei Darussalam	...	...	85.1	...	...	3.6	...	...	6.7
Hong Kong	50.8	47.2	47.4	36.9	41.0	39.9	9.7	9.9	11.1
Indonesia	31.6	39.0	48.6	58.7	47.7	30.9	9.3	8.6	5.8
Japan	29.7	23.1	60.3	50.9	51.1	53.4	19.3	24.4	28.5
Korea, Rep.	24.5	24.8	18.6	51.9	53.4	52.3	23.7	21.9	29.1
Malaysia	47.3	41.4	34.2	43.5	46.1	48.7	4.5	9.0	13.6
Philippines	...	...	19.7	...	...	43.1	...	...	35.4
Singapore	35.8	26.9	23.4	25.3	26.8	25.9	28.3	42.4	52.8
Thailand	72.7	68.1	39.9	11.7	10.9	46.8	10.4	17.3	0.2
Average	41.8	38.6	41.9	39.8	39.6	38.3	15.0	19.1	20.3
Standard deviation	16.6	15.9	21.6	16.6	15.4	16.0	8.8	12.1	17.2

Source: World Development Indicators Online (2007), averaged by author.

Notes:

Unemployment by level of educational attainment shows the unemployed by level of educational attainment, as a percentage of the unemployed. The levels of educational attainment accord with the International Standard Classification of Education 1997 of the United Nations Educational, Cultural, and Scientific Organization (UNESCO).

Each cell is the average of unemployed persons with a particular level of education over the period and some countries have incomplete data. Hence, the total of columns 1-4-7, 2-5-8 and 3-6-9 is not equal to 100.

Figure 2-1. Regional Income Per Capita Differentials
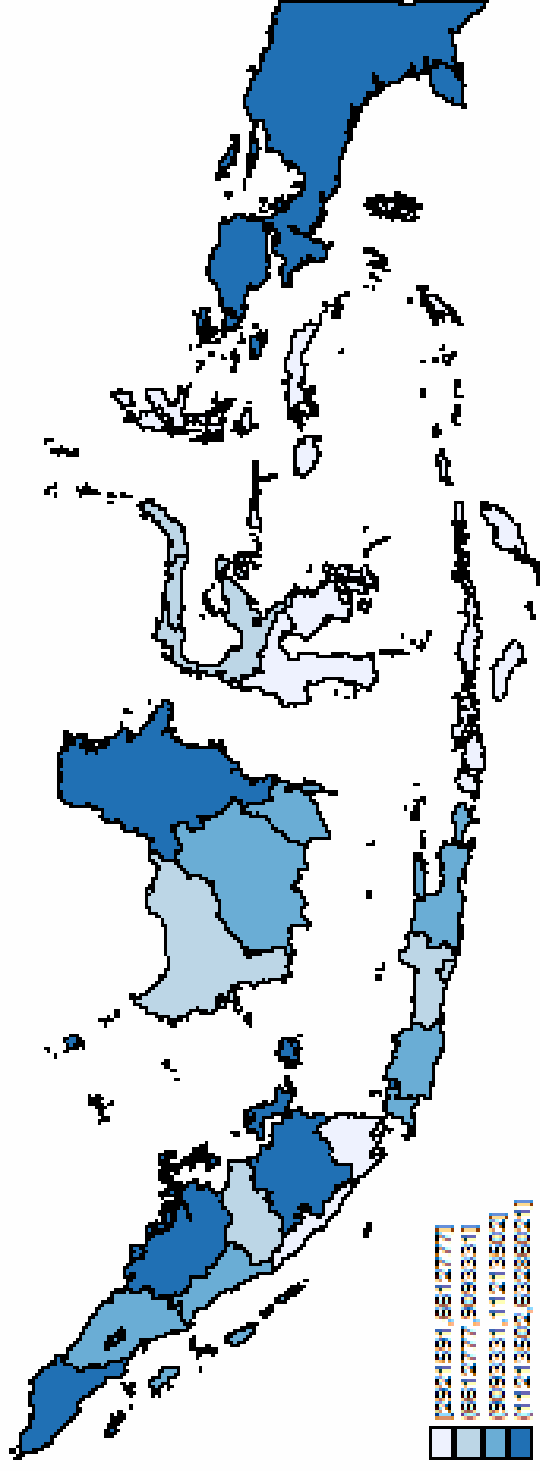
Source: Author's calculation using shp2dta and spmap commands in STATA statistical software; Regional income per capita data are from BPS.

Figure 2-2. Indonesian Population Statistics (2001-20
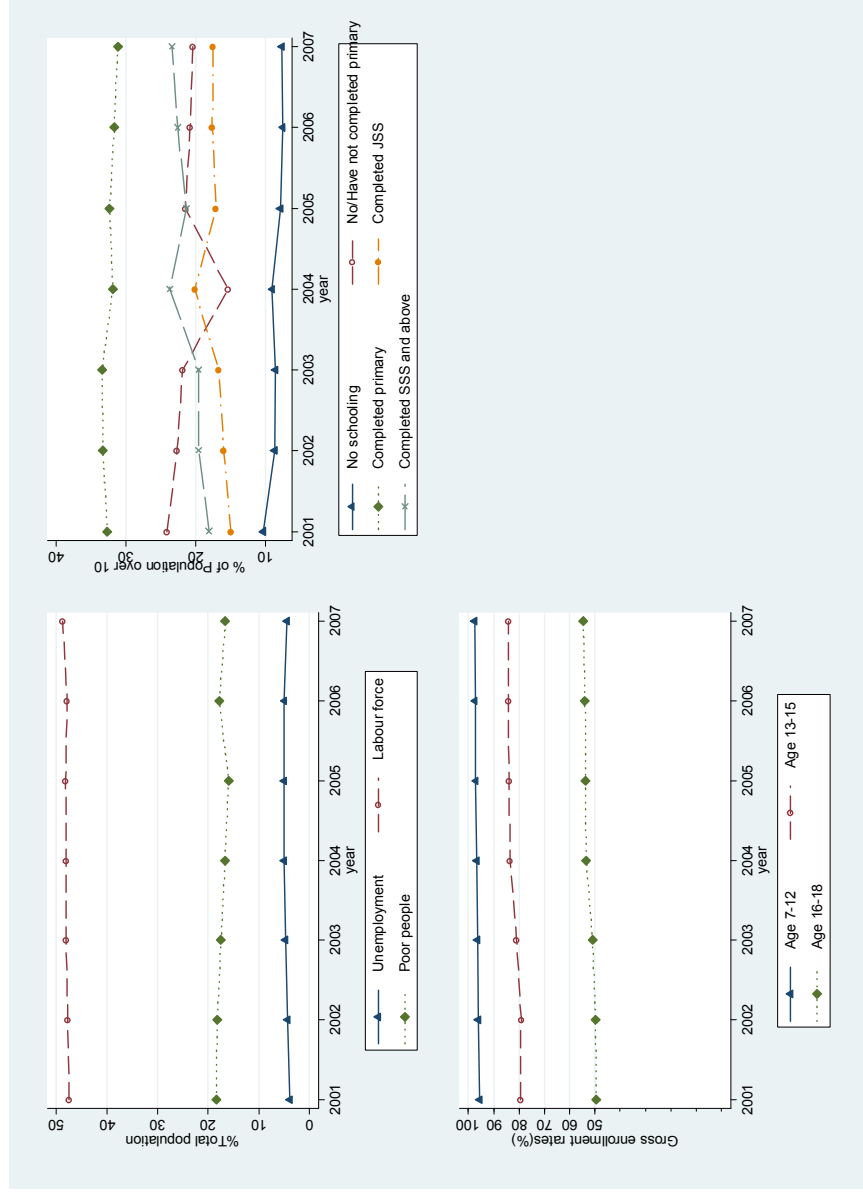
Source: Data from BPS – Statistics Indonesia

Figure 2-3. Indonesian Macroeconomic Indicators (1960-2007)
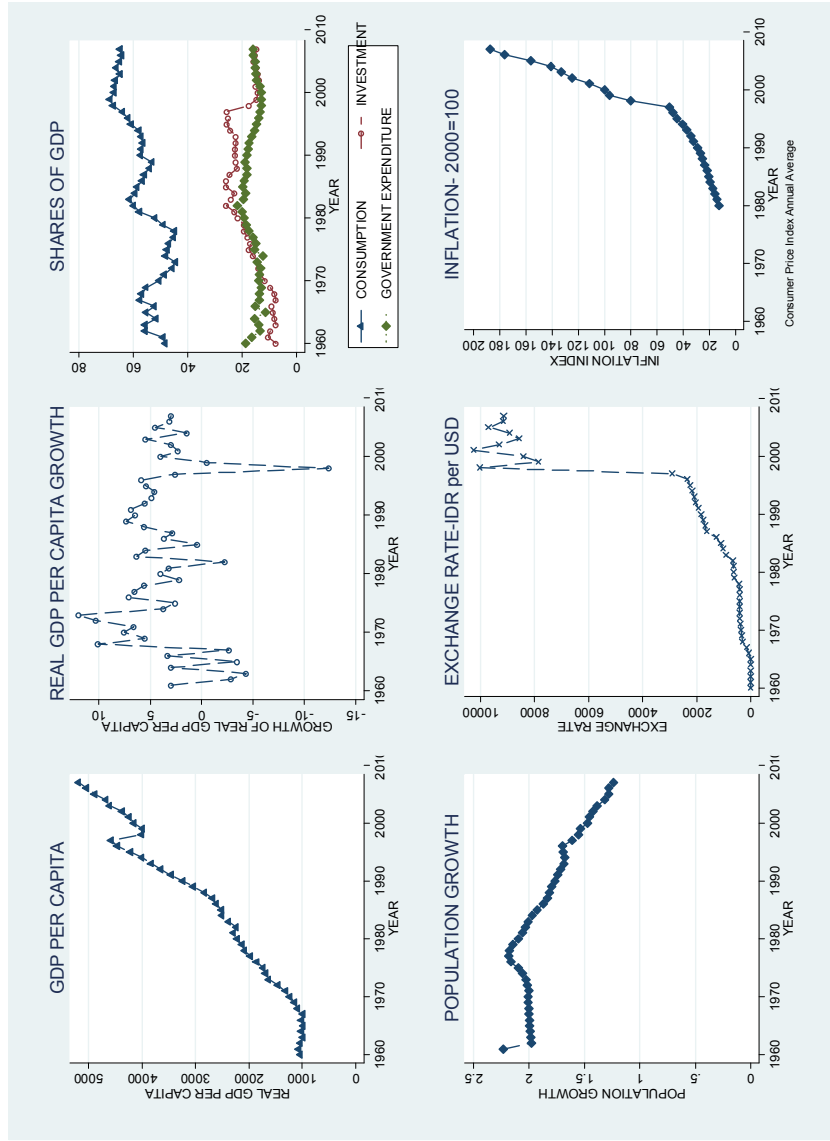
Source: GDP per capita (and growth), Population growth, GDP and its shares, exchange rate are from Penn World Data (2009). Inflation index data are from World Economic Outlook by the IMF. Both sources accessed on 17 September 2009.

2.4 Religious Education in Indonesia

Religion is an essential part of the Indonesian national education system. The system is based on *Pancasila* (five principles) and the 1945 Constitution of Republic of Indonesia (Ministry of National Education 2008).[16] The first principle states "Belief in the one and only God". As one implication, the Indonesian government must ensure that its citizens have their right to pursue religious education. Moreover, it has been argued that the essence of religious education becomes more important in the Suharto leadership era given that his regime ruled out communism which did not acknowledge the existence of God.[17] Religious education is provided by the Government and/or any community group within the same religion in accordance with the enforced law. It can be conducted through formal, non-formal and informal education by taking the form of *Diniyah* education, *Pesantren, Pasraman, Pabhaja Samanera*, etc (Ministry of National Education 2008).[18]

In July 2003, a new Law No. 20 Year 2003 on National Education System was enacted. This new Law replaced Act No.2 Year 1989 which needed to be revised in order to apply the basics of the democratisation of education. The foundation of this new law is still the 1945 Constitution of Republic of Indonesia, more specifically Article 31, Section(1) which states that each and every citizen shall have the fundamental right to education. Hence, the Law provides legal framework to ensure than all citizens aged 7-15 years old to have access to basic education with free of charge (Ministry of National Education 2008).

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[16] Pancasila consists of five principles: (1) belief in the one and only God (*Ketuhanan yang Maha Esa*); (2) just and civilized humanity (*Kemanusiaan yang Adil dan Beradab*); (3) the unity of Indonesia (*Persatuan Indonesia*); (4) democracy guided by the inner wisdom in the unanimity arising out of deliberations amongst representatives (*Kerakyatan yang Dipimpin oleh Hikmat Kebijaksanaan dalam Permusyawaratan/Perwakilan*); (5) social justice for the whole of the people of Indonesia (*Keadilan Sosial bagi Seluruh Rakyat Indonesia*) Wikipedia (2008).

[17] The author would like to thank Akhmad Bayhaqi of NUS and University of Indonesia for pointing out this matter.

[18] Pasraman and Pabhaja Samanera are forms of education for Buddhists and Hindus.

Part Nine Religious Education

Article 30

"(1) Religious education is provided by Government and/or by any group of people belonging to the same religion in accordance with the law in force.

(2) Religious education has the function to prepare learners to become community members who understand and practice religious values and/or acquire expertise in religious studies.

(3) Religious education can be conducted through formal education, non-formal education, and informal education.

(4) Religious education can take the form of *diniyah* education, *Pesantren*, *pasraman*, *pabhaja samanera*, and other education forms of similar type.

(5) The implementation of the provisions for religious education, set forth in verse (1), verse (2), verse (3), and verse (4), shall be further stipulated by the Government Regulation."(Ministry of National Education 2008)

In principle, it is clear that religious values are an important aspect of the construction of the national education system of Indonesia. Indeed, national education has been defined as:

> "…education based on Pancasila and the 1945 Constitution, and is rooted in the *religious values*, national cultures of Indonesia, and one that is responsive to the needs of the ever-changing era"(Ministry of National Education 2008).

Furthermore, the function of the national education system has been stated as:

> "To develop the capability, character, and civilization of the nation for enhancing its intellectual capacity, and is aimed at developing learners' potentials so that they become persons imbued with human values *who are faithful and pious to one and only God*; who possess morals and noble character; who are healthy, knowledgeable, competent, creative, independent; and as

citizens, are democratic and responsible (Ministry of National Education 2008).[19]

The Law also ensures that every learner is entitled to receive religious education in accordance with his/her religion and taught by an educator who has the same religion (Ministry of National Education 2008).

As in other countries, Indonesia has two types of schools based on their ownership: public schools and private schools. Each type consists of religious and non-religious schools. Non-religious schools are called '*Sekolah*' or school in English. Taken from Arabic, the word '*Madrasah*' has also exactly the same context as 'school' in English. The term is used especially for educational levels known in contemporary terminology as primary and secondary schools. *Bahasa* (the national language of Indonesia) absorbs the word *Madrasah* as 'one-day-Islamic schools'.

The schooling system of *Madrasah* shares some similarities as well as dissimilarities to regular schools. Both types facilitate the learning process mainly in the classroom. There is usually one teacher teaching a relatively large number of students. Both have formal and regular evaluation tests, often conducted at the national or regional level. Both *Madrasah* and *Sekolah* have the same level of education. The *Madrasah* vary from primary school (*Madrasah Ibtidaiyah*), junior high school (*Madrasah Tsanawiyah*), to senior high school (*Madrasah Aliyah*). The *Sekolah* vary from primary school (*Sekolah Dasar*), junior high school (*Sekolah Menengah Pertama*), to senior high school (*Sekolah Menengah Umum*).[20]

The central difference between *Madrasah* and *Sekolah* is obviously their curriculum choices. *Madrasah* adopts Ministry of Religious Affairs' (MRA) curriculum, while *Sekolah* adopts Ministry of National Education (MNE)'s curriculum. The MRA's curriculum consists of more hours of Islamic coursework than MNE's curriculum. Despite differences in subjects, implications of this difference is on school uniforms, sitting arrangements and extra-curricular activities. *Madrasah*'s students are required to dress according to Islamic codes. The uniform is a long shirt, long skirt and veil for female students. It is common that the classroom is divided into two parts to ensure female and male students sit separately. Extra-curricular activities such as cheerleading and modern dance are not

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[19] Italic words are added by the author to show emphasis on relevant content.

[20] In Indonesia, primary school, junior high school and senior high school are years 1 to 6, years 7 to 9, and years 10 to 12, respectively.

common in *Madrasah*. These activities have been generally perceived as violent conducts according to Islamic laws.

At the higher secondary level, both *Madrasah* and *Sekolah* have majors, namely science (IPA or Ilmu Pengetahuan Alam), social (IPS or Ilmu Pengetahuan Sosial), and linguistics (or Bahasa). It is commonly perceived that students in science classes generally perform better than students in science and linguistics in comparable subjects such as English and Bahasa.[21]

Indonesia also has another Islamic education institution, namely *Pesantren*. While *Madrasah* is a-day school, *Pesantren* is the term for Islamic boarding schools. *Pesantren* are commonly seen as informal education institutions. However, there are some *Pesantren* who also own *Madrasah* under their institutions. The establishment of *Madrasah* is the symbol of the introduction of secular subjects in *Pesantren*. It was pioneered by *Kyai* Ma'sum from *Pesantren* Tebu Ireng in 1916 (Dhofier 1999, p.82).

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[21] Mathematics test scores are not comparable because students in social and linguistics classes do not have this test in the national examination.

Figure 2-4. The Indonesian Schooling System
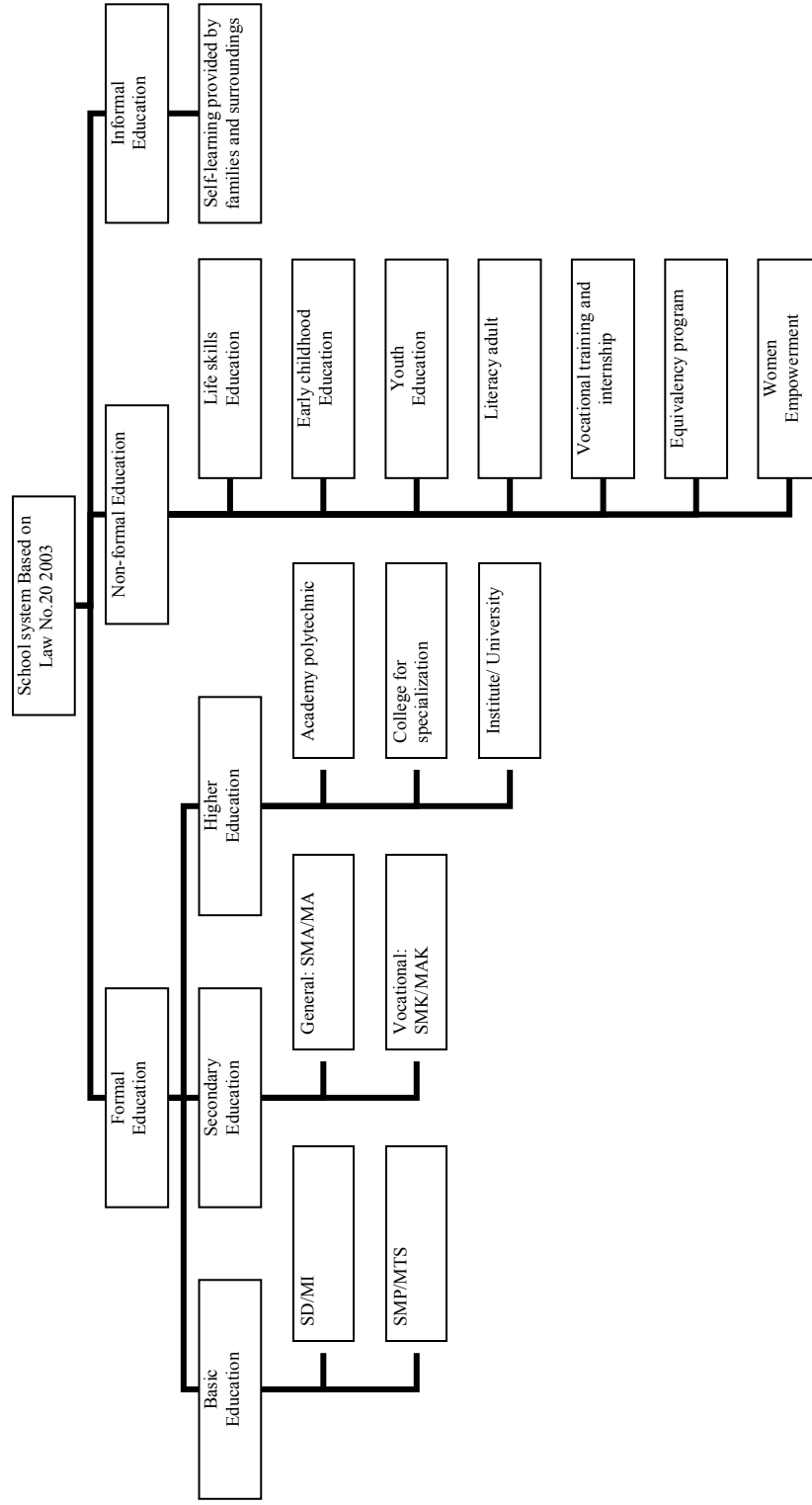
Table 2-10. *Madrasah* National Statistics (2003-2007)

Provincial level means	Level of education	Academic year			
		2003/2004	2004/2005	2005/2006	2006/2007
A. Number of *Madrasah*	Primary (*Madrasah Ibtidaiyah*)	23,164	23,517	22,610	22,189
	Junior Secondary (*Madrasah Tsanawiyah*)	11,706	12,054	12,498	12,619
	Senior Secondary (*Madrasah Aliyah*)	4,439	4,687	4,918	5,043
B. Gross enrolment ratios	Primary (*Madrasah Ibtidaiyah*)	11.0	12.1	10.9	10.8
	Junior Secondary (*Madrasah Tsanawiyah*)	14.3	15.9	15.8	16.3
	Senior Secondary (*Madrasah Aliyah*)	5.2	5.7	5.7	6.0
C. % Private *Madrasah*	Primary (*Madrasah Ibtidaiyah*)	93.60	93.40	93.10	92.90
	Junior Secondary (*Madrasah Tsanawiyah*)	89.40	89.50	89.90	90.00
	Senior Secondary (*Madrasah Aliyah*)	87.00	86.50	86.90	87.20
D. Number of students	Primary (*Madrasah Ibtidaiyah*)	3,124,153	3,152,665	2,996,375	2,957,900
	Junior Secondary (*Madrasah Tsanawiyah*)	2,081,576	2,129,564	2,221,959	2,299,390
	Senior Secondary (*Madrasah Aliyah*)	726,893	744,736	777,627	817,920
E. Parental educational backgrounds (%)	**(i) Primary (*Madrasah Ibtidaiyah*)**				
	No schooling	6.67	7.34	7.36	8.81
	Primary Education	45.64	43.8	42.58	38.32
	Junior Secondary Education	24.55	24.61	24.29	23.97
	Senior Secondary Education	18.91	19.7	20.95	23.04
	Tertiary Education	4.23	4.55	4.82	5.86
	(ii)Junior Secondary (*Madrasah Tsanawiyah*)				
	No schooling	7.75	7.72	7.54	8.29
	Primary Education	41.62	41.44	39.76	38.65
	Junior Secondary Education	24.98	25.05	26.22	26.05
	Senior Secondary Education	19.90	19.89	20.54	20.97
	Tertiary Education	5.75	5.90	5.94	6.04
	(iii) Senior Secondary (*Madrasah Aliyah*)				
	No schooling	6.05	6.14	6.68	8.86
	Primary Education	32.74	32.03	30.50	28.65
	Junior Secondary Education	26.60	26.20	26.87	25.30
	Senior Secondary Education	25.88	26.43	26.50	27.44
	Tertiary Education	8.73	9.20	9.45	9.75
F. Shares of income from Government	Primary (*Madrasah Ibtidaiyah*)	62.4	62.4	63.0	58.6
	Junior Secondary (*Madrasah Tsanawiyah*)	51.5	51.3	53.1	56.3
	Senior Secondary (*Madrasah Aliyah*)	55.4	55.5	53.3	51.7

Source: Ministry of Religious Affairs (2004, 2005, 2006, 2007).

Table 2-11. Muslim vs Secular/non-Muslim Secondary Schools Performance in 2005/2006 National Final Examination (UAN)

Variables [a]	Level	Major	Difference (Type 1-Type 2) [b]	Standard Error	Confidence Interval (95%)		Pr(T,t) for Ha: Difference<0 [c] [d]
Mathematics	SMP/MTS	---	-0.188	0.146	-0.480	0.103	**0.100**
Mathematics	SMA/MA	Science	-0.455	0.139	-0.733	-0.177	0.001
Bahasa	SMP/MTS	---	-0.215	0.098	-0.412	-0.019	0.016
Bahasa	SMA/MA	Science	-0.210	0.115	-0.440	0.020	0.036
Bahasa	SMA/MA	Social	-0.177	0.107	-0.392	0.037	0.052
Bahasa	SMA/MA	Bahasa	-0.216	0.188	-0.592	0.160	**0.128**
English	SMP/MTS	---	-0.043	0.120	-0.282	0.196	**0.360**
English	SMA/MA	Science	-0.302	0.132	-0.566	-0.039	0.013
English	SMA/MA	Social	-0.264	0.144	-0.553	0.025	0.036
English	SMA/MA	Bahasa	-0.210	0.174	-0.558	0.139	**0.117**
Economics	SMA/MA	Social	-0.211	0.123	-0.457	0.035	0.045
Economics	SMA/MA	Bahasa	0.336	0.192	-0.051	0.722	***0.043*** *(see footnote)*
Total score	SMP/MTS	---	-0.447	0.310	-1.066	0.172	**0.077**
Total score	SMA/MA	Science	-0.967	0.320	-1.607	-0.328	0.002
Total score	SMA/MA	Social	-0.652	0.330	-1.312	0.008	0.026
Total score	SMA/MA	Bahasa	-0.090	0.463	-1.019	0.839	**0.424**

Notes:
a) Mathematics is not examined by SMA/MA students with majors in Social and Bahasa. Economics is not examined by SMA/MA students with a major in Science, nor SMP/MTS students. All secondary students must follow examinations in Bahasa and English.
b) Type 1 is Muslim school, ie MTs for junior secondary school level and MA for senior secondary school level.
c) Except for economics at SMA/MA level in Bahasa, where the p-value displayed is for alternative hypothesis that the difference is positive indicating that the Muslim schools for this specific level and major achieves better than secular/non-Muslim schools.
d) The bold numbers show that there is not enough evidence to reject the null hypothesis i.e. difference=0 at 5% level of significance

Madrasah enrolments in both public and private schools, are still minor compared to other types of education, particularly public non-religious schools. In the 2005/2006 academic year, the national average of enrolment rates, calculated as the number of students of a particular age group enrolled in all levels of *Madrasah* divided by the number of people in the population in that age group, for each level of education are below 15% consisting 8.25%, 12.71% and 5.11% for primary, junior secondary and senior secondary level respectively. On average, the contribution of Islamic education is more evident at junior secondary level.[22] Only some provinces have Islamic education enrolment rates over 15%, such as Nanggroe Aceh Darussalam (NAD) with 17.90% of primary education enrolment rates, 20.90% of junior secondary education enrolment rates and 11.60% of senior secondary education enrolment rates, Jambi (34.00%, 17.40% and 7.70%), East Java (29.50%, 22.00%, and 8.90%), and South Kalimantan (17.80%, 24.40% and 9.50%). Furthermore, *Madrasah* academic achievements are not impressive. A recent study concludes that students in public schools and non-Muslim religious private schools performed better than students in Muslim schools or *Madrasah* and secular private schools (Newhouse and Beegle 2006). Having over 3 million primary school and nearly 3 million secondary school students, the effectiveness of religious education is critical.

2.5 Conclusion

The scope of this thesis falls within the area of the economics of education and the economics of religion, with particular reference to Islamic education. A review of existing literature has provided information on how religious aspects may affect educational outcomes. But many challenges remain. In addition to some empirical problems, there is an indication that results on the association between education and religious aspects depend on the characteristics of religious groups being observed. The so called "Catholic advantage" may not be found in Islamic schools. This requires further analysis as to how Islamic schools function and to what extent the religious education providers may benefit their students, the surrounding society and the region as a whole. These topics will be examined in the next chapters.

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[22] The overall enrolment rates for the same year are 110.10%, 82.42% and 58.18% for primary, junior secondary and senior secondary levels respectively.

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3 RECENT REGIONAL INEQUALITY OF EDUCATION IN INDONESIA: DOES RELIGIOUS EDUCATION MATTER FOR ECONOMIC GROWTH?

3.1 Introduction

Since the late 1980s, a large body of literature has focused on the determinants of economic growth. In addition to the importance of physical investment, employment, technology, productivity, openness and other growth factors, empirical research on the determinants of economic growth or income differentials has typically taken into account the importance of education as human capital. Some studies find a significant impact of education on economic growth on the basis of theory and empirical evidence (Romer 1986; Romer 1990; Dougherty and Jorgenson 1996). But others find no supporting evidence (Brist and Caplan 1999; Hanushek and Kimko 2000; Bosworth and Collins 2003). On the other hand, pioneered by Barro and McCleary (2003), economists started looking at the empirical evidence of the religion effect.[23] They found that economic growth had a positive association with religious beliefs, specifically beliefs in hell and heaven, but a negative association with church attendance. However, no research has taken into account the nexus between the above two factors, ie education and religioun, namely religious education.

To fill the research gap, the present study considers the possibility of religious education effect on the growth rate of regional income per capita. The fact that religious education is delivered to students at the expense of 'secular education' such as mathematics and science, which have been empirically evidenced as having positive and significant associations with economic growth (Hanushek and Kimko 2000), raises a question on the trade-off between religious and regular education. If they are not equally financially beneficial, the use of average years of schooling must be adjusted. This variable has been long criticized since it assumes homogenous rates of return across *types* of education (Mulligan and Sala-i-Martin 1997). In the Indonesian context, there is an indication that

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[23] See McCleary and Barro (2006) for more discussion on this matter and Steven, Andros and Chih Ming (2006) for critiques on this article.

workers graduating from non-religious schools earn higher wages in Indonesia. Thus, it is essential to impose a procedure allowing different rates of return between religious and non-religious education.

In addition to the absence of literature on contribution of religious education to growth, literature on education and growth mostly neglects the quality aspect of education. An exception and important contribution is a work by Hanushek and Wobmann (2007) which uses international cognitive achievement tests from 50 countries. They find that when educational quality is added to a model that just includes initial income and years of schooling, the share of variation in economic growth explained by the model (the adjusted R2) jumps from 0.25 to 0.73 (Hanushek and Woessmann 2007). This motivates this current study to overview whether the same pattern is found using provincial data from Indonesia.

In addition to analysis of the quantity and quality aspects of education, the *inequality* of education also becomes the focus of this present study, motivated by findings from previous studies. Using data from 1970-1990s, a study finds that education can effectively reduce regional income imbalances (Garcia and Soelistianingsih 1998). But persistent income imbalance in Indonesia as suggested by some studies (Garcia and Soelistianingsih 1998; Alm, Aten et al. 2001; Resosudarmo and Vidyattama 2006) suggests us to oversee whether education inequality is one of the driving forces of this continuing income difference. The descriptive statistics show that provinces had similar rates of growth of the average of years of schooling in 2002-2005. This indicates relatively stable inequality of education *quantity*.

A further question is whether the inequality of education *quality* matters for economic growth. Inequality per se doesn't tell us the complete story about educational quality. Indeed, policy discussion in Indonesia (as reported by newpapers, etc) as well as some previous studies (Newhouse and Beegle 2006, Bedi and Garg 2006) have been focused on the gap in the levels of academic performance between students from Islamic schools and non-Islamic schools. However, using cross-countries data, Hanushek and Woessmann (2007) have shown that inequality does matter for growth. From econometrics point of view, if inequality of education quality is significant, our estimates will be subject to omitted variable bias. The analysis is also of policy interest. It may provide comparison of how the administrator of each religious and non-religious education sector performs. Note that religious schools in Indonesia are administered by

Ministry of Religious Affairs, while non-religious schools are administered by Ministry of National Education. Unfortunately, no study has addressed the role of regional inequality of education quality in relation to regional income growth.[24]

The use of post-2001 provincial data brings some implications. The data allows me to take a closer look at the role of education in economic growth, especially in the era of decentralisation. Some studies show that since 2001 Indonesia has significantly transformed from a highly centralised economy into highly decentralised one (Alm, Aten et al. 2001; Balisacan, Pernia et al. 2003). [25] This decentralisation will most likely bring some changes to the educational sector.[26] The results of this chapter therefore are of policy interest aiming to provide recommendations on how to improve the equality of education quality.[27]To achieve the objective, I apply some empirical strategies. I use three measures of academic performance, namely average of schooling years, school enrolment and final national examination scores (*Ujian Akhir Nasional* or UAN). The exam scores reflect inequality of quality in the educational sector testing final year students in three subjects, namely English, mathematics and Indonesian language.[28] The scores are used as a proxy for labour force quality. Empirical analyses begin with basic growth regressions taking into account quantity and quality of education. Then, I decompose the year of schooling to allow possibly different contribution of *new human capital stock* from both religious and non-religious education background to regional income per capital growth. This feature could not be captured by the use of years of schooling. In the study, the new stock is defined as the share of workforce who completed primary and secondary education from each religious and non-religious education sector but did not enter higher education. Note that we could not differentiate between the attainment of Islamic and non-Islamic education at the higher education level (ie diploma and above).As a robustness check, I identify three possible sources of bias. First, I test the relevancy of

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[24] While studies on this issue were commonly using cross-country data such as O'Neill (1995), Park (1996), Zhang and Li (2002), currently economists are looking at the education inequality using sub-national data measuring the inequality within the country Xiaolei Qian (2008).

[25] In May 1999, two laws on various aspects of decentralisation were passed: Law No. 22/1999 on Regional Government (UU PD) and Law No. 25/1999 on the Fiscal Balance between the Central Government and the Regions (UU PKPD).

[26] For example, changes in how the education budget from the central government is distributed across local governments and what level of education should be managed by local governments. Alm, Aten and Bahl (2001) argue that primary and secondary education should be assigned to regional governments instead of central governments.

[27] While issues in decentralised education are important, note that it is not of my interest to analyse effects of decentralisation given the data span.

[28] I focus on junior secondary school students given that the data for primary as well as senior secondary school student scores are not easily accessible.

using current academic performance to current labour force quality. In addition to graphical analysis, I also perform instrumental variable method to see alternatives for quality measures. Secondly, I consider migration effects. Studies identify the possible contribution of across-border migration to economic growth (Miyagiwa 1991; Beine, Docquier et al. 2001). But to what extent migration affects regional income per capita growth in Indonesia is an empirical matter. Lastly, I conduct a Monte Carlo experiment to predict the magnitude of small sample bias having panel data with the time dimension $T = 2$ and panel dimension $N = 30$. The dimension can affect which method best predicts the dataset.[29] Previous studies provide remarkable contributions to the application of panel data analysis in the asymptotic condition i.e $T \to \infty$, notably the Anderson-Hsiao (AH) estimator (Anderson and Hsiao 1981). More recent studies consider asymptotic bias when T is finite. Most studies find that the Least Square Dummy Variable (LSDV) is most preferred (Kiviet 1995; Judson and Owen 1999; Buddelmeyer, Jensen et al. 2008). My approach closely follows Judson (1999) and Kiviet (1995). But here I use the growth rate as the dependent variable instead of the level as used in Judson (1999) which better suits the setting of this chapter.

I find that in 2003 Islamic schools (MTS) started with lower educational quality inequality than non-Islamic schools (SMP). But both types of schools ended up with almost identical inequality in 2004. This was driven by a rapid increase in the inequality of MTS by 21.8%, while SMP inequality decreased by 6.2%. For SMP schools, the percentage decreases were more significant across public schools.

The overall empirical results show that quality-inclusive growth model specification is preferred to avoid upward bias. I find that the social marginal effect of years of schooling is only two-thirds the estimate using standard analysis. Nevertheless, the relative importance of the quantity of education is still evident. Classifying education into two types—Islamic and non-Islamic education— suggests that while there is no difference between rates of return to the *quantity* of new human capital stock from Islamic education and non-Islamic education background, quality-augmented new labour stock from non-Islamic education background is more significant that new stock from Islamic education background for regional income per capita growth. However, once we take into account inequality, the difference disappears. This implies that the different

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[29] This issue is important especially for researchers who work using regional data from developing countries. Poor statistical data management in the past resulting in limited access to long-period and large numbers of data have often been barriers to researchers to analyse various regional issues.

contribution of quality-adjusted new stock between human capital with religious and non-religious education backgrounds might be largely due to different inequalities across provinces. The robustness check suggests that: (i) the fixed effect model performs better than the random effect and OLS models using data with number of periods less than 10 and 30 panel units; (ii) migration effects are insignificant for income per capita growth; (iii) current academic schooling has strong predictive power for current labour force quality.

The remainder of this chapter consists of five sections. Section 3-2 provides a background of religious education, measurement of educational inequality and the dataset. Section 3-3 presents the basic growth regression. Quality is taken into account in Section 3-4. Section 3-5 presents the decomposition of years of school participation by taking into account types of schools, quality and inequality aspects of education. Section 3-6 performs a robustness check focusing on quality measures, migration effects and small sample bias. Section 3-7 concludes.

3.2 Background

3.2.1 Education and Economic Growth in Indonesia

The focus of this chapter is on the effect of education on regional income per capita growth. Table 3-1 shows that between 1960 and 1990, the Gini coefficient measuring income inequality had been relatively constant in the range of 0.32-0.38. But the difference between rural and urban had been widening in the 1990s. Persistent income imbalance in Indonesia (Garcia and Soelistianingsih 1998; Asra 2000; Alm, Aten et al. 2001; Resosudarmo and Vidyattama 2006) suggests that one may need to examine whether education inequality is one of the driving forces of this income difference.[30]

In a broader scope, education is an important growth factor but it might not be the main factor of Indonesian economic growth. During the 1960s-1990s, Indonesian economic growth was mainly fueled by investment. Collins and Bosworth (1996) estimate that between 1960 and 1994 over 60% of the 3.4% growth of output was contributed by

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[30] Unfortunately due to data limitation, I cannot take into account rural-urban differences in rates of return to education.

physical capital per worker. TFP explains the 23% of the growth. Human capital only accounts for 14.71% and this figure is relatively stable over the period.[31]

Regarding the significance of education as human capital on Indonesian economic growth, the results using regional data from earlier studies are mixed. Based on 1969-1998 data, a study suggests that the significance of education is identified only if higher weights are assigned to secondary education and no weight is assigned for primary education as it gives insignificant impact on skill development and productivity (Bayhaqi 2001). Focusing on economic growth in Java, a study found that the change in the distribution of income per capita between 1984 and1990 was associated with increased educational attainment (Cameron 2000).[32] Furthermore, using district-level data from national survey year (Susenas or the National Socioeconomic Survey) in 1993, 1996 and 1999, a study found mixed results (Balisacan, Pernia et al. 2003). They found that whilst the mean of years of schooling is insignificant for income across groups of income levels, the variable is significant for the poor. On the contrary, adult literacy appears to have significant influence on the overall income growth but insignificant for the welfare of the poor. The variation in results seems to correlate to the period of data covered by the study. While a study using data from 1993-2002 found insignificant influence of education (Resosudarmo and Vidyattama 2006), another found a strong effect of education on regional economic growth using data from the 1970s and 1990s (Garcia and Soelistianingsih 1998).

Nevertheless, as evidenced in most countries, education in Indonesia is empirically evidenced as a significant income determinant at the micro level. Using 1995 inter-censal data, a study concluded that each primary school per 1000 children led to an average increase of 0.12-0.19 years of education as well as a 1.5-2.7 percent increases in wages, which implied 6.8-10.6 percent economic returns to education (Duflo 2001).[33] While

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[31] Additionally, long lists of other variables have been empirically evidenced as growth determinants. Saving of physical capital, trade openness and the contribution of the gas and oil sectors are concluded as significant determinants of provincial income per capita growth by Resosudarmo and Vidyattama (2006). Using district-level data in the 1990s, Balisacan, Pernia and Asra (2003) conclude that term-of trade regime, infrastructure and access to technology are important factors of poverty reduction in addition to the overall economic growth. Using data from the 1970s and 1990s, Garcia and Soelistianingsih (1998) find positive effects of shares of revenues from oil and gas and a negative effect of fertility on the rates of economic growth.

[32] Cameron (2000) also found a significant association with the aging of population, decreased participation in the agricultural sector and change in incomes within industry and age/education groups.

[33] Although its direct effect is not supported by all empirical studies, education may have an *indirect* effect on economic growth. The first channel is through the fertility rate. Using data from a national-scale survey, the 1993 Indonesia Family Life Survey found that increased education level was seen as an important policy tool for lowering fertility

there is evidence for significant private rates of return to education, results from various studies show no clear pattern on social rates of return. Table 3-2 shows the compilation of social rates of return to education in Indonesia. It only indicates that tertiary education does not provide the highest rates of return. This probably suggests at which stage the Indonesia economy was during that particular period.

While the above works have substantially contributed to the literature on education and economic development in Indonesia, unfortunately they do not take into account the differenct impacts of education provided by religious schools and non-religious schools. One notable exception is a micro-level study by Bedi and Garg (2000).

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rate (Angeles, Guilkey and Mroz (2005). Interestingly, this study also noted a potential two-way causal relationship between education and fertility rate. In addition to the significance of student-teacher ratios and school size, the family planning effects operate to increase the likelihood that the young woman continue on in school (Angeles, Guilkey and Mroz (2005).

Table 3-1. Inequality Indices of Income Per Capita

Year	Gini			Percentage bottom of top 40%		
	Total	Urban	Rural	Total	Urban	Rural
1969/70	0.35	-	-	18.62	19.48	19.56
1976	0.34	0.35	0.31	19.56	19.56	21.22
1978	0.38	0.38	0.34	18.13	17.4	19.88
1980	0.34	0.36	0.31	19.55	18.66	21.16
1981	0.33	0.33	0.29	20.44	20.83	22.81
1984	0.33	0.32	0.28	20.75	20.63	22.35
1987	0.32	0.32	0.26	20.87	21.48	24.3
1990	0.32	0.34	0.25	21.31	19.67	24.41
1993	0.34	0.33	0.26	20.34	20.48	25.12
1996	0.36	0.37	0.28	20.28	19.03	23.24

Source: (Asra 2000)

Table 3-2. Social Rates of Return

Level of education	1982	1986	1988	1989	2004
Primary	n.a	n.a	n.a	n.a	0.04
Junior secondary	0.17	0.14	0.13	0.14	0.25
Senior Secondary General	0.22	0.16	0.13	0.11	0.28
Senior Secondary Vocational	0.16	0.15	0.10	0.06	n.a
Academy (3 years)	0.13	010	0.12	0.05	n.a
University	0.11	0.07	0.06	0.05	n.a
Source	McMahon and Boediono (1992)	McMahon and Boediono (1992)	McMahon and Boediono (1992)	McMahon and Boediono (1992)	Arze Del Granado et.al (2007)

Source: Compiled by author from various sources.

Bedi and Garg (2000) found that graduates from public and private Islamic and Christian schools enjoyed premium earnings compared to private non-religious schools (Bedi and Garg 2000). They also concluded that there was no religious discrimination manifested in the labour market (Bedi and Garg 2000). Yet, studies taking into account this issue, such as one by Bedi and Garg (2000), are usually projected to look at its impacts on *individual* earnings. Hence, neither the association between the two types of educational institutions and the *regional* economic growth, nor education inequality between and within provinces is clear yet. This analysis is important to observe what policy should be chosen by both the central and provincial governments in the era of education decentralisation. More specifically, is the role of religious education in regional income difference as important as regular education?

Focusing on the quality aspect of education, this study is of policy interest in dealing with issues of education discrepancies across provinces in the decentralisation era. Decentralising education in an economy with large economic gaps across provinces may lead to further serious income inequality. The verdict that the EBTANAS score shows inequality of quality across provinces is not supported by thorough assessment on the inequality index of education. Furthermore, the determinants of the overall inequality are not clear either, whether it is mostly due to the within or between province inequality. This suggests a need to calculate the inequality index and analyse any pattern in the index.

Table 3-3. Summary of Statistics (2003-2005)

Indicators	Mean	Standard deviation	Min.	Max.	No. Obs
Real GDP per capita growth	0.039	0.109	-0.287	0.797	86
Natural log of Real GDP per capita	15.581	0.629	14.509	17.320	86
Investment Ratio	0.187	0.073	0.036	0.372	86
Openness	0.698	0.287	0.106	1.413	86
Population Growth	0.009	0.051	-0.237	0.132	86
Average years of schooling	7.406	0.901	5.500	10.100	85
MTS average exam scores	17.056	2.448	13.640	21.930	83
Non-MTS (SMP) average exam scores	17.415	2.623	10.550	22.850	84
Average exam scores	17.199	2.495	13.055	22.040	85
Gini index of MTS exam scores	0.022	0.009	0.004	0.040	45
Gini index of SMP exam scores	0.023	0.006	0.008	0.035	44

Source: Indonesian statistics and Ministry of National Education.
Notes: Investment Ratio refers to fixed capital formation – GDP ratio; Openness is shares of total exports and imports in GDP; Exam scores is the total scores of three subjects being tested i.e. Mathematics, Bahasa and English (each is a maximum of 10).

Table 3-4. List of Province Codes

Name	Codename	Code	Name	Codename	Code
Nangroe Aceh Darussalam	NAD	1	Bali	BALI	16
North Sumatera	SUMUT	2	West Kalimantan	KALBAR	17
West Sumatera	SUMBAR	3	Central Kalimantan	KALTENG	18
Riau	RIAU	4	South Kalimantan	KALSEL	19
Jambi	JAMBI	5	East Kalimantan	KALTIM	20
South Sumatera	SUMSEL	6	North Sulawesi	SULUT	21
Bengkulu	BENGKULU	7	Central Sulawesi	SULTENG	22
Lampung	LAMPUNG	8	South Sulawesi	SULSEL	23
Bangka Belitung	BABEL	9	South East Sulawesi	SULTERA	24
Special Capital Region of Jakarta	DKIJ	10	Gorontalo	GORONTALO	25
West Java	JABAR	11	West Nusa Tenggara	NTB	26
Central Java	JATENG	12	East Nusa Tenggara	NTT	27
Special Region of Yogyakarta	DIY	13	Maluku	MALUKU	28
East Java	JATIM	14	North Maluku	MALUKU UTARA	29
Banten	BANTEN	15	Papua	PAPUA	30

3.2.2 Data

Data are collected from various sources. Socio-economic provincial data are from the Statistics agency (*Badan Pusat Statistik* or BPS). Data on *Madrasah* are from the Ministry of Religious Affairs (MRA). Data on examination scores are sourced from publicly accessible online datasets published by the Centre for Education Evaluation (*Pusat Penilaian Pendidikan* or PUSPENDIK). It is important to note here that to measure inequality index at the provincial level we need municipality or kabupaten-level data. This implies that this study is dealing with a large dataset. Thus, it is not surprising to find incomplete observations in the dataset.[34]

Table 3-3 presents the descriptive summary of data used in this chapter. Note that the number of observations in econometric models depends on whether the model includes educational inequality indices. To measure educational *quality* inequality indices, I use data from academic years 2002/2003 and 2003/2004 (hereafter mentioned as the year of 2003 and 2004 respectively). A short period covered by this study is mainly due to data availability or more precisely limited access to data. Due to complex bureaucratic procedures, it is difficult to collect examination scores data prior to 2002. The main reason is because the centre (*Puspendik*) which is currently responsible for collecting and publishing the data was established in 2002 and, hence, bears less responsibility to manage data published prior its establishment.[35]

As for data on *Madrasah*, the first publication of detailed *Madrasah* (and other types of Islamic schools such as *Pesantren*) data was in 2002 by a specially designated statistics centre in Ministry of Religious Affairs, namely Education Management Information System (EMIS). This again limits the scope of this study.[36]

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[34] While this source provides the most reliable and complete dataset of 30 provinces focused on by this study, it still has some incomplete observations. This would significantly affect the comparison between periods and across types of schools. First, Bengkulu and West Nusa Tenggara have incomplete observations for both SMP and MTS in 2002. Hence, these two provinces must be dropped if I attempt to compare inequality in 2002 and 2003. They can, however, be used to compare inequality between SMP and MTS in 2003. Second, Special Capital Region of Jakarta, North Sulawesi and Papua have incomplete observations for MTS in 2002. Again, these three provinces must be dropped if I attempt to compare overall educational inequality in 2002 and 2003. But they can be included to compare inequality of SMP education in both years and to compare inequality between SMP and MTS in 2003.

[35] While recent examination scores are available, limited access to the data is still applied. Access to obtain the dataset at the municipality level for individuals can only be obtained from Ministry of Education offices at each province making the data collection extremely complicated due to large number of provinces in Indonesia. The national office would only serve enquiries from institutions requiring provincial level data.

[36] For economic indicators, I also use data from 2003 and 2004. I do not use data from more recent years given the unavailability of *actual* data (not preliminary figures) of economic indicators. I discuss possible econometric problems and solutions to this short period data problem in the next sub-section.

The provincial average of national examination scores data are classified into two aspects: (1) whether the school is an Islamic, MTS or regular school (including non-Muslims schools); (2) whether the status of the school is public (*negeri*) or private (*swasta*). Hence the inequality indices can be measured to see differences in quality across provinces and across types of schools. I analyse within and between inequality indices considering these aspects. Here, I focus on two issues. First, I discuss the within and between inequality index comparison and see which inequality affects the overall index more significantly. Given that the three indices are decomposable and the provinces grouping are mutually exclusive, the sum of within and between indices equals to the total inequality. Second, I look at the correlation between indices and how it can affect my analysis.

Table 3-5. Public and Private School's Inequality of Education Quality

NOTE:

This table is included on page 71
of the print copy of the thesis held in
the University of Adelaide Library.

Source: Ministry of National Education (2008).
Note: GINI, A and GE refers to the Gini coefficient, the Atkinson index and the Generalized Entropy index respectively. Data are from 24 provinces
in 2003 and 2004 excluding Bengkulu, DKIJ, KALBAR, SULUT, NTB and PAPUA. "%Within" and "%Between" refer to the within and between
inequality indices respectively as a percentage of Total inequality. "Growth of within inequality" refers to the percentage growth of within inequality,
while "Growth of %Within" refers to the percentage growth of %Within.

Table 3-6. Public School's Inequality of Education Quality

NOTE:
This table is included on page 72
of the print copy of the thesis held in
the University of Adelaide Library.

Source: Ministry of National Education (2008).
Note: GINI, A and GE refers to the Gini coefficient, the Atkinson index and the Generalized Entropy index respectively. Data are from 24 provinces in 2003 and 2004 excluding Bengkulu, DKIJ, KALBAR, SULUT, NTB and PAPUA. "%Within" and "%Between" refer to the within and between inequality indices respectively as a percentage of Total inequality. "Growth of within inequality" refers to the percentage growth of within inequality, while "Growth of %Within" refers to the percentage growth of %Within.

Table 3-7. Private School's Inequality of Education Quality

NOTE:
This table is included on page 73
of the print copy of the thesis held in
the University of Adelaide Library.

Source: Ministry of National Education (2008).
Note: GINI, A and GE refers to the Gini coefficient, the Atkinson index and the Generalized Entropy index respectively. Data are from 24 provinces in 2003 and 2004 excluding Bengkulu, DKIJ, KALBAR, SULUT, NTB and PAPUA. "%Within" and "%Between" refer to the within and between inequality indices respectively as a percentage of Total inequality. "Growth of within inequality" refers to the percentage growth of within inequality, while "Growth of %Within" refers to the percentage growth of %Within.

3.2.2.1 The Inequality Index: Public
versus Private Schools

Table 3-5, Table 3-6, and Table 3-7 present the inequality index of educational quality of all types of schools, public schools and private schools respectively. As the Gini coefficients are bigger than other indices, these patterns can be easily seen from column (3). Note that those indices are proportional. Hence the inequality's rank order is maintained. I present the summary as follows:

Table 3-8. Total Inequality

Types of schools	Initial Inequality (in 2003)			The rate of growth		
	All	Public	Private	All	Public	Private
SMP	0.0422	0.0493	0.0396	-6.2%	-12.3%	-9.1%
MTS	0.0315	0.0366	0.0334	21.8%	19.2%	21.0%

Firstly, for both SMP and MTS, it is quite striking to find that inequality between public schools was indeed higher than inequality between private schools. My second observation is that MTS schools started with lower educational quality inequality than SMP's inequality. The initial difference in 2003 was quite substantial having MTS' inequality 1.3 times greater than SMP's inequality. But both types of schools ended up with almost a similar magnitude of inequality in 2004; SMP's inequality is 0.0396 and MTS' inequality is 0.0384. This was driven by a rapid increase in inequality of MTS by 21.8%, while SMP's inequality decreased by 6.2%. The percentage increases of total inequality in MTS schools were similar between public and private schools, 19.2% and 21% respectively. For SMP schools, the percentage decreases were more significant across public schools (12.3%) compared to 9.1% in private schools.

The result from inequality calculations here is of course quite an alarming fact given the ambitious target that the Indonesian government currently attempts to achieve. In recent years, Indonesia has made significant progress in meeting the Millennium Development Goals targets in education. Primary school enrolment rates have reached more than 90 per cent with no evidence of gender discrimination. The Indonesian Government's priority now aims to improve quality at all levels, and to achieve universal access to junior secondary education. Given the importance of education in economic growth, this progress is surely promising for the country's improved economic development in the

coming years. But the fact that public schools, where the involvement of the government is at the optimum level relative to private schools, performed unequally across provinces raises a question on the cost of rapid expansion in the quantity of education. Potentially, as suggested by the index measured above, increases in the quantity of education were not balanced by equal improvement in the quality of education across provinces.

Table 3-9. Percentages of the Between-province Inequality Index

Types of schools	Initial Inequality (in 2003)			The rate of growth		
	All	Public	Private	All	Public	Private
SMP	72%	69%	59%	-16.3%	-19.2%	-42.4%
MTS	45%	48%	40%	19.3%	3.4%	32.0%

Notes: Based on the Atkinson (0.5) index; total percentages of between and within province indices are 100%.

Table 3-5, Table 3-6, and Table 3-7 also show decomposition of the inequality index into the between-province and within-province inequality index. Table 3-9 provides the summary. I obtain mixed results across types of schools. For SMP schools, in 2003 the total inequality was largely contributed to by the between-province inequality comprising over 70% of total inequality. The percentage of the between-province inequality was more evident across public schools. The year 2004 became the turning point of change in the between-province inequality across SMP private schools. A significant reduction in between-province inequality by 16.3% and constant within inequality yielded a much lower percentage of the between-inequality from 59% to 34% of total inequality.

For MTS schools, the between-province inequality counts towards half of the total inequality. In 2004, a 19.3% increase in percentages of between-province inequality lead to increases in between-province inequality from 45% to 54%. Hence, there is no sign of improved equality of quality of MTS schools across provinces. The increase in between-province inequality is more substantial among private schools, turning the between-province inequality from 40% to 52% of total inequality.

Relating the findings to decentralisation in education provides an indication of different patterns of inequality growth across public SMP and MTS schools. Looking at the role of

government, we can see that between 2003 and 2004 the Indonesian government had successfully improved equality of educational quality across public SMP schools. This finding shows that some regional or local governments, who now bear more responsibility in education services and whose academic outcomes were initially low, were catching up to more advanced provinces reducing the gap in their academic performance. However, this success story was not true for MTS schools. Although it is only a 3.4% increase in between-province inequality across public MTS schools, the between inequality remained large across provinces. An important question lies on whether there is discrimination from local governments in providing education services to different types of schools. Unfortunately this question is beyond the scope of the present study. The good aspect about increases in the proportion of between-province inequality of public MTS schools, however, is consequently the decrease in the proportion of within-province inequality. This is also probably due to more involvement of local governments. Instead of being competitive to other regions, the local governments might indeed focus on increasing equality of quality education within their areas.

3.2.2.2 Correlation between Indices and its Implication

So far, I base my analysis on the Gini coefficient. It is interesting to see how the index correlates to other inequality indices. For this purpose, I use descriptive analysis as shown by Figures 3-1, 3-2 and 3-3. Note that each graph consists of data from two periods, ie 2003 and 2004.

All figures show that there is a difference in correlation between the Gini coefficient and the other two indices. It is clear that the choice of parameter a to calculate the Generalized Entropy index $GE(a)$, whether it is $-1, 0, 1$ or 2, does *not* significantly affects its form of relationship with the Gini coefficient. The relationship is close to quadratic.

On the other hand, the choice of parameter τ to calculate the Atkinson index $A(\tau)$, whether it is $0.5, 1$ or 2, does significantly affect its form of relationship with the Gini coefficient. The Atkinson index with a higher value of parameter τ responds more aggressively for a unit change in the Gini coefficient than those with lower values of τ.

Phrased alternatively, I confirm results by Harvey (2005) who suggests that as parameter τ goes close to zero there is an almost perfect correlation between the Gini coefficient and the Atkinson index. The importance of looking at the difference in calculation results using various indices is due to its implication on how we interpret rate of growth by using different indices. Referring back to Table 3-5, Table 3-6 and Table 3-7, we can see that the rate of change varies significantly across indices. Compared to the growth rate of the Gini coefficient, growth rates of Atkinson and GE indices can be up to 5 times bigger. This of course may lead us to a wrong interpretation when we only use one index.

Let us take inequality of private MTS as an example. If I only measured the Gini index, I would conclude that the educational quality inequality for SMP decreased by 6.2 %. But if I used the GE(-1) index, I would argue that the inequality decreased by 37.7%. In terms of percentages, the reduction is definitely far from negligible. These two different results can leave the researcher in confusion as to whether or not there has been reduction in the educational quality inequality.

A visible pattern in Table 3-5, Table 3-6 and Table 3-7 is that the Atkinson and the GE indices tend to have similar rates of growth compared to the Gini index. But the difference between the two indices is while higher parameter a for $GE(a)$ index magnifies the growth rate, higher parameter τ for the Atkinson index $A(\tau)$ shrinks the growth rate. Furthermore, given that the Atkinson index is more sensitive to the *lower end* of the distribution as the parameter τ rises and the Gini coefficient puts more weight on the surrounding *mode* of the distribution, the results implicitly indicate that between 2003 and 2004 changes in the national examination score were closer to the lower end of the distribution rather than to the surrounding mode of the distribution.

Figure 3-4 supports the above remark. For both types of education, it is clear that the lower bounds of the distribution increased in 2004, while the upper bounds were relatively unchanged. The increase was more evident for SMP scores.

Relating the above argument to the calculation of the inequality index in the previous section suggests a more specific source of decreasing gap of the quality of SMP scores. In short, lower SMP's inequality is due to catching up of low performers to high performers. This might be due to a higher contribution by local governments especially in the region where average academic outcome was low.

Although the above results can give insight to how educational quality varied across types of education and provinces, it is important, however, to note that the educational quality inequality calculated using national exam scores is lower than educational inequality index calculated using average of schooling years as shown by Table 3-10. The index is indeed much smaller than income inequality index in Table 3-11. It is then interesting to find what factors affect each of these indices and how they all correlate to each other controlling for other factors. This is the focus of the next section.

Figure 3-1. Gini-GE and Gini-Atkinson's Correlation – SMP and MTS
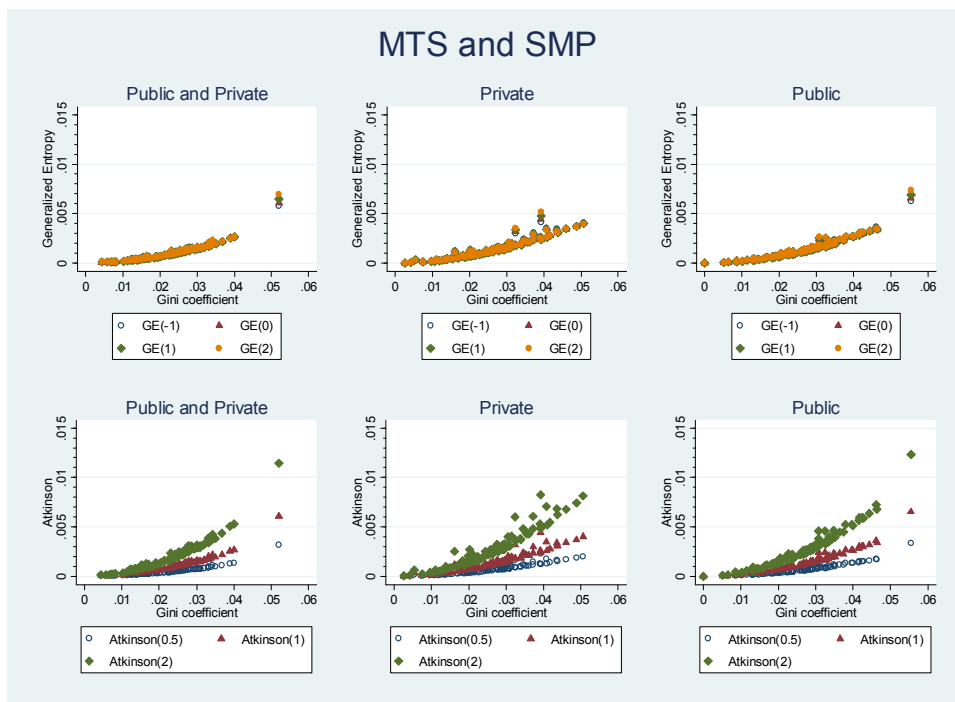
Notes: Data are from 24 provinces in 2003 and 2004 excluding Bengkulu, DKIJ, KALBAR, SULUT, NTB and PAPUA.

Figure 3-2. Gini-GE and Gini-Atkinson's Correlation – SMP
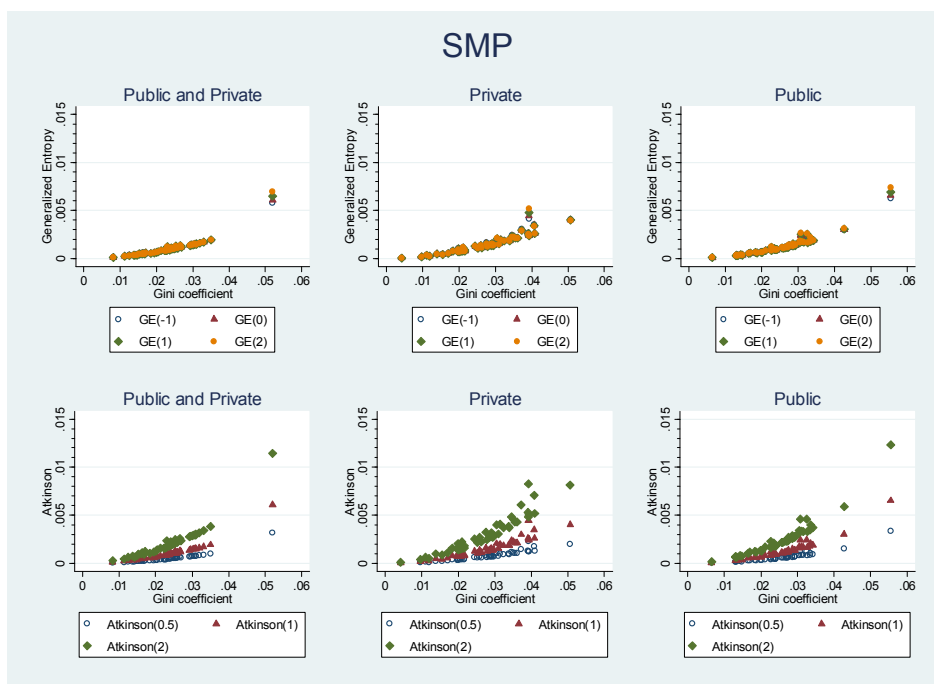
Notes: Data are from 24 provinces in 2003 and 2004 excluding Bengkulu, DKIJ, KALBAR, SULUT, NTB and PAPUA.

Figure 3-3. Gini-GE and Gini-Atkinson's Correlation - MTS
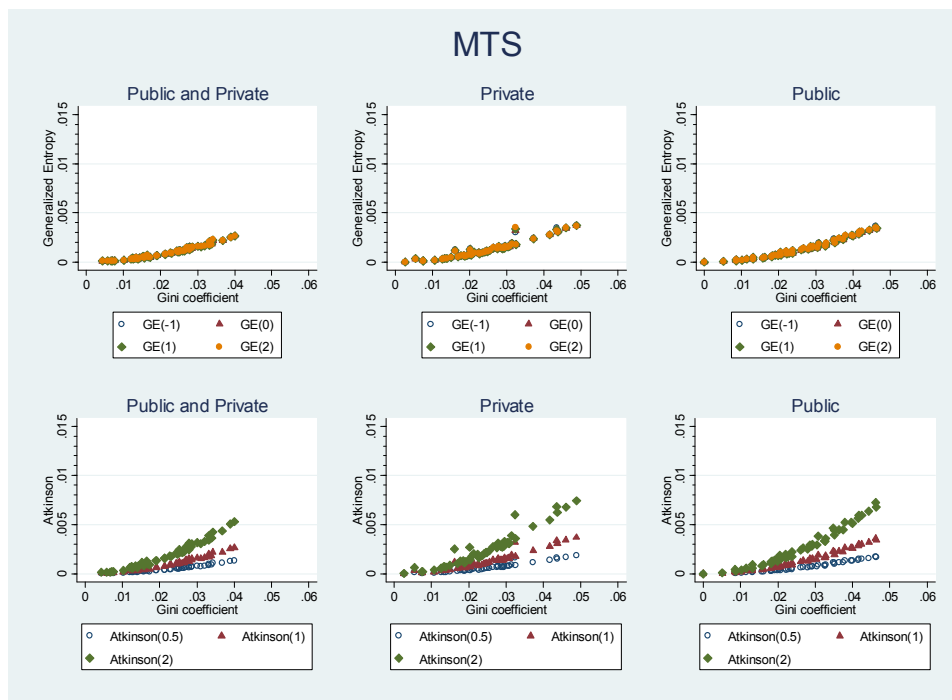
Notes: Data are from 24 provinces in 2003 and 2004 excluding Bengkulu, DKIJ, KALBAR, SULUT, NTB and PAPUA.

Figure 3-4. The Distribution of Exam Scores
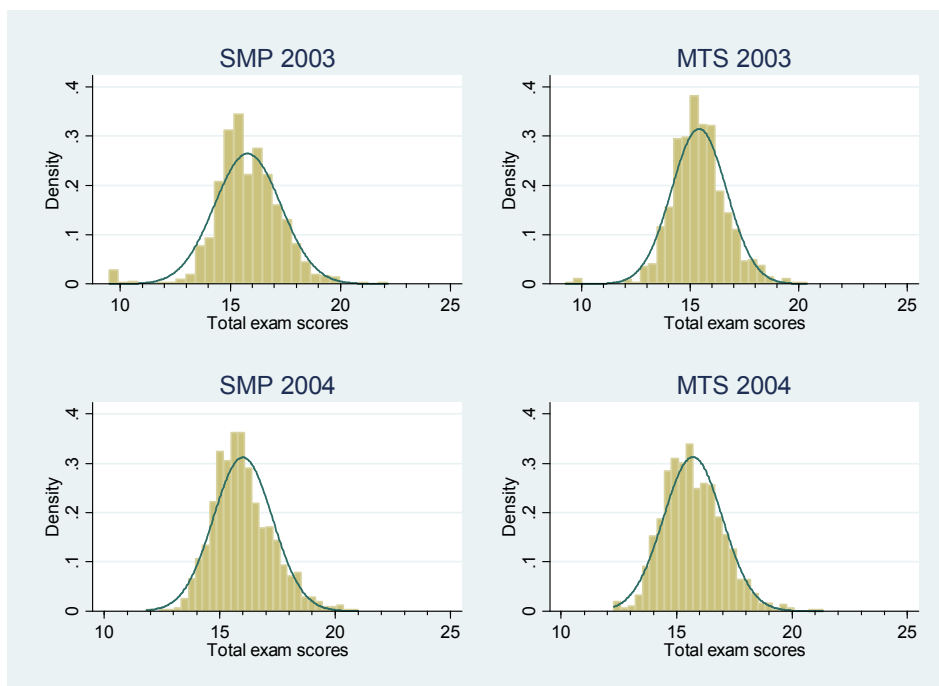
Notes: Data are from 24 provinces in 2003 and 2004 excluding Bengkulu, DKIJ, KALBAR, SULUT, NTB and PAPUA.

Table 3-10. Overall Schooling Year Inequality Index (2002-2005)

Inequality index	2002	2003	2004	2005	2002-2005
GINI	0.064	0.066	0.063	0.059	-7.57
ATKINSON(0.5)	0.004	0.004	0.003	0.003	-16.87
ATKINSON(2)	0.014	0.014	0.013	0.011	-15.56
ATKINSON(1)	0.007	0.007	0.007	0.006	-16.42
GE(-1)	0.007	0.007	0.006	0.006	-15.74
GE(0)	0.007	0.007	0.007	0.006	-16.47
GE(1)	0.007	0.008	0.007	0.006	-17.34
GE(2)	0.008	0.008	0.007	0.006	-18.37

Notes: Data are from 24 provinces in 2003 and 2004 excluding Bengkulu, DKIJ, KALBAR, SULUT, NTB and PAPUA.

Table 3-11. Overall Income Inequality Index (2002-2005)

Inequality index	2002	2003	2004	2005	2002-2005
GINI	0.312	0.299	0.294	0.297	-4.55
ATKINSON(0.5)	0.100	0.093	0.092	0.094	-6.07
ATKINSON(2)	0.251	0.235	0.231	0.237	-5.39
ATKINSON(1)	0.167	0.156	0.154	0.157	-6.05
GE(-1)	0.167	0.154	0.150	0.156	-7.07
GE(0)	0.183	0.170	0.167	0.171	-6.60
GE(1)	0.239	0.225	0.223	0.225	-5.81
GE(2)	0.380	0.363	0.364	0.360	-5.04

Notes: Data are from 24 provinces in 2003 and 2004 excluding Bengkulu, DKIJ, KALBAR, SULUT, NTB and PAPUA.

3.3 The Quantity of Education and Economic Growth

In the previous section, I have shown results from calculation of inequality of education quality. But before I go in to the analysis of the role of inequality of education quality in regional economic growth, it might be important to perform a standard growth analysis where average of schooling years is used as a proxy for education quantity. At this point, I ignore the possibility of different rates of return to religious and non-religious education.

Following previous growth studies (Barro 2001; Resosudarmo and Vidyattama 2006), I estimate the aggregate production function based on the following reduced-form model using the average of schooling years as a proxy for human capital:

$$dY_{jt} = \beta_0 + \beta_1 Y_{jt-1} + \beta_2 School_{jt} + \beta_3 X_{jt} + \alpha_j + \gamma_t + \varepsilon_{jt} \qquad \textbf{3-1}$$

The dependent variable is the annual growth rate in GDP per capita. Y_{jt-1} refers to the average of annual income per capita in previous period.[37] I also include the square form of this variable. Variable *School* refers to the regional average of schooling years. Vector X is included to control time-varying provincial characteristics. α_j and γ_t indicate province-specific and time-specific effects respectively.

As estimation methods, I compare various panel data analysis including fixed effect (FE), random effect (RE) and OLS estimation results. It is likely that the OLS is inconsistent given the correlation between right hand side variables and the error term. The key point in choosing between FE and RE panel models is on the assumption on the time-invariant province-specific effect (α_j). In the absence of dummy α_j, the RE model assumes that the error term ε'_{jt}, where $\varepsilon'_{jt} = \alpha_j + \varepsilon_{jt}$, is not correlated with the explanatory variables X_{jt}. This would mean that we must be a hundred percent sure that there is no omitted variable bias or other misspecification problem in the model. With limited data available at the provincial level, such assumption is very strong. Consider

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[37] In economic growth studies, a negative coefficient of lagged income implies that there exists convergence across provinces (or countries for cross-country studies). But given the short period covered by the data, this issue is not the focus of this study.

time-invariant province effect such as culture, work ethic, language etc. These factors are likely to be associated with average schooling years but unobservable (or not available) at the provincial level. With the FE model, variable α_i absorbs variation in all of these factors. With the RE model, failing to add them into the model will cause inconsistent estimates. Unless variance of the error term in Equation (1) (σ_ε^2) is much smaller than variance of the country specific effect (σ_α^2), the OLS model will yield similar results to the RE model though the standard error will be different.

Table 3-12 presents the basic results. The comparison of three methods, namely FE, RE and OLS evidently shows that choosing the right method is crucial especially in a study using a limited number of observations. In general, OLS and RE estimates in columns (1) and (3) present similar results. But these two models have different estimates on most coefficients from the FE model.[38] The Heckman test concludes that the fixed effect panel model in column (2) is preferred. This model can explain the biggest proportion of variation in the dependent variable as indicated by the coefficient of determinant (R^2). I therefore conclude that the FE model in column (2) best estimates the data.

Based on the FE model, at 5% level of significance, one year increase in year of schooling is associated with 0.181 percentage points increases in the growth rate of income per capita.[39] By far the quantity of education seems to be important growth factors. Note that the inclusion of variables in vector X is to control variation in regional characteristics that may vary over time and might be correlated with the education measure. Hence, excluding these variables will potentially cause omitted variable bias.[40] But the inclusion of these variables also helps interpretation of the coefficient for

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[38] The only consistent result across the three models is the significance of the population rate of growth.

[39] Regarding other important growth factors, similar to Resosudarmo and Vidyattama (2006) who uses Indonesian provincial data for 1993-2002, I find a negative significant coefficient for Lagged (Natural log of) Real GDP per capita but with higher magnitude (-0.878 compared to -0.592). But unlike Resosudarmo and Vidyattama (2006), I find insignificant effect of variable openness in this model. In contrast, one unit increase in capital-income ratio and the population rate of growth are associated with 1.966 and 1.199 percentage points decreases in the growth rate of income per capita respectively. The negative significant coefficient of investment ratio might be puzzling. But using simple graphical analysis, Figure 3-5 shows that the inclusion of two provinces, ie NAD and Papua to the samples seems to be the reason for this negative coefficient. Excluding those two provinces, the association between investment ratio and income growth is insignificant controlling for other factors. Table 3-13 shows that excluding NAD and Papua from the samples only weakens the significance of the investment ratio. Other variables, although there is slight variation in the magnitude, have no change in the level of their significance. On this basis, I still include NAD and Papua because without the exclusion we already have relatively small sample size and our interest in on educational aspects.

[40] Even if we include both province-fixed effects and time-fixed effects, we may still have omitted variable bias from excluded variables which vary across provinces *and* over time (and are determinants of the dependent variable and correlated with the independent variable of interest).

variable *School*. Let us take variable *Capital / GDP* as an example. A province with high investment in the education sector might have a higher investment ratio. This will in turn improve schooling. By including the variable, the model limits the interpretation of the positive coefficient for *School* as unit increases in income per capita growth associated with one unit increase in schooling *not* due to higher investment. Also controlling other variables such as population growth, openness and initial level of income per capita, one may re-interpret the coefficient for *School* as unit increases in income per capita growth associated with one unit increase in schooling holding investment ratio, population growth, openness, and other time-invariant province-specific effects constant.

Since it is not my interest in this chapter to study which factor exactly stimulates progress in education, the policy implication of results from excercising this growth analysis is as follow. If the coefficient for *School* is significant, any change, policy or program (without necessarily change the investment ratio, openness, population, the income level) that can keep students longer at school will contribute to economic growth. Two examples of programs that might fit into this criterion are: (1) increased homework (for example reading tasks to improve literacy so a student's probability of passing the exam increases); (2) imposing (optimum) minimum age of entry to primary schools.[41] Of course, how effective these programs to improve schooling are beyond the scope of this present study.

Note that at this stage, we assume the quality of education plays no important role in this process. So the next question would be whether keeping students longer at school, or the quality they accumulated from schooling matters, for income growth.

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[41] A seminal work on age of entry to school is by Angrist and Krueger (1992). Note that the minimum age must be well examined. While being too young can be negatively associated with academic performance, Byrd and Weitzman (1997) find that being old-for-grade is associated with increases in rates of behaviour problems.

Table 3-12. Growth Regression [Basic Results]

Dependent variable = Growth rate of real GDP per capita	OLS (1)	FE (2)	RE (3)
Lagged (Natural log of) Real GDP per capita	-0.027	-0.878***	-0.031
	(-1.466)	(-5.754)	(-1.319)
Capital/GDP	0.068	-1.966*	0.03
	(0.728)	(-2.210)	(0.241)
Openness	0.02	0.054	0.023
	(0.635)	(0.437)	(0.570)
Population rate of growth	-1.661***	-1.199***	-1.721***
	(-3.950)	(-8.815)	(-4.349)
Lagged years of schooling	**-0.001**	**0.181****	**-0.001**
	(-0.100)	(3.280)	(-0.026)
Constant	0.454*	12.694***	0.522
	(2.000)	(5.830)	(1.854)
F-stat	6.385	24.196	
R2-within		0.863	0.69
R2-between		0	0.427
R2-overall		0.028	0.624
R2	0.625	0.863	
No. observations	86	86	86

Note: For all columns, t-statistics are in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively. Estimation method is the OLS, FE and RE method for Column (1), (2) and (3), respectively..

Figure 3-5. Investment Ratio and Income Growth Rate
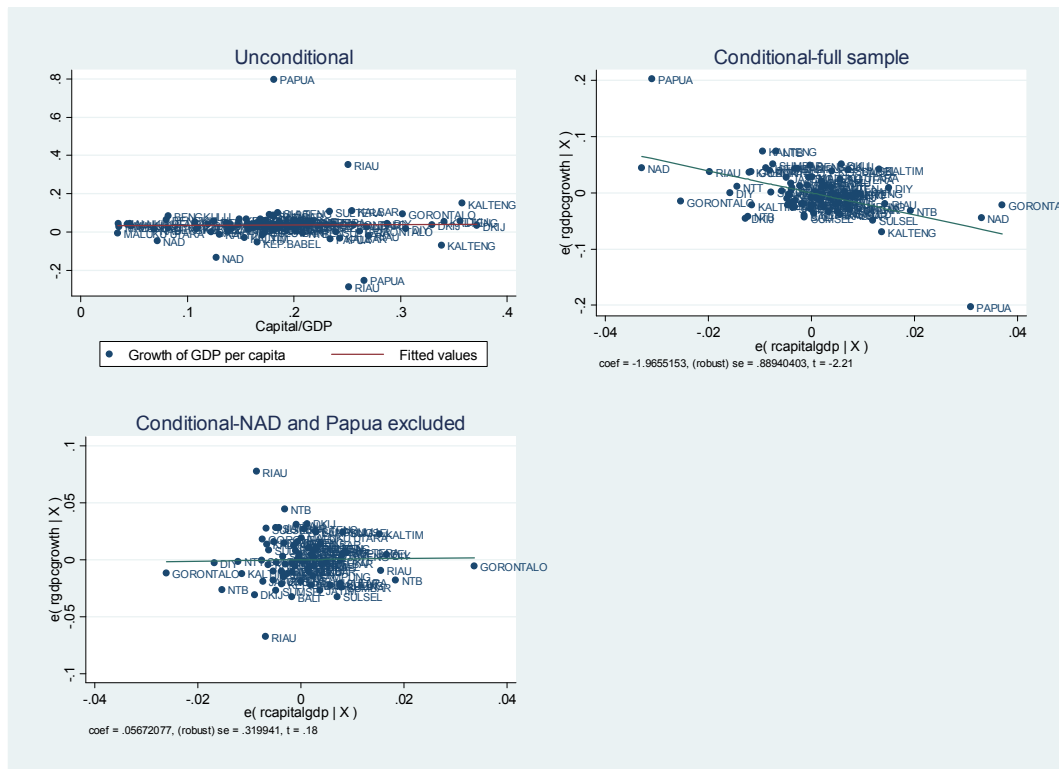
Table 3-13. Growth Regression [NAD and Papua excluded]

Dependent variable = Growth rate of real GDP per capita	Full-sample (1)	Excluding NAD and Papua (2)
Lagged (Natural log of) Real GDP per capita	-0.878***	-0.612**
	(-5.754)	(-3.343)
Capital/GDP	-1.966*	0.057
	(-2.210)	(0.177)
Openness	0.054	-0.029
	(0.437)	(-0.377)
Population rate of growth	-1.199***	-0.980***
	(-8.815)	(-7.201)
Lagged years of schooling	**0.181****	**0.099****
	(3.280)	(2.892)
Constant	12.706***	9.828**
	(5.851)	(3.349)
F-stat	6.308	7.167
R2	0.884	0.89
No. observations	86	82

Note: For all columns, t-statistics are in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively. Estimation method is the FE method.

Figure 3-6. Average of Schooling Years (2003-2005)
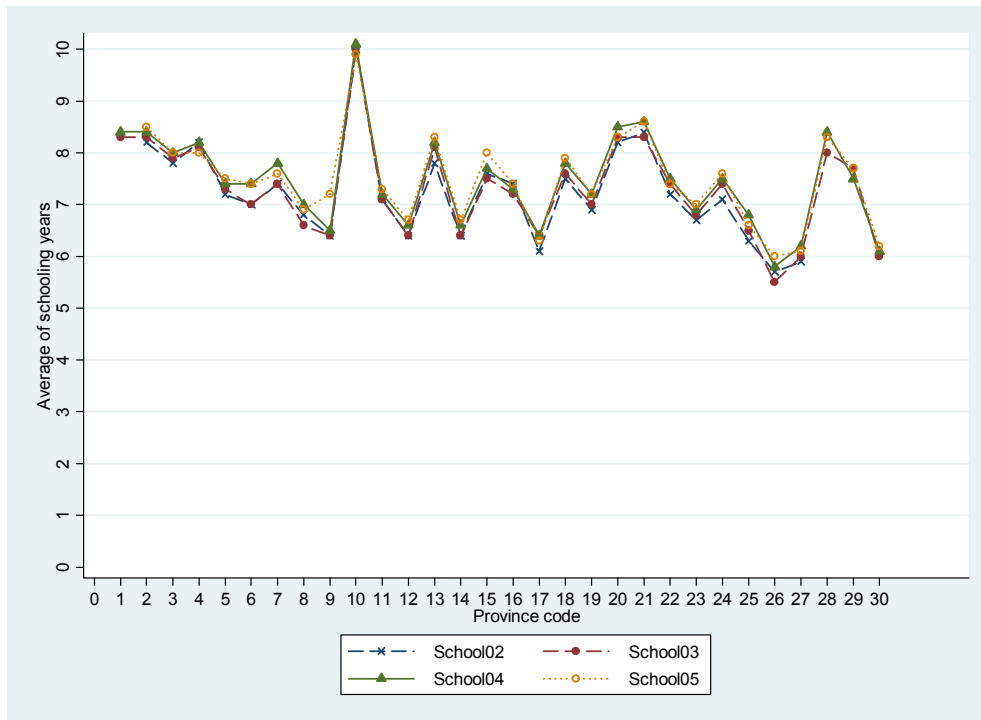
Note: Province code refers to Table 3-4.

Figure 3-7. Income per Capita and Income Growth [By Province]
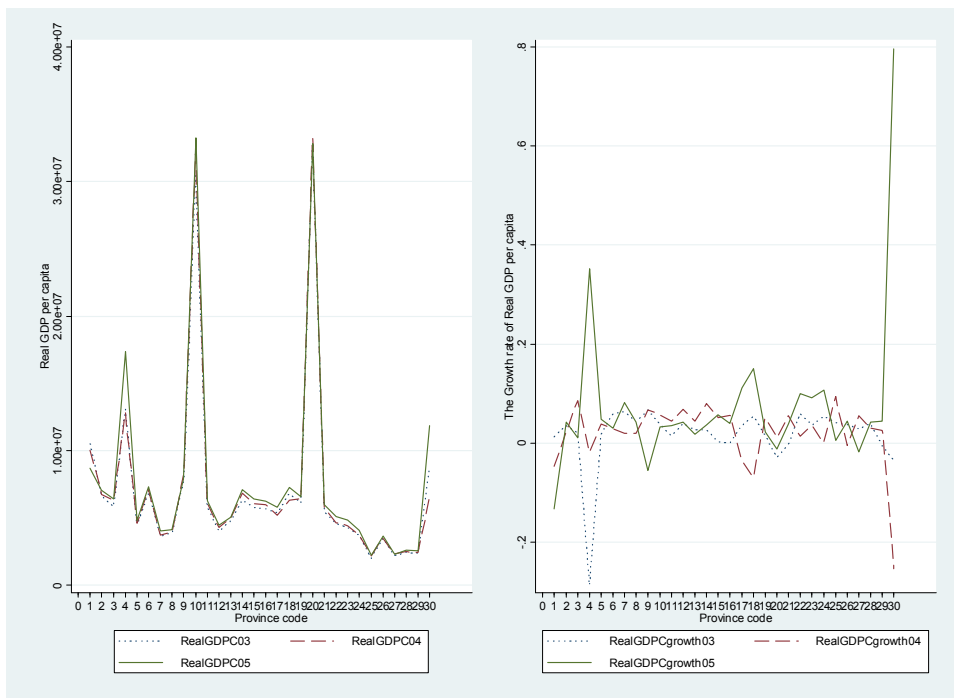
Note: Province code refers to Table 3-4.

Figure 3-8. MTS and SMP Exam scores (By Province)
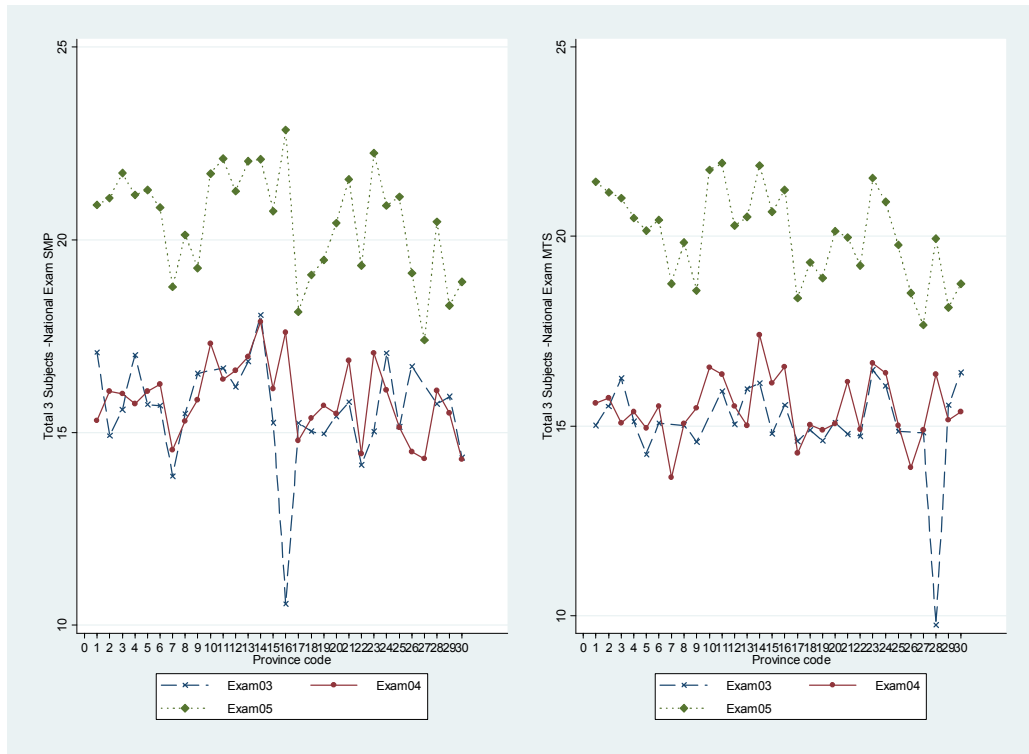
Note: Province code refers to Table 3-4.

Table 3-14. Growth Regression [Quality of Education Included]

Dependent variable= The growth rate of real GDP per capita

	Subjects				Subjects			
	Total	Math	English	Bahasa	Total	Math	English	Bahasa
Lagged (Natural log of) Real GDP per capita	-0.977***	-0.968***	-0.984***	-0.961***	-0.963***	-0.955***	-0.969***	-0.951***
	(-6.304)	(-6.299)	(-6.323)	(-6.326)	(-6.319)	(-6.315)	(-6.335)	(-6.327)
Capital/GDP	-2.172*	-2.171*	-2.188*	-2.153*	-2.210*	-2.210*	-2.219*	-2.189*
	(-2.356)	(-2.352)	(-2.376)	(-2.348)	(-2.365)	(-2.365)	(-2.381)	(-2.356)
Openness	-0.01	-0.018	-0.007	-0.012	-0.023	-0.031	-0.02	-0.023
	(-0.148)	(-0.270)	(-0.100)	(-0.167)	(-0.356)	(-0.496)	(-0.291)	(-0.322)
Population rate of growth	-1.042***	-1.051***	-1.046***	-1.056***	-1.057***	-1.065***	-1.061***	-1.068***
	(-7.587)	(-7.706)	(-7.830)	(-7.657)	(-7.587)	(-7.746)	(-7.804)	(-7.598)
Lagged years of schooling	**0.106**	**0.112***	**0.110***	**0.114**	**0.098**	**0.104**	**0.102**	**0.105**
	-1.933	-2.075	-2.051	-1.947	**(1.685)**	**(1.845)**	**(1.819)**	**(1.691)**
Exam scores of Subject	**0.007***	**0.020***	**0.022***	**0.018***				
	-2.859	-2.934	-2.91	-2.418				
Lagged years of schooling x Exam scores					**0.001***	**0.002***	**0.003***	**0.002***
					(2.703)	**(2.838)**	**(2.757)**	**(2.289)**
Constant	14.723***	14.565***	14.807***	14.430***	14.595***	14.440***	14.656***	14.364***
	-6.251	-6.27	-6.294	-6.233	(6.260)	(6.288)	(6.297)	(6.226)
F-stat	23.819	24.135	24.068	22.09	24.783	25.114	25.302	22.883
R2-within	0.885	0.885	0.885	0.883	0.885	0.885	0.884	0.883
R2-between	0.001	0.001	0.001	0.001	0.001	0	0.001	0
R2-overall	0.027	0.027	0.026	0.027	0.027	0.027	0.026	0.027
R2	0.885	0.885	0.885	0.883	0.885	0.885	0.884	0.883
No. observations	85	85	85	85	85	85	85	85

Note: For all columns, t-statistics are in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively. Estimation method is the FE method.

3.4 The Quality of Education and Economic Growth

The first set of empirical results measures human capital by the quantity of education, in the sense of the value at the start of each period of the years of school attainment of a population group aged 15 and older. The graphical analysis in Figure 3-6 shows that provinces seemed to have similar rates of growth in the quantity of education as measured by average years of schooling in 2003-2005. I also find that the relative level of income per capita, as shown by the first panel of Figure 3-7, was maintained between 2003 and 2005. But when it comes to the relative provincial rank in the rate of income growth as shown by the second panel of Figure 3-7, variation in changes in growth rates looks evident. A potential determinant of income growth I want to test in the following empirical analysis is the quality of education. Unlike years of schooling, variation in change of exam scores across countries is more evident as shown by Figure 3-8. The hypothesis to be tested is whether variation in the schooling quality contributes to variation in income growth rates controlling other factors.

I estimate the following reduced form model:

$$dY_{jt} = \beta_0 + \beta_1 Y_{jt-1} + \beta_2 School_{jt} + \beta_3 Exam_{jt} + \beta_4 X_{jt} + \alpha_j + \gamma_t + \varepsilon_{jt} \qquad \textbf{3-2}$$

Where $Exam_{jt}$ is the average exam scores of province j at period t. I test four different exam scores: total scores, Mathematics, English and Indonesian language (*Bahasa*).

Table 3-14 presents the results of the inclusion of the quality of education. I use the fixed effect method in all columns. The first column uses total exam scores as the proxy of the quality of education. The second, third and fourth columns use Mathematic, English and Indonesian (*Bahasa*) exam scores respectively. I find that the inclusion of the quality of education variable improves the goodness of fit but not as much as jump in adjusted R^2 reported by previous studies for example Behrman and Birdsall (1983) who find the inclusion of quality variable boosts the adjusted R^2 from 0.33 to 0.73. The coefficient for exam scores suggests that one unit increase in total exam score is significantly associated with 0.007 percentage points increases in growth of income per capita.

One important result from Table 3-14 is that compared to column (2) of Table 3-12 the magnitude and the significance of coefficient for lagged years of schooling weakens although it is still statistically significant at 5% level of significance using some proxies. Similar to the study, Hanushek and Wobmann (2007) who use international cognitive achievement tests from 50 countries also find that the inclusion of the quality of education weakens the effect of the quantity of education. The weakening importance of the quantity of education implies that in general it is more effective to close the economic gap between provinces by improving the quality of education rather than the quantity of education. But this must be interpreted carefully.

First, the coefficient for the quantity of schooling suggests that one-standard deviation increase in years of schooling is associated with 0.1 percentage increase in income per capita growth. This is up to 6 times higher than increases in income per capita growth associated with one-standard deviation increase in the quality of education. The results suggest that with relatively small variation in quality across provinces, increases in years of school participation, where variation across provinces is quite substantial, is still important. Secondly, the above interpretation saying that improving quality is more important is limited to models using Indonesian language exam scores as a proxy for labour force quality in column (4) of Table 3-14. Models using Maths and Science as quality proxies in columns (2) and (3) of Table 3-14 do have significant coefficients for the quantity of education. The following are some possible explanations. First, literacy skills as indicated by Indonesian language exam scores are basic skills such that the level of literacy skills is proportional to the level of education. Hence, variation in literacy skills is similar to variation in years of school participation. Once we control for literacy skills, differences in years of schooling are no longer significant for explaining differences in income per capita growth. On the other hand, as the second possible explanation, differences in Maths and Science abilities might not be only accounted by differences in level of schooling. Once we control for Maths and English abilities, variation in income per capita growth due to variation in schooling is still left—perhaps from more basic skills such as literacy. But it is important to note that the difference in the significance of the year of schooling variable across columns in Table 3-14 is quite small. The coefficients in columns (1) and (4) are both significant at 6%.

Of three exam subjects being observed, holding other factors constant the results show that English and Maths subjects have a stronger association with income per capita than

the Indonesian subject. One unit increase in English, Mathematics and Indonesian subjects are associated with 0.022, 0.020 and 0.018 percentage point increases in growth of income per capita. This result is not surprising. A province whose population has good English proficiency is normally the one which engages more with the international market. This kind of province most likely has high foreign direct investment and, consequently, high demands for employees with a good command of English. In its turn, this leads to a positive association between English proficiency and growth of income per capita. As for Maths, the reason for its strong correlation with income per capita might because Maths skills reflect a primary component of human capital relevant to labour force as suggested by Hanushek and Kimko (2000). But in general, all proxies show similar rates of return to the quality of education.

Based on columns (5)-(8) of Table 3-14, the significant coefficients for the interaction term between lagged years of schooling and exam scores indicate that the relationship between income per capita growth and years of schooling differs between provinces with different qualities of education. I do not include the quality of education variable so as to avoid severe multi-collinearity between the quality variable and the interaction term. Also, it is much more logical to include years of schooling and drop the quality variable rather than do the opposite. The overall results again emphasise the importance of the quality of education and years of school participation only matters if it is equipped with improved quality.

On the robustness check, compared to the FE model in column (2) of the inclusion of the quality of education slightly changes the magnitude of some variables. But it does not change the interpretation of other variables. The inclusion magnifies the coefficient for lagged income per capita from -0.775 to more than -0.95. Predicted effects of initial income per capita levels on income per capita growth in developed provinces would have been higher if variation in the quality of education would not have been controlled. But a possible multi-collinearity between lagged income per capita and the quality of education does not affect the significance of other variables. With similar magnitude with those in column (2) of Table 3-12, I also find significant effects of capital-income ratio and population rate of growth at 5% level of significance in all columns of Table 3-14.

Overall, the results show that the quality-inclusive specification is preferred. The study confirms that standard analysis which does not take into account the quality of schooling would cause upward bias as suggested by previous studies (Behrman and Birdsall 1983;

Pritchett 1996; Hanushek and Woessmann 2007). I find that the social marginal effect of years of schooling is only two-thirds the estimate using standard analysis. Nevertheless, the relative importance of the quantity of education is still evident. Although, I find that the quality of education is important for Indonesian provincial income per capita growth but its importance is to a lesser extent than what has been suggested by previous studies.

3.5 Religious Versus Non-religious Human Capital

3.5.1 Decomposition of Human Capital Stock

After analysing the quality as well as quantity aspects of education impacts on income per capita growth, I now bring up debate on whether there are different rates of return to education between religious and non-religious education. In this context the use of years of schooling must be reviewed.

One of the shortcomings of using the average of schooling years is it suggests homogenous rates of return across *types* of education. This contradicts results from previous studies which argue that there are significant differences between Islamic and non-Islamic school outcomes in terms of schooling and individual earnings (Bedi and Garg 2000; Newhouse and Beegle 2006). The problem is, to my knowledge, the Indonesian Statistics Agency has no information about the number of workers who were educated in Islamic schools. I can, however, look at the addition of Islamic school-educated human capital stock by decomposing the average of schooling years.[42] In short, while the use of average of schooling years ignores the wage differentials across levels and types of education, the decomposition allows us to see whether there exist different rates of return to new stock from Islamic and non-Islamic education.

I assume that human capital stocks accumulated from religious and non-religious education. I decompose the average of schooling year variable into four components: addition in attainment ratios of Islamic education, non-Islamic education, higher education, and existing human capital stock components.

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[42] Average years of schooling are the most common proxies for human capital stocks. This measure is motivated by the shortcomings from adult literacy rates and enrolment ratios. There have been various attempts to develop methods of measuring the average of schooling years Kyriacou (1991), Nehru (1995), Barro and Lee (1996). The most recent contribution is a revised method from Barro and Lee's (1996) method Barro and Lee (2001). In this study, I follow Barro and Lee's method but I impose some modifications. These modifications are also in response to some criticisms of their method.

I present details on how variable on years of schooling is decomposed as well as STATA programs to run the method in Appendix 3B. Here I provide the summary. Initially, according to Barro and Lee (2001) the schooling year in province j in year t can be stated as:

$$s_{jt} = \sum_{g=1}^{6} d_g h_{gjt} \qquad\qquad \text{3-3}$$

The attainment ratio h_{gt} shows the share of population aged over 15 who are in the workforce with g level as the highest level of education attained. The level of education g refers to no-schooling, completing primary education, junior secondary school (both vocational and general), senior secondary school (both vocational and general), diploma I and II, diploma III and university for g =0,1,2,3,4,5,6 respectively. The duration of each level of education is d_g =0, 6, 9, 12, 10.5, 13 and 16 years for g =0,1,2,3,4,5,6 respectively. Note that most studies, including Barro (2001), use the proportion of population aged over 15 to proxy the education attainments. But using the shares of workforce should provide better prediction on human capital stock contributing to the productivity.

As I cannot differentiate between the attainment of Islamic and non-Islamic education at the higher education level (ie diploma and above) and I do not have enough information on the stock of human capital graduating or ever attending religious education in the previous year, I must exclude higher education in the schooling year variable:

$$s'_{jt} = \sum_{g=1}^{3} d_g \Delta a_{g,s,j,t} \qquad\qquad \text{3-4}$$

The left-hand side variable could be interpreted as adjusted-changes in schooling years:

$$s'_{jt} = s_{jt} - (1 - (L16_t / L_t) s_{j,t-1} - (L19_t / L_t) \sum_{g=4}^{6} (d_g - d_4) Enroll_{gt} \qquad\qquad \text{3-5}$$

Where $L16_t, L19_t$ and L_t are number of people participating at the labour force aged between 16 and 19, aged between 19 and 24 and total labour force, respectively. $Enroll_{gt}$ is the enrolment rates of g level of education at period t. The variable

s'_{jt} therefore measures the changes in schooling years as a result of changes in the attainment ratios *excluding* contribution of higher education. The changes can be interpreted the addition of human capital stock in one year consisting of the proportion of population unable to continue their study to the next level. The right-hand side variables Δa can be measured using the following equation for each province and each type of education:

$$\Delta a_{gst} = \begin{cases} (L16_t / L_t) * (PRI_{st} - JSEC_{st}), g = 1 \\ (L16_t / L_t) * (JSEC_{st} - SSEC_{st}), g = 2 \\ (L16_t / L_t) * SSEC_{st}, g = 3 \end{cases} \qquad \textbf{3-6}$$

Where s is equal one for Islamic education and 0 otherwise. $PRI, JSEC, SSEC$ are enrolment rates of primary, junior secondary and senior secondary, respectively. Each variable is assessed for each type of education (s).

Putting the decomposed components of schooling years altogether in the right hand side of the equation provides:

$$s_{jt} = \underbrace{\left(6 * \Delta a_{11jt} + 9 * \Delta a_{31jt} + 12 * \Delta a_{31jt}\right)}_{Islam} + \underbrace{\left(6 * \Delta a_{12jt} + 9 * \Delta a_{32jt} + 12 * \Delta a_{32jt}\right)}_{Non-Islam} + \underbrace{(1 - (L16_t / L_t)s_{j,t-1}}_{Lagschool}$$

$$+ \underbrace{(L19_t / L_t)\sum_{g=4}^{6}(d_g - d_4)Enroll_{gt}}_{High}$$

Or, $s_{jt} = Islam_{jt} + Non - Islam_{jt} + Lagschool_{jt} + High_{jt}$ \qquad \textbf{3-7}

New stock from each sector of education is represented by variables " $Islam$ "and " $Non - Islam$ ".. Note that this new stock completed primary and (senior and junior) secondary education but did not enter university. " $Lag - school$ " variable indicates existing or old human capital stock. Lastly, " $High$ " variable measures additional human capital stock consisting those who completed diploma education and above (bachelor's degree, master and doctorate level). These right hand side variables can then be substitutes for average of schooling years in regional income regression. The limitation of this approach is that we cannot capture potential differences in the (long-term) effects of religious and non-religious education. There could be a case where non-religious education better equips its graduates to enter university or to be more competitive in the job market..

Figure 3-9. Correlation between Components of Years of Schooling
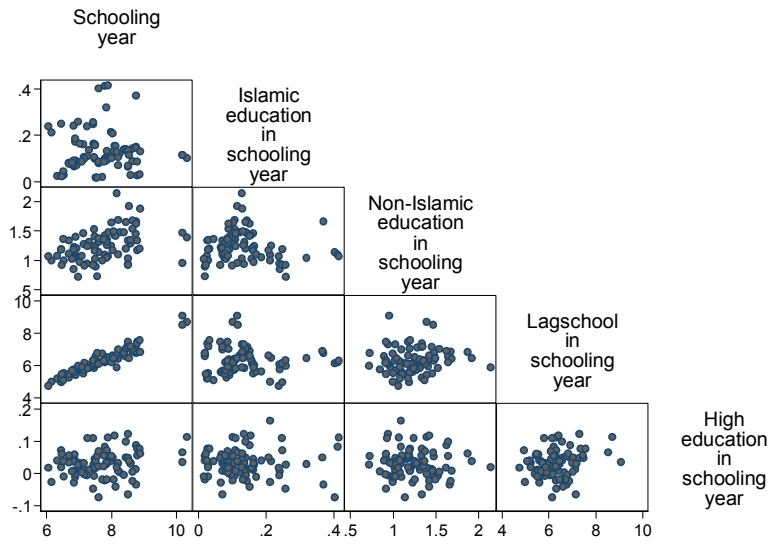
Table 3-15. Growth Regression [Decomposition of Schooling Variable]

Dependent variable = The growth rate of real GDP per capita	OLS (1)	FE (2)	RE (3)
	b/t	b/t	b/t
Capital/GDP	-0.038	-2.061	-0.043
	(-0.422)	(-1.918)	(-0.455)
Openness	-0.004	0.052	-0.004
	(-0.108)	(0.405)	(-0.101)
Population rate of growth	-1.640***	-1.205***	-1.645***
	(-4.067)	(-7.790)	(-4.110)
Lagged (Natural log of) Real GDP per capita	-0.019	-0.775***	-0.019
	(-1.086)	(-6.037)	(-1.089)
Islamic education in schooling year ($Islam$)	**-0.089**	**-0.026**	**-0.092**
	(-0.801)	(-0.190)	(-0.812)
Non-Islamic education in schooling year ($Non-Islam$)	**-0.04**	**-0.011**	**-0.042**
	(-1.485)	(-0.152)	(-1.513)
Lagschool in schooling year ($Lag-school$)	**0.003**	**0.145***	**0.004**
	(0.171)	(2.494)	(0.186)
High education in schooling year ($High$)	**0.178**	**0.061**	**0.179**
	(1.038)	(0.498)	(1.051)
Constant	0.389	11.547***	0.4
	(1.801)	(6.144)	(1.803)
F-stat	5.698	19.095	
R2-within		0.868	0.708
R2-between		0	0.462
R2-overall		0.034	0.657
R2	0.657	0.868	
No. observations	85	85	85

Note: For all columns, t-statistics are in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively. Estimation method is the FE method.

Figure 3-9 presents the correlation between components of years of schooling. Descriptively, $Lag - school$ component has the strongest correlation with the schooling year. Positive correlation between $Non - Islam$ and the year of schooling is evident. Correlation between $High$ and year of schooling also seems to be evident but at a less degree. Interestingly, $Islam$ has the weakest correlation with the schooling year. If the relationship between each component and the schooling year is translated into the relationship between each component and regional income, it is interesting to find whether this association holds significant for $Lag - school$, $Non - Islam$ and $High$; or insignificant for $Islam$.

For a while I ignore the quality aspect of education. I rewrite the reduced-form model in Equation 3.1 as:

$$dY_{jt} = \beta_0 + \beta_1 Y_{jt-1} + \beta_2 Islam_{jt} + \beta_3 Non - Islam_{jt} + \beta_4 Lagschool_{jt} + \beta_5 High_{jt} \qquad \textbf{3-8}$$
$$+ \beta_6 X_{jt} + \alpha_j + \gamma_t + \varepsilon_j$$

Table 3-15 presents the results. Similar to Table 3-12, The OLS and RE model in columns (1) and (3) present similar results. Of all three models, the FE model in column (2) once again shows the highest R^2. Based on the FE model, I find no evidence for the significance of new stock of labour force from either Islamic or non-Islamic educational background. One possibility is that additional labour with primary and secondary education –as captured by variables "$Islam$" and "$Non-Islam$"— might not yield a significant contribution to the growth process. Note that only those who did not continue to university who were included in the new stock variables ie. "$Islam$" and "$Non-Islam$". One may argue that more educated labours might be significant. However, although the sign is positive, the $High$ component which shows new addition to the labour force with university education also has insignificant effect on income growth. Of all four schooling components only $Lag - school$ - capturing years of schooling in the previous year weighted by proportion of workforce aged between 16 and 19- has a significant coefficient.

The results indicate that the positive association between regional income growth and education might be built up upon the effect of old human capital stock in the labour force instead of addition to the stock in each year is made. This interpretation might be

relevant to issues about whether it is the level or the growth rate of educational attainment that matters. As previously noted in Chapter 1, it is argued that to capture long-run effects, studies should focus on the *levels* of human capital rather than their *rate of change* (Bloom, Canning and Malaney 2000). The argument is supported by evidence of the positive effect of educational levels but not of changes in education (Benhabib and Spiegel 1994). But I will show later on that inequality and quality aspects of changes in human capital stock can provide more information about how the Indonesian economy grows.

On robustness check, the decomposition of years of schooling affects the significance of the coefficient for the capital-income ratio. This might be due to correlation between investment and some schooling components. The descriptive analysis shows that the investment ratio is significantly correlated with $Non-Islam$ and $Lag-school$ at 5% level of significance. But this does not affect the magnitude as well as the significance of other variables. Therefore, my prediction that the quantity of additional human capital stock does not matter still holds.

Table 3-16. Growth Regression [Decomposition; Quality of Education Included]

Dependent variable = The growth rate of real GDP per capita	Subjects			
	Total Score	Math	English	Bahasa
Capital/GDP	-1.979	-1.987	-1.919	-2.05
	(-1.746)	(-1.727)	(-1.725)	(-1.804)
Openness	-0.092	-0.1	-0.093	-0.081
	(-0.933)	(-1.048)	(-0.910)	(-0.793)
Population rate of growth	-1.038***	-1.045***	-1.027***	-1.071***
	(-6.900)	(-6.941)	(-6.905)	(-6.977)
Lagged (Natural log of) Real GDP per capita	-0.918***	-0.907***	-0.949***	-0.880***
	(-8.232)	(-8.142)	(-7.861)	(-8.231)
Islamic education in schooling year ($Islam$)	0.083	0.087	0.028	0.098
	(0.298)	(0.313)	(0.114)	(0.328)
Non-Islamic education in schooling year ($Non-Islam$)	-0.137	-0.129	-0.143	-0.109
	(-1.770)	(-1.858)	(-1.712)	(-1.364)
Lagschool in schooling year ($Lag-school$)	0.088	0.085	0.09	0.104
	(1.251)	(1.255)	(1.300)	(1.402)
High education in schooling year ($High$)	0.04	0.033	0.034	0.052
	(0.320)	(0.272)	(0.263)	(0.422)
$Islam \times$ **Exam scores**	**-0.009**	**-0.029**	**-0.021**	**-0.028**
	(-0.628)	**(-0.670)**	**(-0.502)**	**(-0.584)**
$Non-Islam \times$ **Exam scores**	**0.006***	**0.017***	**0.019***	**0.014***
	(2.431)	**(2.626)**	**(2.236)**	**(2.045)**
Constant	14.256***	14.104***	14.721***	13.547***
	(8.246)	(8.325)	(7.844)	(8.009)
F-stat	19.848	18.703	20.298	19.481
R2-within	0.891	0.892	0.891	0.889
R2-between	0.001	0.001	0.001	0
R2-overall	0.029	0.029	0.028	0.03
R2	0.891	0.892	0.891	0.889
No. observations	81	81	81	81

Note: For all columns, t-statistics are in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively. Estimation method is the FE method.

3.5.2 Incorporating Quality

In the previous section, the results show that there is a difference in rates of return to education between provinces with different qualities of schooling. Using a decomposition method previously described, I examine whether there exists different rates of return to new human capital stock between different types of education, ie religious versus non-religious education. I perform the following reduce-form model:

$$dY_{jt} = \beta_0 + \beta_1 Y_{jt-1} + \beta_2 Islam_{jt} + \beta_3 Non-Islam_{jt} + \beta_4 Lagschool_{jt} + \beta_5 High_{jt}$$
$$+ \beta_6 Islam_{jt} \times ExamMTS_{jt} + \beta_7 Non-Islam_{jt} \times ExamSMP_{jt} + \beta_8 X_{jt} + \alpha_j + \gamma_t + \varepsilon_j$$

3-9

Note that $ExamMTS_{jt}$ and $ExamSMP_{jt}$ refer to exam scores of Islamic schools (MTS) and non-Islamic schools (SMP) in province j at time t respectively. As before, I do not include the quality of education variable to avoid severe multicollinearity between the quality variable and the interaction term. Also, it is much more logical to include years of schooling and drop the quality variable rather than do the opposite.

Table 3-16 presents the results. The inclusion of the interaction term between quality and new human capital stock improves the goodness of fit of all models. The adjusted-R^2 increases between 2% and 3% when the quality of education is taken into account. Previously, I find that new human capital stock is not significantly associated with income per capita growth. But once the new stock is augmented by quality, the interaction term between $Non-Islam$ and exam scores is significant for income per capita growth. In contrast, the interaction term between $Islam$ and exam scores is insignificant. This leads to a finding that at the regional level, there is different rates of return to additional the quantity of education between provinces with different quality. But this only applies to non-religious education.

Some potential explanations are listed here. First, increased years of participation in religious schools might not be balanced with improved skills required by the labour force. Second, as there is only a small proportion of the labour force graduating from religious schools relative to non-religious schools, in terms of magnitude, their contribution to income per capita growth is minor regardless of the level of skills that new "religious" human capital stocks have.

Table 3-17. Growth Regression [Decomposition; Quality and Inequality Included]

Dependent variable = The growth rate of real GDP per capita	Specification		
	(1)	(2)	(3)
Capital/GDP	-1.979	1.013*	0.969*
	(-1.746)	(2.986)	(2.843)
Openness	-0.092	0.029	0.005
	(-0.933)	(0.353)	(0.061)
Population rate of growth	-1.038***	-0.751***	-0.790**
	(-6.900)	(-5.637)	(-4.562)
Lagged (Natural log of) Real GDP per capita	-0.918***	-0.652***	-0.681***
	(-8.232)	(-9.126)	(-9.562)
Islamic education in schooling year ($Islam$)	0.083	0.084	1.196
	(0.298)	(0.424)	(0.764)
Non-Islamic education in schooling year ($Non-Islam$)	-0.137	0.088	0.043
	(-1.770)	(1.019)	(0.611)
Lagschool in schooling year ($Lag-school$)	0.088	-0.008	0.02
	(1.251)	(-0.104)	(0.409)
High education in schooling year ($High$)	0.04	0.135	0.126
	(0.320)	(2.046)	(1.878)
$Islam \times$ **Exam scores**	-0.009		-0.064
	(-0.628)		(-0.707)
$Non-Islam \times$ **Exam scores**	0.006*		0.003
	(2.431)		(1.102)
$Islam \times$ **Inequality of Exam scores**		-9.688	-13.656
		(-2.059)	(-1.510)
$Non-Islam \times$ **Inequality of Exam scores**		-0.846	-0.648
		(-0.860)	(-0.640)
Constant	14.256***	9.919***	10.226***
	(8.246)	(13.342)	(11.196)
F-stat	19.848	74.262	40.813
R2-within	0.891	0.963	0.973
R2-between	0.001	0.304	0.314
R2-overall	0.029	0.22	0.225
R2	0.891	0.963	0.973
No. observations	81	44	43

Note: For all columns, t-statistics are in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively. Estimation method is the FE method.

3.5.3 Incorporating Inequality of Quality

The empirical findings suggest that the contribution of quality-adjusted new human capital stock with a *non-religious* education background to income per capita growth is more evident than the contribution of new human capital stock with a *religious* education background. In an earlier section, I find that there has been an increasing trend in inequality of quality of education in Islamic schools. Here I examine to what extent the inequality of quality of education matters for income per capita growth. There might be a case that quality-adjusted new human capital stock with religious education background contributes significantly to income per capita growth in some municipalities in a province. But due to substantial inequality within the province, *on average* the contribution becomes less evident. Hence, I include the inequality index as measured in the previous section to my estimation:

$$dY_{jt} = \beta_0 + \beta_1 Y_{jt-1} + \beta_2 Islam_{jt} + \beta_3 Non - Islam_{jt} + \beta_4 Lagschool_{jt} + \beta_5 High_{jt}$$
$$+ \beta_6 Islam_{jt} \times ExamMTS_{jt} + \beta_7 Non - Islam_{jt} \times ExamSMP_{jt} +$$
$$+ \beta_8 Islam_{jt} \times InequalityMTS_{jt} + \beta_9 Non - Islam_{jt} \times InequalitySMP_{jt} + \beta_{10} X_{jt} + \alpha_j + \gamma_t + \varepsilon_j$$
3-10

$InequalityMTS_{jt}$ and $InequalitySMP_{jt}$ refer to inequality of exam scores of Islamic schools (MTS) and non-Islamic schools (SMP) in province j at time t respectively.

I test three different specifications. Note that I do not put the year of schooling component-inequality interaction terms together with the year of schooling component-exam score interaction terms to avoid multi-collinearity. The two interaction terms have correlation over 0.5 significant at 5%. The correlation between "$Islam \times$ **Exam scores**" and "$Non - Islam \times$ **Exam scores"** is insignificant.

Table 3-17 presents the results. Previously, I find that there are different rates of return to additional human capital stock between provinces with different quality which only applies to non-religious education. Based on Table 3-17, this might be due to substantial inequality of exam scores of Islamic schools between provinces. Hence *on average* the contribution of quality-adjusted new human capital stock with religious education background to income per capita growth is minor. The reason is that once we control for different rates of return to inequality-adjusted new stock with non-religious background,

the significance of $Non-Islam \times$ exam scores diminishes. This implies that the different contribution of quality-adjusted new stock between human capital with religious and non-religious education background might be largely due to different inequalities across provinces. The results call for actions to reduce the inequality of Islamic school quality.

3.6 Some Possible Empirical Problems

3.6.1 Quality Measures

One of the main shortcomings of using national examination scores at the junior secondary level is the scores might not reflect the labour force quality in the same year. Phrased alternatively, later values of test scores are allowed to influence earlier values of economic growth. In Hanushek and Wobmann (2007), the problem has not been addressed. To estimate the determinants of the economic growth in 1960-2000, they take the average of internationally comparable exam scores in some given years rather than having a complete dataset of exam scores over 1960-2000. In Indonesia the labour force is generally defined as those who are over 15 years old and this is also the average age of junior secondary school (JSS) leavers. This implies that the JSS leavers who do not continue their education and enter the job market can be considered as the labour force. This suggests that the coefficient on the average of national examination scores actually indicates how significant the role of *new* human capital stock who completed junior secondary education is in boosting the economic growth. Barro (2001) finds that academic attainment at the secondary level is more significant for economic growth than primary education. If we find that provinces have similar rate of growth in the education sector, current education quality can indeed proxy a province's over-period quality relative to other provinces. This seems to be the case in Indonesia as shown by Figure 3-6.[43]

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[43] Mathematically, if it is true that provinces grow at the same rate, data in Figure 3-6can be written as:

$$s_t = \alpha_0 + \alpha_1 s_{t-1} \text{ where } \alpha_1 = 1$$

Using provincial data from 2002-2005, I obtain the following empirical result from panel random effect model:[43]

$$s_t = \underset{(0.143)}{0.362} + \underset{(0.019)}{0.963} s_{t-1}$$

$R^2 (overall) = 0.9671; R^2 (within) = 0.0738; R^2 (between) = 0.9956;$

Using t-test, I do not have strong evidence to reject the null hypothesis that the coefficient α_1 equals to one. This supports my argument that the provinces do grow at the same rate.

Alternatively, as suggested by Barro (2001), I include instruments which contain prior values of variables that have predictive power for test scores such as pupil-teacher ratios, school dropout rates and gross enrolment ratios.

Table 3-18 presents the results. Compared to results from the first two columns of Table (11) using the FE model, results from the instrumental variable method seem to overestimate the effect of the quality of education. The IV model in columns (1) and (2) of Table 3-18 indeed shows an insignificant effect of the quality of education. Checking the statistics in the first stage regression, none of the models show satisfying performance. The F-statistics from the first stage regression (the F-statistics for testing the hypothesis that the instruments do not enter the first-stage regression of 2SLS) ranges between 1.2 and 7.5. This is lower than 10 which is commonly used as the rule of thumb to decide strong instrument. We can immediately see that models in columns (1), (2) and (3) are not satisfying. According to the critical values based on two-stage least square size in Stock and Yogo (2002); if I want to limit the bias of IV estimator to 20% of OLS bias the first stage F-statistics should be greater than 6.66 for one endogenous variables and one instrument.[44] Only the model in column (4) can meet this criterion. But 20% bias is of course not desirable. The Hausman test further concludes that the FE model assuming exogenous exam scores is preferred at 5% level of significance. Based on previous graphical analysis and the specification test, I argue that current junior secondary exam scores have strong predictive power for regional income growth.

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[44] The critical values of less bias; 10% and 15% are 16.38 and 8.96 respectively.

Table 3-18. Growth Regression [Instrumental Variable]

Dependent variable = Growth rate of real GDP per capita	(1)	(2)	(3)	(4)
SMP-total scores	0.015	0.015		
	-1.204	-1.065		
MTS-total scores			0.026***	0.028**
			-3.392	-2.925
Lagged (Natural log of) Real GDP per capita	-1.114***	-1.080***	-1.173***	-1.192***
	(-4.755)	(-5.025)	(-7.343)	(-6.810)
Capital/GDP	-1.974***	-2.213***	-2.429***	-2.448***
	(-4.183)	(-6.098)	(-5.279)	(-5.097)
Openness	-0.029	0.028	0.078	0.086
	(-0.287)	-0.25	-0.675	-0.706
Population rate of growth	-0.864**	-0.890**	-0.709***	-0.677**
	(-2.958)	(-3.060)	(-3.714)	(-3.095)
Lagged years of schooling	0.025	0.02	-0.115	-0.135
	-0.187	-0.127	(-1.174)	(-1.148)
Constant	17.629***	17.092***	19.510***	19.948***
	-3.891	-3.957	-6.956	-6.258
Instrumented variable	SMP-total scores	SMP-total scores	MTS-total scores	MTS-total scores
Additional exogenous variable	Student-teacher ratio, Gross enrolment ratio	Student-teacher ratio	Student-teacher ratio, Gross enrolment ratio, Dropout rates, %Public schools	Student-teacher ratio
R-2	0.89	0.892	0.838	0.826
No. observations	84	85	83	83
First-stage F-stat	1.196	1.749	2.665	7.456
First-stage Partial-R2	0.048	0.034	0.195	0.137

Note: For all columns, t-statistics are in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively. Estimation method is the IV method.

3.6.2 Mobility

An implicit assumption of using current educational measure to predict the current quality of human capital stock is no mobility between provinces. This means people studied and then worked in the same province. We probably should see potential mobility not only as flows of labour but also flows of other growth factors, such as capital. This is indeed a problem posed by the traditional neoclassical growth models from the implicit assumption of capital immobility. One may argue this assumption is too strong especially for within-country growth studies. It is theoretically plausible that the problem could be minor. First, a study argues that if there is factor mobility between provinces, labour will tend to migrate from the capital poor to the capital rich province. In contrast, capital will tend to migrate in the other direction (Jian, Sachs et al. 1996). Hence, both types of migration will tend to offset each other. Capital-labour ratio between province is equalised and so is income per capita level (Jian, Sachs et al. 1996).

Looking at studies on across-border labour migration, there is a possibility of positive contribution of migration to economic growth. Migrants, both emigrants and immigrants, commonly had higher human capital (ie education level) than the average labour force (Miyagiwa 1991; Beine, Docquier et al. 2001). The growth effects can be further classified into two types: (i) an ex ante "Brain effects" (migration prospects increase investments in education because of higher return in the migration destination); and (ii) an ex post "Drain effects" in the region of origin because of the actual migration flows (Beine, Docquier et al. 2001).

Which of the above argument is relevant to Indonesia is an empirical matter. I expect that the inclusion of province fixed effects should be able to absorb such variation. Also, it seems that relative to total population there is small inter-provincial labour mobility in Indonesia. Based on the Indonesian Family Life Survey (IFLS) data, 85% of the Indonesian population lives in their provinces of birth. There is higher variation in within-province mobility, ie mobility between village and districts. Higher education also increases the probability of migration. Nevertheless, even for university degree holders, 87% of the Indonesian population lives in their provinces of birth. Over 90% of secondary education completers live in their provinces of birth. In short, the IFLS data show that there seems to be correlation between education and migration but the contribution of migration to the overall human capital accumulation process –and

perhaps to the economic growth— might be minor because the ratio to the total population is small.

At the provincial level, empirical analysis using provincial data is restricted by a limited period of available data. Migration data comes from Indonesia's population census conducted every ten years. Given that migration is measured based on five year periods of difference in residential province, there are gaps of migration data in between each census. Indonesia's central statistics agency (BPS) actually conducts a survey using a similar questionnaire in the middle of the two censuses called SUPAS, so the information gaps can be filled.[45]

Table 3-19 presents the net migration rates. Note that positive figures indicate more labour inflows than outflows in terms of percentage of total population over five years old. In 2005, top income provinces such as Riau and East Kalimantan had the highest net migration rates. Additionally, Yogyakarta, well-known as a student city (*kota pelajar*), ranks third.

In the present study, I impute data for 2003 and 2004 based on five-year gap data from 1980 to 2005 taking into account province-fixed effects and time trends. The 2003-2005 imputed data show similar correlation with income per capita as the original data in 2005 as shown by Figure 3-10. The graph indicates a possibility of positive correlation between net migration rates and (natural logarithm) income per capita.

Table 3-20 presents the growth regression controlling net migration rates and other growth factors. I find insignificant association between net migration rates and income per capita growth although the sign is positive. The results suggest that the growth specification model used in previous sections without taking into account migration effects most likely do not suffer from omitted variable bias.

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[45] Vidyattama (2008) argues that the SUPAS survey underestimates the extent of migration. But he claims that the survey data is still valuable in terms of immigration and emigration distribution across provinces since the patterns are reasonably similar to the result from the censuses.

Table 3-19. Provincial Net Migration Rates (%) (1980-2005)

Province	1980	1985	1990	1995	2000	2005
Aceh	0.96	0.63	0.20	-0.59	-8.56	-0.36
North Sumatra	-1.29	-1.28	-1.87	-0.98	-2.08	-0.88
West Sumatra	-2.06	-1.76	-1.28	-0.22	-3.12	-0.49
Riau	2.15	2.03	5.11	0.58	10.12	4.90
Jambi	5.59	1.36	3.91	0.17	1.18	0.62
South Sumatra	2.10	-0.15	0.19	-0.90	0.20	-0.53
Bengkulu	7.45	2.36	5.11	2.31	2.32	0.19
Lampung	11.56	0.81	1.35	-0.85	-0.01	-0.29
Jakarta	6.09	3.85	-2.06	-2.50	-1.72	-1.79
West Java	0.16	0.77	2.66	1.86	2.22	1.01
Central Java	-3.22	-1.79	-2.94	-1.40	-2.28	-1.12
Yogyakarta	0.82	0.35	1.40	1.89	2.21	3.18
East Java	-1.44	-0.60	-1.09	-0.02	-1.06	-0.28
Bali	-0.74	-0.14	0.34	0.48	1.37	1.21
West Nusa Tenggara	-0.72	0.43	-0.07	0.03	0.26	-0.15
East Nusa Tenggara	-0.49	-0.27	-0.77	-0.59	0.45	0.08
West Kalimantan	0.44	0.03	-0.07	0.29	0.11	-0.45
Central Kalimantan	3.94	1.56	3.29	-0.44	6.11	-0.88
South Kalimantan	0.75	0.24	0.82	0.44	0.98	0.69
East Kalimantan	8.41	4.05	7.09	2.92	5.09	3.93
North Sulawesi	0.31	-0.75	-0.77	-1.12	-0.33	-0.27
Central Sulawesi	5.80	1.23	2.69	2.44	2.49	1.21
South Sulawesi	-1.71	-0.75	-0.77	-0.38	-1.26	-0.47
Southeast Sulawesi	2.44	5.99	2.83	1.12	5.61	0.57
Maluku	1.40	-0.08	1.76	-1.24	-5.18	-1.39
Papua	1.62	2.95	2.74	1.57	2.22	0.80

Source: Vidyattama (2008) using data from Population Census (BPS) 1980, 1990, 2000 and Supas (BPS) 1985, 1995, 2005.

Note: The net migration rate shows the difference between immigration and emigration rates. The emigration rate is the ratio of emigrants to total population five years previously while the immigration rate is the ratio of immigrants to total population above five years of age currently. The number for Aceh in 2005 is estimated based on the data of other provinces.

Figure 3-10. Net Migration Rate (%) and (Natural Log) Income per Capita
(2003-2005)

NOTE:
This figure is included on page 111
of the print copy of the thesis held in
the University of Adelaide Library.

Notes: Source Vidyattama (2008)

Table 3-20. Growth Regression [Migration Included]

Dependent variable = Growth rate of real GDP per capita	Specification	
	(1)	(2)
Lagged (Natural log of) Real GDP per capita	-0.945***	-1.026***
	(-5.841)	(-6.467)
Capital/GDP	-2.475*	-2.919**
	(-2.503)	(-3.092)
Openness	0.133	0.017
	(0.907)	(0.221)
Population rate of growth	-1.165***	-0.971***
	(-9.414)	(-7.670)
Lagged years of schooling	0.187**	0.086
	(3.175)	(1.250)
Net migration rate	**0.012**	**0.004**
	(1.734)	**(0.521)**
Lagged years of schooling x Exam scores		0.001*
		(2.431)
Constant	13.779***	15.797***
	(5.915)	(6.429)
F-stat	25.375	29.162
R2-within	0.882	0.907
R2-between	0.001	0
R2-overall	0.027	0.026
R2	0.882	0.907
No. observations	77	76

Note: For all columns, t-statistics are in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively. Estimation method is the **FE method.**

3.6.3 Small Sample Bias

A question on how significant the small sample bias would affect my estimation is far from simple. Assuming the LSDV as suggested by previous studies is the best estimator for the present dataset requires further investigation. To begin, the time dimension in the present study $(N = 30; T = 2)$ is lower than the one tested by previous studies (Judson and Owen 1999; Buddelmeyer, Jensen et al. 2008). Judson (1999) suggests that LSDV does not dominate the alternatives with a time dimension smaller than 30. Also, the LSDV underperforms the OLS if the coefficient of lagged dependent variable is high (Buddelmeyer, Jensen et al. 2008). This seems to be the case in this study. But opting OLS as the best method seems to contradict the economic theories given the correlation between the error term and the explanatory variables in the absence of province-specific effect. In addition, the dependent variable in this present study is the growth rate of income per capita instead of the level of income per capita as used in Judson (1999). Surely, the growth rate can be easily transformed into similar setting like previous studies. But it is not clear yet how severe bias using short period as small as $T = 2$ with a specific number of N. Additionally, I characterized the province-specific effect such that it has strong correlation with the other right-hand side variables.

The following data generation is similar to the one in Judson (1999) and Kiviet (1995). But here I consider the dynamic fixed effects model using the rate of growth as the dependent variable. The growth is proxied by log-difference of the (real) income level:

$$\Delta \log y_{i,t} = \gamma \log y_{i,t-1} + x'_{i,t-1}\beta + \eta_i + \varepsilon_{i,t}, \qquad \textbf{3-11}$$
where $\Delta \log y_{i,t} = \log y_{i,t} - \log y_{i,t-1}$

The dependent variable is the income growth rate. η_i is a province-specific effect, $x_{i,t}$ is a $(K-1) \times 1$ vector of exogenous regressors and $\varepsilon_{i,t} \sim N(0, \sigma_\varepsilon^2)$ is the error term. The assumptions are: σ_ε^2 is positive, no correlation between the error term and variables $x_{i,t}$ in province i at period t and the error term in province j at period s for $i \neq j; t \neq s$.

We can easily obtain:

$$\log y_{i,t} = (1 + \gamma) \log y_{i,t-1} + x'_{i,t-1}\beta + \eta_i + \varepsilon_{i,t} \qquad \textbf{3-12}$$

First, I set $x_{i,0} = 0$. Parameter ρ and variance of the error term σ_ξ^2 can then be obtained from the following regression.

$$x_{i,t} = \rho x_{i,t-1} + \xi_{it} \text{ where } \xi_{it} \sim N(0, \sigma_\xi^2)$$ **3-13**

Specifically, I generate the province-specific effect η_i from the following equation:

$$\eta_i = \alpha \frac{\sum_{t=1}^{T} x_{i,t}}{T}$$ **3-14**

The coefficient α is included to form the non-zero correlation between xs and the province-specific effect. Here I choose $\alpha = 0.7$.

I choose $\beta = 1$, $\gamma = -0.5$ and set $y_{i,0} = 1$ (hence, $\log y_{i,0} = 0$). I assume σ_ε^2 is normalized to 1. After generating η_i and $\varepsilon_{i,t}$, I can obtain $\log y_{i,t}$. Next, I calculate the signal-to-noise ratio σ_s^2:

$$\sigma_s^2 = \text{var}(v_{i,t} - \varepsilon_{i,t}) \text{ where } v_{i,t} = y_{i,t} - \frac{1}{1-\gamma}\eta_i$$ **3-15**

The ratio increases with the power of $x_{i,t}$ in explaining $y_{i,t}$. Kiviet (1995) finds that variation in the ratio affects the relative bias significantly.

I perform 1000 replications with fixed seeds for the random number generator so that the simulation results can be replicated. I only test two combinations of panel with fixed $N = 30$ and varying T between 2 and 10. Considering recommendations from previous studies (Kiviet 1995; Judson and Owen 1999; Buddelmeyer, Jensen et al. 2008), I compare results between OLS, LSDV (or FE) and RE. Table 3-21 provides complete results and Figure 3-11 presents the graphical illustration. Similar to the empirical results, Figure 3-11 shows that coefficients of RE and OLS models are similar.

Figure 3-11. Simulation Results
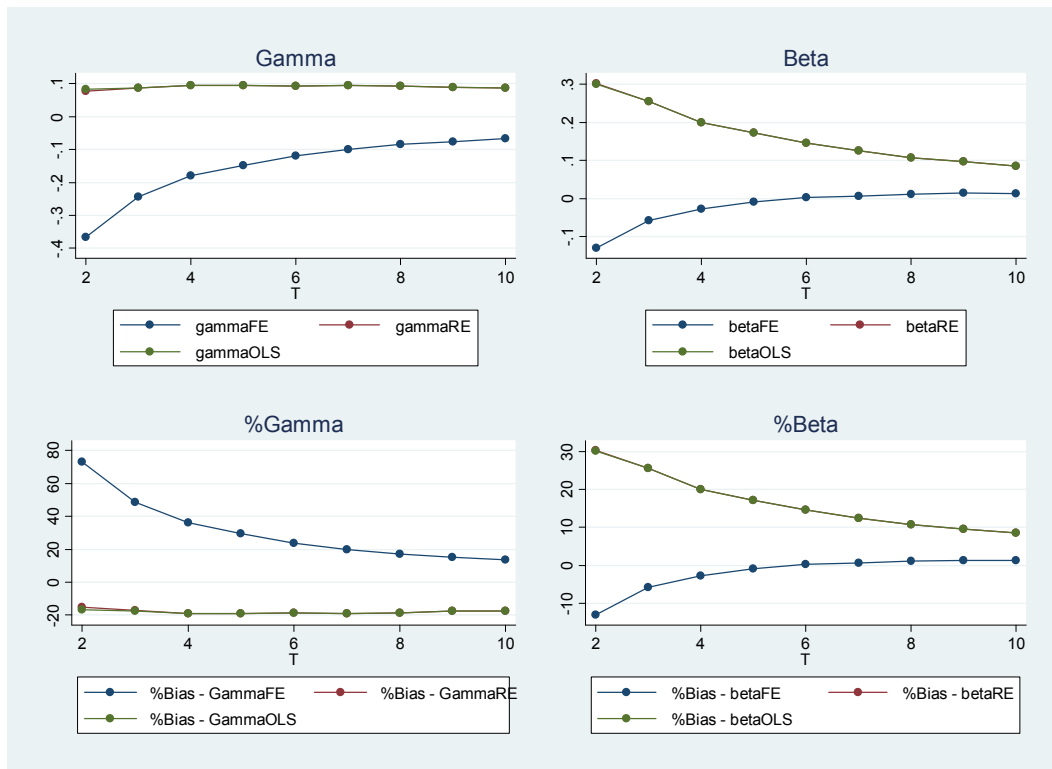
1000 replications; $\gamma = -0.5; \beta = 1; N = 30$

Table 3-21. Simulation Results –Bias

Estimator: Bias Standard error Percentage bias(%)	T								
	2	3	4	5	6	7	8	9	10
Gamma (γ)									
FE	-0.37	-0.24	-0.18	-0.15	-0.12	-0.10	-0.09	-0.08	-0.07
	0.15	0.09	0.07	0.06	0.05	0.05	0.04	0.04	0.04
	73.27	48.81	36.03	29.53	23.88	20.01	17.04	15.29	13.47
RE	0.08	0.09	0.10	0.09	0.09	0.10	0.09	0.09	0.09
	0.12	0.07	0.06	0.05	0.04	0.04	0.03	0.03	0.03
	-15.28	-17.27	-19.06	-18.96	-18.75	-19.00	-18.51	-17.69	-17.37
OLS	0.08	0.09	0.10	0.09	0.09	0.10	0.09	0.09	0.09
	0.11	0.07	0.05	0.05	0.04	0.04	0.03	0.03	0.03
	-16.56	-17.32	-19.06	-18.96	-18.75	-19.00	-18.51	-17.69	-17.37
Beta (β)									
FE	-0.13	-0.06	-0.03	-0.01	0.00	0.01	0.01	0.01	0.01
	0.22	0.15	0.11	0.10	0.08	0.08	0.07	0.06	0.06
	-13.08	-5.71	-2.79	-0.87	0.26	0.63	1.14	1.37	1.36
RE	0.30	0.26	0.20	0.17	0.15	0.12	0.11	0.10	0.08
	0.14	0.11	0.10	0.09	0.08	0.07	0.07	0.06	0.06
	30.19	25.61	20.01	17.20	14.59	12.49	10.78	9.62	8.48
OLS	0.30	0.26	0.20	0.17	0.15	0.12	0.11	0.10	0.08
	0.13	0.11	0.09	0.08	0.08	0.07	0.07	0.06	0.06
	30.15	25.61	20.01	17.20	14.59	12.49	10.78	9.62	8.48
RMSE									
FE	0.09	0.09	0.10	0.10	0.10	0.10	0.10	0.10	0.10
RE	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
OLS	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10

1000 replications; $\gamma = -0.5 ; \beta = 1 ; N = 30$

I find that a reduction in the number of periods (T) significantly affects the precision of estimates for β (Beta) for OLS, FE and RE models. The FE estimates tend to underestimate β, while the RE and OLS overestimate β. At a very short period, say $T = 2$, the FE bias estimate for β can be as high as 13% of true parameter value while the RE and OLS bias estimates are up to three times larger. Unfortunately, the relative advantage of the FE model does not reflect in estimation of the coefficient of lagged dependent variable (γ) or Gamma. With a smaller number of T, FE coefficient underestimates γ. In contrast, OLS and RE models perform quite consistently across number of periods. Particularly, with $T = 2$, bias estimates of OLS and RE models are 20% of its true parameter, while the FE model produces bias 80% of the true parameter value.

On the basis of results from this simulation, I show that the FE model performs better than the RE and OLS models especially if we are more interested in looking at the effect of coefficient x on the dependent variable. This implies that results from previous section are quite predictive in estimating effects of variables of interests.

3.7 Conclusion

The picture of Islamic education in Indonesia at junior secondary schools becomes education with not only low academic achievement but unequal performance. In contrast, non-Islamic schools (including public non-religious schools) have shown significant improvement in equality across provinces. The reduction in inequality was most likely due to the catching up of low performers supported by more involvement of local governments in this decentralisation era.

Decomposition of years of schooling showed that the positive association between regional income growth and education is built up upon the effect of *existing* human capital stock in the labour force instead of how much additional stock in each year is made. But the specification check showed that current schooling quality as measured by junior secondary national examination scores has strong prediction power for current quality of labour force.

The overall empirical results showed that quality-inclusive growth model specification is preferred to avoid upward bias. I find that while there is no difference between rates of

return to the *quantity* of new human capital stock from Islamic education and non-Islamic education background, there are different rates of return to new human capital stock between provinces with different *quality* of education. But this only applies to new labour stock from non-Islamic education background. However, once we control for different rates of return to inequality-adjusted new stock with non-religious background, the significance of quality-adjusted non-Islamic new human capital stock diminishes. This implies that the different contribution of quality-adjusted new stock between human capital with religious and non-religious education background might be largely due to different inequalities across provinces.

The results call for action from the Indonesian government both at central and local levels to improve the quality of Islamic education and at the same time to ensure fair distribution of resources across provinces. To reduce the educational inequality of MTS schools, the contribution of government is essential. This is based on unexpected positive growth of inequality across *public* MTS. Private schools, in addition, also need assistance to improve their quality, especially in the area in which academic achievement is low. One possible way to improve the quality of education is to reduce class sizes. In a process to find the best instrument for exam scores, although I found that the FE model performs better than the Instrumental Variable method, I also found that reduction in student-teacher ratio is statistically associated with improved the quality of education.

This chapter has identified how quantity, quality and inequality of human capital stock with religious background are linked to income growth. However, identification is limited by data. The analysis can be improved with the help of the central statistic agency (BPS) and other government ministries. Some important variables which are not available (or perhaps not easily accessible) are the proportion of existing labour force by level and type of education, earnings by level and type of education, labour mobility by level and type of education, and many other variables. Given the availability of data, further work should also look at similar analysis at lower-level for example municipality.

Appendix 3A

In this section, I review three inequality measures used in this chapter, namely the Gini coefficient, the Atkinson index and the Generalized Entropy index.

1. The Gini Coefficient

Conceptually, the Gini coefficient is the ratio between an area between the perfect distribution line and the Lorenz Curve and the total area below the perfect distribution line. The Gini coefficient is characterized by some features. Unlike coefficient of variation, it is viewed that G puts more weight on changes in the surrounding mode of the distribution than at the tails (Zhang and Li 2002).[46] Moreover, an empirical study using time series data for income in rural China between 1985 and 2002 finds that the Gini coefficient is less affected by bias from the exclusion of inflation relative to Theil L, Theil T and coefficient of variation (CV) indices (Wan 2008). Considering its relatively simple interpretation, the Gini coefficient is by far the most commonly used by empirical studies. Evidence for its association with other socio-economic variables have been found such as its association with immigration (Stark 2006), post-1990 economic growth (Lopez 2006), crime (Choe 2008), electoral systems (Verardi 2005) and many other variables.

In practice, the Gini coefficient is given by (Pyatt, Chen et al. 1980):

$$G = \frac{2Cov(e, r_e)}{N\overline{e}}$$
<div align="right">3A-1</div>

Where $Cov(e, r_e)$ is the covariance between educational quality (e) and ranks of all provinces according to their educational quality (r_e) ranging from the province achieving the lowest educational quality (rank= 1) to the highest (rank=N). N is total number of provinces. The average of educational quality is denoted by $\overline{e}$.

Although it is considered as one of the inequality indices with lowest computational costs, it is interesting to find that there have been many studies which attempt to

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[46] Let σ stand for the standard deviation. Hence the coefficient of variation or CV is: $CV = \left(\sqrt{p_i(e_i - m)^2}\right)/m$. CV simply shows the standard deviation for each unit of the mean, μ. Given the formula, it is obvious that any changes in the variable distribution would significantly change the index.

reinterpret the Gini coefficient and to find a simpler way to calculate the Gini coefficient. For example, a study proposes that the calculation of Gini coefficient can be further simplified into (Milanovic 1997):

$$G \approx \frac{1}{3} \frac{\sigma_e}{\bar{e}} \rho(e, r_e)$$ **3A-2**

Where σ_e is the standard deviation of educational quality (e). Coefficient $\rho(e, r_e)$ is the correlation coefficient between educational quality (e) and ranks of all provinces according to their educational quality (r_e). In this study, I will further exercise whether this simplification derives similar result to Pyatt's formula.

In regard to re-interpreting the Gini coefficient, Pyatt (1976) interprets the Gini coefficient as the expected value of a game in which a randomly drawn individual compares his outcome, in this case educational quality, with others. Moreover, another study proposes to use the coefficient to calculate the measure of 'satisfaction of the society' (Yitzhaki 1979).

The most discussed issue regarding the Gini coefficient is how to decompose the inequality index to look at the contribution of between and within groupings to the overall educational inequality. I follow the approach used by Bhattacharya and Mahalanobis (1967), Pyatt (1976) and later re-interpreted by Lambert and Aronson (1993).[47] The method basically attempts to decompose the gini coefficient G into two main components and residuals (Bhattacharya and Mahalanobis 1967; Pyatt 1976; Lambert and Aronson 1993):

$$G = G_B + \sum_i f_i^2 G_i + R$$ **3A-3**

Where G_B, f_i and G_i are the between-groups Gini coefficient, the population share and the within-group Gini coefficient of group i, respectively.[48] Following Bhattacharya and Mahalanobis (1967, p. 150) and, later, Zhang and Li (2002), the 'between groups' Gini coefficient G_B is given by:

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[47] Zhang and Li (2002) give the empirical application on international educational attainments data.

[48] Another breakdown is offered by Mangahas (1975) who decomposes *income* inequality into rural and urban components as follows: $G = \sum_i \theta_i G_i + \sum_{j>i} \phi_i \phi_j (D_{ij} / \bar{Y})$ where G =overall Gini coefficient; θ_i =family income in group i as proportion of total income; ϕ_i = number of families in group i as proportion of all families; $\bar{Y}$ =mean income; and D_{ij} =Gini difference.

$$G_B = \left(\sum_i \sum_j f_i f_j \left| e_i - e_j \right| \right) / 2m \text{ , for } i \neq j \qquad \text{3A-4}$$

where e_i denotes a continuous variable indicating academic attainments of region i. p_i is the proportion of population in the country for region $i=1,2, \ldots, n$. Variable m stands for the mean of academic attainments.

With regard to the residual term, it is interesting to find that there is an ongoing debate on whether the term itself has meaning instead of 'just the residuals'. A study remarks that the residual R is 'impossible to interpret with any precision' (Mookherjee and Shorrocks 1982). But another study argues that Mookherjee and Shorrocks' interpretation is wrong (Lambert and Aronson 1993). They conclude that R will be positive if the subgroup variable of interest ranges are overlapping. In this study the 'group' can be province or the type of education (Islamic versus non-Islamic and private versus public). As a student can only either attend an Islamic *or* non-Islamic school, or similarly, attend either a private *or* public school, I can assume in this study that R would be zero, ie the sub-groups of the population are exclusive.

2. The Atkinson Index

The Atkinson index represents the cumulative deviation of the actual distribution from the the equally-distributed-equivalent (EDE) variable (Atkinson 1970). A recent study finds that the Atkinson index can act

To calculate the Atkinson index, we must initially calculate the EDE of variable of interest, ie the educational quality:

$$Q_{EDE}(\tau) = \begin{cases} = \left(\sum_i f_i e_i^{(1-\tau)} \right)^{\frac{1}{1-\tau}} ; \tau > 0 \wedge \tau \neq 1 \\ = \exp \sum_i f_i \log e_i ; \tau = 1 \end{cases} \qquad \text{3A-5}$$

Parameter τ shows the relative inequality aversion, as specified by the researcher. The values can take from zero to infinity. Based on the above equation, Q_{EDE} variable defines that level of the quality of education such that if it is equally distributed, the resulting educational outcomes level will be the same as that which obtains under the actual distribution under consideration.

The Atkinson indices can then be defined by:

$$A(\tau) = 1 - \left(Q_{EDE}(\tau) / m \right)$$
<div align="right">**3A-6**</div>

The measure $A(\tau)$ has the convenient property of lying between 0 (complete equality) and 1 (complete inequality). According to Atkinson (1970), if for example we are using income data yields $A(\tau) = 0.3$, we can say that if incomes are equally distributed, then we should need only 70% of the present national income to achieve the same level of social welfare (Atkinson 1970, p.250).

A recent study finds that a relationship exists between the Gini coefficient and the Atkinson index or $A(\tau) = f(G, \tau)$ (Harvey 2005). Based on simulation, they conclude the correlation between the Atkinson index and the Gini index: "(1) as $\tau \to 0$ there is an almost perfect correlation between the indices, which decreases as τ increases (and does not weaken until $\tau > 2$); (2) the range of G values consistent with a single $A(\tau)$ value increases with τ; (3) the number of possible τ values with a single $A(\tau)$ value increases with $A(\tau)$" (Harvey 2005, p. 1023). It is interesting to see whether this form of relationship is also applied to the dataset used in this study.

The critical issue arising from using this index is deciding the value of parameter τ. As τ rises, society assigns more weight to income transfer at the lower end of variable distribution. In contrast, lower τ (approaches 0) causes the index to be more sensitive to changes in the upper end of the distribution. Hence, it is clear that with the Atkinson index value judgments are an integral part of inequality measurement. But, typically used values of τ are 0 and 2. In this study, I calculate the Atkinson index based on three values of τ: 0, 1 and 2.

If the population is divided into mutually exclusive group and jointly exhaustive, the Atkinson index are decomposable. But it is not *additively* decomposable with properties as suggested by an earlier study (Shorrocks 1980; Shorrocks 1984).

$$A(\tau) = A_W(\tau) + A_B(\tau) - A_W(\tau).A_B(\tau)$$
<div align="right">**3A-7**</div>

Where A_W and A_B are the 'within' and 'between' indices, respectively which can be given by:

$$(i)\, A_W(\tau) = 1 - \sum_k v_k \left(Q_{EDE\,k}\,/\,m\right)$$

$$(ii)\, A_B(\tau) = 1 - \left(Q_{EDE}\,/\,\sum_k v_k Q_{EDE\,k}\right)$$

3A-8

Where $v_k = N_k\,/\,N$ where N_k is the number of students in municipality k,

3. The Generalized Entropy (GE) Index

The third index is the Generalized Entropy (GE) index. The Theil, Hirschman-Herfindahl (H-H) indices are two particular cases of the GE index.

The GE class of inequality indices is given by:

$$GE(a) \begin{cases} = \dfrac{1}{a(a-1)} \sum_i f_i \left(\dfrac{e_i}{m}\right)^a - 1; a \neq 0 \wedge a \neq 1 \\[2em] = \sum_i f_i \left(\dfrac{e_i}{m}\right) \log\left(\dfrac{e_i}{m}\right); a = 1 \\[2em] = \sum_i f_i \log\left(\dfrac{m}{e_i}\right); a = 0 \end{cases}$$

3A-9

Where m is the arithmetic mean of variable e_i and shares of population in region i is $f_i = w_i\,/\,N$. Total population N can be simply calculated using $N = \sum_i w_i$.

The GE index when a towards zero is the Theil index, while the GE index when a towards one is named the Hirschman-Herfindahl index.

The GE index is classified as additively decomposable (Shorrocks 1980; Shorrocks 1984, p.1370). While there might be some circumstances in which the Gini coefficient and the Atkinson index are more preferred to the GE index, it is generally accepted that when decomposability is desired, and scale and replication invariance are accepted, nothing substantial is lost by focusing exclusively on the Generalized Entropy indices (Shorrocks 1984, p.1383).

In practice, the GE index can be decomposed by:

$$GE(a) = GE_W(a) + GE_B(a)$$

3A-10

Where $GE_W(a)$ is the within-region inequality and $GE_B(a)$ is the between-region inequality. Given that the sub-groups in this study i.e municipality is mutually exclusive we can ignore the residual term. The within-region can be calculated using:

$$GE_W(a) = \sum_k v_k^{(1-a)} s_k^{\ a} GE_k(a) \qquad \text{3A-11}$$

Note that $v_k = N_k / N$ where N_k is the number of students in municipality k, s_k is the average of exam score in municipality k and $GE_k(a)$ is inequality for sub-group k.

Appendix 3B

I closely follow the method by Barro (2001) but with some modifications. I break down secondary level into junior secondary (ie. SMP or MTS in the Indonesian context) and senior secondary education (ie. SMU or MA). Also, the higher education consists of three categories, namely Diploma-I-II, Diploma III and University. This classification seems to be more relevant to Indonesia.

Note that the Diploma-I on average can be completed within one year while Diploma II and III can be completed within two and three years respectively. But because the data from the Bureau Statistics (BPS) combine two categories Diploma I and II, I therefore assign the average duration for this level of education (g=4) i.e 13.5 years (12 years for senior secondary school and 1.5 years for the diploma education). I use the following equations:

$$h_{0,t}=h_{0,t-1}[1-(L16_t/L_t)]+(L16_t/L_t)*(1-PRI_{t-3}) \tag{a}$$

$$h_{1,t}=h_{1,t-1}[1-(L16_t/L_t)]+(L16_t/L_t)*(PRI_{t-3}- JSEC_t) \tag{b}$$

$$h_{2,t}=h_{2,t-1}[1-(L16_t/L_t)]+(L16_t/L_t)*(JSEC_t -SSEC_t) \tag{c}$$

$$h_{3,t}=h_{3,t-1}[1-(L16_t/L_t)]+(L16_t/L_t)*SSEC_t - (L19_t/L_t)*\left(\sum_{h=1}^{3} HIGH_{ht}\right) \tag{d}$$

$$h_{4,t}=h_{4,t-1}[1-(L16_t/L_t)]+ (L19_t/L_t)*HIGH_{1t} \tag{e}$$

$$h_{5,t}=h_{5,t-1}[1-(L16_t/L_t)]+ (L19_t/L_t)*HIGH_{2t} \tag{f}$$

$$h_{6,t}=h_{6,t-1}[1-(L16_t/L_t)]+ (L19_t/L_t)*HIGH_{3t} \tag{g}$$

The attainment ratio h_{gt} shows the share of population aged over 15 who are in the workforce with g level as the highest level of education attained. The variables PRI, JSEC, SSEC and HIGH are the enrolment ratios for primary, junior secondary, senior secondary and higher schools, respectively. The index h to variable HIGH enrolment refers to Diploma I-II, III and university for h=1,2,3 respectively. L16 is the population aged 16-18. L19 denotes the number of persons aged 19-24.

The schooling year is simply the product of attainment ratios and the duration of each level education:

$$s_{jt} = \sum_{g=1}^{6} d_g h_{gjt} \tag{h}$$

As the first terms in the right hand side of equations (a-g) show human capital stock from the previous year, we can collect this as one term and put it on the left hand-side together with the higher education attainments to obtain the following:

$$s_{jt} - \sum_{g=0}^{6} d_g (1-(L16_t/L_t))h_{jg,t-1} - \sum_{g=4}^{6}(d_g - d_3)(L19_t/L_t)HIGH_{hgt} = \sum_{g=1}^{3} d_g \Delta a_{g,s,j,t} \tag{i}$$

Where,

$$\Delta a_{gst} = \begin{cases} (L16_t/L_t)*(PRI_{st} - JSEC_{st}), g = 1 \\ (L16_t/L_t)*(JSEC_{st} - SSEC_{st}), g = 2 \\ (L16_t/L_t)*SSEC_{st}, g = 3 \end{cases} \tag{j}$$

The second term of the left hand side is simply the schooling years in the previous year weighted by $(1-(L16_t/L_t))$. This leads to the Equation 3-5 in the text:

$$s_{jt}' = s_{jt} - (1-(L16_t/L_t)s_{j,t-1} - (L19_t/L_t)\sum_{g=4}^{6}(d_g - d_4)Enroll_{gt} \tag{k}$$

Where $Enroll_{gt}$ is the diploma and above (g>=4) gross enrollment ratio. Putting the decomposed components of schooling years altogether in the right hand side of the equation provides:

$$s_{jt} = \underbrace{(6*\Delta a_{11jt} + 9*\Delta a_{31jt} + 12*\Delta a_{31jt})}_{Islam} + \underbrace{(6*\Delta a_{12jt} + 9*\Delta a_{32jt} + 12*\Delta a_{32jt})}_{Non-Islam} + \underbrace{(1-(L16_t/L_t)s_{j,t-1}}_{Lagschool}$$

$$+ \underbrace{(L19_t/L_t)\sum_{g=4}^{6}(d_g - d_4)Enroll_{gt}}_{High}$$

Or,

$$s_{jt} = Islam_{jt} + Non - Islam_{jt} + Lagschool_{jt} + High_{jt} \tag{l}$$

which is the main equation used in the text.

Stata Program to Decompose Years of Schooling

```
/*
age1618        – population aged between 16 and 19
totalwork      – total work force
jhsgp          – % of workforce with (general)junior secondary education
jhsvocp        – % of workforce with (vocational)junior secondary education
shsgp          – % of workforce with (general)senior secondary education
shsvocp        – % of workforce with (vocational)senior secondary education
dipl12p        - % of workforce with Diploma-I and Diploma-II education
univp          - % of workforce with a university degree
germi          - Madrasah Ibtidaiyah (primary) Gross enrolment ratio
germts         - Madrasah Tsanawiyah (junior secondary)Gross enrolment ratio
germa          - Madrasah Aliyah (senior secondary)Gross enrolment ratio
gersd          - Non-Islamic primary schools (primary) Gross enrolment ratio
gersmp         - Non-Islamic junior secondary schools Gross enrolment ratio
gersma         - Non-Islamic senior secondary schools Gross enrolment ratio
school         - Years of schooling
*/

gen l16p= (age1618/totalwork);
gen jhsp= jhsgp + jhsvocp;
gen shsp= shsgp + shsvocp;
gen highp= dipl12p + dipl3p + univp;

gen l19penroldipl12= dipl12p - ((1-l16p)*l.dipl12p );
gen l19penroldipl3= dipl3p - ((1-l16p)*l.dipl3p );
gen l19penroluniv= univp - ((1-l16p)*l.univp );
gen l19phigh=highp-(1-l16p)*l.highp;

gen x11=l16p*((germi-germts)/100);
gen x12=l16p*((germts-germa)/100);
gen x13=l16p*(germa/100);

gen x21=l16p*((gersd-gersmp)/100);
gen x22=l16p*((gersmp-gersma)/100);
gen x23=l16p*(gersma/100);

gen x1=6*x11+9*x12+12*x13;
gen x2=6*x21+9*x22+12*x23;
gen x3=(1-l16p)*l.school;
gen x4=(1.5*l19penroldipl12 + 3*l19penroldipl3 + 4*l19penroluniv);

label var x1 "Islamic education in schooling year";
label var x2 "Non-Islamic education in schooling year";
label var x3 "Lagschool in schooling year";
label var x4 "High education in schooling year";
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4 CAN GOVERNMENT REGULATION IMPROVE COMPETITIVENESS OF GRADUATES OF RELIGIOUS SCHOOLS?

4.1 Introduction

The role of government in the provision of public education has been one of the most debated topics in the literature. However, when it comes to the government's role in religious education, large variation exists across countries. In most western countries, religious education is seen as a private good; governments normally have no control over the delivery of religious education in public schools. Parents who want their children to have a religious education must send their children to private schools run by religious organizations. The opposite happens in Indonesia and some other countries, such as Malaysia and England, where religion is a compulsory course in public schools.

Although issues relating to ways to improve education in religious public schools can be found in existing studies, for example school competition (Hoxby 1994; Hanushek and Rivkin 2003), school finance (Hoxby 2001) and determinants of schooling (Behrman 1999), one critical issue in religious education in public schools, which has not received the attention it deserves, is the allocation of school hours to religious education. In Indonesia, for those who attend Islamic schools (*Madrasah*), religious courses take up 30% of their school hours. A significant proportion of time dedicated to religious courses, at the expense of hours given to regular subjects, makes it extremely challenging for the schools to compete with other types of schools in terms of academic attainments and future earnings. This leads to the question of whether the 30–70 religious–secular education ratio imposed by the Indonesian government is effective.

This chapter assesses government intervention in religious education. In 1975, through the 3-ministers-collective decision letter (*Surat Keputusan Bersama or SKB*) enacted by the Minister of Religious Affairs, the Minister of Home Affairs and the Minister of Education and Culture (currently named Minister of National Education), the curricula of *Madrasah* in Indonesia ranging from primary to senior secondary schools were

regulated by the Indonesian government to a curricula compromising 70% regular education and 30% religious education.[49] However, the position of *Madrasah* as regular schools with Islamic characteristics (*sekolah umum berciri khas agama Islam*) was not integrated into the Indonesian education system until 1989 through the issue of the National Education System Law No. 2. The change in the *Madrasah* system was basically meant to standardize the academic quality of *Madrasah* and, therefore, improve Islamic school graduates' competitiveness in the labour market relative to graduates from other types of schools. However, there is no evidence supporting the success of this strategy.

Most studies on education in Indonesia focus on the contribution of government, for example, on the positive impacts of the 1970s' major school construction program (Duflo 2001), the success of expanding basic education from grade 6 to grade 9 which was launched in 1989 to improve social rates of return to education in Indonesia (McMahon and Boediono 1992), and the role played by Indonesia's Social Safety Net Scholarships Program in reducing school drop-out rates during the Asian financial crisis (Cameron 2009). But little is known about the effect of government regulation on religious education.

This study is of policy interest given some current stylized facts in relation to Islamic school performance. First, using data from three waves of the Indonesian Family Life Survey (IFLS1 in 1993, IFLS2 in 1997 and IFLS3 in 2000), a recent study concluded that students in public schools and non-Muslim religious private schools performed better than students in *Madrasah* and secular private schools (Newhouse and Beegle 2006). Second, another study found that graduates of Islamic schools did not enjoy wage premiums, and were disadvantaged over graduates of public and non-Muslim religious private schools (Bedi and Garg 2000). Taken together, these two findings indicate that Islamic schools are not yet able to compete with public schools. The success of the 1989 major curriculum change in the context of schooling and individual earnings should therefore be questioned.

Another focus of this study is to see the distribution of educational outcomes and individual earnings conditional on policy implementation and other individual characteristics. This is motivated by an indication that the 1989 regulation might be effective only for some groups of the population, an element not captured by standard

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[49] The term *Madrasah* refers to both plural and singular forms.

least squares estimation. An alternative is Quantile Regression (QR), which extends the estimation of quantile functions to allow the distribution of quantiles of the response variable as functions of the covariates (Koenker and Gilbert Bassett 1978).[50] This feature has made the model appealing for economists. In particular, QR has been a common tool used by a large number of studies to estimate return to education in a wage equation and to look at the contribution of education to shaping wage structure or inequality (Buchinsky 1994; Mwabu and Schultz 1996; Manning 1999; Hartog, Pereira et al. 2001). In regard to education production, some studies have looked at a particular factor which is usually of policy interest such as peer effects, class size reduction, school quality etc. (Eide and Showalter 1998; Levin 2001; Schneeweis and Winter-Ebmer 2007).[51] There are few applications of QR to analyse the impacts of a specific government regulation. This study therefore can add to the literature on this specific matter.

To look at the impacts of the 1989 *Madrasah* integrating progression, I use the 2000 Indonesian Family Life Survey (IFLS3) dataset, more precisely working men and women aged over 15 who are no longer attending school.[52] Some new approaches are applied to allow the use of cross-sectional data to analyse the effects of policy introduced almost 20 years ago. I construct cohorts based on the year of completion and types of school. I consider a possibility of different impacts of the program between males and females and between respondents living in urban and rural areas and a mobility effect. I also apply the QR method to verify the possibility of different impacts of regulation across quantiles and perform QR on schooling year and income models.

I find that while in general the reform has not improved either educational outcomes or individual earnings of *Madrasah* graduates, it has contributed to the promotion of nine years of basic education in rural areas. QR presents similar results to the OLS estimation. The impacts of regulation on earnings are uniform across quantiles.

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[50] See Koenker and Hallock (2001) for an excellent review of Quantile Regression.

[51] Using QR, a study finds that students in Austria with lower skills benefit more from being exposed to clever peers, whereas those with higher skills receive no visible benefit (Schneeweis and Winter-Ebmer (2007). Balanced by no significant adverse effect of social heterogeneity on academic attainment, the study suggests considerable social gains of reducing educational stratification (Schneeweis and Winter-Ebmer (2007). Another study finds that class size reduction might play a role in improving peer effects (Levin (2001).

[52] Since the 2000 survey tracks the respondents in the 1993 IFLS with an over 90% response rate and I focus on those aged over 15 and who are in the labour market, using data from three waves together would not give a significant effect unless I wanted to focus on the change in socio-economic behaviour of the respondents, which is not the purpose of this study.

The remaining section of this chapter is organized as follows. Section 4-2 reviews data used in this study, gives a brief historical background of *Madrasah* and details how the Indonesian government has intervened in the curriculum of *Madrasah*. Section 4-3 describes the identification strategy including how I capture the effect of the reform from the data and outlines the conceptual framework based on an endogenous schooling model to define the relationship between individual earnings and education variables. Section 4-4 presents econometric models on the 1989 regulation's impacts on education, whilst impacts on individual earnings are presented in Section 4-5. In Section 4-6, I further discuss the empirical findings, the policy implication of such findings and areas of future research to follow up some issues raised here.

4.2 Background

4.2.1 Data

I use data from the third wave of the Indonesian Family Life Survey (IFLS3). The IFLS is a large-scale longitudinal survey collecting data from respondents living in 13 provinces and representing 83% of the Indonesian population. It was a collaborative effort of RAND and the Center for Population and Policy Studies (CPPS) of the University of Gadjah Mada. Funding for IFLS3 was provided by the National Institute on Aging (NIA) grant 1R01 AG17637, and the National Institute for Child Health and Human Development (NICHD) grant 1R01 HD38484. The dataset can be accessed free of charge from RAND's official website.[53]

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[53]Address: http://www.rand.org/labor/family/software_and_data/FLS/IFLS/download.html

Table 4-1. Descriptive Statistics – IFLS3 Data

Variable	Mean	Standard error of mean	No. of observations
Age	29.444	0.095	7436
Male (dummy)	0.627	0.006	7436
Working experience	7.280	0.128	2425
Marital Status (dummy)	0.664	0.005	7436
Java ethnicity (dummy)	0.441	0.006	7436
Speak Bahasa at home (dummy)	0.144	0.004	7436
Currently lives in urban area (dummy)	0.548	0.006	7436
Born in urban areas (dummy)	0.194	0.005	7436
Family size	4.883	0.026	7436
Years of schooling	9.323	0.033	7436
Madrasah attendance (Ever attended *Madrasah*? (1=Yes))	0.018	0.002	7436
Completed highest level of pre-university education after 1989 (dummy) (AFTER 1989)	0.414	0.006	7436
Attended *Madrasah* Ibtidaiyah (primary) (dummy)^	0.020	0.003	2681
Attended *Madrasah* Tsanawiyah (JSS) (dummy)^	0.054	0.005	2103
Attended *Madrasah* Aliyah (SSS) (dummy)^	0.024	0.004	1481
Total years of *Madrasah* Schooling	0.093	0.009	7436
Self-reported welfare (between 0 and 6)	3.116	0.013	7434
Hourly wage	2592.288	97.196	4123
Lives in poor village (dummy)	0.810	0.005	7436
Father's years of schooling	2.953	0.047	7436
Mother's years of schooling	1.758	0.036	7436
JSS located in the same province of residence (dummy)^	0.848	0.009	1451
SSS located in the same province of residence (dummy)^	0.839	0.012	1022
University/college located in the same province of residence (dummy)^	0.831	0.027	201
Never moved to other provinces since finishing highest education (dummy)	0.849	0.007	2390
Never moved to other municipalities since finishing highest education (dummy)	0.664	0.010	2336

Source: Author's calculation based on IFLS3 data of respondents aged over 15 with at least primary education, whose main activity is working and no longer attend school (Primary - SSS). The full sample (N=5228) refers to samples in the years of schooling equation.

The first wave (IFLS1) was administered in 1993 to over 22,000 individuals living in 7224 households. In IFLS3 the re-contact rate was 95.3% of IFLS1 households, considered a high relative to longitudinal surveys held in developed countries.

Table 4–1 shows the descriptive statistics. The average age of the respondents is 30 with around 7 years of work experience. Over 60% of the respondents are males. The majority of respondents (66%) are married. Around 44% of them are Javanese. Over 50% of the respondents currently live in urban areas, but less than 20% were born in urban areas indicating trends in urbanization. The family size is quite large, with an average of 5.

With regard to education, around 40% of the respondents completed their highest level of education after 1989. Between 2% and 5% attended Islamic schools: primary (2%), JSS (5.4%) and SSS (2.4%). Compared to the national average of gross enrolment ratios in 2003–2007 in Table 2-10 this number is lower especially for primary and junior secondary levels. The national statistics show that between 2003 and 2007, over 10% of school age people attended primary and junior secondary *Madrasah*. Around 5% attended senior secondary *Madrasah*. The differences might suggest increases in enrolment rates of *Madrasah* primary and junior secondary schools relative to senior secondary schools over the periods. I will later show that this argument seems to be supported by my empirical analysis. From my samples, the average years of *Madrasah* schooling is 0.09 years while the average years of schooling is 9 years. With regard to mobility, nearly 85% of respondents were educated in the same province and 65% were educated in the same municipalities where they resided in 2000 (when the survey was conducted).

The parental background of respondents shows that most come from low-educated families: 74% of their mothers and about 61% of their fathers had no formal education, and only 26% had primary education. Taking only respondents who attended *Madrasah*, I get slightly bigger proportions of respondents reporting that their parents have no schooling.

I see some interesting statistics in regard to their economic status. The average monthly wage is IDR 383,615, only slightly higher than the minimum regional wage in Jakarta in 2000 (IDR 344,257). Those who never attended *Madrasah* have statistically significant (at the 5% level of confidence) higher average wages than those who attended *Madrasah*.

This becomes the starting point to see the difference between those who attended *Madrasah* and those who never attended, and various factors which might affect individual earnings.

4.2.2 The *Madrasah* Program

Religious education has a long history as an important part of the Indonesian education system.[54] The establishment of *Madrasah* in the beginning of the 20th century was marked by the establishment of *Madrasah Mambaul Ulum* in The Sultan's Palace of Surakarta in 1905 and *Sekolah Adabiyah* or Adabiyah School built by Syekh Abdullah Ahmad in West Sumatra in 1909 (Zuhdi 2005; Syukur 2008). *Madrasah*'s existence itself has been an integral part of *Pesantren* (Islamic boarding schools). It was argued that the *Madrasah* progressive movement was influenced by the Islamic revival in the Middle East, the western education system and Indonesian indigenous education, namely *Pesantren* (Syukur 2008).[55]

While the root of contemporary *Madrasah* was established in the early 1900s, it was in 1952 when the Indonesian government made its first attempt to intervene in the *Madrasah* system by enacting the Minister of Religious Affair (MRA)'s Decision Letter (*Surat Keputusan Menteri Agama*) No.1 Year 1952 on classification and levels of *Madrasah* education.[56] Based on this decision letter, education in *Madrasah* is conducted in three levels, namely a primary level of 6 years (*Madrasah* Ibtidaiyah), a junior secondary level of 3 years (*Madrasah Tsanawiyah*) and a senior secondary level of 3 years (*Madrasah Aliyah*). This classification has not changed. The decision letter also states that all *Madrasah* levels must provide three of the academic subjects taught in regular schools and follow the standard curriculum of MRA.

Then in 1958, MRA introduced an 8-year *Madrasah* compulsory education program or *Madrasah Wajib Belajar*. This program attempted to develop an integrated curriculum combining religious aspects, general knowledge and vocational skills. However, there was

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[54] See Kristiansen and Pratikno (2006) for a brief review of the history of education in Indonesia and Zuhdi (2006) for a review of changes in *Madrasah* education between 1945 and 2003.

[55] The establishment of *Madrasah* in *Pesantren* itself has been seen as the symbol of the introduction of secular subjects. It was pioneered by *Kyai* Ma'sum from *Pesantren Tebu Ireng* in 1916 Dhofier (1999), p.82. It is argued that competition to obtain good employment between European-type schools and Muslim schools was the main reason for the presence of secular subjects in Muslim schools (Thomas (1988). Then, under the leadership of Wahid Hasyim, the *Madrasah* system was modernized (Lukens-Bull (2005), p.36. His *Madrasah* classification is now used as the national *Madrasah* system.

[56] According to Zuhdi (2006), this was 6 years after the formation of the MRA's aim to supervise religious education

no evidence of successful results of this program (Zuhdi 2005, p. 37; Syukur 2008). Indeed, the private *Madrasah* continued to run their own curricula (Zuhdi 2005). As a response, the Indonesian government was moved to build more public *Madrasah* (Zuhdi 2005, p. 38).

One of the first major government interventions to the *Madrasah* system was through the 1975 3-ministers-collective decision letter (*Surat Keputusan Bersama or SKB*) enacted by the Minister of Religious Affairs, Minister of Home Affairs and Minister of Education and Culture (currently named Minister of National Education).[57] The decision letter was a follow up to the 1975 Presidential decree which required that all formal education should be administered under the Minister of Education. The SKB ruled that *Madrasah* education must consist of 70% regular education and 30% religious education. The reform was implemented nationwide. It is obvious that a 70% proportion of regular education is higher than having 3 subjects as previously required by the 1952 regulation. This transformation emphasizes *Madrasah*'s evolution from Islamic schools into 'regular schools with Islamic characteristics' (*sekolah umum berciri khas agama Islam*). One major change resulting from the SKB was the acceptance of *Madrasah* graduates to university which was pioneered by Bogor Agricultural University (Institut Pertanian Bogor) (Zuhdi 2005, p. 39).

Although the reform was initially imposed in 1975, not until the late 1980s were *Madrasah* considered an integral part of the Indonesian education system or equivalent to 'secular schools' (Azra 2008, p.4). The result of the 1975 reform was not evident since the curriculum of Islamic schools throughout the country continued to exhibit local variations (Zuhdi 2006, p.421). The turning point was in 1989 when the National Education System Law No.2 Year 1989 was enacted. ThisLaw strengthened the position of *Madrasah* as regular schools with Islamic characteristics. Indeed, it was the first act to explicitly refer to the *Madrasah* as part of Indonesia's national education system (Zuhdi 2006). According to the Law, *Madrasah* must provide the same curriculum as regular schools plus 7 religious subjects.

The 1989 Law attracted some criticism. For some, the law was perceived as an attempt to downgrade the importance of religious education among young children. For others, it was accepted as a progressive reform to integrate *Madrasah* into the formal education

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[57] See Zuhdi (2005) for a review of this 1975 3-minister decree.

system. Being integrated implied that *Madrasah* graduates had equal access to pursue further study at, or move to, other types of schools given that their education was fully accredited by the government. It was also expected that this reform would equalize a *Madrasah* graduate's competitiveness in the labour market.

Unfortunately, while the Indonesian government has attempted to standardize their curriculum, *Madrasah* academic achievements are still not as impressive as in other types of schools (Newhouse and Beegle 2006). Furthermore, there is no evidence of increased competitiveness among Islamic school graduates in the labour market relative to graduates from other types of schools (Bedi and Garg 2000). The question would be whether the reform transforming *Madrasah* into regular schools with Islamic characteristics (*sekolah umum berciri khas agama Islam*) has been effective.

4.3 Identification Strategy

4.3.1 Sources of Variation

The study analyses the impacts of the 1989 reform on years of schooling and probability of completing junior secondary and senior secondary education as well as earnings. These variables might be able to proxy changes in *Madrasah* schooling quality.

The *Madrasah* reform might lead to changes in the average of *Madrasah* quality. Before 1989, *Madrasah* were not regulated by the government and their standards were lower. For example, they might not have provided as many textbooks and teachers in regular subjects as did after 1989. The changes might have encouraged more students to attend *Madrasah*. Indeed, the percentage of respondents attending *Madrasah* is higher in the period after 1989, as shown by Figure 4-1. [58] *Madrasah* could be more selective in accepting new students due to a limited class capacity while ruling out those with lower academic skills.[59] The ideal dependent variable would therefore be test scores. Unfortunately the IFLS3 dataset does not have sufficient information on this variable, especially for those who completed schooling many years ago.

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[58] Duflo (2001) uses the number of primary schools per capita to capture the effect of the school construction program. This approach seems to be unsuitable for analysing the effects of *Madrasah* reform as the reform was not designed to construct schools but rather to 'optimize' the *Madrasah* curriculum.

[59] In Indonesia, it is common for a school, especially a private school, to conduct an independent admission test for primary level. The tests for kindergarten leavers are usually reading and basic mathematics. A good quality school usually has a more difficult test than the test conducted by lower quality schools.

An alternative variable to capture the reform effects is years of schooling. Increases in enrolment rates may indicate that the individual expectation of future returns to education (when the individual made his schooling decision) was higher for those who attended *Madrasah* after 1989. Parents might expect their children to be more competitive in the future job market as their children would be equipped with more regular subjects such as maths and science. Consequently, conditional on parental preference on religious education, parents would probably keep their children longer at school than they would otherwise wish if the reform was not introduced. Therefore, years of schooling can be used to proxy increases in *Madrasah* quality.

If we look at the year 1989, it is clear that there was a slight jump in the percentages of respondents attending *Madrasah*. The use of dummies on completion of each level of secondary education allows us to see whether the reform was equally effective across different levels of education. In particular, Figure 4-2 indicates that the positive trends between the 1970s and the 1990s are largely contributed to by an increased percentage of respondents attending *Madrasah* at junior secondary school instead of primary level.

Moreover, Figure 4-3 shows that there have also been increases in the average of *Madrasah* attendance years. The variable is defined as total years of attending *Madrasah* weighted by the number of respondents. The positive trends indicate that over the period there have been more *Madrasah* students who furthered their study in *Madrasah* schools. The increase was more obvious after 1989. This may be an effect of the government's attempt to integrate *Madrasah* into the national education system. The average of total years attending *Madrasah* is very small compared to the average of schooling years in general, which is 9 years. But the figures are still aligned with my prediction that conditional on having attended a *Madrasah*, if the reform was effective, students would stay longer at school, verifying the appropriateness of the use of years of schooling as the outcomes.[60]

As a consequence of potential changes in the education outcomes, it is then interesting to see whether the 1989 regulation had any effect on individual earnings and, generally,

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[60] Another potential change is the increase in the average cost of education. Given that schools must provide more textbooks and teachers to support their non-religious subjects, it is realistic to expect an increase in their educational costs. We should also expect to have an increase in the educational costs due to a possible increase in demand for *Madrasah* education. If the increase in expected future returns to education is proportional to the increase in costs of education, based on the optimal schooling choice, this implies constant schooling years. In contrast, an increase in schooling years as a result of the *Madrasah* reform after controlling relevant variables indicates an increase in expected returns to education will outperform an increase in costs of education. Unfortunately, the IFLS dataset has no sufficient information on cost of schooling for those who no longer attend schools.

welfare. Figure 4-4 shows that over the period from the 1970s to the 1990s the (natural logarithm) average monthly income of people being educated in *Madrasah* has been consistently lower than those who completed their studies in non-*Madrasah* schools.[61] There is no difference for those who completed primary education after 1989 and were exposed to the reform for a longer period. However, if we look closely at Figure 4-4, we see that there seems to be a smaller income gap between *Madrasah* and non-*Madrasah* completers. Thus the reform might contribute to a reduction in wage penalties for *Madrasah* completers.

Interestingly, like its relationship with individual earnings, there seems to be an association between experience, roughly equal to survey year minus year of leaving school, and self-assessed welfare as shown by Figure 4-5. I construct a welfare indicator by taking into account the respondent's evaluation over 3 categories: (i) current standard of living; (ii) food consumption; and (iii) healthcare. For these three aspects, respondents may respond either 'less than adequate for my needs', 'just adequate for my needs', 'more than adequate for my needs' and 'don't know'. For simplicity, I drop those who gave the last option. The other three options are coded 0, 1 and 2, respectively. Consequently, 'welfare' variable values lie between 0 and 6. Figure 4-5 shows that respondents who enrolled in *Madrasah* and completed primary education prior to the mid-1980s have lower welfare on average than those who never attended *Madrasah*. After 1986, however, the pattern changed. The hypothesis to be tested is whether the reform has contributed to the change in the trend when other variables are controlled for. This will be one of the focuses of my empirical work.

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[61] Note that the x axis refers to completion year of primary education. Hence, the negative time trend does not associate with decreasing wages but shows a positive relationship between earnings and experience given that our samples consist of school leavers.

Figure 4-1. Shares of *Madrasah* Attendance Before and After 1989 in Total School Attendance
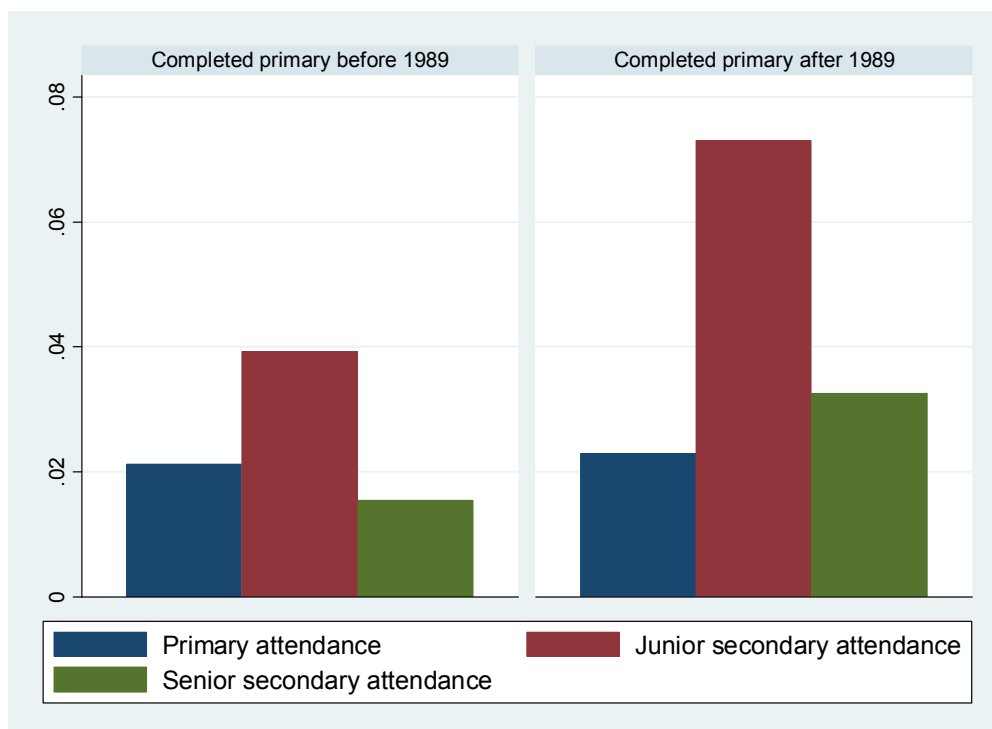
Source: Author's calculation using data from IFLS3.

Figure 4-2. Respondents Attending *Madrasah*, 1969-1993 (% Total Respondents Attending Schools)
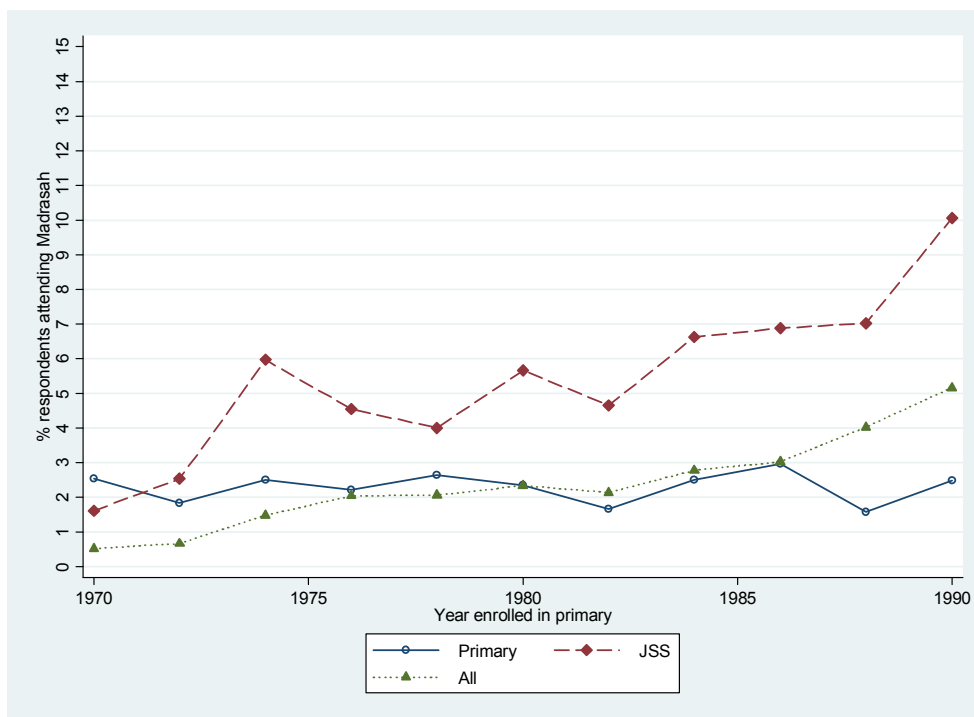
Source: Author's calculation using data from IFLS3; data are 2-year averaged.

Figure 4-3. Average of Years of Attending *Madrasah*
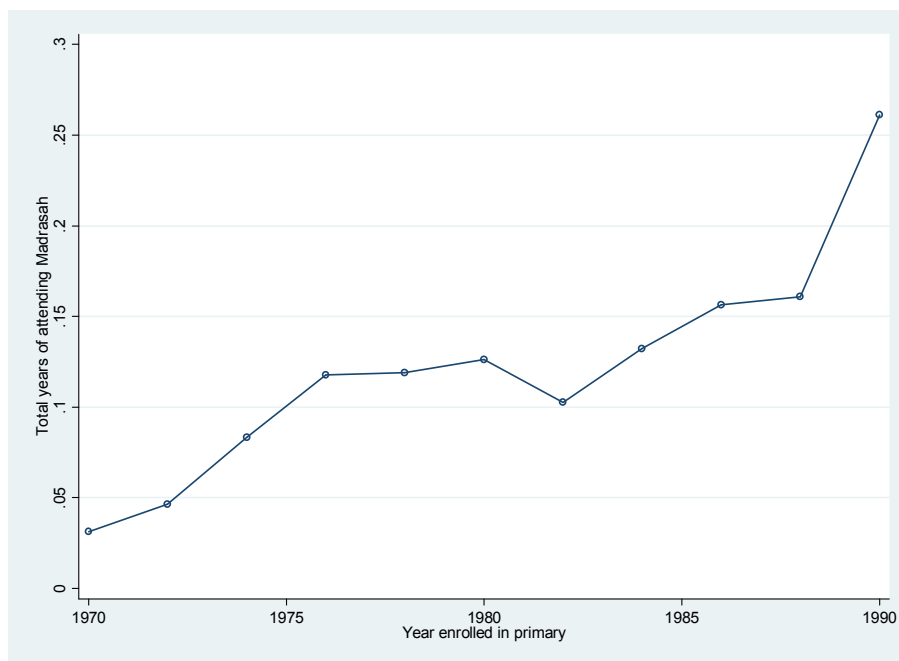
Source: Author's calculation using data from IFLS3; data are 2-year averaged.

Figure 4-4. (Natural Log) Monthly Income and *Madrasah* Attendance
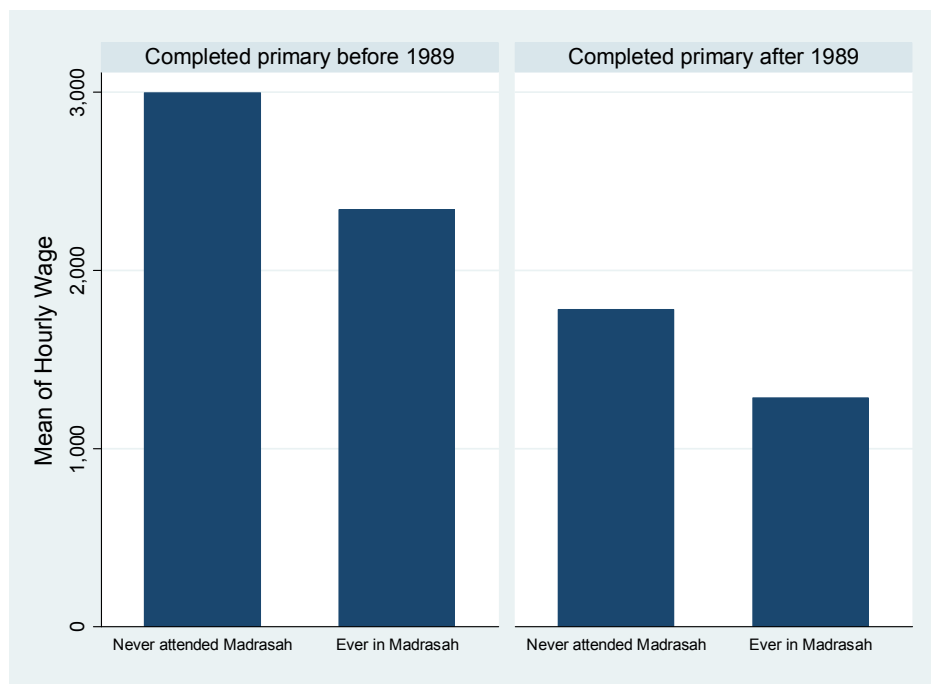
Source: Author's calculation using data from IFLS3.

Figure 4-5. Self-assessed Welfare and *Madrasah* Attendance
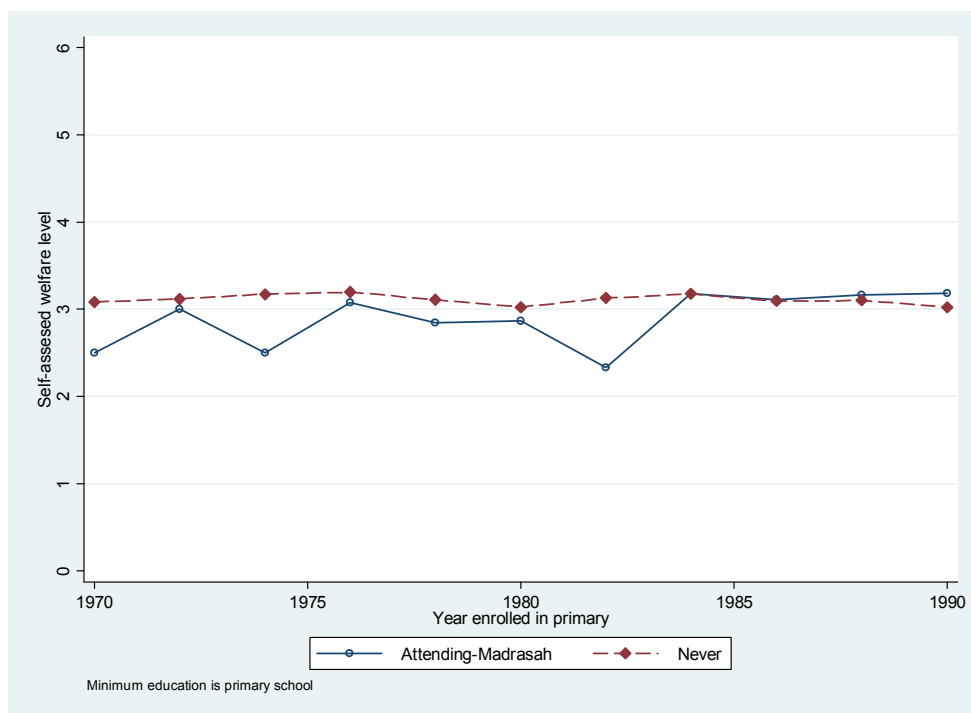
Source: Author's calculation using data from IFLS3; data are 2-year averaged.

4.3.2 The Conceptual Framework

In this section, I use a simple version of the model of endogenous schooling (Becker 1967; Card 1999).[62] I extend the model to take into account two types of education that was received during the schooling years.

Suppose the log-wage of individual i in cohort k is determined by:

$$\log w_i = \beta S_i + \tilde{a}_i + e_i \qquad \qquad \textbf{4-1}$$

The coefficient β is a change in log earning for an additional year of schooling, while $\tilde{a}_i$ incorporates all 'ability' factors, ie. access to educational funds, intelligence.[63] I assume this ability term is not observable. Variable e_i is an iid error. The implication of the above equation is that each additional year of schooling has the same proportional effect on earnings, holding constant other factors in the labour market.[64]

Applying OLS will most likely yield upward bias unless ability is not correlated with the schooling year:

$$\beta_{OLS} = \beta + \frac{Cov(S_i, \tilde{a}_i)}{Var(\tilde{a}_i)} \qquad \qquad \textbf{4-2}$$

To reduce the bias, studies incorporate more control variables, for example using twin data (Behrman and Rosenzweig 1996) and other methods. In this study, I define the ability term as a function of cohort characteristics. The previous descriptive analysis has shown that there seems to be variation in earnings between those who ever attended *Madrasah* and those who never attended before and after the reform. Suppose the reform is significant for *Madrasah* graduate's earnings. The significance can be due to various reasons, such as differences in either ability, impacts of differences in ability on schooling

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[62] The model was initially developed by Becker (1967) and further improved by Card (1995).

[63] Assume we have controlled other factors which may affect earnings such as gender, experience in the labour market etc.

[64] This, however, can be empirically wrong, ie. the squared schooling year is significant for log earnings. But, again, for simplicity I assume that the relationship is linear.

years or a problem of selection bias.[65] For simplicity, I assume that all these factors are included in the unobservable term of ability.

I define:

$$\tilde{a}_i = \gamma_1 M_i + \gamma_2 t_i + \gamma_3 M_i t_i \qquad \qquad \textbf{4-3}$$

The respondents can be classified into four cohorts. There are two aspects in deciding whether an individual is exposed to the new regulation on *Madrasah* curriculum: year of completion and Madrasah attendance. To be exposed to the reform, the person must attend *Madrasah* after 1989. I define t_i as the year of highest level of pre-university schooling completion, which equals 1 if it is after 1989 and 0 otherwise. Variable M_i refers to whether the respondent ever attended *Madrasah* at one point of his schooling. The coefficient on t_i indicates the differences between those who completed schooling before and after 1989, irrespective of the types of school attended. The coefficient on M_i shows the differences between those who attended *Madrasah* and those who never attended *Madrasah*, irrespective of the year of completion. The coefficient on the interaction term indicates the additional effect of attending at least one level of education at a *Madrasah* school for those who completed their highest level of pre-university education after 1989. One problem with the above specification is 'switching'. Suppose a person enrolled in primary *Madrasah* in 1980 then completed primary education in 1986. Then he went to non-*Madrasah* junior and senior secondary and completed his highest level of pre-university schooling in 1992. Based on the above specification, he has $t_i = 1$ and $M_i = 1$ which makes him part of the treatment cohort (ie. the interaction term equals 1) whereas he was not supposed to be affected by the reform.[66]

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[65] School sorting can be highly correlated to family perceptions towards education (and religious education) and financial condition (eg parents choose to send their children to a *Madrasah* because of its lower tuition fees).

[66] Another potential switching problem is the following. Those who enrolled in *Madrasah Ibtidaiyah* (primary schools) in 1989 experienced 6 years of exposure to the school reform. Assuming the student did not repeat any grade, in 1995, if he or she decided to continue to non-*Madrasah* schools he or she would then no longer become part of the reform's targets. I therefore assume that respondents started and finished their study at the same school type for each level of education. Descriptive statistics suggest, however, that the share of respondents who switched within the same level of education is very small.

Table 4-2. Classification of Cohorts

Cohort	As % in the samples (N= 7436)	Description	Type of schools attended (1=*Madrasah*; 0=Non-*Madrasah*) (M_i)	Year of completion (1=before 1989; 0 after 1989) (t_i)	Interaction (1=exposed to the 1989 reform; 0=otherwise) $(M_i t_i)$
0	58.02%	Respondents who completed their highest level of schooling *before* 1989 and never attended *Madrasah*.	0	0	0
1	0.62%	Respondents who completed their highest level of schooling *before* 1989 and ever attended *Madrasah*	1	0	0
2	40.16%	Respondents who completed their highest level of schooling *after*1989 and never attended *Madrasah*.	0	1	0
3	1.21%	Respondents who completed their highest level of schooling *after* 1989 and ever attended *Madrasah*	1	1	1

Regarding the reform effects on earnings, substituting Equation 4-3 to 4-1 yields:

$$\log w_i = S_i \beta + Z_i \gamma + e_i \qquad\qquad \text{4-4}$$

where $\gamma' = \begin{bmatrix} \gamma_1 & \gamma_2 & \gamma_3 \end{bmatrix}$ and $Z_i' = \begin{bmatrix} M_i & t_i & M_i t_i \end{bmatrix}$.

The focus is on testing the hypothesis, ie. $\gamma_3 = 0$, which indicates the association between exposure to the 1989 regulation and the log-income. If we refer to Table 4–2, this coefficient simply shows the difference in earnings between the fully exposed cohort (Cohort 4) and other cohorts holding other factors constant including types of schools attended and year of completion. Coefficients γ_1 and γ_2 simply show differences in log-earnings between Cohort 0–Cohort 2 and between Cohort 0–Cohort 3, respectively, *ceteris paribus.* If the model has well-behaved residuals, the bias from excluding Z_i in the earnings equation is $(X'X)^{-1} X'Z\gamma$. Note that this equals 0 if $\gamma = 0$. A further question is whether S_i is indeed a function of Z_i. Policy wise, a significant relationship between S_i and Z_i shows the impact of the regulation on education. However, econometrically this implies endogeneity of schooling years. Even when $M_i t_i$ is not significant for schooling years, it is important to check whether we can use some potential instruments such as school proximity and check the consistency and efficiency of OLS estimation compared to the instrumental variable method. Finally, it will be interesting to see whether $M_i t_i$ is significant for log-earnings. The impact of the reform might work through channels other than average of schooling years. A broad concept of ability might capture the positive impacts of the reform from having it stimulate higher productivity of *Madrasah* graduates or give positive signals to the job market.

4.4 Effects on Education

4.4.1 Basic Results

To evaluate the impact of the 1989 regulation on education, I consider years of education and probability of completing junior secondary school (JSS) and senior secondary school (SSS).

First, I perform the following reduced form of the equation:

$$School_{ij} = b_0 + b_1 t_{ij} + b_2 M_{ij} + b_3 \left(M_{ij} \times t_{ij} \right) + b_4 x_{ij} + \hat{T}_{ij} + \rho_j + \varepsilon_{ij} \qquad \textbf{4-5}$$

where $School_{ij}$ is the years of schooling for individual i in region j. The cohort is defined by: (i) the individual year of completion (t_{ij}) which equals 1 if the person completed his highest (pre-university) level of education after 1989; (ii) type of school attended (M_{ij}) which equals 1 if the person ever attended *Madrasah*.[67] The effect of the 1989 regulation can be observed from the combination of these two factors . The coefficient shows the additional effect of attending at least one level of education at a *Madrasah* school for those who completed education after 1989. I allow the standard error to be clustered at municipality (*kabupaten*) level.

Variables x_{ij} reflect the observable characteristics of individual respondents. I include gender, parental educational background, whether the person was born in urban areas, age enrolled in primary school, whether the person speaks Bahasa at home, and whether the person has Javanese ethnicity.

In addition to the inclusion of the exogenous variable, I consider that inclusion of year enrolled in primary fixed effects is essential (T_{ij}). This variable should be able to control changes in *Madrasah* attendance (and other factors such as educational inequality and development in the educational sector) across the years.

Figure 4-6 shows changes in averages of schooling years of respondents in the work force and its inequality across the years.

However, the year fixed effect should not capture the effect of the 1989 regulation to avoid serious multi-collinearity with the variable of interest. Of course, this is unlikely to happen given that the interaction between year of completion and *Madrasah* attendance is the variable I use to capture the program's effect. Hence, I need an instrument that is able to capture the fluctuations in *Madrasah* attendance across periods but at the same is not closely related to the implementation of the regulation.

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[67] It is worth noting here that there is a possibility that variable t_{ij} captures the impact of the 9-year compulsory program which was launched in 1989. However, studies suggest that the program was not in practice until 1994. But given that the program was expected to be uniform across types of schools, it should not affect our estimation on the effects of the 1989 *Madrasah* reform.

Here I use an indicator of agricultural productivity, ie. agricultural value added in year of enrolment to primary, measured in constant 2000 US$. The choice of an instrument from the agricultural sector is based on two reasons. First, there is an indication that in Indonesia the educational sector is closely related to production in the agricultural sector, given the significant contribution of the agricultural sector to individual as well as to regional income. Using the 1993 IFLS, a study finds that educational expenditure responds to crop loss (Cameron and Worswick 2001). The response of schooling decision to agricultural production might be more evident in rural areas where most individuals work in the agricultural sector. In 1960, the surplus of food obtained by rural farmers became the reason for low urban–rural income inequality (Booth 2000). Additionally, agricultural productivity has a long history of being a significant determinant of rural poverty in Indonesia (Booth 2000, p.96). On the other hand, studies argue that *Madrasah* contribution is more significant in rural areas. Although their number was less than in non-religious schools (including public regular schools), Islamic schools' role in educating Indonesian youth, especially in rural areas, was quite significant (Zuhdi 2005, p.36). Taking these two findings together, there is a possibility that variation in agricultural productivity can provide a good prediction on changes in *Madrasah* attendance. I later see whether the relationship is more evident in rural areas.

I consider the fixed effects of province of birthplace (ρ_j). Studies argue that birthplace is more exogenous compared to current residence, which might be a result of market (job, housing, etc) observations. This variable takes into account a possible endogeneity issue in the presence of *Madrasah* schools. A province with a high Muslim population is predicted to have more Islamic schools. The inclusion of province fixed effects should also control other variables with such differences as investment in education, average of teacher quality and other possible important factors across provinces. Based on the dataset, 85% of respondents (in 2000) lived in their province of birthplace.

For years of education, I report the OLS estimate in Column (1) of Table 4–3. The OLS method simply assumes that all variables are exogenous. I find that being educated in *Madrasah* has a positive and significant association with total schooling years. Having attended *Madrasah* is associated with a 1.1 increase in years of schooling. Those who completed pre-university schooling after 1989 on average stayed 2 years longer in school than those who completed before 1989. However, in relation to the effect of the 1989 regulation indicated by the interaction between dummy on year of completion and

Madrasah attendance, I find insignificant coefficients. If significant, the coefficient implies that the relationship between the average of schooling years and being educated in *Madrasah* differs for those who completed before and after 1989. Although insignificant, it is interesting to see that the effect of being educated in *Madrasah* on the schooling years is lower for those who completed school after 1989 given the negative coefficient.

There are some possibilities why the reform was not effective in improving school participation. The findings suggest that the *Madrasah* effect itself is positive. This could be because parents who sent their children at one point of their school years to *Madrasah* might attempt to send them to higher education to catch up with their lack of competitiveness in regular subjects. It might also be because *Madrasah* schooling equips students with values needed to succeed, eg. discipline, etc. The exact reason is admittedly beyond the scope of the present study. Yet the reform might not change parental expectations on their children's future income. Students received no additional benefit from completing *Madrasah* schooling after the reform.

For individual characteristics, the results are as expected. First, controlling for other factors, being born in urban areas, speaking the national language of Bahasa and being male, are associated with a higher schooling year. In contrast, age at the time enrolled in primary school is negatively related to schooling years. For parental background, I find a significant effect of parents' education. The father's educational background is more highly correlated with children's schooling year. A 1-year increase in a father's schooling year is associated with 0.1-year increase in children's education. I find the same result as Meghir (2005) in that low education of the father tends to be associated with low educational outcomes for the children.

Figure 4-6. Schooling Years and Education Gini of the Working Force (1970-2000)
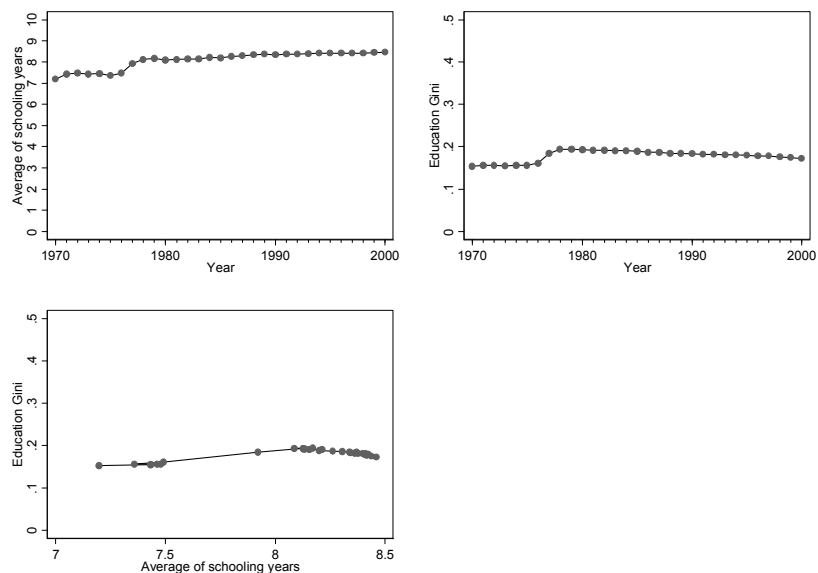
Source: Author's calculation using data from IFLS3 (RAND 2000).

Notes: Population of the dataset used to draw Figure 1 is defined as men and women aged over 15 in the working force whose primary activity is working and no longer attending school. I assume that participation in the work force starts once the respondent completed their highest education.

Table 4-3. The Impact of the 1989 Regulation on Education [Basic Results]

Dependent variables:	Years of Schooling	Completion of JSS	Completion of SSS
	(1)	(2)	(3)
Completed primary education after 1989 – AFTER 1989 PRI(t_PRI)		-0.090***	
		(-3.794)	
Pirmary *Madrasah* attendance – *MADRASAH* PRI (M_PRI)		0.065	
		(0.758)	
AFTER 1989 PRI x *MADRASAH* PRI (t_PRI x M_PRI)		0.083	
		(0.512)	
Completed highest level of pre-university education after 1989 – AFTER 1989 (t)	2.084***		0.422***
	(26.487)		(19.538)
Madrasah attendance – *MADRASAH* (M)	1.105***		-0.017
	(3.601)		(-0.188)
AFTER 1989 x *MADRASAH* ATTENDANCE (t x M)	-0.642		-0.044
	(-1.814)		(-0.406)
Male	0.345***	0.076***	0.050***
	(4.414)	(5.570)	(3.325)
Age enrolled in primary	-0.306***	-0.064***	-0.047***
	(-8.184)	(-8.848)	(-5.735)
Java ethnicity	-0.099	-0.009	-0.031
	(-0.926)	(-0.343)	(-1.674)
Speak Bahasa at home	0.479***	0.081**	0.091***
	(3.794)	(2.811)	(3.606)
Mother's schooling years	0.089***	0.014***	0.016***
	(8.502)	(6.320)	(7.993)
Father's schooling years	0.133***	0.025***	0.023***
	(14.955)	(16.018)	(13.179)
Born in urban areas	0.964***	0.173***	0.185***
	(9.876)	(8.815)	(10.849)
Agriculture value added per worker (constant 2000 US$)in Year of enrollment to primary	-0.011***	0.001***	-0.003***
	(-15.869)	(5.299)	(-14.592)
Pseudo/Adjusted-R2	0.218	0.101	0.155
Log-likelihood	-18256.187	-4686.905	-4954.446
No. Observations	7436	7061	7436

Note: For all columns, t-statistics are in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively. Estimation method for Column(1) is OLS, while columns (2) and (3) are based on probit model. Coefficients in columns (2) and (3) show marginal effects. Standard errors are clustered at the municipality level. Province fixed effects are included.

Next, I look at the effect of the 1989 regulation on whether the person completed 9-year education or junior secondary education. I use similar sets of explanatory variables but different variables to capture the reform effect. The idea is to estimate whether the effect of the 1989 reform at primary education has medium-term effects on the probability of completing 9 years of basic education (junior secondary education). I estimate the probability of completing junior secondary school based on the following reduced form model:

$$\Pr(JSS_{ij} = 1) = b_0 + b_1 t\_PRI_{ij} + b_2 M\_PRI_{ij} + b_3 \left(M\_PRI_{ij} \times t\_PRI_{ij} \right) + b_4 x_{ij} + \hat{T}_{ij} + \rho_j + \varepsilon_{ij}$$
4-6

where b_1 shows the differences between those who completed primary education after 1989 (t_PRI=1 if primary education was completed after 1989); b_2 shows the differences between those who attended primary *Madrasah* and those who did not attend (M_PRI=1 if the person attended primary *Madrasah*). Therefore, the coefficient b_3 shows the additional effect of attending primary education after 1989 conditional on having been to primary *Madrasah,* which captures the reform effect.

Column (2) of Table 4–3 presents the results showing marginal effects from a probit model. Hence, the coefficients simply show the effect of one unit change in the right-hand side on the probability of success.

The coefficient on 'completed primary education after 1989' is negative and significant. This is not surprising. Note that my sample comprises those who have completed their schooling and whose primary activity is working. The 2000 survey year gives a sufficient period of time for respondents who completed primary school after 1989 to complete higher education. However, the probability of completing higher education is less than for those who completed before 1989, holding other factors equal. Assuming that 16 years is needed to complete education until a university degree or 10 years from the completion of primary school, only those who completed primary education in 1989 and 1990 are 'able' to finish a university degree. Only those who completed primary education between 1989 and 1994 are 'able' to complete SSS. Hence, the inclusion of this variable can be seen as a controlling variation in the probability of completing higher education between those who completed primary education before and after 1989, holding other factors equal.

The effect of the 1989 regulation itself is positive but insignificant. The coefficient on primary *Madrasah* attendance is positive but insignificant. I consider that there might be a positive effect of the regulation, but a positive coefficient in a sub-group is cancelled out or dominated by a negative or insignificant coefficient of another sub-group leading to an insignificant coefficient in the all samples modelled. I will further explore the source of heterogeneity in the next section. For individual characteristics, all coefficients in Column 2 have the same signs as those in Column 1. However, the magnitude of the marginal effects is much smaller than in Column 4. This implies that a unit change in the explanatory variable will affect the probability of completing junior secondary education less than the average of schooling years. Next, I look at the effect of the 1989 regulation on the probability of completing senior secondary education. I use the same sets of explanatory variables as in the years of schooling equation. I perform the following reduced form of the equation:

$$\Pr(SSS_{ij} = 1) = b_0 + b_1 t_{ij} + b_2 M_{ij} + b_3 \left(M_{ij} \times t_{ij} \right) + b_4 x_{ij} + \hat{T}_{ij} + \rho_j + \varepsilon_{ij} \qquad \text{4-7}$$

where the dependent variable is the probability of completing senior secondary school. The right-hand side of the variables are the same as those in the years of schooling equation.

Table 4–3 Column (3) presents the basic results based on a probit model. In relation to the effect of the 1989 regulation, I find an insignificant coefficient. Similar to Column (1), which analyses the determinants of average of schooling years, I find that completing the highest level of education after 1989 is associated with a 0.4 increase in the probability of completing senior secondary education. Nevertheless, the positive effect of *Madrasah* schooling is not evident. There it is possible that *Madrasah* schooling is not effective in the higher end of (pre-university) schooling years but could be effective in the junior secondary school for some sub-groups of the population given my previous results on the determinants of probability of completing junior secondary education. This is an issue that the study aims to further explore. For individual characteristics, all coefficients in Column (3) have the same signs as those in Column (2).

4.4.2 Empirical Issues

In this section, I verify whether the basic results are robust to some possible specification problems. In particular, I focus on 4 conditions lying behind the use of OLS estimation

and the specification model in the previous section: (i) samples are limited to those who completed at least primary education; (ii) it assumes that the model has no mobility bias; (iii) we ignore possible gender and location effects; and (iv) we ignore endogeneity of *Madrasah* attendance.

First, I consider the effect of limiting samples to those who at least completed primary education. Since, in order to capture the effect of the 1989 regulation, I must limit the population of interest to those who completed at least primary education,, the control cohort consists of those who never attended *Madrasah* but at least completed primary school before 1989 conditional on other factors (female, living in rural areas, etc). Including those who never completed primary education would make the interpretation of the intercept unclear. Conditional on other factors, using all samples would define the intercept as the schooling year of those who either: (i) never attended school; or (ii) never attended *Madrasah* but completed all levels of education (at least primary school) before 1989. The later interpretation is the one used here.

To deal with this sample limitation, I re-estimate the equation using truncated regression in which the dependent variable (years of schooling) is limited to the value of equal to and greater than 6 years. I present the OLS estimates using all samples in Column (1) of Table 4–5 and the results from the truncated regression in Column (2). As a comparison Column (3) of Table 4–5 presents estimates using 'truncated samples' based on the OLS method. Given the difference between Column (1) and Column (3), there is an indication that the estimates of the coefficients in Column (3) are distorted due to the fact that 2298 observations are no longer included in the estimation. If my goal is to find the relation between the reform effects and years of schooling in the population, then the truncation of years of schooling in my sample is going to lead to biased estimates. A better approach to analysing these data could be to use truncated regression as in Column (2). The coefficients from the truncated regression in Column (2), however, are only slightly different from the OLS. The difference represents an attempt to adjust the analysis for the arbitrary cut-off of years of schooling at 6 years. The results suggest that it is important to emphasize that the results from this study are confined to those who at least completed primary education.

Second, I analyse the impact of mobility on the results. It is true that the 1989 reform is a national program, however, supply of religious schools might not be equal across provinces/municipalities/sub-districts. This may affect whether or not the individual

enrolled in religious schools or completed their studies. If we assume that there was no mobility, ie. respondents were born and studied in the same place, such variation could be captured by province of birthplace fixed effects. However, respondents may have moved residence to further their study or moved to a region in which the preferred school is located. Based on my samples, Table 4–4 indicates that there is a possibility that the migration flows are far from negligible especially for higher education. When I exclude respondents living in Jakarta, the percentages are only slightly different. Ignoring the effect of mobility, if it then appears to be significant, it may create omitted variable bias.

The IFLS3 dataset has information on the location (village, sub-district (*kecamatan*), municipality (*kabupaten*) and province) of residence when the respondents were 12 years old, and additional information if the respondents moved to other places after the age of 12. Based on all samples, I find that 50% of respondents live in the same village of their birth, 58% in the same *kecamatan*, 70% in the same *kabupaten* and 85% in the same province. When I limit the observations to only those who completed at least primary education, the mobility figures are similar and in the same order but about 1–2% lower than the figures using all samples.

Table 4-4 indicates that higher education might increase the likelihood of migration. But the question is whether education or employment is the driving factor of such mobility. Given that in this sub-section I look at the impact on education, I compare the respondent's municipality and province when they were 12 years old and then when they completed junior secondary school. More specifically, I generate two dummy variables whether between age 12 and the completion of junior secondary school (in average age 15–16) the respondent stayed in the same municipality and province. The summary statistics show limited mobility, with over 99% of respondents living in the same municipality and province. It therefore would not be surprising to see that the impact of mobility at the lower secondary level is insignificant for schooling years.

Column (4) of Table 4–5 presents results from the OLS by including mobility variables. Comparing the difference between the location of residence when respondents were aged 12 and the age when they were expected to complete junior secondary education (ie. 3 years later for those who did not complete senior secondary education) suggests that mobility is not significant for years of schooling.

Table 4-4. Respondents Mobility

Level of education	Location of schools relative to current residences	Percentage of total respondents	
		All samples	Excluding Jakarta
Primary	In the same municipality	78.5%	78.3%
	In the same province	90.1%	90.0%
Junior secondary	In the same municipality	77.4%	77.0%
	In the same province	90.6%	90.4%
Senior Secondary	In the same municipality	70.3%	70.0%
	In the same province	90.5%	90.5%
University	In the same municipality	49.1%	48.7%
	In the same province	86.9%	87.0%

Source: author's calculation using data from IFLS3.

Another empirical issue that has not been reviewed in this study is whether or not the endogeneity nature of *Madrasah* attendance should be dealt with in a simultaneous model. A study using data from Pakistan finds that, allowing for the endogeneity of religious school attendance by using parental religiosity as its instrument, students of religious schools and secular students do not differ in terms of their academic performance measured by secondary-level mathematics (Asadullah, Chaudhury et al. 2007). Unfortunately, the IFLS3 dataset does not collect information on parental religiosity of adults over 15.

An alternative method is to use local availability of *Madrasah* as the instrument. This method has been used by some researchers, especially in studies on the effect of religious schools in the US (Neal 1997; Altonji, Elder et al. 2002). Using an IFLS dataset but from a different wave, Newhouse and Beegle (2006) argue that OLS and instrumental methods using local proximity show consistent results to predict the examination scores of junior secondary students. While attendance at JSS might be well proxied by such an instrument, this does not necessarily imply that the instrument can also be a good proxy for the total years of *Madrasah* schooling and the interaction between attendance at one level of education and the binary variable of the completion year (ie. before or after 1989).

One problem caused by using this instrument in this study is that the respondents entered schooling in a wide time range. Hence the construction of such an instrument is not really as straightforward as it may seem because I must observe the presence of *Madrasah* at each level of education in different years. The community facilities listed by IFLS3 only list those which are still functioning in 2000. However, there is a question of

when the school was established. Using this information, I can then decide whether a school was available in a particular year. If a school was available in, say, 1985, I would assume that it was also available in 1986 and so on. To get a smoother figure of school availability, I take the 5-year averages starting with year=1960. I construct a dummy variable 'At least one school is available in the region' if the average of Islamic schools in the region over the period is more than 0. Then, I relate this variable to each respondent depending on their year of enrolment in primary school. For example, a person who completed primary education in 1987 would have a *Madrasah* presence dummy variable based on the *Madrasah* availability in 1980–1985. Note that the availability also takes into account schools which were established before 1980. I use this procedure for *Madrasah* presence at both *kecamatan* and *kabupaten* levels.

To check whether the instruments are legitimate, I follow results from a recent study suggesting reporting the partial R^2 and the F-statistics to qualify the IV estimates (Bound, Jaeger et al. 1995).[68] This is because, using survey data with over 300,000 observations, they find that if the relationship between instrumental variables and the endogenous variable is weak, even enormous samples will not eliminate IV bias (Bound, Jaeger et al. 1995). To check whether the instruments are weak, I use critical values from a previous study (Stock and Yogo 2002).

In practice, I use the presence of primary, junior secondary and senior secondary *Madrasah* presence and their interaction with three dummy variables of year of completion as instruments for *Madrasah* attendance and its interaction with a dummy variable on year of completion. In addition I use current height of respondents to proxy their *Madrasah* attendance. The idea is that adult height can be a proxy for childhood

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[68] Suppose that we are interested in estimating β from the following system. For simplicity, let us assume that all variables are random:

$$y = X\beta + \varepsilon$$
$$X = Z\Pi + v$$

The IV estimator can be easily derived using the following equation:

$$\hat{\beta}_{IV} = \left(X'P_Z X\right)^{-1} X'P_Z y$$

where $P_Z = Z\left(Z'Z\right)^{-1} Z'$ is the projection matrix for Z. Bound et al. (1995) suggest that the bias of IV relative to OLS is *inversely* proportional to $\dfrac{\left(\Pi'Z'Z\Pi\right)}{K\sigma_v^2}$ where K is the number of observations, σ_v^2 is the variance of the error term from the first stage regression. This function can be seen as the F-statistics on the Z instruments for $K > 2$. If both first and second stage regressions use the same explanatory variables, the statistics will be analogous to the F-statistics on the excluded instruments.

height. Furthermore, it is argued that students from low-income families have a higher probability of choosing *Madrasah* schooling. Whilst to some extent this can be captured by the inclusion of parental educational background, the inclusion of height may capture additional effects of family socio-economic conditions which may be correlated with school choice such as maternal employment and child health status (Thomas, Strauss et al. 1991).

Column (5) of Table 4–5 presents the results from the instrumental variable (IV) method. I find a striking result: the second-stage regression shows a big difference between OLS and IV estimation. Hence, a careful interpretation must be taken here. The F-statistics from the first-stage regression (the F-statistics for testing the hypothesis that the instruments do not enter the first-stage regression of 2SLS) show a very low 0.85. This is much lower than the 10 commonly used as the rule-of-thumb to decide a strong instrument. Based on the critical values in Table 1 in Stock and Yogo (2002), even if I want to limit the bias of the IV estimator to 30% of OLS bias (which is definitely not desirable), the first stage F-statistics should be greater than 4.78 for 2 endogenous variables and 10 instruments.[69]

In short, *Madrasah* presence is a weak instrument for endogenous variables in the study, ie. total years of *Madrasah* schooling and the interaction between the binary variable of year completion at each level of education and *Madrasah* attendance. The Hausman test further concludes that the OLS estimation is preferred at the 5% level of significance.[70] Based on this specification check, I use the model in Column (4) to counter the next issue, which is heterogeneity across gender and location of birthplace (rural or urban).

It might also be important to check the robustness of the regression results by taking into account the source of heterogeneity. This can be done by splitting the samples by the most important source of heterogeneity for the impact selected. At this stage, I focus on gender and location of residences, ie. whether the individual lives in an urban or rural

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[69] According to Stock and Yogo (2002), the critical values of less bias at 5%, 10% , 15% and 30% are 18.76, 10.58, 6.23 and 4.66, respectively.

[70] Given the above results, it is interesting to find why a study such as Newhouse and Beegle (2006) has similar findings between OLS and IV estimation using the same instruments, although here I have a different set of endogenous variables and a different population of respondents. It is possible that such an instrument is only strong in predicting *Madrasah* attendance at a particular level of education, namely junior secondary school. A simple chi-square test concludes that the association between *Madrasah* attendance and local *Madrasah* presence is only at junior secondary level.

area. Note that defining whether the respondent is classified as a resident in urban or rural areas is not a simple task. Given the mobility, some had different residence locations when they were school age. I therefore use their birthplace as the classification base. Fortunately, the IFLS3 dataset has information on how the respondents describe their birthplace: whether it is a village, small town or city, but unfortunately this classification is not clear-cut. I define village as equal to rural areas and cities as urban areas. However, the second classification, small town, is ambiguous. For those who at the time of the survey were living in the same place as their birthplace, I use information from their current residence. If they claim they live in rural areas, I assign them into rural areas and vice versa. Given the positive economic growth in Indonesia, it is unlikely to have a place that was classified as an 'urban area' before 2000 but was then turned into 'a village' in 2000.

Table 4–6 summarizes the results taking into account heterogeneity across gender and location of birthplace (rural or urban). I find that the only effects of the 1989 regulation are on the probability of junior secondary education completion in rural areas. Conditional on having been to *Madrasah*, completing primary education after 1989 is associated with a 23% increase in the probability of completing junior secondary school.

A recent ADB report suggests that over 90% of *Madrasah* are private and that private *Madrasah* tend to serve more rural and poor communities. [71] The report also suggests that, due to cultural constraints in rural areas, *Madrasah* have a comparative advantage to reach sub-populations who are at risk of dropping out of school, such as school-aged married females and female students from poor families. It is argued that *Madrasah* appeal strongly to the parents of female students especially at upper levels of education as they are seen as providing a safer environment for their daughters and giving a values-oriented education.

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[71] The Report can be downloaded from: http://www.adb.org/Documents/Reports/Consultant/37475-INO/37475-INO-TACR.pdf

Table 4-5. The Impact of the 1989 Regulation on Schooling Years [Specification Check]

Dependent variables: Average of schooling years	(1)	(2)	(3)	(4)	(5)
Estimation methods	OLS –all samples	Truncated regression (y>6)	OLS (y>=6)	OLS +mobility (y>=6)	IV
AFTER 1989	4.785***	2.094***	2.084***	2.081***	4.310***
	(33.195)	(26.581)	(26.487)	(26.792)	(4.153)
MADRASAH	3.917***	1.110***	1.105***	1.102***	150.241**
	(12.122)	(3.612)	(3.601)	(3.586)	(2.841)
AFTER 1989 x *MADRASAH*	-3.477***	-0.646	-0.642	-0.635	-134.225*
	(-9.338)	(-1.826)	(-1.814)	(-1.791)	(-2.551)
No mobility to other municipality age 12 – finish JSS				0.375	2.882
				(0.549)	(0.638)
No mobility to other province age 12 – finish JSS				0.516	-3.472
No. observations	9734	7436	7436	7436	4882

Note: For all columns, t-statistics are in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively. Standard errors are clustered at the municipality level. Province fixed effects, constants and individual control characteristics of male, age enrolled in primary, Javanese ethnicity, speaking Bahasa, mother's schooling years, father's schooling years, and born in rural area are included. The IV method in Column (6) uses the respondent's current height, the presence of *Madrasah* in birth district (dummy) assessed at primary, junior secondary and senior secondary education levels as instruments to proxy *Madrasah* attendance. The first stage F-statistics for Column (5) is 0.85. According to Stock and Yogo (2002), the critical values of less bias at 5%, 10%, 15% and 30% are 18.76, 10.58, 6.23 and 4.66, respectively.

Table 4-6. The Impact of the 1989 Regulation on Education [Heterogeneity Considered]

PANEL A					
Dependent variables:	All	Urban	Rural	Male	Female
Schooling years	(1)	(2)	(3)	(4)	(5)
AFTER 1989	2.081***	2.032***	2.033***	2.131***	2.040***
	(26.792)	(11.803)	(20.224)	(17.925)	(23.021)
MADRASAH	1.102***	1.63	1.048***	0.941*	1.162***
	(3.586)	(0.958)	(3.717)	(2.102)	(3.911)
AFTER 1989 x *MADRASAH*	**-0.635**	**-3.102**	**-0.312**	**-0.419**	**-0.685**
	(-1.791)	**(-1.675)**	**(-0.936)**	**(-0.808)**	**(-1.824)**
Pseudo R-2	0.218	0.156	0.197	0.227	0.219
Log-likelihood	-18256.2	-3431.18	-14655.8	-6918.48	-11328.4
No. observations	7436	1441	5995	2775	4661
PANEL B					
Dependent variables:	All	Urban	Rural	Male	Female
Completion of JSS	(1)	(2)	(3)	(4)	(5)
AFTER 1989 PRI	-0.090***	-0.103*	-0.087**	-0.029	-0.128***
	(-3.813)	(-2.574)	(-2.896)	(-0.805)	(-4.435)
MADRASAH PRI	0.065		0.068	0.077	0.062
	(0.754)		(0.747)	(0.515)	(0.516)
AFTER 1989 PRI x *MADRASAH* PRI	**0.084**		**0.230***	**0.129**	**0.056**
	(0.507)		**(2.099)**	**(0.553)**	**(0.269)**
Pseudo R-2	0.101	0.094	0.086	0.118	0.101
Log-likelihood	-4686.91	-686.674	-3880.17	-1782.54	-2895.12
No. observations	7061	1345	5704	2642	4412
PANEL C					
Dependent variables:	All	Urban	Rural	Male	Female
Completion of SSS	(1)	(2)	(3)	(4)	(5)
AFTER 1989	0.422***	0.436***	0.397***	0.423***	0.421***
	(19.490)	(14.717)	(15.260)	(13.910)	(15.832)
MADRASAH	-0.018	0.141	-0.039	-0.02	-0.019
	(-0.193)	(0.392)	(-0.448)	(-0.147)	(-0.171)
AFTER 1989 x *MADRASAH*	**-0.042**	**-0.553**	**0.042**	**-0.05**	**-0.021**
	(-0.384)	**(-1.765)**	**(0.386)**	**(-0.295)**	**(-0.163)**
Pseudo R-2	0.156	0.117	0.14	0.181	0.153
Log-likelihood	-4954.45	-974.333	-3826.78	-1832.73	-3114.35
No. observations	7436	1435	5987	2768	4659

Note: For all columns in panel A, t-statistics are in parentheses For all columns in panel B and C, z-statistics are in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively. The estimation method is OLS for panel A and probit model for panels B and C. Standard errors are clustered at the municipality level. Province fixed effects, constants and individual control characteristics: male, age enrolled in primary, Javanese ethnicity, speaking Bahasa, mother's schooling years, father's schooling years, born in rural area, the Heckman selection criterion term and mobility between age 12 and completion of junior secondary school are included.

4.4.3 Quantile Regression

The previous section showed that the only effects of the 1989 regulation are on the probability of junior secondary education completion in rural areas. One possibility is that the reform might only be effective for some groups of the population. Perhaps the reform was effective in improving the education outcomes and, consequently, the earnings of those in the lower end of the economy both in terms of highest education achieved and current income.

The above condition would not be captured by standard least square estimation. An alternative is Quantile Regression (QR). Whereas the OLS method yields estimates that approximate the conditional mean of the response variable given certain values of the predictor variables, QR yields estimates approximating the quantiles of the response variables. If the results between the OLS and QR methods were similar, we would be even more convinced that the effect of regulation is uniform across sub-groups of population, eg. not affected by outliers, etc.

Following Koenker and Bassett (1978), I adopt the QR model in a wage equation to express in a schooling year equation setting:

$$S_i = Z_i\beta_\theta + u_{\theta i} \text{ with } Quant_\theta(S_i|Z_i) = Z_i\beta_\theta \qquad \textbf{4-8}$$

In this setting, Z_i is all the right-hand side variables listed in Equation 4-5 and β_θ is the vector of parameters. $Quant_\theta(S_i|Z_i)$ is the θ-th conditional quantile of S_i given Z_i. The θ th regression quantile, $0 < \theta < 1$, is defined as a solution to the following problem:

$$\min_{\beta \in R^k}\left\{\sum_{i;Si \geq Zi\beta} \theta|S_i - Z_i\beta| + \sum_{i;Si < Zi\beta} \theta|S_i - Z_i\beta|\right\} \qquad \textbf{4-9}$$

The minimization problem can be solved by linear programming. To improve efficiency, standard errors are commonly bootstrapped. Note that the median estimator is a special case of QR by setting $\theta = 0.5$. I only focus on two variables, years of attending and the interaction between *Madrasah* attendance and exposure to the 1989 regulation plus intercept. The horizontal dashed line represents the OLS estimate with 2 dotted lines representing a 95% confidence interval for this coefficient. The solid line with filled dots represents the 19 point estimates of the coefficients for θ s. The shaded grey area depicts a 95% confidence band. Given 'the spikes' in the schooling year distribution, I regress at

θ equals 0.3, 0.5, 0.7 and 0.9. Figure 4–7 shows that the respondent's schooling years are concentrated at these θ s.

Following the graphical illustration in Koenker and Hallock (2001), I present a concise visual summary of QR in Figure 4-8. Note that variable 'reform' refers to the interaction between dummy on year of completion (ie. after 1989) and *Madrasah* attendance. I find no evidence of the impact of the 1989 regulation across schooling year distribution. At the 0.5^{th} quantile, in which schooling year is approximately 9 years, the regulation impact turns into upward slopes. *Madrasah* schooling, on the other hand, has a lower effect at the higher end of the distribution. If we relate QR findings to results from the previous sections, we will find a consistent pattern. The reform has contributed to increased schooling but only up to junior secondary level. At higher levels, no evidence of its impact is found 11 years after its introduction.

Figure 4-7. Quantile of Schooling Year
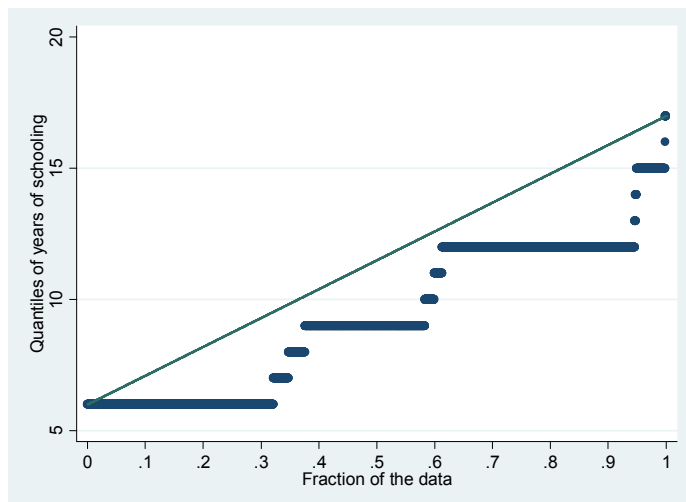
Source: Author's calculation using data from IFLS3.

Figure 4-8. Quantile Regression for Schooling Years (All-samples)
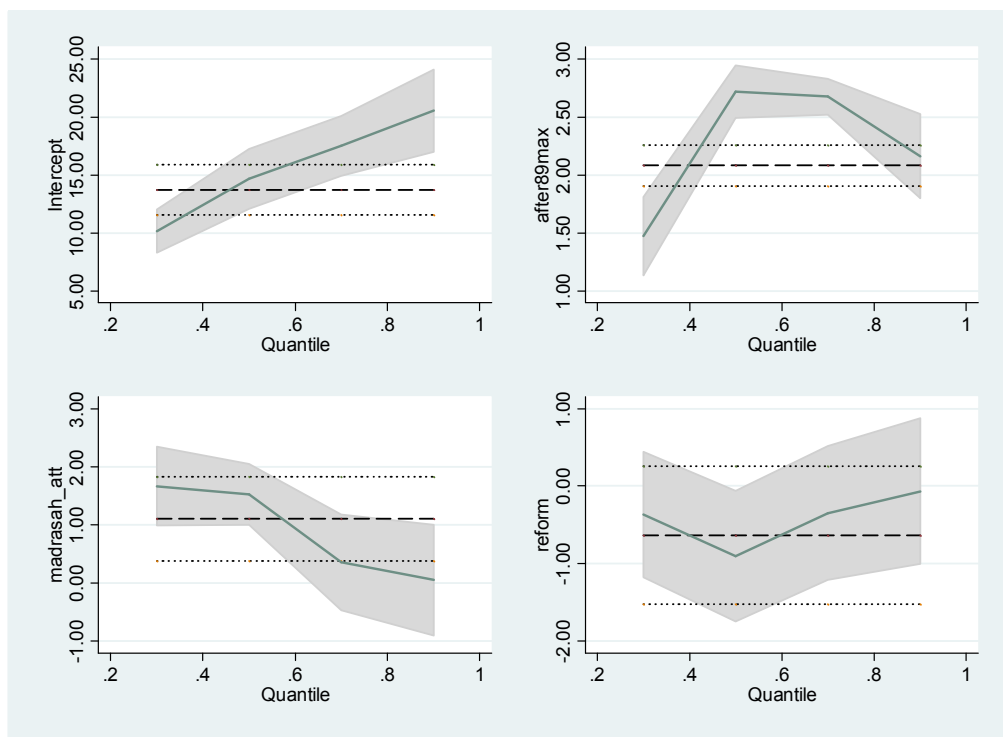
Source: Author's calculation using data from IFLS3. The solid line connects the coefficients from QR at the 0.3, 0.5, 0.7 and 0.9[th] quantiles. The shaded area shows the 95% confidence interval of the QR coefficients. The horizontal dashed line shows coefficients from the OLS estimation, while the two dotted lines show the 95% confidence interval of the OLS estimation.

4.5 Effects on Earnings and Welfare

In this section I estimate the earnings model. I have a relatively complete set of individual characteristics which have long been viewed as important factors of earnings. In practice, I estimate the following reduced-form model based on the Mincerian wage equation:

$$\log(wage_{ij}) = b_0 + b_1 t_{ij} + b_2 M_{ij} + b_3 (M_{ij} \times t_{ij}) + b_4 x_{ij} + \eta_j + \varepsilon_{ij} \qquad \textbf{4-10}$$

In addition to variables defined above to capture the impact of the 1989 regulation on education, I control for individual characteristics such as marital status, work experience (measured by the survey year (2000) minus the year when the respondent started working full time) and its squared form, whether the person works in the agricultural sector (including forestry, fishing and hunting), the highest education attained, whether the person lives in a poor area (based on self-assessment), and parental educational backgrounds. I also include provincial fixed effects. Note that the province used here is the province of current residence, while in the education model I use province of birthplace. I allow standard error to be correlated between persons in the same municipality.

Some potential empirical problems are identified. The insignificant coefficient of the 1989 regulation effect in the education model suggests that no multicollinearity problem is involved. This is further confirmed by a simple VIF test. As with the previous section, I consider the effect of mobility and heterogeneity across genders and location of residence. However, I use different measures to capture mobility effect. I basically compare the respondents' village, district (*kecamatan*), municipality (*kabupaten*) and province of current residence and their birthplace.

Panel A of Table 4–7 shows the OLS estimation results. With regard to my focus, namely the effect of the 1989 regulation, I find no supporting evidence to conclude a positive effect of government intervention to *Madrasah* schooling. I can only find strong effects of being male, being married, years of schooling and working experience. The association between earnings and education is 1.4 times higher in urban areas compared to rural areas. This might show low demand for skilled labour in rural areas. It is also interesting to see that the return to education for females is about 1.7 times the return rate for males.

Next, I look at the welfare model. The idea of using a self-reported welfare variable to capture the reform effects is to provide additional information on whether the exposed cohort is better off. There could be the case where the reform effect was actually effective in terms of increasing one's utility (for example a mother was better equipped with science and maths to teach her children at home) but not translated to increased earnings as the respondent was absent from the labour force. I use the same model as the wage equation:

$$Welfare_{ij} = b_0 + b_1 t_{ij} + b_2 M_{ij} + b_3 (M_{ij} \times t_{ij}) + b_4 x_{ij} + \eta_j + \varepsilon_{ij} \qquad \textbf{4-11}$$

I control for province of birth fixed effects. I allow standard errors to be clustered at *kabupaten* level.

Panel B of Table 4–7 presents the results. With regard to the effect of the 1989 regulation, none of the models show significant coefficients of either years of attending *Madrasah* or the interaction effect between *Madrasah* attendance and completion after 1989. Similar to earnings, education has a positive effect on welfare.

Table 4-7. The Impact of the 1989 Regulation on Wage and Welfare

[Heterogeneity Considered]

PANEL A					
Dependent variables:	All	Urban	Rural	Male	Female
Log(hourly wage)	(1)	(2)	(3)	(4)	(5)
AFTER 1989	-0.141*	-0.095	-0.22	-0.066	-0.305*
	(-2.370)	(-1.115)	(-1.906)	(-1.057)	(-2.037)
MADRASAH	-0.025	-0.052	0.111	0	0.029
	(-0.148)	(-0.194)	(0.507)	(0.002)	(0.122)
AFTER 1989 x *MADRASAH*	-0.02	-0.136	0.164	0.082	-0.245
	(-0.084)	(-0.365)	(0.526)	(0.218)	(-0.698)
Adj. R-2	0.208	0.186	0.334	0.188	0.214
No. observations	4812	2313	2499	2983	1829
PANEL B					
Dependent variables:	All	Urban	Rural	Male	Female
Self-assessed welfare (range between 0 and 6)	(1)	(2)	(3)	(4)	(5)
AFTER 1989	0.052	0.051	0.055	0.09	-0.055
	(0.762)	(0.630)	(0.511)	(1.220)	(-0.384)
MADRASAH	-0.175	-0.165	-0.187	-0.107	-0.444
	(-1.154)	(-0.709)	(-0.940)	(-0.674)	(-1.235)
AFTER 1989 x *MADRASAH*	-0.027	0.015	-0.013	-0.039	0.114
	(-0.118)	(0.035)	(-0.046)	(-0.152)	(0.213)
Adj. R-2	0.105	0.117	0.093	0.09	0.118
No. observations	2414	1351	1062	1702	711

Note: For all columns, t-statistics are in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively. Estimation method is OLS. Standard errors are clustered at the municipality level. Province fixed effects, constants and control individual characteristics: male, working experience (and its square), marital status, whether the person works in the agricultural sector, years of schooling, Javanese ethnicity, speaking Bahasa, mother's schooling years, father's schooling years, currently living in urban area, and mobility dummies (whether village, district, municipality, and province of current residence is the same as birthplace) are included.

Table 4-8. The Impact of the 1989 Regulation on Earnings [Endogeneity Considered]

Dependent variable: Log (Hourly wage)	(1)	(2)	(3)
Estimation methods	OLS	IV	HECKMAN
AFTER 1989	-0.133*	-0.185***	-0.141*
	(-2.223)	(-3.766)	(-2.370)
MADRASAH	-0.015	-0.056	-0.025
	(-0.087)	(-0.264)	(-0.148)
AFTER 1989 x *MADRASAH*	-0.027	-0.035	-0.02
	(-0.109)	(-0.146)	(-0.084)
Years of schooling	0.129***	0.181**	0.129***
	-12.222	-2.893	-12.507
Heckman selection criterion term (labour participation)			-0.3
^Standard error of Heckman selection criterion term			0.208
First-stage F-test ^		13.488	
No. observations	1443	1014	4812

Note: For all columns, t-statistics are in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively. Standard errors are clustered at the municipality level. Province fixed effects, constants and individual control characteristics: male, Javanese ethnicity, working experience (and its square), marital status, whether the person works in the agricultural sector, years of schooling, speaking Bahasa, mother's schooling years, father's schooling years, currently living in urban area and mobility dummies (whether village, district, municipality, and province of current residence is the same as birthplace) are included. The instruments used in Column (2) are respondent's current height, age enrolled in primary and whether the person was born in a rural area. The first-stage F-statistics for Column (5) is 13.488. According to Table 1 in Stock and Yogo (2002), the critical values of less bias at 5%, 10% , 15% and 30% are 13.91, 9.08, 6.46 and 5.39, respectively, for 1 instrumented variable and 3 exogenous instruments. Additional variables included in the first-stage regression to estimate determinants of labour participation in Column (3) are number of young children at home and difference between self-reported expected and current self-assessed welfare level.

4.5.1 Empirical Issues

Some empirical problems might arise from the basic results. The first possible problem is the endogeneity of the schooling years. To deal with this problem, I perform the IV model. I use age when the respondent enrolled in primary, respondent's current height and whether s/he was born in a rural area as instruments. Statistical tests suggest that these variables are insignificant for wages but appear to be significant for schooling years, making them promising candidates of schooling instruments.

Column (2) of Table 4–8 shows the results. The IV estimates of schooling years appear to be significant at the 5% level of significance. The difference in the magnitude between the IV model and OLS is not substantial. The F-statistics from the first-stage regression is above 10 indicating strong instruments. However, using critical values from Stock and Yogo (2002), the bias of IV can be up to 15% relative to OLS when using these instruments, suggesting that the instruments are not very strong. The Hausman test further confirms that the OLS model presented in Column (4) is preferred to the IV model at the 5% level of significance. Nevertheless, both the OLS and the IV methods suggest insignificant effects of the reform variable captured by the interaction between *Madrasah* attendance and a dummy on year of completion.

The second potential problem is on sample selection. As the wages are only observable for those who are working for positive wages excluding those who are self-employed and some who work in the informal sector, it is important to control for selection bias. I first regress a dummy variable, ie. whether the person earns a positive wage on a series of exogenous variables such as number of children under the age of 15 living at home, schooling years, gender, marital status and the interaction between gender and marital status.

In addition I also exploit information from the IFLS3 dataset which asks respondents their current level of welfare (options available between 0 and 6) and their expected level of welfare in the following year. The difference between current and expected level of welfare may be able to capture their willingness to earn more. I find schooling year and being a married male have positive and significant effects on labour market participation. While the number of children at home, being married and (surprisingly) the difference between current and expected welfare have a negative association with the decision to

enter the labour market. Using the fitted values from this result, I construct the Hausman selection criterion term.

Column (3) of Table 4–8 presents the results using the Heckman method. With regard to my focus, it suggests no evidence of significant effects of the 1989 reform.

To look at a possibility of different effects of the reform across distribution of earnings, I use QR. The results suggest that there is no variation in the magnitude and significance of the coefficients across quantiles. Figure 4–9 shows the visual illustration of this analysis. All model specifications suggest insignificant impacts of the 1989 reform on hourly earnings based on the 2000 dataset.

4.6 Robustness Checks

The previous section uses the interaction term between *Madrasah* attendance and a dummy on year of highest level of schooling completion to capture the 1989 reform effects. Here, I extend the analysis by looking at the gap between year of highest pre-university education completion and the reform year by getting its interaction with the dummy on *Madrasah* attendance. The specification shows how *Madrasah* attendance affects the outcomes (ie. years of schooling and earnings) of different cohorts. If exposure to the reform affected outcomes, we would expect to find no effect of *Madrasah* attendance for those who completed pre-university schooling prior 1989 (ie. the 'gap' is less than 0) and increasing effects for younger cohorts. Due to the limited number of observations of attending *Madrasah*, I construct three dummies to indicate the gap.

I estimate the following equation:

$$School_{ij} = b_0 + b_1 GAP_{1ij} + b_2 GAP_{2ij} + b_3 GAP_{3ij} + b_4 M_{ij} + b_5 \left(GAP_{1ij} \times M_{ij} \right) +$$
$$b_6 \left(GAP_{2ij} \times M_{ij} \right) + b_7 \left(GAP_{3ij} \times M_{ij} \right) + b_8 x_{ij} + \rho_j + \varepsilon_{ij}$$

<div align="right">**4-12**</div>

where GAP_1, GAP_2 and GAP_3 equal 1 if 10≤GAP<0, 0≤GAP<5 and GAP≥5, respectively; where GAP is the difference between years of the highest level of pre-university education completion and the reform year (1989). The omitted category is GAP<-10. I control for province of birth fixed effects. I allow standard errors to be clustered at municipality level. If the reform were effective, we would expect that b_6 and b_7 would be significant and positive.

Figure 4-9. Quantile Regression for Natural Log of Income
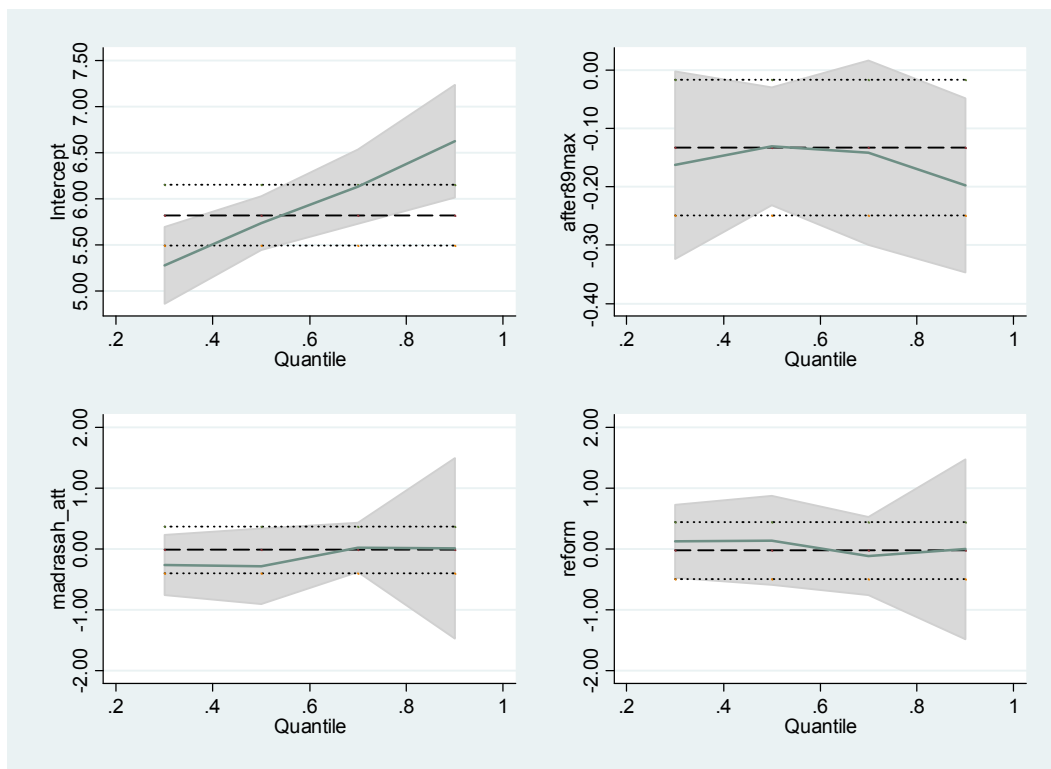
Source: Author's calculation using data from IFLS3. The solid line connects the coefficients from QR at 0.3, 0.5, 0.7 and 0.9[th] quantiles. The shaded area shows the 95% confidence interval of the QR coefficients. The horizontal dashed line shows coefficients from the OLS estimation, while the two dotted lines show the 95% confidence interval of the OLS estimation.

I use the same strategy to estimate the reform effects on earnings:

$$\ln(wage_{ij}) = b_0 + b_1 GAP_{1ij} + b_2 GAP_{2ij} + b_3 GAP_{3ij} + b_4 M_{ij} + b_5 \left(GAP_{1ij} \times M_{ij} \right) +$$
$$b_6 \left(GAP_{2ij} \times M_{ij} \right) + b_7 \left(GAP_{3ij} \times M_{ij} \right) + b_8 x_{ij} + \eta_j + \varepsilon_{ij}$$

4-13

I control for province of current residence fixed effects. I allow standard errors to be clustered at municipality level.

Table 4–9 presents the results. Overall, the results point in the same direction as those in Table 4–3: the reform appears to increase the probability of completing junior secondary school in rural areas although it is insignificant for years of schooling, probability of completing senior secondary school and earnings. Analysis in the present section adds more information that the reform might have taken at least 5 years before it was effective on improving completion rates of JSS. The effectiveness could be due to increased demand for *Madrasah* education (which might indicate increases in parental expectation on their children's future earnings; therefore they might want to keep their children longer at school) as well as increased supply of *Madrasah* schooling. Looking at descriptive statistics of the availability of *Madrasah* schools (graphs not presented), while increases in *Madrasah* supply were quite evident 1 year after the reform, a significant increase was more obvious in 1993, ie. five years after the reform especially at primary and junior secondary levels. Given the increasing trends, additional effect of post-reform *Madrasah* schooling might be more evident in the coming years.

With regard to the reform effects on earnings, Table 4–10 shows insignificant effects of the *Madrasah* attendance across cohorts. Indeed, although insignificant, coefficients on the interaction terms show negative signs. This might be related to the fact that the majority of *Madrasah* graduates are from rural areas. Given the increased discrepancy between rural and urban earnings – perhaps due to limited labour demand and low investment in rural areas – there has been no additional benefit in attending *Madrasah* after the introduction of the reform.

Table 4-9. The Impact of the 1989 Regulation on Education [Using the GAP]

Dependent variable:	Years of Schooling		JSS Completion		SSS Completion	
	All	Rural	All	Rural	All	Rural
	(1)	(2)	(3)	(4)	(5)	(6)
GAP_1 (=1 if -10<GAP<0)[a]	5.432***	5.497***	0.575***	0.585***	4.058***	4.189***
	(53.907)	(41.446)	(4.396)	(3.570)	(38.012)	(33.809)
GAP_2 (=1 if 0≤GAP<5)	8.577***	8.566***	0.343*	0.361*	6.792***	7.001***
	(78.051)	(57.517)	(2.392)	(2.033)	(42.242)	(36.575)
GAP_3 (=1 if GAP≥5)	10.713***	10.797***	0.187	0.277	8.114***	8.392***
	(77.425)	(60.946)	(0.937)	(1.123)	(41.069)	(35.876)
MADRASAH [b]	1.608**	1.584**	-0.01	-0.048	0.634	0.599
	(3.029)	(2.975)	(-0.017)	(-0.080)	(1.345)	(1.270)
GAP_1 x *MADRASAH*	-0.741	-0.841	0.015	0.071	-0.653	-0.727
	(-1.093)	(-1.308)	(0.022)	(0.102)	(-0.962)	(-1.087)
GAP_2 x *MADRASAH*	-1.172	-1.02	1.101	1.192	-0.909	-0.78
	(-1.766)	(-1.532)	(1.442)	(1.567)	(-1.650)	(-1.420)
GAP_3 x *MADRASAH*	-1.195	-0.957	0.563	1.253*	-0.784	-0.589
	(-1.949)	(-1.612)	(0.755)	(2.284)	(-1.377)	(-1.074)
Log-likelihood	-18256	-14656	-1763	-1470	-4954	-3827
No. observations	7436	5995	2678	2179	7436	5987

a) GAP is defined as: (i) the difference between year of highest level of pre-university education completion for Columns (1), (2), (5) and (6); (ii) the difference between year of *primary* education completion and the reform year for Columns (3) and (4). The omitted category is GAP≤-10.

b) Proxied by *primary Madrasah* attendance for Columns (3) and (4), ie. JSS completion.

Note: For all columns, t-statistics are in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively. Standard errors are clustered at the municipality level. Province of birth fixed effects, constants and individual control characteristics: male, Javanese ethnicity, speaking Bahasa, mother's schooling years, father's schooling years, born in urban area, age enrolled in primary, agricultural value added and mobility dummies (whether village, district, municipality and province of current residence is the same as birthplace) are included.

Table 4-10. The Impact of the 1989 Regulation on Earnings [Using the GAP]

Dependent variable:	Log(hourly wage)		Self-assessed welfare (between 0 and 6)	
	All	Rural	All	Rural
	(1)	(2)	(3)	(4)
GAP$_1$ (=1 if -10<GAP<0)[a]	-0.051	-0.11	0.048	-0.011
	(-0.623)	(-1.109)	(0.614)	(-0.105)
GAP$_2$ (=1 if 0≤GAP<5)	-0.049	-0.137	0.137	0.096
	(-0.506)	(-1.223)	(1.629)	(0.753)
GAP$_3$ (=1 if GAP≥5)	-0.334***	-0.410***	0.199	0.198
	(-4.163)	(-4.240)	(1.827)	(1.322)
MADRASAH	1.42	1.351	0.036	0.056
	(1.807)	(1.684)	(0.060)	(0.090)
GAP$_1$ x *MADRASAH*	-1.559	-1.525	-0.225	-0.288
	(-1.866)	(-1.817)	(-0.360)	(-0.440)
GAP$_2$ x *MADRASAH*	-1.467	-1.338	-0.51	-0.4
	(-1.697)	(-1.472)	(-0.801)	(-0.607)
GAP$_3$ x *MADRASAH*	-1.474	-1.433	-0.088	-0.07
	(-1.834)	(-1.737)	(-0.127)	(-0.096)
Log-likelihood	4812	4053	2414	1947
No. observations	4812	4053	2414	1947

a) GAP is defined as the difference between year of highest level of pre-university education completion. The omitted category is GAP≤-10.

Note: For all columns, t-statistics are in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively. Standard errors are clustered at the municipality level. Province of birth fixed effects, constants and individual control characteristics: male, working experience (and its square), marital status, whether the person works in the agricultural sector, years of schooling, Javanese ethnicity, speaking Bahasa, mother's schooling years, father's schooling years, currently living in urban area and mobility dummies (whether village, district, municipality and province of current residence is the same as birthplace) are included.

4.7 Conclusion

The only effects of regulation are on the probability of junior secondary education completion of respondents in rural areas. I find that both the timing, ie. whether the individual completed schooling after 1989, and *Madrasah* attendance have positive effects on the probability of completing year 9. These findings indicate that *Madrasah* education has actually contributed to the government program in promoting 9-year basic education especially in rural areas. The nature of *Madrasah* as an alternative educational institution, especially for low-income families, has probably opened more opportunities for Indonesian families who would not otherwise have had access to affordable education, to send their children to school, especially those who live in rural areas.

Nevertheless, the finding implies that the government's initial target to improve *Madrasah* graduates' performance in academic attainments as well as in the labour market *in general* was not evident based on respondents who are economically active in 2000. Thus, it is important for the government to review the current form of *Madrasah* curriculum. The Indonesian government plans to reduce the proportion of religious courses to 10% of school hours. While there is a possibility that *Madrasah* students will gain better academic outcomes, this policy will accentuate clearly the tendency of contemporary *Madrasah* to be more secular than the traditional *Madrasah*. It might be important to consider whether *Madrasah* should have longer school hours. Longer hours would probably 'save' *Madrasah*'s identity as religious schools and, at the same time, provide *Madrasah* students with the same amount of regular courses as students from other types of schools.

This chapter can be improved in many ways. After it was completed RAND launched the newest IFLS dataset from the 2007 survey (IFLS4). But the version was still preliminary and community datasets were not yet available. Using the new dataset, researchers can have a sufficient period to assign 2 cohorts, ie. control and fully exposed from primary to senior secondary (if the person attended *Madrasah*). The 2 cohorts have the same probability of completing university conditional on other factors given the time between the introduction of the regulation in 1989 and the 2007 survey year is sufficient to complete higher education. There is a possibility that the positive effect of the reform is more evident in more recent years.

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5 THE PRESENCE OF RELIGIOUS SCHOOLS AND THE EFFECTS OF RELIGIOSITY ON EARNINGS AND DEMAND FOR RELIGIOUS EDUCATION

5.1 Introduction

Research has shown that there are substantial variations by religion and religiosity in educational attainment and earnings. At the macro level, Barro and McCleary (2003) find a positive association between economic growth and religious beliefs but a negative association between economic growth and church attendance. At the individual level, while there have been some studies suggesting the association between religious attendance and earnings (Tomes 1984; Tomes 1985; Lehrer 2004; Lile and Trawick 2004; Chiswick and Huang 2008), only a few offer thorough empirical proof to explain how exactly religious institutions affect the association. Even fewer studies use data from non-western countries.

To fill a void in the literature, the objective of this chapter is to analyse the relationship between religious attendance, earnings and educational choices among Indonesian Muslim heads of households and to see how religious institutions contribute to the formation of these relationships. To what extent are differences in earnings and educational choices a result of schooling, marital status, age, etc are issues that have been examined by many studies. Unique features of this study are to what extent individual earnings are influenced by distance to a worship place (both geographical and religious distances), degree of religiosity (frequency of religious attendance) and the role of religious leaders.

The context of this study, which focuses on non-western communities, gives a comparative analysis relative to the existing studies on the economics of religiosity. Most of them observe communities in western countries especially the US. A study on Islam in Indonesia argues that in Indonesia there is no separation between state and church (Tamney 1979). The Indonesian government is actively involved in religion and

encourages participation from various religious organizations to develop social capital.[72] This reflects how religious values are seen as more important and integrated on a larger scale to many aspects of 'life in Indonesia than in the US. Therefore, from an econometrics point of view, the inclusion of religious attendance in the earnings equation might be important to avoid bias in earnings estimates. Also, from a policy analysis point of view, analyses of the determinants and effects of religious attendance might have important policy implications.

In addition to examining the association between religious attendance and earnings, the present study examines the effects of the head of household's religiosity on educational choices with particular reference to children's proportion of religious education. The study therefore complements existing studies which use information from *Madrasah* (Islamic formal schools) students or graduates in comparison to students or graduates from other types of schools (Bedi and Garg 2000; Newhouse and Beegle 2006). While it is important to evaluate the outcomes of *Pesantren* education, it is also important to understand the demand for such education. Moreover, a literature search suggests that some studies have addressed the link between parental religiosity and children's educational attainment and school choices (Bartkowski, Xu et al. 2008; Cohen-Zada and Sander 2008).[73] But for Muslim schools or Muslim students or schools in Muslim countries, little has been written. While existing studies provide useful insights into issues such as gender discrimination and effects of the presence of Islamic schools and their academic outcomes compared to those of other schools (Asadullah and Chaudhury 2006; Asadullah, Chaudhury et al. 2007; Asadullah and Chaudhury 2008; Hajj and Panizza 2009), no study has focused on the community-religious school relationship.[74]

To look at the effects of Indonesian Muslim heads of household's' religious attendance on earnings and demand for religious education, I use data from a recent survey of

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[72] It is important to note that according to Tamney (1979) "the Indonesian government affirms religion is not a religion (p.127)". Religious freedom is well protected by the national constitution.

[73] Bartkowski, Xu and Levin (2008) find that parental religiosity is linked with kindergarteners and first graders' pro-social behaviour, while Cohen-Zada and Sander (2008) conclude that parental religiosity is also important on the demand for private schools.

[74] On the gender discrimination issue, data from Lebanese, Hajj and Panizza (2009) finds no support for the hypothesis that Muslims discriminate against female education. On the academic outcomes issue, Asadullah and Chaudhury (2008) finds the presence of *Madrasah* is positively associated with secondary enrolment growth exposure to females, and Asadullah and Chaudhury (2006) find that younger teachers lead to more favourable attitudes among female graduates. The shortcomings of Islamic schools are observed in some studies. Using data from Bangladesh, Asadullah, Chaudhury and Dar (2007) find girls and graduates of primary *Madrasah* have significantly lower test scores in the selection into secondary.

communities surrounding *Pesantren* (Islamic boarding schools) across three provinces in Indonesia. In the education sector, *Pesantren*'s role has been well known, especially for providing education for low-income families. Over the past 4 years, the number of *Pesantren* has increased from 14,067 in academic year 2002/2003 to 17,506 in academic year 2006/2007. The schools provided education to over 3 million students during the period. While the formal structure of the organization of *Pesantren* is as an educational institution, *Pesantren* in Indonesia also act as centres of Islamic teachings aiming to develop the human capital of their students as well as the surrounding community. The schools therefore are ideal case studies to observe the links between religious attendance, education and community welfare.

A new approach is used to allow the use of cross-sectional data to analyse the role of *Pesantren* in forming the relationship between religious attendance, earnings and demand for religious education. In an ideal research design, comparison between religiosity and other community characteristics of the same individuals before and after the establishment of *Pesantren* could better predict the impacts of *Pesantren*.[75] However, as most *Pesantren* were established decades ago, such data are unfortunately not available. I therefore include a residence location variable differing between the 'within' and 'outside' communities based on their distance to the nearest *Pesantren*.[76] I apply standard Ordinary Least-Squares (OLS) methods for earnings and demand for religious education equations and conduct some robustness checks regarding limitations of religiosity measures and possibilities of non-random residence selection. I use ordered probit to analyse determinants of religiosity. I next use Oaxaca decomposition to find further explanations of how the surrounding communities benefit from the presence of *Pesantren*.

The within-versus-outside approach, however, brings some unique features to this study.[77] It allows one to look at two types of distances: physical and religious distances. Where time and resource allocation become the key points in Azzi and Ehrenberg's model on

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[75] Using the difference-in-difference estimator and assuming the community characteristics between the within and the outside area would have been the same had no *Pesantren* been established.

[76] The former refers to the internal community located within walking distance of *Pesantren*, while the latter is located between 5 and 10 kilometres from *Pesantren* as the control cohort.

[77] Furthermore, the selection of *Muslim* (believers in Islam) in Indonesia provides two advantages in terms of contribution to the literature. First, the respondents represent individuals whose religious affiliation requires frequent attendance since their religion, *Islam,* commands them to practice compulsory prayers five times daily.[77] Second, transportation costs to worship places might play an important role in their decision to attend the mosque, given low average income compared to respondents in western countries. Although I develop the theory based on theoretical models previously applied to western countries by Azzi and Ehrenberg (1975), Sullivan (1985), Sawkins, Seaman and Williams (1997), the empirical results from this study will show whether the theoretical framework is supported by data from different communities.

household allocation to religious activities, any factor which can shift time and budget allocation should be closely examined, including the physical distance to a worship place and other benefits which might arise from living close to it.[78] I also take into account various characteristics of *Pesantren* as a proxy for religious distances. Studies assume religious bodies or religion as a collective action of their members (Wallis 1990; Iannaccone 1992).[79] The equilibrium, ie. actual church attendance, is therefore shaped when individual preference conforms to church characteristics. The argument suggests that the characteristics of the religious institutions where an individual regularly attends services reflect an institution with the closest religious distance for a given physical distance (and holding other factors constant). Therefore, the inclusion of variables on distance to a worship place (both religious and physical distances) indicates how individuals deal with the trade-off between costs of religious attendance and religious conformity. Further discussion is included to see related concepts on this matter, namely whether localism or religious conformity is more significant in the relationship between religious bodies and communities in Indonesia.

The chapter develops a simple theoretical foundation in Section 5-2 and provides empirical analysis in Sections 5-4 and 5-5. The theoretical prediction suggests that: (i) religious attendance might matter for earnings and demand for religious education; (ii) the individual's decision on religious attendance might be affected by the strictness of the local religious institution (ie. religious distance) and his residence location relative to the worship place (ie. physical distance). I find statistical evidence to support the first hypothesis and some explanations to explain the second hypothesis.

Overall, the empirical results show the important roles of the *Kyai* (or the *Pesantren*'s leader) and religiosity and that the effects of these variables on earnings and religiosity are different between internal and external communities. For the internal communities, religiosity matters more on earnings. Oaxaca decomposition further suggests that, in the

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[78] In addition, Glaeser, Laibson and Sacerdote (2002) predict that an individual's decision to accumulate social capital might be related to physical distance. Hence the study can suggest how social capital – in terms of community support from the *Pesantren* – differs between communities whose geographical distances to a worship place are different. The within-versus-outside framework can also test the literature on repeated games e.g.Fudenberg and Maskin (1986) and Abreu (1988) i.e. whether cooperation becomes easier when individuals expect to interact more often. It is expected that the within community interacts more with religious clerics. This might lead to a higher accumulation of return to social networking.

[79] Wallis (1990) formulates church characteristics by average participation rates determined by member's contribution, while Iannaccone (1992) defines the *quality* of a church as the average religious quality (or perhaps, more suitably, religiosity) of its members.

absence of different effects of religiosity on earnings, earnings of the within community would have been much lower than of the outside community

I also find that the *Kyai*'s role is important for religious attendance in the internal communities. The role is less evident in the external community where more religious institutions present. Oaxaca decomposition further suggests that without the higher effects of the role of *Kyai* ('discrimination treatment'), religious participation of the within community would be much lower than the current level of religious participation. Regarding demand for religious education, the within community would have always demanded a higher proportion of religious education for their children. Surprisingly, though, the study finds that the *Pesantren* role is not as evident as the religious organization *Muhammadiyah* in the process of a household's decision making on educational choice.

The remainder of this chapter consists of five sections. Section 5-2 derives a simple theoretical framework to derive the two hypotheses that will be tested by empirical analysis. Section 5-3 provides a background of *Pesantren* and their current performance as well as detailing the dataset. Section 5-4 presents the results from wage and demand for religious education regressions as well as some robustness checks. Section 5-5 explores the determinants of income. Section 5-6 presents Oaxaca Decomposition. Section 5-7 concludes.

5.2 A Simple Theoretical Framework

Two hypotheses are tested empirically: (i) religious attendance is significant for earnings and demand for religious education; (ii) characteristics of religious institutions and distances between individuals and religious bodies matter for religious attendance. Theoretical foundations in this section determine the necessary control variables and provide predictions for their effects on the outcomes.

I begin with a standard reduced-form earnings regression model taking into account a religiosity factor:

$$\log(w_i) = \beta_1 X_i + \beta_2 R_i + e_i \qquad\qquad \textbf{5-1}$$

where w_i is an hourly wage rate, X_i an individual characteristic variable, R_i the degree of religiosity (proxies by number of religious visits) and e_i the error term. The use of an

hourly wage rate controls the possibility of increases in earnings due to increases in hours of working.[80]

In this study, I include religious institution's characteristics $(\overline{P}_k)$ to avoid omitted variable bias. The variable is assumed to be exogenous. The role of religious institutions in earnings can be explained by one, or a combination of two possible explanations. First, religious institutions might provide human capital development programs such that the program increases the wage rate, ie. direct effects. Second, religious institutions might attract more frequent religious attendance of individuals. Then, increased religious attendance might provide some mechanisms to benefit the individuals from attending the mosque, for example through networking effects. The second implies indirect effects of religious institutions. There is a possibility that those effects differ between individuals living close to the religious institution and individuals in the external community.

Given the above illustration, the reduced-form model of individual i where religious institution k is the nearest large religious worship place in the area:

$$\log(w_{ik}) = \alpha_1 X_{ik} + \alpha_2 R_{ik} + \alpha_3 \overline{P}_k + \alpha_4 \left(R_{ik} \times d_{ik} \right) + v_{ikj} \qquad \textbf{5-2}$$

where d_{ik} refers to a dummy variable of residence location. It equals 1 if the individual lives in the surrounding community and 0 if he lives in the external community. We can use a similar approach to define the relationship between (parental) religious attendance and demand for religious education (E_{ik}).

$$E_{ik} = \lambda_1 X_{ik} + \lambda_2 R_{ik} + \lambda_3 \overline{P}_k + \lambda_4 \left(R_{ik} \times d_{ik} \right) + u_{ik} \qquad \textbf{5-3}$$

In order to understand the formation of 'religious capital', the next relevant question is why might distance matter as denoted by d_{ik} for religious attendance? In the following I derive a static analysis of religious participation similar to Becker (1965).[81] Two key

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[80] For example, as a result of increases in religious attendance, which in turn decreases the marginal rate of substitution between consumption and leisure (eg. increased work ethic).

[81] One may argue that such a setting is not suitable for an analysis of religious participation. Azzi and Ehrenberg (1975) argue that a static household-allocation-of-time model – assuming that the expected stream of 'benefits' which an individual plans to receive terminates at the time of his death – is inappropriate for a model of religious participation because most religions promise their followers some 'afterlife' benefits. However, in their model, expected afterlife consumption is simply a function of time spent in religious-activities. The time spent in religious activities is then defined as a function of wage – from which the analysis can predict that the age–religious participation profile may be U-shaped. The overall results would not be changed if religious commodities (as a function of time spent in religious activities) *directly* enter the utility function as long as an assumption that religious commodities are produced

aspects being focused on are individual time allocation and the prices that the individual pays for religious commodities (Becker 1965). Religious commodities are taken into account in the individual utility function following the seminal work by Azzi and Ehrenberg (1975).[82] Following Sullivan (1985), I focus on the individual, more specifically the head of household, rather than the whole household, and religious activities generate immediate utility rather than just the expectations of a stream of afterlife consumption benefits.[83] However, unlike Sullivan (1985), I follow Sawkins, Seaman and Williams (1997) by ignoring tax effects.[84] Thus, the income is simply defined as after-tax income.

I assume that individuals combine time and goods purchased on the market to produce consumption (C) and religious commodities (R) that directly enter their quasi-concave utility functions[85] $U = U(C, R)$. Individuals produce i number of goods C and j number of religious commodities R based on two production functions. They are concave and twice differentiable:

$$C_i = g_i(x_{Ci}, T_{Ci}) \text{ and } R_j = f_j(x_{Rj}, T_{Rj}, T_{Vj}) \qquad\qquad \textbf{5-4}$$

where x_{Ci} and x_{Rj} are vectors of market goods for producing consumption and religious commodities, respectively; T_{Ci} and T_{Rj} are vectors of time inputs used in consuming consumption and religious commodities, respectively. Time needed to produce a religious commodity (T_{Rj}) only consists of the worship time. The partial derivatives of

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[82] The theoretical model is more recently used as a theoretical baseline in some empirical studies, for example Sullivan (1985); Sawkins, Seaman and Williams (1997).

[83] There is a possibility of immediate benefit of religious activity. Individuals with materialistic views would increase public religious attendance because it can increase career opportunities through networking. Religiosity can also increase earnings if it improves work ethic and conduct.

[84] While taxation might be an important aspect in future work, information on tax in Indonesia is very limited and hence it is not uncommon to observe that individuals do not take into account the tax rates in their decision making. This is especially true for those who work in the informal sector, the sector in which most Indonesians work.

[85] One example of a consumption commodity is sleeping, as suggested by Becker (1965). Sleeping depends on the input of a bed and time. Note that sleeping has a more direct effect on an individual's utility than a bed. An example of a religious commodity is attending the worship place (or mosque for Muslims) which depends on the input of religious clothes, ownership of the holy book (or the Qur'an for Muslims), and time. Ownership of the holy book might not give direct utility to the individual. But if he goes to a worship place and studies the meaning of the holy book, the knowledge he accumulates from attending the worship place will give more direct utility. In addition, I assume that religious commodities have a strong and positive correlation with a belief in afterlife consumption. This assumption can be relaxed by using an approach introduced by Montgomery (1996).

C_i with respect to x_{Ci} and T_{Ci} as well as the partial derivatives of R_j with respect to x_{Rj} and T_{Rj} are non-negative, while the second derivatives are negative. T_{Vj} is travel time. The partial derivative of R_j with respect to T_{Vj} is negative.

Individuals combine goods and time via production functions g_i and f_j based on utility maximization. The goods constraint is needed to impose the bound on resources and can be written as:

$$\sum_{i=1}^{n} p_{Ci} x_{Ci} + \sum_{j=1}^{m} p_{Rj} x_{Rj} = V + T_W \overline{w} \qquad \text{5-5}$$

where p_{Ci} and p_{Rj} are vectors giving the unit prices of x_{Ci} and x_{Rj} respectively, T_W is a vector giving the hours spent at work, $\overline{w}$ is a vector giving the earnings per unit of T_W and V is other income. Throughout this section, I assume the wage is constant.

The time constraints can be written as:

$$T = \sum_{i=1}^{n} T_{Ci} + \sum_{j=1}^{m} \left(T_{Rj} + T_{Vj} \right) + T_W \qquad \text{5-6}$$

The production functions can be written in the equivalent form as the input per unit of commodity: $x_{Ci} = m_{Ci} C_i$; $x_{Rj} = m_{Rj} R_j$; $T_{Ci} = t_{Ci} C_i$; $T_{Rj} = t_{Rj} R_j$; $T_{Vj} = t_{Vj} R_j$, where m_{Ci} and m_{Rj} are vectors giving the input of goods per unit of C_i and R_j respectively; T_{Ci}, T_{Rj} and T_{Vj} are vectors giving the input of time per unit of C_i and R_j respectively.

Substituting T_W using the time constraint and then substituting $x_{Ci}, x_{Rj}, T_{Ci}, T_{Rj}, T_{Vj}$, the budget constraint can be written as:

$$\sum_{i=1}^{n} \left(p_{Ci} m_{Ci} + t_{Ci} \overline{w} \right) C_i + \sum_{j=1}^{m} \left(p_{Rj} m_{Rj} + \left(t_{Rj} + t_{Vj} \right) \overline{w} \right) R_j = V + T\overline{w} \qquad \text{5-7}$$

The above equation suggests that the full price of a unit of religious commodity R_j is the sum of the price of the goods and of the time (worship and travel time) used per unit of R_j. Similar interpretation is for a consumption commodity C_i. Travel time increases

the full price of the religious commodity with particular reference to indirect prices in the form of forgoing of income.

Assuming other factors constant, the equilibrium condition resulting from maximizing utility subject to the above constraint takes a very simple form:

$$MRS_{RC}{}' = \frac{p_{Rj}m_{Rj} + (t_{Rj} + t_{Vj})\overline{w}}{p_{Ci}m_{Ci} + t_{Ci}\overline{w}} \qquad \textbf{5-8}$$

Taking into account travel time, a higher marginal rate of substitution between consumption and religious commodities suggests that the individual must give up more units of consumption commodities (C) to obtain one additional unit of religious commodities (R) relative to the MRS based on a model which does not take into account travel time.

The model simply predicts that living distant from a worship place may discourage one to attend religious services given its high opportunity cost. If we use the same principle in defining the link between religious distance and religious attendance, we will expect to see reasons why people do not attend local religious services. But the explanation is not due to higher opportunity cost (or MRS) but is most likely due to lower marginal utility of worship time. This is explained in the following.

In addition to distance, religious attendance might also be affected by the characteristics of the religious institution to predict religious distances. Here I follow the basic idea of Montgomery (1996) that religious commodities are a function of religious institution's strictness.[86] But I define that the religious institution's strictness can be proxied by the time the institution requires its members to involve themselves in religious activities ($\overline{T}_R$). I assume $\overline{T}_R$ is exogenous. I assume that two variables $\overline{T}_R$ and T_{Rj} affect the production function of religious commodities through a variable 'religious conformity' (S_j).

$$R_j = f_j{}'(x_{R_j}, S_j(|T_{Rj} - \overline{T}_R|)) \qquad \textbf{5-9}$$

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[86] Montgomery (1996) notes that the equilibrium condition suggests that an individual would choose a level of strictness inversely proportional to his wage level.

S_j is increasing in R_j. The individual aims to match his time allocated to religious activities (T_{Rj}) with the time required by the religious institution $(\overline{T}_R)$, ie. to minimize $\left| T_{Rj} - \overline{T}_R \right|$. I assume the functional form is as the following:

$$S_j = \frac{1}{\left| T_{Rj} - \overline{T}_R \right|}$$
5-10

Although the inclusion of institutional strictness does not change either resources or income constraints, it changes marginal utility of time spent in religious activities depending on the relative magnitude between $\overline{T}_R$ and T_{Rj}. Since $\left| T_{Rj} - \overline{T}_R \right|^3$ is always positive, to increase his utility, an individual – whose time spent in religious activities is *below* the amount of time required by the religious institution – will increase his time allocated to religious activities, and vice versa.[87] The model suggests that the individual's decision on how much time is spent in religious activities might actually reflect religious distances between the individual and a local religious institution not simply taking into account trade-offs between leisure, work and pray. The religious distance might then (indirectly) affect the wage rate.

To reiterate, the theoretical foundations defined in this section suggest the following hypotheses to be tested using empirical works controlling for necessary variables:

H1: Religious attendance is important for earnings and demand for religious education

H2: The distance to a worship place discourages one from attending religious services, while religious conformity increases religious attendance.

5.3 Background

5.3.1 The School (*Pesantren*)

The religious institution being focused on in this study is *Pesantren*. *Pesantren* or Islamic boarding schools are indigenous Islamic educational institutions in Indonesia. Based on

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[87] Mathematically, $\dfrac{\partial U}{\partial T_{Rj}} = \dfrac{-\left(T_{Rj} - \overline{T}_R\right)}{\left| T_{Rj} - \overline{T}_R \right|^3} \underbrace{\left(\dfrac{\partial U}{\partial R_j} \dfrac{\partial R_j}{\partial S_j} \right)}_{(+)}$

their objectives, *Pesantren* can be classified into three types: *Salafiyah*, *Khalafiyah* and Combination. The study of classical Islamic texts has often been associated with the *Salafiyah Pesantren*. Most *Nahdlatul Ulama*(NU)-affiliated *Pesantren* are classified as this type. In contrast, formal education has been interpreted as an essential part of modern *Pesantren*, ie. *Khalafiyah Pesantren*. Some *Pesantren* can be defined theologically by *Salafiyah* but structurally by *Khalafiyah*. Thus, instead of reciting classical Islamic manuscripts (*Kitab Kuning*; literally the yellow book) through their informal education, these *Pesantren* also offer formal education, which contain more Islamic courses.

In providing academic services, *Khalafiyah Pesantren* have to choose either the Ministry of Religious Affairs' (MRA) curriculum or the Ministry of National Education's (MNE) curriculum. The MRA curriculum contains more Islamic coursework study hours than does the MNE curriculum. However, some *Pesantren* use the MRA' curriculum, but also have formal schools that use the MNE curriculum. In the 2005/2006 academic year, *Santris* or *Pesantren* students attending MRA-curriculum schools exceed 70% of the total *Santris* who attend formal schools, namely 72%, 78%, 73% and 74% of *Santris* attending primary, junior secondary, senior secondary schools and university, respectively.

Formal schools with MRA curriculum are called *Madrasah*, or 'schools' in Arabic. The *Madrasah* vary from primary schools (*Madrasah Ibtidaiyah*), junior high school (*Madrasah Tsanawiyah*), to senior high school (*Madrasah Aliyah*). The MNE curriculum schools are named *Sekolah* (literally, school in *Bahasa*), which vary from primary school (*Sekolah Dasar*), junior high school (*Sekolah Menengah Pertama*), to senior high school (*Sekolah Menengah Umum*). In Indonesia, primary school, junior high school and senior high school are years 1 to 6, years 7 to 9, and years 10 to 12, respectively.

With over 3 million primary school students and nearly 3 million secondary school students, as shown in Table 5-1, the importance of *Pesantren* in the contemporary Indonesian educational sector is evident. This number is equal to 7% of total students in Indonesia from primary to senior secondary schools. Adding to increased enrolment, *Pesantren* education has no sign of gender disparity, with 50% of students being female.[88]

The *Pesantren* education system has undergone considerable transformation and now encourages their students to attend formal schools. In academic year 2002/2003, only

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[88] Asadullah and Chaudhury (2008) reports similar percentage using data from *Madrasah* in Bangladesh.

38.5% of total *Santris* attended formal schools. Four years later, the percentage increased to 57.75%. This trend follows a decreasing share of traditional *Pesantren* (*Salafiyah*) from 63.3% in academic year 2002/2003 to only a half of this in more recent years.[89]

In addition to their roles in the education sector, unlike schools in other countries many *Pesantren* also engage in the business sector. Cooperatives, Islamic microfinance units (*Baitul Maal Wa Tamsil* or BMT), bookshops and supermarkets are some of the popular business forms in *Pesantren*. Having these income-generating units seems to have significantly helped *Pesantren* to develop their self-financed management. Between academic years 2003/2004 and 2004/2005 the total contributions of the central and local governments have decreased from over 20% to 16% of total income. Donations, including almsgiving, (*zakat*) have also decreased from 30.9% to only 10% of total income. In contrast, the internal income sources including *Pesantren*'s business units and tuition fees paid by parents have increased from 43% in academic year 2003/2004 to 62.1% in academic year 2004/2005.[90] Given the *Pesantren*'s activities in the education and business sectors as well as their position as religious centres, it is interesting to examine how they interact with the surrounding community. No previous study has quantitatively explored these issues using data from *Pesantren* in Indonesia.

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[89] While there seems to be transition in the curriculum and activities within *Pesantren*, *Pesantren* affiliation to external organizations has been relatively unchanged. Over 60% of *Pesantren* are affiliated to *Nahdlatul Ulama* indicating the importance that this mass organization plays in the spread of Islamic education in Indonesia. Less than 2% of *Pesantren* are affiliated to *Kyai*. Note that while 60% of *Pesantren* are NU-affiliated, only 30% of total *Pesantren* are *salafiyah*. This implies that either/both some NU-affiliated *Pesantren* have transformed themselves into combination *Pesantren* or/and newly developed NU-*Pesantren* claim to be combination *Pesantren*. These transitions are probably linked to the government's regulation on reduction in religious courses. They can also be due to changes in demands from the education and labour markets. Either way, it seems that *Pesantren* in Indonesia have indeed been able to adapt to changes in the educational sector.

[90] Note that there is also a possibility that the low proportion of income from the government is due to a small percentage of government-hired teachers, called *Pegawai negeri sipil* (government officials). On average, only 5% of teachers are salaried by the government. Therefore, it is reasonable to assume that *Pesantren* indeed manage their schools as private schools.

Table 5-1. *Pesantren* **National Statistics**

NOTE:
This table is included on page 189
of the print copy of the thesis held in
the University of Adelaide Library.

Source: Ministry of Religious Affairs, Republic of Indonesia (2003 - 2007).

5.3.2 Data

In this study, I use data from a survey in 2007 that collected information from nearly 500 households.[91] The study limits the observation to Muslim respondents. I also limit my observations to the heads of households as I assume that heads of households are the decision makers. As previously noted, I focus on two variables: earnings and demand for religious education. Three important determinants include frequency of religious attendance, the geographical location of the household and selected *Pesantren* characteristics as well as the interaction terms between these variables. The geographical location of the household is represented by a binary variable, ie. value of 1 if the households live in the internal community.

Table 52 presents the summary of statistics of the heads of households (HH) by proximity to a *Pesantren*. Two dependent variables observed and the selected individual characteristics—normally associated with earnings—show insignificant difference between respondents living close to and outside *Pesantren* areas at the 5% level of significance, suggesting similar socio-economic characteristics between the two types of communities. But note that the within community has indeed lower religious participation. The only significant difference is in head of household's preference on Shariah-compliant finance. The variable might suggest a different degree of religiosity. It is therefore interesting to see whether *Pesantren* contributes to two outcomes, ie. earnings and demand for religious education, by controlling for more control variables.

I provide more detailed summary of statistics in Appendix 5a, 5b and 5c. Appendix 5a presents the summary statistics of HH by proximity to a traditional *Pesantren*.[92] The statistics show more variation than Table 52. It is statistically significant that respondents living close to a traditional *Pesantren* have lower human capital as indicated by written skills and lower schooling years than respondents living close to other types of *Pesantren*. As well, the nature of traditional *Pesantren,* which value religious education more than regular subjects, seems to affect HH's preference on percentage (of total schooling hours) of religious courses that they think is ideal for their children.

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[91] The survey was conducted by a team of researchers from the University of Adelaide (Australia) and Bogor Agricultural University (Indonesia) funded by the Australia Indonesia Governance Research Partnership (AIGRP) at the Australian National University in 2007. The survey was designed to analyse the impact of religious organizations and *Madrasah* on social capital and democratic performance in Indonesia.

[92] Note that I only include respondents who live close to a *Pesantren*. The 'non-traditional' category consists of respondents living close to modern and combination *Pesantren*.

Table 5-2. Summary Statistics by Proximity to Pesantren

Variables	Outside *Pesantren* area		Close to *Pesantren*		Difference = (2) – (4)
	N	Mean	N	Mean	
	(1)	(2)	(3)	(4)	
1. Religious Outcomes.					
HH's expected %religious course	211	51.15	254	52.85	-1.7
HH's participation at religious activities(1=Never;2=Sometimes;3=Frequent)	188	2.48	234	2.43	0.06
2. Individual Characteristics					
HH's marital status	221	0.94	260	0.95	-0.01
No. children aged 0-14 years	221	1.62	259	1.76	-0.14
Ability to write(0=No; 1=Yes)	220	0.95	260	0.92	0.03
HH's schooling years	217	9.62	258	9.33	0.29
Work in the agricultural sector(0=No;1=Yes)	221	0.24	260	0.22	0.02
HH's type of job(1=in religious sector, 0=otherwise)	221	0.08	260	0.09	-0.01
3. Income and Expenditure					
HH's (Natural log)monthly income(Rupiah)	221	14.27	260	14.26	0.01
HH's(Natural log) expenses on clothes	218	12.78	250	12.68	0.1
4. Religion-related Preference					
HH's preference on Type of financial institution(0=conventional;1=Shariah-compliant)	101	0.13	117	0.04	0.09**
HH's donation to Muslim(1=Never;2=Rarely;3=Sometimes;4=Frequent)	219	3.18	257	3.27	-0.09

Notes: ** Difference is significant at 5%. Samples are Muslim males who are heads of household (HH).

Appendix 5b suggests that respondents living close to a modern *Pesantren* earn more. This might be related to the statistics informing that those who live close to traditional *Pesantren* receive lower education. In contrast, Appendix 5b shows that respondents living close to a modern *Pesantren* demand less in the proportion of religious education they want their children to receive. The statistics indicate possibilities of significant effects of *Pesantren* characteristics on two outcomes: earnings and demand for religious education.[93]

5.4 Basic Regressions

5.4.1 Individual Earnings

First, I analyse whether the religiosity is a determinant of earnings using the OLS method. In computing the standard errors, I allow for arbitrary 'community-level' spatial correlation. Hence, the standard errors are clustered at the community level. I use the following reduced-form model to define the wage rate of individual i who lives close to *Pesantren* j and whose frequency of religious attendance is in m-th category:

$$\log(wage_{ij}) = \beta_0 + \sum_{m=1}^{3}\beta_{1m}R_{ijm} + \beta_2 d_{ij} + \sum_{m=1}^{3}\beta_{3m}R_{ijm} \times d_{ij} + \sum_{p=1}^{P}\beta_{4p}X_{ijp}$$
$$+ \sum_{l=1}^{L}\beta_{5l}Q_{jl} + \sum_{h=1}^{H}\beta_{5l}V_{jh} + \varepsilon_{ij}$$

5-11

R_{ijm} refers to a vector of religious attendance equal to 1 if the respondent is in the m category $(m = 0(never),1(sometimes),2(very\ often/always))$. I include P number of individual characteristics (X_{ij}), L number of *Pesantren* j characteristics (Q_j) and a dummy variable on residence location (d_{ij}).

The individual characteristics consist of marital status, age, number of children aged between 0 and 14, years of schooling, and categorical variables of endowed wealth proxied by the ownership status of their residence.[94] The latter might affect one's decision on labour participation. *Pesantren* characteristics include *Kyai* (religious leader)'s age and experience (years of services), *Pesantren*'s year of establishment, whether the *Kyai* guides the community.

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[93] Appendix 5c presents the summary statistics of *Pesantren*'s characteristics by modern *Pesantren*.

[94] The respondents were asked about the ownership of dwellings: '*What is the ownership status of dwelling*? Options: (1) owned with title; (2) owned without title; (3) given by relation or other to use; (4) provided by the government.

I also include community control variables (V_j) to take into account competition (could also be complementarities) effects between *Pesantren* and other religious institutions. [95] The basic idea is to ensure that increases in religiosity are only affected by the *Pesantren* instead of by other religious bodies in the area. In the present chapter, the theoretical baseline and data description *implicitly* assume that *Pesantren* is a single religious provider in the community.[96] Fortunately, the survey collects data on community facilities available both in the within and outside area, including the presence religious organizations such as NU, *Muhammadiyah*, HTI, LDII, PERSIS, etc.[97] These alternative religious bodies might also contribute to respondent's religiosity. There are two strategies I use here. First, I include two dummy variables to control for the presence of the two largest religious organizations, namely NU and *Muhammadiyah*. Second, I consider the competition effect. A previous empirical study shows that competition between religious bodies can affect their members' voluntary contribution as a proxy of religiosity (Zaleski and Zech 1995). I therefore include the Herfindahl index (H_{ijk}) in the regression:

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[95] It is difficult to analyse any system in *Pesantren* without exploring the role of the *Kyai*. Indeed, according to Binder (1960), Geertz (1960), Lukens-Bull (2000), Abdurrahman (2006), this is the main aspect which distinguishes between *Pesantren* and other schools A literature review shows that the *Kyai*'s roles in *Pesantren* are not only significant from religious perspectives but also from economic, cultural, educational and political perspectives. The *Kyai* are seen as cultural brokers for the flow of modernization (e.g. Syahyuti (1999), Anshor (2006)), wealthy landowners (Dhofier 1999, p.34), teachers of a modern discourse but a distinctly Islamic way (Lukens-Bull 2000), decision makers who are not only distributing new skills and knowledge but also deciding which ones are lawful (*Halal*) and which are not (*Haram*) for his *Santri* (Abdurrahman 2006), and in Java the *Kyai* even claim their *Pesantren* as small kingdoms, in which they have absolute authority (Dhofier 1999, p.34). More broadly, the *Kyai* also play a strategic and influential role in politics. A substantial number of studies focus on this issue (see for example Binder (1960), p.254-255, Geertz (1960), Horikoshi (1975), Turmudi (c2006)). Indeed, in recent years, due to *Pesantren*'s success in producing political elites, the existence of *Pesantren* is more acknowledged from its political importance than its educational function.'.

[96] Let us re-assess the regression method discussed previously. Now assume that there are two treatments being observed. Both treatments might have an effect on the outcome, ie. religiosity. The first treatment (T_1) is the main focus of this study, ie. the effect of living close to a *Pesantren*. For simplicity, I assume the second treatment (T_2) is the effect from an alternative religious body in the outside area.[96] Consequently, respondents in the within area become the control group of treatment 2 (C_2) and respondents in the outside area become the control group of treatment 1 (C_1). I observe: $D = E[R_i^{T1}|T_1, C_2] - E[R_i^{T2}|T_2, C_1]$. Adding and subtracting $E[R_i^{C1}|T_1, C_2]$, I obtain:

$$D = E[R_i^{T1}|T_1, C_2] - E[R_i^{C1}|T_1, C_2] + E[R_i^{C1}|T_1, C_2] - E[R_i^{T2}|T_2, C_1]$$
$$= \underbrace{E[R_i^{T1} - R_i^{C1}|T_1, C_2]}_{The\ treatment\ effect} + \underbrace{E[R_i^{C1}|T_1, C_2] - E[R_i^{T2}|T_2, C_1]}_{Selection\ bias}$$

To get unbiased estimates, we must ensure: $E[R_i^{C1}|T_1, C_2] = E[R_i^{T2}|T_2, C_1]$ This is a strong assumption. It implies that the expected religiosity of individuals in the within and outside areas would have been equal if no *Pesantren* had been established, regardless of whether or not there is an alternative religious body in the outside area. In the absence of information on alternative religious bodies, it is likely that the estimates will underestimate the true effect given negative selection bias.

[97] HTI stands for *Hizbut Tahrir* Indonesia; LDII is *Lembaga Dakwah Islam Indonesia* (Indonesia Institute of Islamic Dawah); PERSIS is *Persatuan Islam* (Islamic Unity).

$$H_{ijk} = \sum_{k=1}^{n_{ij}} Share_{ijk}$$ 5-12

where i, j, k refers to individual i living in the surroundings of the *Pesantren* j having k alternative religious bodies. $Share_{ijk}$ is the market share of k-th religious body in the area, ie. the number of its members per total members of all religious bodies in the area.

One might argue that the location of *Pesantren*, the presence of NU and *Muhammadiyah* are endogenous. Based on a qualitative survey, there is no clear pattern in the distribution of *Pesantren* across regions. Some *Pesantren* were built to tackle social problems (drugs, alcohol, prostitution, etc) in the neighbourhood, but others were built simply based on the location of donated land (*waqf*). Some are located in the busy districts, while some others are quite isolated. There is no strong indication that there exists any factors that affect the location of *Pesantren* and simultaneously affect the outcomes (earnings, demand for religious education and religiosity) except the roles of the *Pesantren* itself. In addition, since these institutions were established decades ago, if there were any factors that drove *Pesantren* to build in a specific area, they might be no longer relevant to the characteristics of the *current* communities. Based on this argument, I treat the location of *Pesantren*, the presence of NU and *Muhammadiyah* as exogenous variables.

I compare two different specifications: (i) with *Pesantren* fixed effects (FE); and (ii) without *Pesantren* FE but with *Pesantren* characteristics. Each approach has its advantages and disadvantages. Using specification (ii) we are able to identify whether a particular characteristic of *Pesantren* contributes to variation in outcomes. The trade-off is we must be sure to include all necessary variables to avoid omitted variable bias. With specification (ii), the FE not only capture potential effects of *Pesantren* but also other geographical, political and socio-economic differences across regions that might affect the outcomes, ie. earnings (eg. demand for labour, land fertility, sanitation, etc.). It is, however, difficult to identify whether *Pesantren* contribute to those differences.

Table 5-3 reports OLS estimation of earnings functions. Column (1) includes the *Pesantren* FE. The coefficient for frequent mosque attendance is positive and significant. Compared to those who never attend religious activities, respondents who 'frequently' attend religious activities earn nearly 35% more. The size and significance of this coefficient is robust when I include *Pesantren* characteristics in Column (2). Note that the

use of *Pesantren* characteristics can give more information about the channel through which *Pesantren* affect the community but the results might be subject to omitted variable bias if we exclude important variables. However, the similarity between magnitude of coefficients for religiosity in Columns (1) and (2) suggests omitted variable bias is not evident in Column (2).

In Column (3), I include the interaction term between frequency of religious attendance and residence location to see whether the role of religiosity in earnings differs between the internal (ie. within) and external (ie. outside) communities. The significance of coefficients for Location*x*mosque attendance="sometimes' and Location*x*mosque attendance="frequent' implies that being involved in religious activities is more rewarding in the within community.

Table 5-3. OLS Wage Equations

Dependent variable: Log(hourly wage)	Pooled sample			Within		Outside	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1. Religious attendance and Residence location							
Location (1=within *Pesantren* area;0=outside *Pesantren* area)	0.099	-0.023	-0.491*				
	(0.085)	(0.124)	(0.198)				
HH's mosque attendance='sometimes'	0.176	0.291	-0.019	0.531	0.598*	-0.085	0.044
	(0.170)	(0.178)	(0.202)	(0.230)	(0.210)	(0.190)	(0.208)
HH's mosque attendance='frequent'	0.347*	0.348*	0.055	0.503	0.500*	-0.03	0.108
	(0.142)	(0.161)	(0.164)	(0.258)	(0.211)	(0.172)	(0.168)
Location=1 x mosque attendance='sometimes'			0.540*				
			(0.251)				
Location=1 x mosque attendance='frequent'			0.530*				
			(0.238)				
2. *Pesantren* Characteristics							
Kyai's Age		-0.005	-0.004	-0.021***	-0.022**	0.007	0.004
		(0.006)	(0.007)	(0.002)	(0.005)	(0.005)	(0.008)
Pesantren's year of establishment		0.001	0.002	-0.004	-0.002	0.002	0.002
		(0.003)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)
Kyai's Years of services		0.007	0.006	0.027***	0.021*	-0.011	-0.018
		(0.011)	(0.010)	(0.004)	(0.009)	(0.005)	(0.015)
Do *Kyai* guide the community? (1=Yes; 0=No)		-0.268	-0.32	-0.163	-0.177	-0.123	-0.263*
		(0.163)	(0.170)	(0.189)	(0.184)	(0.171)	(0.093)
3. Competition Effects							
The Herfindahl index (religious market competition)		-0.452	-0.429	-1.582**		-0.206	
		(0.343)	(0.349)	(0.336)		(0.131)	
An NU-affiliated organisation is in the community (1=Yes;0=No)		0.003	-0.037	0.959*		-0.321	
		(0.268)	(0.261)	(0.344)		(0.195)	
A *Muhammadiyah*-affiliated organisation is in the community (1=Yes;0=No)		0.441	0.534	1.032**		0.273	
		(0.133)	(0.155)	(0.390)		(0.329)	
Constant	8.260***	5.829	5.108	16.948**	13.537	4.189	4.371
	(0.478)	(5.511)	(5.566)	(4.558)	(6.899)	(5.491)	(6.163)
Pesantren fixed effects	Yes	No	No	No	No	No	No
Individual control characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj-R2	0.168	0.123	0.127	0.223	0.181	0.091	0.063
Log-likelihood	-482.595	-430.497	-428.657	-226.331	-233.07	-186.045	-190.207
No. observations	406	358	358	195	195	163	163

Note: For all columns, standard errors are in parentheses. *, ** denote significance at the 5% and 1% level respectively. Standard errors are corrected for clustering at the community level. Individual control characteristics include marital status, age, years of schooling, number of children aged between 0 and 14.

Next, I split the sample into two categories based on residence location: within and outside. I find a mechanism of how religious attendance matters for earnings. The estimates in Columns (4) and (5) indicate important roles of two mass organizations, namely *Nahdlatul Ulama* (NU) and *Muhammadiyah*. In Column (4) I include two dummy variables of the presence of these two organizations in the community. Both coefficients are positive and significant. The two organizations often run entrepreneur development workshops, free public clinics, etc. *Muhammadiyah* is especially known for providing education and health services (Fuad 2002). These activities might affect their members' earnings positively. In contrast, none of the coefficients for religious attendance is significant in Column (4). Once I exclude variables on the presence of NU and *Muhammadiyah*, the adjusted R-2 decreases by about 5% as shown by Column (5) and the two dummy variables of religious attendance become significant. The mechanism does not appear in the outside community, as suggested by Columns (6) and (7). Taken together, the results suggest that living close to a *Pesantren* significantly increases the effect of frequent religious attendance on earnings.[98] The presence of NU and *Muhammadiyah* seems to contribute to the process.

5.4.2 Demand for Religious Education

Next, I consider a form of 'consequential religiosity', namely demand for religious education. I test whether a more religious parent wants his children to attend a higher proportion of religious courses. The head of household's preference on children religious education (E_{ij}) is generated from a survey question '*Based on your opinion, what is the ideal ratio between religious subjects and regular subjects for your children*?' Figure 5-1 shows that most heads of households expect their children to attend religious courses as much as 50% of schooling hours. Note that we cannot observe the proportion of religious courses that the children actually attend. Hence, the variable simply shows parental expectation regardless of various aspects (for example, the levels of education their children currently attend, gender, how possible it is to provide a particular proportion of religious courses in the formal schooling, etc). While the variable seems to be too raw, it does offer good insight to how religiosity and demand for religion courses correlate.

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[98] Regarding individual characteristics, two variables are significant: years of schooling (positive) and when residence ownership status is 'given by relative' (negative).

Figure 5-1. Parental Expectation on Children's Proportion of Religious Education

NOTE:
This figure is included on page 198
of the print copy of the thesis held in
the University of Adelaide Library.

Source: Survey data.

Table 5-4. OLS Expectations of Children's Proportion of Religious Education

Dependent variable: %Expected religious education proportion (scale between 0-100)	Pooled sample			Within		Outside	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1. Religious attendance and Residence location							
Location (1=within *Pesantren* area;0=outside *Pesantren* area)	1.950*	1.414	5.55				
	(0.905)	(1.291)	(2.668)				
HH's mosque attendance='sometimes'	0.731	2.145	4.03	-0.86	-1.078	3.975	4.644
	(1.963)	(1.335)	(2.354)	(1.394)	(1.447)	(2.831)	(2.439)
HH's mosque attendance='frequent'	1.909	2.768	5.858*	-2.46	-3.824	5.347	6.153
	(2.114)	(1.691)	(2.313)	(1.684)	(2.165)	(2.719)	(2.694)
Location=1 x mosque attendance='sometimes'			-3.131				
			(3.168)				
Location=1 x mosque attendance='frequent'			-5.65				
			(2.968)				
2. *Pesantren* Characteristics							
Kyai's Age		-0.141	-0.148	-0.027	-0.019	-0.321**	-0.275*
		(0.082)	(0.081)	(0.121)	(0.116)	(0.069)	(0.094)
Pesantren's year of establishment		-0.059	-0.064	-0.079	-0.067	-0.105*	-0.077
		(0.043)	(0.044)	(0.053)	(0.058)	(0.043)	(0.058)
Kyai's Years of services		0.037	0.062	0.098	0.196	0.032	0.01
		(0.059)	(0.055)	(0.066)	(0.102)	(0.068)	(0.100)
Do *Kyai* guide the community? (1=Yes; 0=No)		-2.813	-2.205	-1.261	0.524	0.905	-0.781
		(2.753)	(2.861)	(3.208)	(3.345)	(2.997)	(3.357)
3. Competition Effects							
The Herfindahl index (religious market competition)		-2.788	-2.97	-6.074*		3.743	
		(5.768)	(5.827)	(2.537)		(6.809)	
An NU-affiliated organisation is in the community (1=Yes;0=No)		4.059	4.422	7.719		-3.393	
		(3.922)	(4.028)	(3.291)		(3.911)	
A *Muhammadiyah*-affiliated organisation is in the community (1=Yes;0=No)		8.875	7.738	12.677**		-1.141	
		(4.929)	(5.030)	(3.574)		(6.217)	
Constant	54.963***	174.427	182.783	223.077	196.4	265.568*	208.277
	(5.226)	(86.433)	(87.159)	(104.569)	(114.835)	(90.025)	(120.207)
Pesantren fixed effects	Yes	No	No	No	No	No	No
Individual control characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj-R2	0.081	0.007	0.008	0.045	0.011	0.001	0.018
Log-likelihood	-1494.37	-1340.53	-1339.4	-708.851	-713.846	-615.329	-615.616
No. observations	395	351	351	193	193	158	158

Note: For all columns, standard errors are in parentheses. *, ** denote significance at the 5% and 1% level, respectively. Standard errors are corrected for clustering at the community level. Individual control individual characteristics include marital status, age, years of schooling, number of children aged between 0 and 14.

I test the following reduced form:

$$E_{ij} = \beta_0 + \sum_{m=1}^{3} \beta_{1m} R_{ijm} + \beta_2 d_{ij} + \sum_{m=1}^{3} \beta_{3m} R_{ijm} \times d_{ij} + \beta_4 X_{ij} + \beta_5 Q_j + \beta_5 V_j + \varepsilon_{ij} \quad \textbf{5-13}$$

I include the same control variables as the earnings equation. I use the OLS method by allowing the standard errors clustered at the community level.

Table 5-4 shows the results. The same set of explanatory variables as used in the earnings equation has less predictive power in this model. It is generally believed that more religious parents will demand a higher proportion of religious education for their children. But this does not seem to be the complete story. Column (1) using the FE method suggests that there is a positive association between residence location relative to a *Pesantren* and demand for religious education. But none of the religious attendance variables is significant. But once I control for the interaction term between residence location and mosque attendance as well as *Pesantren* characteristics, Column (3) shows a positive and significant coefficient of frequent mosque attendance.

The results suggest that, controlling for differences in effects of religiosity across communities, frequent religious attendance is associated with higher demand for religious education. In contrast, controlling for frequency of religious attendance, there is not enough evidence of differences in the effect of religiosity on demand for religious education between the internal and external communities. Religiosity matters and its effect on both the internal and external communities is indifferent. This might indicate an insignificant role of *Pesantren* in affecting parental educational choice. Indeed, I find that living in the external area of *Pesantren* with an old *Kyai* is negatively associated with the expected proportion of religious education. The present study could not clearly identify the exact reason for this finding.

I find a strong and positive association between the presence of *Muhammadiyah* in the internal community and demand for religious education. This might be due to institutional aspects of *Muhammadiyah*. It is acknowledged that *Muhammadiyah* has strong concerns over religious education in Indonesia. This might lead the organization to run more programs such that the local communities are eager to give more religious education to their children. In short, *Pesantren*'s role might not be as evident as *Muhammadiyah* in the process of household's decision making on educational choice.

5.4.3 Robustness Check

Results from Section 5-4 might be subject to some possible sources of bias or limitations of variables. In this section, I focus on two aspects, namely religious measures and non-random residence selection.

5.4.3.1 Religiosity Measures

One possible source of bias in the study is the measurement bias. I use a variable on frequency of participating in religious activities (MOSQUE). However, this proxy may suffer from potential bias. Such a measure might not cause a serious problem for religions which require regular service attendance for all members such as Protestant Christian or Catholic. But for religions in which attendance at services is restricted to only some parts of a group or it is believed to be compulsory only by some groups, the index might cause some bias.[99] We rule out the possibility of 'gender bias' as we only observe Muslim men. However, among Muslim men, some might believe public religious attendance is not as important as what is believed by some other people. I therefore extend my analysis by conducting factor analysis to allow alternatives for public religious attendance.[100] If we think of religiosity as a latent variable (so called 'factor') and we have three indicators (we expect that the relationship between the 'religiosity factor' and the three indicators are all positive), the use of factor analysis allows us to reduce these three indicators into one variable 'factor scores'. The factor scores can then be used in the regression. This method has been widely used in many empirical works (Schieman, Nguyen et al. 2003; Tan 2006).

I consider two additional variables, donation among Muslims (DONATION) and types of preferred financial institutions (TYPEFIN), ie. whether conventional or Shariah-compliant institutions. Types of preferred financial services are chosen due to recent trends.[101] There

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[99] Potential bias could be more evident in the estimates using data from Muslim men and women. In Islam, women are recommended to worship (*shalat*) at their houses, more specifically in their own rooms. In contrast, worshipping at the mosque is considered obligatory for men. In addition, Muslim men attend the mosque at least once a week to conduct Friday prayer (*shalat jumat*), giving them, in general, a higher frequency than women.

[100] Although the standard factor analysis as applied in this study is based on Pearson correlation for continuous data, Vermunt and Magidson (2005) show that the results of latent class factor analysis (LFCA), which is specifically designed for categorical variables, are similar to standard factor analysis. In addition, a disadvantage of LCFA is that its parameters are difficult to interpret. This motivates me to apply standard factor analysis.

[101] In the survey the respondents were asked: *Do you have saving accounts?(1=Yes; 2=No); If Yes, what types of financial institutions do you choose to save your money in?(1=conventional bank; 2= a Shariah bank; 3= Baitul Maal Wa Tamsil (BMT); 4= Cooperatives; 5=Others, please specify).* To simplify, I reduce the answers into two categories: 0=Non-Shariah and 1=Shariah. The 'non-Shariah' category consists of conventional banks and cooperatives, while the 'Shariah' consists of Shariah banks and BMT.

have been increasing demands for Shariah products in Indonesia in recent years, including Shariah financial instruments. Many argue that the increasing trend is associated with the increase in religious awareness of Muslims who observe the importance of implementing Shariah laws in every aspect of life, including the financial sector. A study in Bangladesh finds a positive effect of joining the Shariah microfinance program on religiosity (Rahman 2008). Furthermore, although the values are not confined to Muslims, the goodness of donation has been claimed as a manifestation of one's religiosity. Hence, I also consider the altruism aspect.

Given that one advantage of factor analysis is data reduction and the first factor has high variance, I limit the number of factors to one. All variables appear with positive signs as expected. I find that the religiosity factor is closely related to mosque attendance given its highest factor loadings.[102] A high uniqueness number shows that the other two variables, on donation and preferred types of financial institutions, are not informative.[103] After some preliminary regression, I find that religious participation and the factor analysis proxy perform equally. On this basis, I argue that frequency of participation in religious activities (MOSQUE) is a strong proxy for religiosity and therefore the results from Section 5-4 are reliable.

5.4.3.2 Residence Selection

I next consider the possibility of non-random residence selection. My interest is to capture the treatment effect of *Pesantren* (T) by using distance to the *Pesantren* as a proxy. Those who live in the outside area, about 5–10 kilometres from the *Pesantren*, are assumed as the control group (C). We may find the expected average effect of living close to a *Pesantren* on religiosity in a population: $E\left[R_i^T - R_i^C\right]$. But access to data is only available to capture $D = E\left[R_i^T \mid T\right] - E\left[R_i^C \mid C\right]$. In a large sample, the equation gives the average religiosity of both groups (the control and the treatment groups) and examines the difference between religiosity in a community close and far from *Pesantren*.

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[102] Communality or squared factor loadings shows the proportion of variance of explanatory variables explained by m factors. Uniqueness can be then obtained by 1 minus communality.

[103] Uniqueness: MOSQUE=0.2808, DONATION=0.9332, TYPEFIN=0.9631.

Subtracting and adding $E\left[R_i^C|T\right]$ is needed to decompose our results to the treatment effect and selection bias. The term $E\left[R_i^C|T\right]$ is the expected religiosity of a person living close to *Pesantren* (the treatment group) had he not been treated. This is an unobservable outcome but actually needs to be observed. The previous equation can be rewritten as follows:

$$D = E\left[R_i^T|T\right] - E\left[R_i^C|T\right] + E\left[R_i^C|T\right] - E\left[R_i^C|C\right] = \underbrace{E\left[R_i^T - R_i^C|T\right]}_{The\ treatment\ effect} + \underbrace{E\left[R_i^C|T\right] - E\left[R_i^C|C\right]}_{Selection\ bias}$$

5-14

The above equation suggests that the unbiasedness of the regression method would heavily rely on 0 selection bias. This requires $E\left[R_i^C|T\right] = E\left[R_i^C|C\right]$, implying that the expected religiosity of an individual in the within and outside areas would have been equal if no *Pesantren* had been established. This implies that selection to live close to a *Pesantren* has to be random. However, in reality, selection to live close to a particular *Pesantren* may represent an unobservable variable (or a latent index) showing the net benefit of living close to *Pesantren*. Hence, the use of standard OLS in the wage equation (or a standard ordered logit model for the religiosity equation and a probit model for the demand for religious education equation) might yield bias results.

To deal with this issue, my approach is to control non-random residence selection bias using the Heckman selection criterion term in the outcome equation (Heckman 1979). The term is the inverse Mills ratio using fitted values from the first stage probit model estimating the probability of living close to *Pesantren*.[104] I estimate the following Probit model:

$$\mathbf{Pr}[d_{ij} = 1] = \beta_0 + \beta_1 X_{ij} + \beta_2 Q_j + \beta_3 W_{ij} + \varepsilon_{ij} \qquad\qquad \textbf{5-15}$$

where d_{ij} is equal to 1 if individual i lives in the within area of *Pesantren* j, and 0 otherwise; X_{ij} is the vector of the head of household's characteristics (marital status, age

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[104] It is important to note that I do not assume *causal* relationships between the dependent variable and the right-hand side variables. While I assume *Pesantren*'s characteristics are exogenous (therefore might *cause* variation in residence selection), *current* observations of individual characteristics might not predict exactly the individual's decision on moving to a particular area in the past. For example, the person might have stayed in the area of birth, indicating a case where residence selection is indeed exogenous. However, it is logical to assume that each individual has a choice to move to another area. Hence, the association between current individual characteristics and a decision to still live close to a *Pesantren* indicates conformity between the presence of *Pesantren* and an accommodating environment to live in.

(and its squared), number of children, years of schooling and ability to write); Q_j is the vector of *Pesantren j* characteristics and ε_{ij} is the error term.[105] To differentiate between the first-stage regression and the second stage model, I include W_{ij}. It includes an (exogenous) dummy variable of whether the head of household's parents also lived in the same area.[106] As in the previous estimations, I include *Pesantren* characteristics not only for the within but also the outside communities. There are some possibilities that *Pesantren* characteristics affect the outside area, especially the big *Pesantren*. Given the sampling method, there is no assurance that the outside area is not affected by *Pesantren*. The inclusion of location of residence cannot fully ensure the absence of *Pesantren* effects. It can only proxy 'physical distance'. The theoretical framework suggests that there is another mechanism which determines whether *Pesantren* affect communities, namely religious distance. If we ignored this aspect, we would be faced with omitted variable bias. Of a long list of variables included, I only find being married is positively correlated to the probability of living close to *Pesantren*. The positive effect of marital status might be motivated by individual commitment to instil religious values in their family life and possibly their children. The model can only explain 1.4% of variation in probability of residing close to *Pesantren*.

Table 5-5 re-estimates results from Section 5-4. Overall, the estimates suggest that living close to a *Pesantren* significantly increases the effect of frequent religious attendance on earnings. *Pesantren* and community characteristics previously argued as important determinants of earnings also appear to be significant in Table 5-5 and have similar magnitude to coefficients in Table 5-3, namely *Kyai*'s age, *Kyai*'s experience, the presence of NU and *Muhammadiyah*. The results suggest the robustness of our previous findings on earnings.

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[105] Although the survey has a wide range of *Pesantren* characteristics, a limited number of *Pesantren* being surveyed cause some of the variables to have collinearity. After some specification checks, I include 3 *Kyai* characteristics (age, working experience and whether the HH guides the community in the election) and 4 *Pesantren* characteristics (years of establishment, percentage income from governments and tuition fees and also whether the *Pesantren* has a borrowing-lending unit).

[106] An alternative determinant of residence selection is school availability and other community facilities such as post offices, hospitals, banks, supermarkets, internet kiosk, etc in the area surrounding *Pesantren*. But the variation between the within and outside area is almost zero in all *Pesantren*. It is logical to argue that they will not be significant factors of residence choice to differentiate between religiosity and earnings in the within and outside areas due to a reasonable distance between *Pesantren* and the 'outside' community (approximately 5–10 kms). This argument might sound contradictory to the reason why geographical effect is important for analysis of religiosity. But I argue that in the community it is very common for children to travel 5–10 kms to their schools given how their parents view the value of education. It is not, however, very common to travel this far to attend religious services on a daily basis, five times a day.

Table 5-5. Heckman-corrected Wage and Demand for Religious Education Equations

Dependent variable:	Hourly Wage		Demand for religious education	
	Within	Outside	Within	Outside
	(1)	(2)	(3)	(4)
1. Religious attendance and Residence location				
HH's mosque attendance='sometimes'	0.529*	-0.094	-0.993	4.06
	(0.010)	(0.668)	(0.503)	(0.092)
HH's mosque attendance='frequent'	0.502*	-0.014	-2.604	6.507*
	(0.030)	(0.924)	(0.186)	(0.033)
2. *Pesantren* Characteristics				
Kyai's age	-0.021***	0.008	-0.016	-0.288
	(0.000)	(0.342)	(0.920)	(0.362)
Pesantren's year of establishment	-0.004*	0.002	-0.075	-0.092
	(0.042)	(0.671)	(0.185)	(0.552)
Kyai's years of services	0.026**	-0.011	0.096	0.075
	(0.001)	(0.142)	(0.434)	(0.844)
Do *Kyai* guide the community? (1=Yes; 0=No)	-0.162	-0.117	-1.272	0.517
	(0.407)	(0.696)	(0.723)	(0.959)
3. Competition Effects				
The Herfindahl index (religious market competition)	-1.627***	-0.131	-6.745	5.108
	(0.001)	(0.754)	(0.149)	(0.693)
An NU-affiliated organisation is in the community (1=Yes;0=No)	0.986*	-0.41	7.889	-6.039
	(0.017)	(0.156)	(0.096)	(0.466)
A *Muhammadiyah*-affiliated organisation is in the community (1=Yes;0=No)	1.082***	0.173	13.546*	-5.451
	(0.000)	(0.810)	(0.018)	(0.499)
Constant	16.740***	4.273	217.899*	245.32
	(0.000)	(0.611)	(0.038)	(0.433)
Pesantren fixed effects	No	No	No	No
Individual control characteristics	Yes	Yes	Yes	Yes
The inverse Mill's ratio	-0.192	-0.338	-3.879	-12.955
Log-likelihood	-226.331	-233.07	-186.045	-190.207
No. observations	247	215	247	215

Note: For all columns, standard errors are in parentheses. *, ** denote significance at the 5% and 1% level, respectively. Standard errors are corrected for clustering at the community level. Individual control characteristics include marital status, age, years of schooling, number of children aged between 0 and 14.

5.5 What Pesantren Characteristics Are Associated with Higher Religious Attendance?

The previous section has shown the link between religious attendance and earnings as well as the link between religious attendance and demand for religious education. In the absence of a strong and exogenous instrument for religious attendance, I previously examined both earnings and demand for religious education functions using the OLS method. Specification checks based on preliminary regressions advise that the OLS method performs better than the Instrumental Variable method using selected instruments such as donations to fellow Muslims, the use of Shariah-compliant financial methods, views on *Pesantren*'s roles in the communities, whether the person works in the religious sector, and some other instruments.

I also examine whether rainfall data is a strong instrument to explain variation in mosque attendance. There are some possibilities that people stay at home and do not go to religious activities at religious centres on bad weather days. A study suggests that higher early-life rainfall has large positive effects on the adult outcomes of women, ie. women with 20% higher rainfall (relative to the local norm) are 0.57 centimetres taller, complete 0.22 more schooling grades, and live in households scoring 0.12 standard deviations higher on an asset index (Maccini and Yang 2009). In this study, I look at the present rainfall data. People responded to the question on how often they attend religious services based on their current experience (Smith 1998). Note that the survey was conducted between 20 August 2007 and 12 September 2007, the dry season in Indonesia. Daily rainfall data during the period show little variation across the municipalities being surveyed although the distance between municipalities can be over 100 kilometres. Between August 1 and September 30 2007, municipalities where *Pesantren* are located only experienced 3–4 rainy days. Based on the F-statistics in the first stage regression and the Hausman test, the earnings equation using the OLS method is preferred as it is more efficient.

In this section, I explore what *Pesantren* characteristics might explain variation in religious attendance. The results from this section should only indicate further explanations of the role of religious institutions instead of dealing with the endogenous nature of religious attendance and using the following equation as the first-stage regression, for example. Our exercises are along the lines of some previous studies which define religiosity as

determinants of earnings rather than the other way around (Tomes 1984; Lehrer 2004; Chiswick and Huang 2008)

Given that the religious attendance variable is inherently ordered, I use an ordered probit model.[107] This takes the explanatory variables and estimates of the probability of being in each religious attendance (*Mosque attendance*) category (never, sometimes, and very often/frequent). The following regression is estimated for individual *i* in the area surrounding of *Pesantren j* :

$$\Pr(Mosque \quad attendance_{ij}) = f\left(X_{ij}, d_{ij}, Q_{j}, V_{j},\right) \qquad \textbf{5-16}$$

In addition to explanatory variables used in the wage equation, I also include number of working hours per day.

While the coefficients of the ordered probit model only indicate whether the variables generally improve the frequency of mosque attendance, marginal effects describe how the probability of being in each mosque attendance category changes for a one-unit change in a particular variable, or for a discrete jump in a dummy variable. To save space, I only report the coefficients in Table 5-6. Marginal effects are reported when they are needed for interpretation.

Of *Pesantren* characteristics, the religious leader or *Kyai* who is experienced and involved in the community is significant for increased religious attendance, as suggested by the significant coefficients for 'Years of services' and 'Do *Kyai* guide the community? (1=Yes; 0=No)' variable. After I split the sample into two categories, ie. within versus outside, it is evident that the effects of the *Kyai*'s guidance are greater on the religious attendance of respondents in the within area. In the within area, the marginal effects suggest that for a discrete jump in the *Kyai*'s guidance variable and one-unit increase in the *Kyai*'s years of services, the probability of the individual attending the mosque in the 'frequent' category versus the combined 'sometimes' and 'never attend' categories increase by over 60% and 3%, respectively.

Column (1) of Table 5-6 shows that the presence of NU and *Muhammadiyah* is positively associated with the probability of being in the frequent religious attendance category.

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[107] While an ordered logit could also be used, the nature of my variables supports normally, rather than logistically, distributed errors.

However, this result should be interpreted carefully. After I control for the interaction term between the presence of NU and *Muhammadiyah* and the variable on the *Kyai*'s guidance, the two coefficients become insignificant; whilst coefficients for the two interaction terms are negative and significant. One possible explanation is that the presence of religious organizations (other than *Pesantren*) creates competition effects such that the role of the *Kyai* becomes less significant. In such a situation, leaders of religious mass organizations may also play important roles in affecting community religious participation. In Column (4), I exclude the interaction term between the presence of *Muhammadiyah* and the variable on the *Kyai*'s guidance to avoid collinearity. The Herfindahl index, however, suggests that the more religious organization options for the community is positively associated with religious attendance. This might be correlated to the finding that the *Kyai* have a lesser contribution in the external community compared to their roles in the internal (within) community.

Taken together, the results suggest that the *Kyai*'s role is important for community religious participation but the role is to a lesser extent in the community where more religious institutions are present in the community.

Table 5-6. Ordered Probit: Religious Attendance

Dependent variable: Religious attendance (0=never; 1=sometimes; 2=very often/always)	Pooled sample		Within	Outside
	(1)	(2)	(3)	(4)
Location (1=within *Pesantren* area;0=outside *Pesantren* area)	0.138	0.001		
	(0.556)	(0.998)		
1. *Pesantren* Characteristics				
Kyai's age	0.013	-0.004	-0.011	-0.011
	(0.286)	(0.686)	(0.130)	(0.384)
Pesantren's year of establishment	-0.007	-0.014**	-0.022***	-0.015*
	(0.142)	(0.006)	(0.000)	(0.017)
Kyai's years of services	0.023	0.029	0.068***	-0.001
	(0.126)	(0.071)	(0.000)	(0.812)
Do *Kyai* guide the community ?(1=Yes; 0=No)	0.842*	1.825***	2.199***	1.689***
	(0.022)	(0.000)	(0.000)	(0.000)
Location=1*x* Do *Kyai* guide the community ?(1=Yes; 0=No)		-0.218		
		(0.384)		
2. Competition Effects				
The Herfindahl index (religious market competition)	0.513	0.506	-0.382	1.157*
	(0.096)	(0.180)	(0.498)	(0.020)
An NU-affiliated organisation is in the community (1=Yes;0=No)	-0.627*	-0.082	0.6	-0.775*
	(0.042)	(0.803)	(0.255)	(0.028)
A *Muhammadiyah*-affiliated organisation is in the community (1=Yes;0=No)	-1.297**	0.58	0.157	-0.559
	(0.005)	(0.432)	(0.781)	(0.685)
"Do *Kyai* guide the community?" *x* the presence of NU-affiliated organisation		-2.332***	-2.209***	-2.124***
		(0.000)	(0.000)	(0.000)
"Do *Kyai* guide the community?" *x* the presence of *Muhammadiyah*-affiliated organisation		-2.833**	-2.352***	
		(0.003)	(0.000)	
cut1				
Constant	-13.88	-27.076**	-45.401***	-28.802*
	(0.167)	(0.009)	(0.000)	(0.023)
cut2				
Constant	-12.631	-25.761*	-43.924***	-27.449*
	(0.210)	(0.013)	(0.000)	(0.029)
Pseudo-R2	0.126	0.165	0.238	0.193
Log-likelihood	-299.153	-285.846	-141.877	-125.873
No. observations	358	358	195	163

Note: For all columns, standard errors are in parentheses. *, ** denote significance at the 5% and 1% level, respectively. Standard errors are corrected for clustering at the community level. Individual control characteristics include marital status, age, years of schooling, number of children aged between 0 and 14 and average number of working hours per day.

5.6 Decomposition

Earnings and parental choice on children's proportion of religious education equations are estimated using OLS. In this section, I compare results from the regression models and the Oaxaca decomposition method to analyse the difference between groups based on proximity to *Pesantren* and types of *Pesantren*. The first simply refers to estimating the equation with the inclusion of dummy variable on residence location (and its interaction with religious attendance and other variables). Hence the coefficient shows the difference between the exposed community and the control cohort. [108] The latter explains the gap in the means of an outcome variable between two groups by deriving a gap in endowments, a gap in coefficients and a gap arising from the interaction between endowments and coefficients. Results from Oaxaca decomposition would give complementary explanations of how *Pesantren* contribute to the communities by suggesting whether there exist 'unobserved effects'.

The use of Oaxaca decomposition is relevant to the theoretical framework from which I draw two hypotheses: (1) religious attendance matters for earnings; (2) physical and religious distances matter for religious attendance. OLS models show different magnitude of the *Pesantren*'s characteristics effects for the within and outside area. Oaxaca decomposition is therefore used to confirm whether it is about the distance, 'endowed' characteristics or other unexplained aspects. The significance of the unexplained aspects suggests that our previous estimates might deal with omitted variable bias. In the literature on gender bias in earnings, this term is often referred to as 'gender discrimination'. In the context of the present study, the term could capture both other unexplained effects (eg. *Pesantren* could be located centrally and wages are higher in central locations) and discrimination by the *Pesantren* (eg. providing information only to the within area).

I decompose the source of variation in three dependent variables being estimated in the previous section using Oaxaca decomposition method:[109]

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[108] I assume that the outside community is 'the control cohort'.

[109] Oaxaca decomposition to explain differences between communities i and j can be written in a more general form as:

$$\bar{y}_i - \bar{y}_j = (\bar{X}_i - \bar{X}_j)\left[D\hat{\beta}_i + (1-D)\hat{\beta}_j\right] + (\hat{\beta}_i - \hat{\beta}_j)\left[\bar{X}_i(1-D) + \bar{X}_j D\right] + \hat{\gamma}_i\bar{\lambda}_i + \hat{\gamma}_j\bar{\lambda}_j$$

$$\left(\overline{y}_i - \overline{y}_j\right) = \underbrace{(\overline{X}_i - \overline{X}_j)'\hat{\beta}_j}_{Endowment(E)} + \underbrace{\overline{X}_j{}'(\hat{\beta}_i - \hat{\beta}_j)}_{Coefficient(C)} + \underbrace{(\overline{X}_i - \overline{X}_j)'(\hat{\beta}_i - \hat{\beta}_j)}_{Interaction(CE)} \qquad \textbf{5-17}$$

where $\overline{y}, \overline{X}, \hat{\beta}$ are the average of each group's outcome variable, covariates (seen as 'endowments') and estimated parameters. I define respondents in the outside area as the control group (Group 1) and respondents in the within area as Group 2. The $Endowment(E)$ component reflects the differences in endowments or characteristics of respondents living close to *Pesantren* and living in the outside area, each multiplied by the appropriate coefficient from the 'within area' equation. Hence, this first term represents the amount of the differential that can be accounted for by differences in explanatory variables (including individual and *Pesantren* characteristics) across the within and outside groups. The second component, ie. $Coefficient(C)$ quantifies the difference between the within and outside outcomes of a person with the same characteristics, ie. characteristics of living in the within area (including *Pesantren* characteristics close to where the community is located). Studies often interpret that a big proportion of the unexplainable component is due to discrimination.[110] But here, as we could not identify whether it is a matter of discrimination or other unexplained aspects, we define the term as 'other unexplained aspects'. Finally, the $Interaction(I)$ component measures the simultaneous effect of difference in endowments and coefficients.

Table 5-7, Table 5-8 and Table 5-9 present the decomposition outputs. In Column (1), I use *Pesantren* fixed effects, while Column 2 estimates the model using information on *Pesantren* characteristics. The 'difference' rows report differences in the mean predictions between groups conditional on other factors. The rest of the tables report three components of decomposition and their standard errors. Overall, I find no significant difference in unconditional means of earning, religious attendance or demand for religious education across the communities. However, interpretation of the results might still be useful to find further explanations of what we have found from the regressions.

D is a matrix of weight. Oaxaca suggests two values, ie. $D = 0$ and $D = 1$ Oaxaca (1973). Two more recent studies suggest $diag(D) = 0.5$ Cotton (1988) and $diag(D) = f_i$ (Reimers (1983), where f_i is the fraction of group i in the sample. But the results of all these methods in terms of relative magnitude of each component are similar. Here, I apply $D = 0$.

[110] For example gender discrimination as in studies on female earnings.

Regarding religious attendance, Table 5-7 supports findings from the regression on different effects between within and outside communities. Previously, regressions suggest that while the importance of the *Kyai*'s guidance is evident in both communities, the effect is more significant in the within community. Oaxaca decomposition further describes that if the effects of the *Kyai*'s guidance (in addition to effects of other control variables) were the same, the outside community would attend the mosque more frequently and the difference would be greater than the difference in unconditional means. Note that based on the unconditional mean, the within community attend the mosque less frequently. But if both communities had the same characteristics, including the same level of *Kyai* involvement, the within community would attend the mosque more frequently. The results imply that in the absence of differences in effects of the role of the *Kyai*, the religious participation of the within community would be even lower than the current level of participation.

Regarding individual earnings, Oaxaca decomposition in Table 5-8 suggests that the difference in earnings across the communities is mainly due to different effects of income determinants. The *Endowment* (E) component suggests that if the effects of the control variables on earnings of both communities were equal, the within community would indeed earn more, contradicting the sign of the difference in unconditional means. I suspect this is due to the gap in educational background. Interpretation of regressions in the previous sections has focused on individual religious attendance and *Pesantren* characteristics. However, the regression model also finds years of schooling as an important income determinant and its effect on income is more evident in the outside community. However, a big proportion of the difference in wages can be explained by the *Coefficient* (C) component. It suggests that if both communities had the same characteristics, including the level of education, the difference in wages would be smaller than the difference in unconditional means. The different effects of variables such as religiosity, as suggested by previous regressions, might explain this smaller gap. Without the differences in the effects of religiosity on earnings, earnings of the within community would have been much lower than the outside community.

Regarding demand for religious education, Oaxaca decomposition in Table 5-9 suggests that the within community would have always demanded a higher proportion of religious education for their children. Previous regressions suggest that

the role of *Pesantren* is not as evident as *Muhammadiyah* in affecting household's educational choice and religiosity matters for demand for religious education. The regression also finds that more educated parents demand a lower proportion of religious education. Given that the within community has a higher average of years of school participation but the community has greater effects of religiosity on their life; the mixture between different effects of religious attendance between communities and different characteristics of the communities lead to a positive figure in the *Interaction*(I) component contradicting the sign of the difference in demand for religious education between communities.

In addition to grouping based on distance to *Pesantren*, I divide the samples based on whether or not the *Pesantren* in the area is traditional. Decomposition based on the first grouping, ie. the within versus the outside, is reported in Columns (1) and (2) of each table, while decomposition based on type of *Pesantren* nearby is reported in Column 3. A large proportion of *Coefficient*(C) indicates that there might be treatment discrimination by traditional *Pesantren*.

Table 5-7. Oaxaca Decomposition of Religious Participation

Classification	Closeness to *Pesantren*		Proximity to a traditional *Pesantren*
Group 1	Outside	Outside	Non-traditional
Group 2	Within	Within	Traditional
Pesantren fixed effects	Yes	No	No
Differential			
Average of Earnings of Group 1	1.423***	1.423***	1.406***
	(0.000)	(0.000)	(0.000)
Average of Earnings of Group 2	1.421***	1.421***	1.650***
	(0.000)	(0.000)	(0.000)
Difference (Group 1 - Group 2)	0.003	0.003	-0.244
	(0.989)	(0.988)	(0.144)
Decomposition			
Endowments	-0.016	0.052	0.115
	(0.938)	(0.781)	(0.780)
Coefficients	0.077	-0.065	-0.17
	(0.504)	(0.738)	(0.343)
Interaction	-0.058	0.016	-0.189
	(0.731)	(0.942)	(0.668)

Table 5-8. Oaxaca Decomposition of Earnings

Classification	Closeness to *Pesantren*		Proximity to a traditional *Pesantren*
Group 1	Outside	Outside	Non-traditional
Group 2	Within	Within	Traditional
Pesantren fixed effects	Yes	No	No
Differential			
Average of Earnings of Group 1	9.038***	9.038***	8.989***
	(0.000)	(0.000)	(0.000)
Average of Earnings of Group 2	8.961***	8.961***	8.904***
	(0.000)	(0.000)	(0.000)
Difference (Group 1 - Group 2)	0.077	0.077	0.085
	(0.627)	(0.610)	(0.775)
Decomposition			
Endowments	0.067	-0.029	-0.061
	(0.738)	(0.899)	(0.897)
Coefficients	0.000	0.022	0.056
	(0.999)	(0.886)	(0.854)
Interaction	0.01	0.084	0.089
	(0.962)	(0.733)	(0.854)

Table 5-9. Oaxaca Decomposition of Percentage of Expected Children's Proportion of Religious Education

Classification	Closeness to *Pesantren*		Proximity to a traditional *Pesantren*
Group 1	Outside	Outside	Non-traditional
Group 2	Within	Within	Traditional
Pesantren fixed effects	Yes	No	No
Differential			
Average of Earnings of Group 1	50.114***	50.114***	51.115***
	(0.000)	(0.000)	(0.000)
Average of Earnings of Group 2	52.005***	52.005***	50.250***
	(0.000)	(0.000)	(0.000)
Difference (Group 1 - Group 2)	-1.891	-1.891	0.865
	(0.363)	(0.336)	(0.749)
Decomposition			
Endowments	-1.108	-1.077	1.716
	(0.552)	(0.529)	(0.721)
Coefficients	-1.839	-2.57	1.281
	(0.295)	(0.205)	(0.700)
Interaction	1.056	1.756	-2.131
	(0.699)	(0.492)	(0.666)

5.7 Further Discussion

Results from the regression analysis and the Oaxaca decomposition are expected to shed light on how *Pesantren* benefit the communities. In this section, I extend the discussion on whether *localism* or *religious conformity* plays a more important role in connecting *Pesantren*'s influence and changes in the community. This identification would define implications of the study for policy implementation and possible future work.

Localism and religious conformity differ in terms of what the community prefers most. Localism occurs when the community prefers to support local religious bodies to searching for an institution more suitable to its religious taste in the external area. In contrast, religious conformity occurs when individuals are more likely to share variants of a religious trait with individuals in the same religious body, including distant individuals, than with nearby individuals from different religious bodies. In a market setting, high demand for localized religious services from the community might force local religious bodies to lower their prices or provide more access to local communities.

Let us review two possible channels of how *Pesantren* benefit internal communities in terms of religious participation as defined in the theoretical model: short physical distance and possibly short religious distance. Given the definition of localism and religious conformity, it can be seen that the first channel, ie. physical distance, is relevant to localism. On the other hand, the second channel indicates religious conformity placing the *Pesantren* at the centre of advancement in socio-economic aspects, which then spread the influence across regions. In a bigger picture, the localism hypothesis suggests the extent of the *Pesantren* effect is more limited than the religious conformity hypothesis. However, it empowers local communities more significantly and allows any conflict which might occur between *Pesantren* and the community to be more easily solved at the local level.

Concluding whether localism or religious conformity is more evident is not straightforward. The results from the Oaxaca decomposition suggest that difference in geographical location of residence cannot fully explain variation in focused outcomes. This is against the localism hypothesis. Moreover, if we consider results from previous econometric models, we find that the within community benefits from more intense interaction with the *Kyai*. However, the significance of such interaction diminishes as

soon as we take into account the presence of alternative religious bodies. Also, the positive effect of the *Kyai*'s involvement on religious attendance does not only apply to the within community but also the external community. In a way, this indicates that *Pesantren* outreach is quite evident and that their religious values conform to the majority of the surrounding communities. Finding out how vast their outreach is beyond the scope of the present study.

Nevertheless, it is important to note that the above interpretation does not necessarily imply an insignificant role for the *Pesantren* in the internal community. As we can see from the regression analysis, the internal communities do receive benefit in terms of the *Kyai*'s guidance and more 'economic rewards' from attending the mosque, as indicated by the more significant effects of religious attendance on earnings. In addition to the existence of religious benefits, there might be network effects or social effects such that it is beneficial for the internal community to attend the mosque more regularly.

5.8 Conclusion

The theoretical framework in this study can be used to draw two hypotheses: (1) religious attendance matters for earnings; (2) physical and religious distances matter for religious attendance. Observing the surrounding community, this study has provided statistical evidence to support the first hypothesis and some explanations of how distances might matter by examining the association between *Pesantren* and the household's decision-making process relating to religiosity, earnings and demand for religious education.

Overall, the empirical results show the important roles of the *Kyai* and religiosity and that the effects of these variables are different for different communities First, the empirical results suggest that living close to a *Pesantren* significantly increases the effect of frequent religious attendance on earnings. The presence of NU and *Muhammadiyah* seems to contribute to the process. In addition to the existence of religious benefits, there might be network effects or social effects such that it is beneficial for the internal community to attend the mosque more regularly. Oaxaca decomposition further suggests that, in the absence of difference effects of religiosity on earnings, earnings of the within community would have been much lower than the outside community

Examining the determinants of religious attendance, the *Kyai*'s role is important, although to a lesser extent in a community that has more religious institutions, such as in the external community. Oaxaca decomposition further suggests that without the higher

effects of the role of the *Kyai* ('discrimination treatment'), religious participation of the within community would be much lower than the current level of religious participation.

Regarding demand for religious education, the within community would have always demanded a higher proportion of religious education for their children. Surprisingly, the study finds that *Pesantren*'s role is not as evident as the *Muhammadiyah* in the process of household's decision making on educational choice.

The result from this present analysis may bring some policy implications. Many view that *Pesantren* are potential candidates as agents of change from socio-economic, political and education perspectives. This issue is a timely one, especially in the era of decentralization when local participation in every aspect is invaluable. How the government or other parties empower and work with *Pesantren* largely depends on how *Pesantren* can benefit the communities. Two important features to allow the community to benefit from the presence of religious institutions are: (i) the community must share similar religious beliefs with the *Pesantren* teachings; and (ii) the *Pesantren*'s community involvement. The empirical results suggest that *Pesantren* outreach is quite evident and their religious values are aligned with the majority of the surrounding communities. This condition further opens possibilities of positioning *Pesantren* as important agents of change in Indonesia.

There is still much room for improvement in further research or survey. Further research is recommended to explore the above hypothesis using different sets of data and a greater number of *Pesantren* with more diverse characteristics, for example data from *Pesantren* outside Java, which may act differently than *Pesantren* in Java.

Questions to capture individual religiosity should also move beyond asking someone's frequency of attending religious places or activities. This study has not addressed private devotion. Future work can consider the religiosity index used in a study on American Arabic women (Witkowski 1999). It uses four aspects to measure religiosity: frequency of prayer, going to mosque, fasting during Ramadan and going to Makkah (Mecca in English).[111] Alternatively, a study examining the impact of Shariah-compliant microfinance programs on poverty alleviation in Bangladesh suggests the use of some religious activities

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[111] Of course, this proxy might still capture measurement bias. Holding other variables constant, 'going to Makkah' may cause bias due to the economic level of the respondents, given that the costs of doing Hajj in Makkah is relatively high from the US, in which the study was conducted. Consequently, the index cannot capture the religious behaviour of someone who intends to go to Makkah but cannot afford to do so.

or beliefs, such as praying, ability to recite the Qur'an, reciting the Qur'an, fasting, missionary activities involvement with dowry, maintaining Parda, practising usury, the likelihood of conflict with husband, and involvement with social activities (Rahman 2008). Such data are relatively difficult to obtain, especially for a survey which was not specifically designed to capture the religiosity aspect of the respondents.

Furthermore, it is important to note that the above analysis has not considered the social pressure effect. This aspect can be important in the analysis of adolescent religiosity. Using longitudinal data from school completers (and after they enrol in college) in Australia, a study finds mobility changes church attendance but the change is likely due to the removal of pressure (from parents, society etc) that would still exist if they did not move from their hometown (Vaus 1982). A future work should develop a theoretical model to take into account the social pressure effect on religious attendance.

Another issue is on the survey design. Given the progressive movement of *Pesantren*, it is indeed difficult to define 'the control group' to assess the community impacts of *Pesantren*. What I have shown here is probably only the association between *Pesantren* characteristics and three variables of interests that focus on the difference between the 'assumed to be' exposed cohort, ie. those who live close to *Pesantren*, and the control cohort, ie. those who live far from *Pesantren*. Given easy access to *Pesantren* by transportation, for example, there is a possibility that the control cohort is not completely unexposed to the presence of *Pesantren*. Hence, to really capture the community *impacts* rather than *association*, a better survey strategy might be needed. It might be important to ask some censoring questions which decide whether the person can be classified into the control cohort, for example whether the respondents living far from *Pesantren* know about *Pesantren* 'X' and to what extent *Pesantren* 'X' might affect their behaviour.

Appendix 5a. Summary statistics of Head of Households (HH) by Proximity to a *Traditional Pesantren*

NOTE:
This table is included on page 220
of the print copy of the thesis held in
the University of Adelaide Library.

Source: Survey 2007.
Notes: This table only consists of those who live close to a *Pesantren*. The term "non-traditional" refers to modern and combination types.

Appendix 5b. Summary statistics of Head of Households (HH) by Proximity to a *Modern Pesantren*

NOTE:
This table is included on page 221
of the print copy of the thesis held in
the University of Adelaide Library.

Source: Survey 2007.
Notes: This table only consists of those who live close to a *Pesantren*. The term "non-modern" refers to combination and traditional types.

Appendix 5c. Summary Statistics of *Pesantren* Characteristics by *Modern Pesantren*

NOTE:
This table is included on pages 222-223
of the print copy of the thesis held in
the University of Adelaide Library.

Source: Survey 2007. The term "non-modern" refers to combination and traditional types.

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6 CONCLUSION

6.1 Introduction

Education and economics are not easy partners. For decades economists have asked whether education is classed as investment or simply consumption. Admittedly, education is a very large part of the total expenditure by the public sector. But as in many parts of the public sector, educational outcomes are not easily valued in monetary terms. Hence, the answer to the previous question depends on how significantly education contributes to economic performance. Ultimately, the answer will help us to determine how much should be spent on education and which aspects of education should be priorities.

The relationship between religious education and various aspects of the economy is even less clear. While there has been increasing interest in religious education in Muslim countries, religious education has often been aligned to extremism and even terrorism. As suggested by Asadullah (2006), in the absence of evidence-based research, much of the current discourse on Islamic schools is predicated on anecdotal accounts. The fact is religious education does have positive potential. Modernised religious education is associated with pro-democracy attitudes (Asadullah and Chaudhury 2006). Religious education might also improve one's religiosity which in turn can enhance life satisfaction, moral attitudes etc (Scheepers, Grotenhuis et al. 2002; Greene and Bong Joon 2004).

Such benefits from religious education can be offset by the fact that graduates might have lower academic performance and, consequently, suffer wage penalties. The exact reason is hard to identify. It might be due to school sorting. But at the school level, we understand that religious schools must deal with more challenging resource constraints as they must allocate teachers, facilities and other types of resources to two different purposes. Students attending religious schools must also deal with more challenging time constraints by studying religious and secular subjects. If educational outcomes were only measured by exam scores on Mathematics and Science, it would be interesting to analyse whether students from religious schools perform worse than students from regular schools. Such analysis might be highly sensitive to the choice of dataset.

This thesis is about the economics of Islamic education in Indonesia. It consists of three core chapters that examine impacts of Islamic education at different levels: individual, regional and local community levels. These chapters cover the relative inequality of educational quality across Islamic schools and its impact on regional income per capita growth, the impacts of government intervention in Islamic schools on graduates' earnings and schooling, and the positive externalities that might arise from the presence of Islamic boarding schools. This work adds to our understanding about how Islamic schools function, as well as how Islamic education could be improved in the future.

Indonesia is an interesting subject for such a study, given that its religious education delivery system is different from western countries. Religion is an essential part of the Indonesian national education system. Islamic schools in Indonesia allocate around 30% of schooling hours to religious subjects, whilst the proportion of religious education in religious schools in western countries is about the same as the proportion of religious education in "non-religious" schools in Indonesia. At the individual level, given the education system in Indonesia, the central question would be whether fewer hours of regular courses, as indicated by the type of the school, lead to lower academic attainment and future earnings of Islamic schools graduates? Does religious education contribute to income growth? Also, what externalities might arise from the presence of religious schools? One important feature this thesis aims to address is whether religious education (including religious education providers) might contribute to the formation of social capital which in turn will positively affect economic growth.

The remainder of this chapter is as follows. Section 6.2 outlines the main empirical findings, Section 6.3 discusses some implications of the findings and Section 6.4 discusses the scope for further research.

6.2 Main findings

This present thesis has provided analysis of how Islamic schools function and to what extent religious education providers may benefit their students, the surrounding society and the region as a whole. Readers would find that the following 6 points are the key findings from this thesis:

1. Based on 2003-2005 provincial data, Islamic education in Indonesia at junior secondary schools has only low academic achievement but also unequal

performance. In contrast, non-Islamic schools (including public non-religious schools) have shown significant improvement in equality of performance across provinces, most likely due to the catching up of low performers supported by a larger involvement of local government in this decentralisation era.

2. A quality-inclusive growth model specification is preferred to avoid upward bias of the estimate of the return to education. I find that the social marginal effect of years of schooling is only two-thirds of the estimate using standard analysis. Nevertheless, the relative importance of the quantity of education is still evident.

3. While there is no difference between rates of return to the *quantity* of new human capital stock from Islamic education and non-Islamic education backgrounds, quality-augmented new labour stock from non-Islamic education backgrounds is more significant than new stock from Islamic education backgrounds for regional income per capita growth. However, once we take into account inequality of the quality of education, the difference disappears. This implies that the different contribution of quality-adjusted new stock between human capital with religious and non-religious educational background might be largely due to different inequalities across provinces.

4. Eleven years after its launching, the 1989 reform imposing a 70-30 regular-religious education ratio has not shown any effect on earnings, welfare, average of schooling years and completion of senior secondary schooling. But it has contributed to the promotion of nine-year basic education in rural areas.

5. On positive externalities of religious schools, local community benefits from more intense interaction with the local religious leaders of Islamic boarding schools (*Pesantren*) than does the external community. But the direct benefit of living close to *Pesantren* only matters for religious participation, not for earnings or demand for religious education. However, I find that religiosity is more positively significant for earnings of the community surrounding the *Pesantren*, probably due to networking effects. Hence, community involvement of religious leaders can indirectly and positively affect earnings of the surrounding community and affect demand for religious education. The overall results suggest that *Pesantren* contribute to the formation of social capital, particularly in the form

of religiosity, which contribute to the improved welfare of the surrounding community.

6. The presence of alternative religious bodies affects the significance of *Pesantren* contribution. The role of *Kyai* in community religious participation is to a lesser extent in the community where more religious institutions present in the community such as in the external community. Also, *Pesantren* role is not as evident as *Muhammadiyah* in the process of household's decision making on educational choice. Regarding individual earnings, the presence of *Kyai* and *Nahdlatul Ulama* (NU) is positive and significant.

6.3 Implications

6.3.1 Implications for Literature on Relevant Areas

This thesis shows that different samples can produce uncommon findings contradicting expectations. On determinants of religiosity, I find that most of the individual's characteristics have insignificant effects on religiosity. This is in contrast to some earlier studies (Fichter 1969; Branas-Garza and Neuman 2003). As an example, using a sample of Spanish Catholics, a study finds significant association between the level of religiosity (measured by beliefs, prayer and church attendance) and age (positively), exposure to religious activity during childhood (positively), schooling (positively) being women (positively) and marital status (positively on men) (Branas-Garza and Neuman 2003). But results from the present thesis mirror the positive and significant effect of schooling on religiosity as found by Branas-Garza and Neuman (2003). Regarding the insignificant effects of most individual characteristics in this study, one possible reason is that individuals in one community share little variation in their religious activities. A substantial social pressure effect might play its role.

Some findings also highlight that some instruments used by various studies are not robust based on the dataset used in this study. Unlike some previous studies on religious schools in the US (Neal 1997; Altonji, Elder et al. 2002), I find that local availability of religious schools is a weak instrument for religious school attendance. Using provincial data, I also find that drop-out rates and student-teacher ratios as suggested by Barro (2001) are not strong instruments for the quality of education as measured by national examination scores.

Despite differences which are most likely are due to different samples, this thesis also shows that different settings can yield different conclusions in simulation results. On a Monte Carlo exercise using simulated data, contradicting findings by Judson (1995) I find that by characterizing the panel-unit specific effect to be correlated with other explanatory variables, the Least Square Dummy Variable (LSDV) or the Fixed Effect (FE) method does dominate the OLS with a time dimension smaller than 10 in terms of prediction of coefficients for explanatory variables. The downfall is that it produces more bias in the coefficient for the lagged dependent variable.

Other findings from this thesis confirm or support the results of earlier studies. Similar to Hanushek and Wobmann (2007) who look at the impacts of the quality of education as measured by international cognitive achievement tests from 50 countries, this thesis confirms that the inclusion of the quality of education weakens the significance of the quantity of education as measured by years of school participation. Also supported is literature concluding that parental religiosity has an important effect on demands for private schools (Cohen-Zada and Sander 2008). Here I find that parental religiosity is associated with an expectation on children's proportion of religious education.

The thesis also supports studies concluding negative association between class size and academic performance (Krueger 2003; Suryadarma, Suryahadi et al. 2006).[112] But given the limited number of control variables that the present thesis has, further work is needed to explore a more precise form of correlation between the two variables. An example would be a peer effect — through which class reduction may play an important role — might have stronger effects (Levin 2001); or whether there is variation in effects of class sizes across grades (Angrist and Lavy 2006).

The study also confirms that standard growth analysis which does not take into account the quality of schooling would cause upward bias as suggested by previous studies (Behrman and Birdsall 1983; Pritchett 1996; Hanushek and Woessmann 2007). Although I find that the quality of education is important for Indonesian provincial income per capita growth, its importance is to a lesser extent than what is suggested by previous studies. I find a significant association between the quantity of education and income per capita growth.

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[112] Results from this thesis contradict Hoxby (2000), Asadullah (2005).

Some other findings have supported previous studies but with some conditions. A previous study using US data finds that church attendance is one of many ways of building social capital, hence more educated people would participate more in religious group (including church) activities (Sacerdote and Glaeser 2001). I find that this claim is true but the effect is more significant for people living in areas close to religious schools (*Pesantren*). This implies that there is a certain condition that must be met to allow positive returns from networking. The fact that the *Pesantren* leaders are local elites might provide higher rates of returns to mosque attendance for people in the surrounding community of *Pesantren* than those who are distant from *Pesantren*.

In addition to either conforming or contradicting results from previous studies, the present thesis also offers empirical evidence of the significance of variables that have never been considered before in the literature. It shows that religious leaders with more community involvement matters for community religiosity. Given that religiosity affects earnings more significantly for people in the surrounding community, the results suggest a mechanism of the formation of social capital through which the Islamic institutions contribute to economic levels of the surrounding community.

The thesis also finds that the presence of religious mass-organisations such as *Muhammadiyah* and *Nahdlatul Ulama* is positively associated with earnings. This result may indicate that these organisations provide support to their members and the surrounding community to develop their human capital, including education and health care. It is publicly known that these two organisations often run entrepreneur development workshops, free public clinics etc. *Muhammadiyah* is especially known for providing education and health services (Fuad 2002). These activities can then positively affect their member's earnings.

The thesis also shows the significance of some variables is sensitive to some sources of heterogeneity, such as location relative to influential religious bodies and rural-urban areas. As previously mentioned, this thesis is not able to identify the positive impacts of the *Madrasah* reform without taking into account differences between rural and urban areas. Also, Chapter 5 shows that location relative to *Pesantren* can change how people measure costs and benefits of attending the mosque, given their educational background and how they are going to provide religious education to their children. Future studies in this area should carefully look at those aspects in order to avoid bias from omitted variables.

6.3.2 Implications for Education Development in Indonesia

There are some lessons to be learned for the education sector in Indonesia. First, this thesis has shown an alarming fact: Islamic education in Indonesia at junior secondary schools shows not only low academic achievement but also an increasing inequality of academic performance. To reduce the educational inequality of Islamic schools, the contribution of government is essential. This is based on unexpected positive growth of inequality across public Islamic schools. Private schools, in addition, also need assistance to improve their quality, especially in the area in which academic achievement is low.

The second lesson is that findings from previous chapters confirm the claim that *Pesantren* are potential candidates as agents of change from socio-economic, political and education perspectives. Results from the study suggest that religious conformity between local communities and *Pesantren* religious values and *Pesantren* involvement in the community matter. Therefore, how the government or other parties empower and work with *Pesantren* should take into account these aspects. This issue is a timely one, especially in the era of decentralisation when local participation at every aspect is important.

The third lesson is that Indonesian governments, both local and central, should review the direction of educational development. Empirical findings in this study show that quality as well as the quantity of education is significant for economic growth and the increasing inequality of quality of Islamic schools is worrisome. The results suggest it might be important to improve academic quality and ensure fair distribution of resources across provinces and types of schools before the government rapidly expands access to tertiary education to optimise its impacts on economic growth. Given a two-way relationship between education and economic growth, literature shows that education should shift with economic growth to avoid a skill-mismatch and, therefore, increases in unemployment (Permani 2009).

The fourth lesson is that the 1989 *Madrasah* reform did not reach its initial target even by 2000. The Indonesian government should therefore review whether a reduction in proportion of religious courses in Islamic schools is a strategic option to improve the competitiveness of Islamic school graduates in the labour market. Or, could increases in hours of schooling in *Madrasah* schools, in contrast, be the solution? This requires further work.

The fifth lesson is that one possible way to improve the quality of education is to reduce the class size. Around 90% of Islamic schools are private schools. This raises a question of how they can afford to increase classrooms or numbers of teachers given that most students are from low-income families. Adding to this problem is that empirical findings show lower rates of return to religious education compared to regular education. Hence, increasing tuition fees in order to increase revenue will potentially lower demand for Islamic schools. On the other hand, relying on subsidies or financial aid (including foreign aid) may have advantages as well as disadvantages.[113] In the short-term, these aids benefit both parties. *Pesantren* can allocate the aid immediately for consumption and the donors can fulfill their political motives. However, in the long term, strong dependence on external organisations including domestic donors may place *Pesantren* in risky situations when their relationships with donors worsen.

A sustainable finance system for *Pesantren* in Indonesia may be based on a new approach: transforming *Pesantren* into the new alternative of microfinance institutions (MFIs). This is suggested for two main reasons: (1) students and their parents as potential clients; (2) similarity between microfinance and Islamic principles, ie. to promote equity and fairness; (3) education as an investment (Permani 2009b). The proposed strategy also implements a specific target of *Bank Indonesia* (the Central Bank of Indonesia) to promote cooperation between Shariah banking institutions and Islamic mass organisations such as *Muhammadiyah* and *Nahdlatul Ulama* (NU) in managing their financial assets as defined in Accelerated Shariah Banking Development Policy 2007-2008 (*Kebijakan Akselesari Pengembangan Perbankan Syariah 2007-2008*) (Bank Indonesia 2007). The framework diversifies current relationships between Islamic organisations such as *Pesantren* and Shariah banks from recipient-donor relationship to partnership with the final target to improve *Pesantren's* performance both academically and financially.

The choice of a microfinance system as a solution is based on the fact that the role of microfinance has been recognised as a valuable economic development path over the last thirty years. Microfinance was established to enhance poverty reductions by providing financial assistance to low-income groups so that they can access a broad range of

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[113] An approach to attract foreign aid is logical. Over the past years, some *Pesantren* in Indonesia have been able to attract foreign aid, especially from western countries. As evidence, on 14 March 2006, Condoleeza Rice (Minister of Foreign Affairs in the United States of America) visited a *Pesantren* in Jakarta and donated US$ 8.5 million for development funding. Two weeks later, Tony Blair (Prime Minister of the United Kingdom–) visited a *Pesantren* in Jakarta. For western countries, giving financial support for *Pesantren* creates a good political image regarding their partnerships with Muslim countries.

financial services. It grew out of experiments in Latin America and South Asia, but achieved its popularity in Bangladesh in 1976 with the establishment of the Grameen Bank (Morduch and Armendariz 2004), which has been claimed as the front line of the microfinance movement. The 98% payment rate of the Grameen Bank indicated that providing services to poor borrowers could be profitable (Morduch 1999).

A Shariah-compliant system is chosen so that the proposed solution can be accepted by Islam-based schools. As Islam-based schools, *Pesantren* are expected to apply Islamic systems including their financing systems. Broadly, Islamic financial instruments must not violate *riba* or *gharar,* and must be approved by a Shariah board of accepted scholars within the bank or financial institution.[114] One major consequence of the banning of interest is the effort to provide alternative financial instruments for Muslims. In general, there are three types of financing schemes in Islam: *Mudaraba* or trustee financing, *Musharaka* or equity participation and *Murabaha* or cost plus mark-up.[115] Permani (2009b) proposes the utility of these three modes based on specific reasons for designated parties. The idea is to mobilize capital from government subsidies and donation, depositors (students can be potential clients for example of educational savings) to provide access for student's parents to financial services under supervision of Shariah banks in a government-free system to limit political intrigue. Simulations show that Shariah financial institutions are more competitive in provision of short-term loans than long-term loans.

Yet, there are still legal barriers to be considered. The Indonesian government tends to force MFIs into the formal sector and to be regulated under the Banking Act.[116] This leaves a microfinance institution to act either as a formal bank with high minimum capital or as a cooperative which has a poor record in Indonesian financial history.

6.4 Future Research

This thesis has provided a foundation for analysis of economics of religious education in Indonesia. But there are obviously several areas where further research is required. In

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[114] See Saeed (1996), Lewis and Algaoud (2001), Hussaini (2002), Siddiqi (2004), Iqbal and Mirakhor (2007) for further details on characteristics of riba, reasons on why riba is prohibited and criteria of Islamic financial instruments.

[115] Although these three schemes are generally accepted by most Islamic financial institutions, there is still ongoing debate on whether or not those schemes are truly as stated by the Qur'an and taught by the Prophet Muhammad. See Saeed (1996) for excellent reviews on interpretation and legitimacy of each financing scheme.

[116] The latest progress regarding to MFI legal status is the handover of microfinance act plan from The Regional Representatives Council (*Dewan Perwakilan Daerah, DPD*) to The People's Representative Council (*Dewan Perwakilan Rakyat*) on 28 March 2007 Dewan Perwakilan Rakyat (dpr.go.id) (2007). Yet, until the end of 2009 the Act plan (RUU) has not been ratified. It is not clear either when the Act will be approved.

general, given the empirical nature of this thesis, how well the model can identify the significance of variables of interest relies on how potential sources of bias can be controlled. A bigger size of sample especially one from a dedicated survey or a randomization project is definitely desirable in order to look at policy effects. Some dataset-specific recommendations have been provided at the end of each core chapter. In the following, I list some other areas which deserve attention. These include analysis of substitutability between religious and regular education, the cost of *Madrasah* schooling, predicting how the job market reacts to changes in the *Madrasah* curriculum, and the impacts of decentralisation on *Madrasah* schooling.

Firstly, it might be important to further explore the substitutability between religious and non-religious education. Chapter 2 has provided theoretical baseline of how to approach this issue. But unfortunately, the present thesis could not collect school-level data on the proportion of religious teachers and other school resources. The outcome of studies analysing the substitutability between religious and non-religious education can advise the optimum form of curriculum content so that academic outcomes of religious schools can be improved. The outcome might, in its turn, explain the differences in academic achievements between religious schools in western countries and Indonesia. An inverse U-shape might be a possible result from such study on the link between academic outcomes and proportion of religious education.

Another aspect not clearly analysed by this study is the cost of *Madrasah* schooling. The analysis in this thesis was not well-informed by trends in *Madrasah* educational costs. Particularly, it is not clear whether increases in proportion of regular schools in 1989 increased the *Madrasah* cost. The increase reflects the higher cost of regular education compared to religious education. Then, we should test whether it leads to increases in demand for non-religious schools.

Still on cost issues, this thesis has a lack of empirical evidence on whether or not parents from low income families choose *Madrasah* or *Pesantren* schooling due to their low costs. A field survey in 2007 to some *Pesantren* in Java indicated that the argument was true. National statistics also show that the majority of *Madrasah* and *Pesantren* students are from low-income families. If the cost factor is contributing to demands for religious education, some implications may arise: (i) analysis of *Madrasah* performance is subject to non-random sample selection; (ii) competitiveness of Islamic schools may be lower if further reduction in proportion of religious education is imposed; and (iii) governments should

place their priority on *Madrasah* students in order to preserve the existence of these schools.

Another important source of change in demand for education is how the job market reacts to changes in *Madrasah* curriculum. If the 1989 regulation were successful in improving *Madrasah* graduates' individual earnings, the increase could be due to increases in both/either productivity of the graduates and/or positive signaling. It is therefore interesting to find whether the signaling affects income or whether the job market has received positive signaling from the reform.

Due to data limitation, unfortunately this present thesis has not thoroughly covered issues on the impacts of decentralisation. The impacts of decentralisation on religious schools as well as other types of schools are definitely of policy interest. This is a broad topic. Here, I focus on three aspects that should be analysed in future work: local government capacity, costs and inequality of education.

The first on is on the capacity of local governments. The decentralisation reforms that Indonesia has undergone since the late 1990s lead to local governments being subjected to education provisions. The financing of education and curriculum design, especially primary and secondary education, would therefore depend on the ability of local government in generating its own revenue in addition to revenues they are entitled to from the central government. Yet, it is widely acknowledged that the difference in the capacity of local governments and the availability of local resources across Indonesia is considerable. In an economy with already large economic differences across regions, decentralised education may lead to even more serious education and income inequality and, the worst of all consequences, national disintegration. A study to investigate the impacts of local government capacity on educational outcomes is therefore important.

The second is on increases in costs of education. A study to empirically identify the impacts of decentralisation in the educational sector on poor families is important. In particular, it should focus on the academic performance of school-aged children and the allocation of household expenditure on educational costs. The testable hypothesis is whether decentralisation increases the economic burden of education on poor families. Alternative channels through which decentralisation may affect family expenditures should also be carefully analysed, for example changes in incomes of head of households due to changes in the local job market, distribution of scholarships etc.

The third aspect is inequality of education. It is essential to empirically analyse whether or not decentralised education lowers inequality of education across provinces. Also, the future study should test whether reduction in inequality is at the expense of lower quality. It should take into account gender issues, differences between rural and urban areas and differences in types of schools (religious versus non-religious).

With such limited data, analysis presented in this thesis may seem to be too partial and incomplete. But in understanding particular aspects of religious education in Indonesia, we may come closer to understanding the economy as a whole.

7 BIBLIOGRAPHY

Abdurrahman, M. (2006). "What's wrong with *Pesantren*?" ICIP Journal **3**(1): 1-6.

Abreu, D. (1988). "On the Theory of Infinitely Repeated Games with Discounting." Econometrica **56**(2): 383-96.

Adnett, N. and P. Davies (2005). "Competition Between or Within Schools? Re-assessing School Choice." Education Economics **13**(1): 109-121.

Albrecht, S. L. and T. B. Heaton (1984). "Secularization, Higher Education, and Religiosity." Review of Religious Research **26**(1): 43-58.

Alm, J., R. H. Aten, et al. (2001). "Can Indonesia Decentralise Sucessfully? Plans, Problems and Prospects." Bulletin of Indonesian Economic Studies **37**(1): 83-102.

Altonji, J. G., T. E. Elder, et al. (2002). "An Evaluation of Instrument Variable Strategies for Estimating the Effects of Catholic Schools." Journal of Human Resources **40**(4).

Anderson, T. W. and C. Hsiao (1981). "Estimation of Dynamic Models with Error Components." Journal of the American Statistical Association **76**(375): 598-606.

Angeles, G., D. K. Guilkey, et al. (2005). "The Effects of Education and Family Planning Programs on Fertility in Indonesia." Economic Development and Cultural Change **54**(1): 165-201.

Angrist, J. D. and A. B. Krueger (1992). "The Effect of Age at School Entry on Educational Attainment: An Application of Instrumental Variables with Moments from Two Samples." Journal of the American Statistical Association **87**(418): 328-336.

Angrist, J. D. and V. Lavy (2006). "Using Maimonides' Rule to Estimate The Effect of Class Size on Scholastic Achievement*." Quarterly Journal of Economics **114**(2): 533-575.

Anshor, M. U. (2006). "Gender and Civic Values in *Pesantren*." ICIP Journal **3**(1): 1-7.

Arellano, M. and S. Bond (1991). "Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations." The Review of Economic Studies **58**(2): 277-297.

Asadullah, M. N. (2005). "The Effect of Class Size on Student Achievement: Evidence from Bangladesh." Applied Economics Letters **12**(4): 217-221.

Asadullah, M. N. and N. Chaudhury (2006). Religious Schools, Social Values and Economic Attitudes: Evidence from Bangladesh. QEH Working Paper Series, University of Oxford. **QEHWPS139**.

Asadullah, M. N. and N. Chaudhury (2008). Madrasas and NGOs : complements or substitutes ? non-state providers and growth in female education in Bangladesh. Policy Research Working Paper Series 4511, The World Bank.

Asadullah, M. N., N. Chaudhury, et al. (2007). "Student achievement conditioned upon school selection: Religious and secular secondary school quality in Bangladesh." Economics of Education Review **26**(6): 648-659.

Asra, A. (2000). "Poverty and Inequality in Indonesia: Estimates, decomposition, and key issues." Journal of the Asia Pacific Economy **5**(1-2): 91-111.

Athukorala, P.-c. (2003). "Foreign direct investment in crisis and recovery: lessons from the 1997-1998 Asian crisis." Australian Economic History Review **43**(2): 197-213.

Atkinson, A. B. (1970). "On the measurement of inequality." Journal of Economic Theory **2**(3): 244-263.

Azra, A. (2008). "Islam in Southeast Asia: Between Tolerance and Radicalism." MUIS (Majelis Ugama Islam Singapore) Occasional Paper Series No.5: 1-24.

Azzi, C. and R. G. Ehrenberg (1975). "Household Allocation of Time and Church Attendance." Journal of Political Economy **83**(1): 27-56.

Balisacan, A. M., E. M. Pernia, et al. (2003). "Revisiting growth and poverty reduction in Indonesia: what do subnational data show?" Bulletin of Indonesian Economic Studies **39**(3): 329-351.

Baltagi, B. H. (1995). Econometric Analysis of Panel Data. New York, John Wiley and Sons.

Bangay, C. (2005). "Private education: relevant or redundant? Private education, decentralisation and national provision in Indonesia." Compare: A Journal of Comparative Education **35**(2): 167-179.

Bank Indonesia (2007). Kebijakan Akselesari Pengembangan Perbankan Syariah 2007-2008. http://www.bi.go.id/web/id/Info+Penting/syariah/.

Barro, R. J. (2001). "Human Capital and Growth." The American Economic Review **91**(No. 2, Papers and Proceedings of the Hundred Thirteenth Annual Meeting of the American Economic Association): 12-17.

Barro, R. J. and J.-W. Lee (2001). "International Data on Educational Attainment: Updates and Implications." Oxford Economic Papers **53**(3): 541-563.

Barro, R. J. and J. W. Lee (1996). "International Measures of Schooling Years and Schooling Quality." The American Economic Review **86**(2): 218-223.

Bartkowski, J. P., X. Xu, et al. (2008). "Religion and child development: Evidence from the Early Childhood Longitudinal Study." Social Science Research **37**(1): 18-36.

Bayhaqi, A. (2001). "Education and Macroeconomic Performance in Indonesia: A Comparison with Other ASEAN Economies." EADN Working Papers No.8 Retrieved 13 May 2008, from http://www.eadn.org/vr13(2000).pdf.

Becker, G. (1967). Human Capital and the Personal Distribution of Income. Michigan, University of Michigan Press.

Becker, G. S. (1965). "A Theory of the Allocation of Time." The Economic Journal **75**(299): 493-517.

Bedi, A. S. and A. Garg (2000). "The Effectiveness of Private versus Public Schools: The Case of Indonesia." Journal of Development Economics **61**(2): 463-494.

Behrman, J. R. (1999). "Schooling in Asia: Selected microevidence on determinants, effects, and policy implications." Journal of Asian Economics **10**(2): 147-194.

Behrman, J. R. and N. Birdsall (1983). "The Quality of Schooling: Quantity Alone is Misleading." The American Economic Review **73**(5): 928-946.

Behrman, J. R. and M. R. Rosenzweig (1996). "College choice and wages: Estimates using data on female twins." Review of Economics & Statistics **78**(4): 672.

Beine, M., F. Docquier, et al. (2001). "Brain drain and economic growth: theory and evidence." Journal of Development Economics **64**(1): 275-289.

Benhabib, J. and M. M. Spiegel (1994). "The Role of Human Capital in Economic Development Evidence from aggregate cross-country data." Journal of Monetary Economics **34**(2): 143-173.

Bhattacharya, N. and B. Mahalanobis (1967). "Regional Disparities in Household Consumption in India." Journal of the American Statistical Association **62**(317): 143-161.

Binder, L. (1960). "Islamic Tradition and Politics: The Kijaji and the Alim." Comparative Studies in Society and History **2**(2): 250-256.

Blaug, M. (1976). "The Empirical Status of Human Capital Theory: A Slightly Jaundiced Survey." Journal of Economic Literature **14**(3): 827-855.

Bloom, D. E., D. Canning, et al. (2000). "Population Dynamics and Economic Growth in Asia." Population and Development Review **26**(Supplement: Population and Economic change in East Asia): 257-290.

Booth, A. (2000). "POVERTY AND INEQUALITY IN THE SOEHARTO ERA: AN ASSESSMENT." Bulletin of Indonesian Economic Studies **36**(1): 73.

Bosworth, B. P. and S. M. Collins (2003). "The Empirics of Growth: An Update." Brookings Papers on Economic Activity **2003**(2): 113-179.

Bound, J., D. A. Jaeger, et al. (1995). "Problems with Instrumental Variables Estimation When the Correlation Between the Instruments and the Endogeneous Explanatory Variable is Weak." Journal of the American Statistical Association **90**(430): 443-450.

Bowles, S. and H. Gintis (1975). "The Problem with Human Capital Theory--A Marxian Critique." American Economic Review **65**(2): 74-82.

Branas-Garza, P. and S. Neuman. (2003). "Analyzing Religiosity Within an Economic Framework: The Case of Spanish Catholics." IZA Discussion Paper No. 868 Retrieved 28 February 2008, from http://ssrn.com/abstract=446300.

Brañas-Garza, P. and S. Neuman (2007). "Parental religiosity and daughters' fertility: the case of Catholics in southern Europe." Review of Economics of the Household **5**(3): 305-327.

Brasington, D. (2007). Public- and Private-School Competition: The Spatial Education Production Function. Time and Space in Economics**:** 175-203.

Brasington, D. M. (2000). "Demand and Supply of Public School Quality in Metropolitan Areas: The role of private schools." Journal of Regional Science **4**: 583-605.

Breidlid, A. (2005). "Education in the Sudan: the privileging of an Islamic discourse." Compare: A Journal of Comparative Education **35**(3): 247-263.

Brist, L. E. and A. J. Caplan (1999). "More Evidence on the Role of Secondary Education in the Development of Lower-Income Countries: Wishful Thinking or Useful Knowledge." Economic Development and Cultural Change **48**(1): 155-175.

Buchinsky, M. (1994). "Changes in the US Wage Structure 1963-1987: Application of Quantile Regression." Econometrica **62**(2): 405-458.

Buddelmeyer, H., P. H. Jensen, et al. (2008). "Fixed Effects Bias in Panel Data Estimators." IZA Discussion Papers No.3487.

Byrd, R. S. and M. Weitzman (1997). "Increased behavior problems associated with delayed school entry and delayed school progress." Pediatrics **100**(4): 654.

Cameron, L. (2000). "Poverty and Inequality in Java: Examining the Impact of the Changing Age, Educational and Industrial structure." Journal of Development Economics **62**(1): 149-180.

Cameron, L. (2009). "Can a public scholarship program successfully reduce school drop-outs in a time of economic crisis? Evidence from Indonesia." Economics of Education Review **28**(3): 308-317.

Cameron, L. A. and C. Worswick (2001). "Education Expenditure Responses to Crop Loss in Indonesia: A Gender Bias." Economic Development and Cultural Change **49**(2): 351-363.

Card, D. (1995). Earnings, Schooling and Ability Revisited. <u>Research in Labor Economics</u>. S.Polachek. Greenwich, JAI Press.

Cass, D. (1965). "Optimum Growth in an Aggregative Model of Capital Accumulation." <u>The Review of Economic Studies</u> **32**(3): 233-240.

Chiswick, B. R. and J. Huang (2008). "The Earnings of American Jewish Men: Human Capital, Denomination, and Religiosity." <u>Journal for the Scientific Study of Religion</u> **47**(4): 694-709.

Chiswick, C. U. (2005). "An Economic Perspective on Religious Education:Complements and Substitutes in a Human Capital Portfolio." <u>IZA Discussion Paper</u> **1456**.

Choe, J. (2008). "Income inequality and crime in the United States." <u>Economics Letters</u> **101**(1): 31-33.

Chou, J. (1995). Old and New Development models: The Taiwanese Experience. <u>Growth Theories in Light of the East Asian Experience</u>. T. Ito and A. O. Krueger. Chicago and London, The University of Chicago Press. **NBER-East Asia Seminar on Economics:** 105-125.

Clark, S. D. (1947). "Religion: The Religious Factor in Canadian Economic Development." <u>The Journal of Economic History</u> **7**(Supplement: Economic Growth: A Symposium): 89-103.

Cohen-Zada, D. and W. Sander (2008). "Religion, religiosity and private school choice: Implications for estimating the effectiveness of private schools." <u>Journal of Urban Economics</u> **64**(1): 85-100.

Cohn, E. (1975). <u>The Economics of Education</u>. Cambridge, Mass., Ballinger Publishing Company.

Collins, S. M., B. P. Bosworth, et al. (1996). "Economic growth in East Asia: Accumulation versus Assimilation." <u>Brookings Papers on Economic Activity</u> **1996**(2): 135-203.

Cook, B. J. (1999). "Islamic versus Western Conceptions of Education: Reflections on Egypt." <u>International Review of Education / Internationale Zeitschrift fur Erziehungswissenschaft / Revue Internationale de l'Education</u> **45**(3/4): 339-357.

Cotton, J. (1988). "On the Decomposition of Wage Differentials." <u>Review of Economics and Statistics</u> **70**(2): 236-243.

D'Souza, M. O. (2000). "Religious Particularism and Cultural Pluralism: The Possible Contribution of Religious Education to Canadian Political Identity." <u>Religious Education</u> **95**(3): 234-249.

Dangor, S. (2005). "Islamization of Disciplines: Towards an indigenous educational system." <u>Educational Philosophy and Theory</u> **37**(4): 519-531.

Dewan Perwakilan Rakyat (dpr.go.id) (2007). DPR Terima RUU Lembaga Keuangan Mikro dari DPD. http://www.dpr.go.id/artikel/terkini/artikel.php?aid=2489. Jakarta, dpr.go.id.

Dhofier, Z. (1999). <u>The *Pesantren* Tradition : The Role of the *Kyai* in the Maintenance of Traditional Islam in Java</u>. Tempe, Arizona, Program for Southeast Asian Studies, ASU.

Dougherty, C. and D. W. Jorgenson (1996). "International comparisons of the sources of economic growth." <u>American Economic Review</u> **86**(2): 25.

Douglass, S. L. and M. A. Shaikh (2004) "Defining Islamic Education: Differentiation and Applications." <u>Current Issues in Comparative Education</u> **Volume**, 1-14 DOI:

Duflo, E. (2001). "Schooling and Labor Market Consequences of School Construction in Indonesia: Evidence from an Unusual Policy Experiment." American Economic Review **91**(4): 795-813.

Easterly, W. and R. Levine. (2001). "It's Not Factor Accumulation: Stylized Facts amd Growth Models." Working Paper Series Retrieved 21 February 2008, from http://ssrn.com/abstract=269108

Eide, E. and M. H. Showalter (1998). "The Effect of School Quality on Student Performance: A Quantile Regression Approach." Economic Letters **58**(3): 345-350.

Evans, P. and G. Karras (1996). "Do Economies Converge? Evidence From a Panel of U.S. States." The Review of Economics and Statistics **78**(3): 384-388.

Evans, W. N. and R. M. Schwab (1995). "Finishing High School and Starting College: Do Catholic Schools Make a Difference?" Quarterly of Journal Economics **110**(4): 941-974.

Fichter, J. H. (1969). "Sociological Measurement of Religiosity." Review of Religious Research **10**(3): 169-177.

Filmer, D., H. Sayed, et al. (1998) "The Impact of Indonesia's Economic Crisis on Basic Education: Findings from a Survey of Schools." **Volume**, 1-44 DOI:

Fraja, G. D. and P. Landeras (2004). "Could Do Better: The Effectiveness of Incentives and Competition in Schools." Research Paper Series Tor Vergata University, CEIS. **48**.

Fuad, M. (2002). "Civil Society in Indonesia: The Potential and Limits of *Muhammadiyah*." SOJOURN: Journal of Social Issues in Southeast Asia **17**(2): 133-163.

Fudenberg, D. and E. Maskin (1986). "The Folk Theorem in Repeated Games with Discounting or with Incomplete Information." Econometrica **54**(3): 533-54.

Garcia, J. G. and L. Soelistianingsih (1998). "Why Do Differences in Provincial Income Persist in Indonesia?" Bulletin of Indonesian Economic Studies **34**(1): 95.

Geertz, C. (1960). "The Javanese Kijaji: The Changing Role of a Cultural Broker." Comparative Studies in Society and History **2**(2): 228-249.

Goode, R. B. (1959). "Adding to the Stock of Physical and Human Capital." American Economic Review **49**(2): 147-155.

Greene, K. V. and Y. Bong Joon (2004). "Religiosity, Economics and Life Satisfaction." Review of Social Economy **62**(2): 245-261.

Hajj, M. and U. Panizza (2009). "Religion and education gender gap: Are Muslims different?" Economics of Education Review **28**(3): 337-344

Hanushek, E. A. and D. D. Kimko (2000). "Schooling, Labour-Force Quality, and the Growth of Nations." American Economic Review **90**(5): 1184-1208.

Hanushek, E. A. and S. G. Rivkin (2003). Does Public School Competition Affect Teacher Quality? The Economics of School Choice. C. M. Hoxby. Chicago, University of Chicago Press**:** 23-47.

Hanushek, E. A. and L. Woessmann. (2007). "The Role of Education Quality for Economic Growth." World Bank Policy Research Working Paper No. 4122, from http://ssrn.com/paper=960379.

Hartog, J., P. T. Pereira, et al. (2001). "Changing returns to education in Portugal during the 1980s and early 1990s: OLS and quantile regression estimators." Applied Economics **33**(1021-1037).

Harvey, J. (2005). "A note on the 'natural rate of subjective inequality' hypothesis and the approximate relationship between the Gini coefficient and the Atkinson index." Journal of Public Economics **89**(5-6): 1021-1025.

Heckman, J. J. (1979). "Sample Selection Bias as a Specification Error." Econometrica **47**(1): 153-161.

Hewer, C. (2001). "Schools for Muslims." Oxford Review of Education **27**(4): 515-527.

Holmes, J. H. (1912). "Religion's Reply to Economics." Annals of the American Academy of Political and Social Science **41**: 313-316.

Horikoshi, H. (1975). "The Dar ul-Islam Movement in West Java (1948-62): An Experience in the Historical Process." Indonesia **20**: 58-86.

Hoxby, C. (2000). "The Effects of Class Size on Student Achievement: New Evidence from Population Variation." Quarterly Journal of Economics **115**(4): 1239-1285.

Hoxby, C. (2001). "All School Finance Equalizations Are Not Created Equal." Quarterly Journal of Economics **116**(4).

Hoxby, C. M. (1994). Do Private Schools Provide Competition for Public Schools? Cambridge, National Bureau of Economic Research.

Hoxby, C. M. (1996). "How Teachers' Unions Affect Education Production." The Quarterly Journal of Economics **111**(3): 671-718.

Hoxby, C. M. (2004). "School choice and school competition: Evidence from the United States." Swedish Economic Policy Review **10**(2).

Hussaini, S. W. A. (2002). Islamic sciences: An Introduction to Islamic Ethics, Law, Education, Politics, Economics, Sociology, and Systems Planning. New Delhi, Goodword Books Pvt. Ltd.

Iannaccone, L. R. (1992). "Sacrifice and Stigma: Reducing Free-Riding in Cults, Communes, and Other Collectives." Journal of Political Economy **100**(2): 271-91.

Iannaccone, L. R. (1998). "Introduction to the Economics of Religion." Journal of Economic Literature **36**(3): 1465-1495.

Iqbal, Z. and A. Mirakhor (2007). An Introduction to Islamic Finance: Theory and Practises. Singapore, John Wiley and Sons (Asia) Pte Ltd.

Islam, N. (1995). "Growth Empirics: A Panel Data Approach." Quarterly Journal of Economics **110**(4): 1127-1170.

Jian, T., J. D. Sachs, et al. (1996). "Trends in regional inequality in China." China Economic Review **7**(1): 1-21.

Jones, G. W. and P. Hagul (2001). "Schooling in Indonesia: Crisis-Related and Longer-Term Issues." Bulletin of Indonesian Economic Studies **37**(2): 207-231.

Judson, R. (1996). "Do Low Human Capital Coefficients Make Sense? A Puzzle and Some Answers." Finance and Economics Discussion Series 96-13 Retrieved 13 May 2008, from http://www.federalreserve.gov/pubs/FEDS/1996/199613/199613pap.pdf.

Judson, R. A. and A. L. Owen (1999). "Estimating dynamic panel data models: a guide for macroeconomists." Economics Letters **65**(1): 9-15.

Khan, M. M. and M. T.-u. D. Al-Hilali (1996). Interpretation of the Meanings of the Noble Quran in English Language. Riyadh, Darussalam Publishers and Distributors.

Kiviet, J. F. (1995). "On bias, inconsistency, and efficiency of various estimators in dynamic panel data models." Journal of Econometrics **68**(1): 53-78.

Kmenta, J. (1967). "On Estimation of the CES Production Function." International Economic Review **8**: 180-89.

Koenker, R. and J. Gilbert Bassett (1978). "Regression Quantiles." Econometrica **46**(1): 33-50.

Koenker, R. and K. F. Hallock (2001). "Quantile Regression." Journal of Economic Perspectives **15**(4): 143-156.

Koopmans, T. C. (1963). On the Concept of Optimal Economic Growth. Cowles Foundation Discussion Papers 163. New Haven, CT, Cowles Foundation Yale University.

Kristiansen, S. and Pratikno (2006). "Decentralising education in Indonesia." International Journal of Educational Development **26**(5): 513-531.

Krueger, A. B. (2003). "Economic Considerations and Class Size." The Economic Journal **113**(485): F34-F63.

Krueger, A. B. (2006). "Experimental Estimates of Education Production Functions*." Quarterly Journal of Economics **114**(2): 497-532.

Krueger, A. B. and M. Lindahl (2001). "Education for Growth: Why and For Whom." Journal of Economic Literature **39**(4): 1101-1136.

Kwack, S. Y. and Y. S. Lee (2006). "Analyzing the Korea's growth experience: The application of R&D and human capital based growth models with demography." Journal of Asian Economics **17**(5): 818-831.

Kyriacou, G. (1991). Level and growth effects of human capital: A Cross-country study of the convergence hypothesis. Working Papers 91-26. New York, C.V. Starr Center for Applied Economics, New York University.

Lall, S. (1998). Meeting the Human Capital Needs of Maturing Asian Economics. The Future of Asian in the World Economy. C. Foy, F. Harrigan and D. O'Connor. Paris, OECD Development Centre**:** 149-194.

Lambert, P. J. and J. R. Aronson (1993). "Inequality Decomposition Analysis and the Gini Coefficient Revisited " The Economic Journal, **103**(420): 1221-1227.

Lazear, E. P. (2001). "Educational Production." The Quarterly Journal of Economics **116**(3): 777-803.

Lee, M., R. Longmire, et al. (1998). "Growth Convergence: Some Panel Data Evidence." Applied Economics **30**(7): 907-912.

Lee, N. (2000). "Education and Economic Growth in Korea, 1966 to 1997." Journal of Applied Business Research **16**(4): 83-93.

Lehrer, E. (2004). "Religiosity as a Determinant of Educational Attainment: The Case of Conservative Protestant Women in the United States." Review of Economics of the Household **2**(2): 203-219.

Lehrer, E. L. (2004). "Religion as a Determinant of Economic and Demographic Behavior in the United States." Population and Development Review **30**(4): 707-726.

Levin, J. (2001). "For whom the reductions count: A quantile regression analysis of class size and peer effects on scholastic achievement." Empirical Economics **26**(1): 221-246.

Lewis, M. K. M. K. and L. M. Algaoud (2001). Islamic Banking. Cheltenham, Edward Elgar.

Lile, S. E. and M. W. Trawick (2004). "Explaining Differences in Religiosity in Kentucky." Journal of Applied Economics & Policy **23**: 14-25.

Lopez, H. (2006). "Growth and inequality: Are the 1990s different?" Economics Letters **93**(1): 18-25.

Lukens-Bull, R. (2005). A peaceful Jihad : negotiating identity and modernity in Muslim Java. New York, Palgrave Macmillan.

Lukens-Bull, R. A. (2000). "Teaching Morality: Javanese Islamic Education in A Globalizing Era." Journal of Arabic and Islamic Studies **3**: 26-48.

Maccini, S. and D. Yang (2009). "Under the Weather: Health, Schooling, and Economic Consequences of Early-Life Rainfall." American Economic Review **99**(3): 1006-26.

Manning, C. (1999). "Labour Markets in the ASEAN-4 and the NIEs." Asian-Pacific Economic Literature **13**(1): 222-226.

Maurer-Fazio, M. and N. Dinh (2004). "Differential Rewards to, and Contributions of, Education in Urban China's Segmented Labor Markets." Pacific Economic Review **9**(3): 173-189.

McCleary, R. M. and R. J. Barro (2006). "Religion and Economy." Journal of Economic Perspectives **20**(2): 49-72.

McLeod, R. H. (2003). "Towards improved monetary policy in Indonesia." Bulletin of Indonesian Economic Studies **39**(3): 303-324.

McMahon, W. W. and W. W. Boediono (1992). "Universal basic education: An overall strategy of investment priorities for economic growth." Economics of Education Review **11**(2): 137-151.

Milanovic, B. (1997). "A simple way to calculate the Gini coefficient, and some implications." Economics Letters **56**(1): 45-49.

Millimet, D. and V. Rangaprasad (2004). Strategic Competition Amongst Public Schools. Econometric Society 2004 North American Summer Meetings 197, Providence, Rhode Island, Econometric Society.

Ministry of National Education. (2008). "Act of The Republic of Indonesia Number 20, Year 2003 on National Education System " Retrieved 4 July 2008, from http://www.depdiknas.go.id/produk_hukum/uu/uu_20_2003_en.pdf.

Ministry of National Education. (2008). "System of National Education." Retrieved 4 July 2008, from http://www.depdiknas.go.id/.

Mishkin, F. S. (1999). "Lessons from the Asian crisis." Journal of International Money and Finance **18**(4): 709-723.

Miyagiwa, K. (1991). "Scale Economies in Education and the Brain Drain Problem." International Economic Review **32**(3): 743-759.

Montgomery, J. D. (1996). "Contemplations on the Economic Approach to Religious Behavior." American Economic Review **86**(2): 443-447.

Montgomery, J. D. (1996). "Dynamics of the Religious Economy: Exit,Voice and Denominational Secularization." Rationality and Society **8**(1): 81-110.

Mookherjee, D. and A. Shorrocks (1982). "A Decomposition Analysis of the Trend in UK Income Inequality " The Economic Journal **92**(368): 886-902.

Morduch, J. (1999). "The role of subsidies in microfinance: evidence from the Grameen Bank." Journal of Development Economics **60**: 229-248.

Morduch, J. and B. Armendariz (2004). Microfinance: Where do we stand? Financial Development and Economic Growth: Explaining the Links. C. Goodhart. Hampshire-UK, Macmillan.

Mulligan, C. B. and X. Sala-i-Martin (1997). "A Labor Income-based Measure of the Value of Human Capital: An Application to the states of the United States." Japan and the World Economy **9**(2): 159-191.

Mwabu, G. and T. P. Schultz (1996). "Education Returns Across Quantiles of the Wage Function: Alternative Explanations for Returns to Education by Race in South Africa " The American Economic Review **86**(2): 335-339.

Nakonezny, P. A., R. D. Shull, et al. (1995). "The Effect of No-Fault Divorce Law on the Divorce Rate Across the 50 States and Its Relation to Income, Education, and Religiosity." Journal of Marriage and the Family **57**(2): 477-488.

Nam, C. B., A. L. Rhodes, et al. (1968). "School Retention by Race, Religion and Socioeconomic Status." Journal of Human Resources **3**(2): 171-90.

Neal, D. (1997). "The Effects of Catholic Secondary Schooling on Educational Attainment." Journal of Labor Economics **15**(1): 98-123.

Nehru (1995). "A New Database in Human Capital Stock in Developing Industrial Countries: Sources, methodology and results." Journal of Development Economics **46**(2): 379-401.

Nelson, R. S. and E. Phelps (1966). "Investment in Humans, Technology Diffusion, and Economic Growth." American Economic Review **56**(2): 69-75.

Newhouse, D. and K. Beegle (2006). "The Effect of School Type on Academic Achievement: Evidence from Indonesia." Journal of Human Resources **41**(3): 529-557.

O'Neill, D. (1995). "Education and Income Growth: Implications for Cross-Country Inequality." Journal of Political Economy **103**(6): 1289-1301.

Oaxaca, R. L. (1973). "Male-Female Wage Differentials in Urban Labor Markets." International Economic Review **14**(3): 693–709.

Oey-Gardiner, M. (2000). "Schooling in a Decentralised Indonesia: New Approaches to Access and Decision Making." Bulletin of Indonesian Economic Studies **36**(3): 127-34.

Park, K. H. (1996). "Educational expansion and educational inequality on income distribution." Economics of Education Review **15**(1): 51-58.

Parry, T. R. (1997). "Achieving Balance in Decentralization: A Case Study of Education Decentralization in Chile." World Development **25**(2): 211-225.

Parry, T. R. (1997). "Decentralization and Privatization: Education Policy in Chile." Journal of Public Policy **17**(1): 107-133.

Permani, R. (2008). Education as a Determinant of Economic Growth in East Asia: Historical Trends and Empirical Evidences (1965-2000). Asia Pacific Economic and Business History Conference. Trinity College, University of Melbourne.

Permani, R. (2009). "The Role of Education in Economic Growth in East Asia: a survey." Asian-Pacific Economic Literature **23**(1): 1-20.

Permani, R. (2009b). Transforming *Pesantren* in Indonesia into Microfinance Institutions: Reviews on Financial and Legal Potencies and Barriers. Adelaide, School of Economics University of Adelaide.

Pigou, A. C. (1928). A Study in Public Finance. London, Macmillan.

Pritchett, L. (1996). "Where Has All the Education Gone?" World Bank Policy Research Working Paper No. 1581 Retrieved 25 February 2008, from http://ssrn.com/abstract=569239.

Pritchett, L. and D. Filmer (1999). "What education production functions really show: a positive theory of education expenditures." Economics of Education Review **18**(2): 223-239.

Pyatt, G. (1976). "On the Interpretation and Disaggregation of Gini Coefficients." The Economic Journal **86**(342): 243-255.

Pyatt, G., C.-n. Chen, et al. (1980). "The Distribution of Income by Factor Components " The Quarterly Journal of Economics **95**(3): 451-473.

Pyo, H. K. (1995). A Time Series Test of the Endogenous Growth Model with Human Capital. Growth Theories in Light of the East Asian Experience. T. Ito and A.

O. Krueger. Chicago and London, The University of Chicago Press. **NBER-East Asia Seminar on Economics:** 229-242.

Rahman, M. M. (2008). 'Rural People's Moral and Ethical Development through Islamic Microfinance Programs and Poverty Alleviation'. Islamic Banking and Finance: Ethics and Financial Practice in Global Perspective Symposium, University of Melbourne.

Ramsey, F. P. (1928). "A Mathematical Theory of Saving." The Economic Journal **38**(Dec 1928): 543-559.

Ravallion, M. and M. Lokshin (2007). "Lasting Impacts of Indonesia's Financial Crisis." Economic Development and Cultural Change **56**(1): 27-56.

Reimers, C. W. (1983). "Labor Market Discrimination against Hispanic and Black Men." Review of Economics and Statistics **65**(4): 570-579.

Resosudarmo, B. P. and Y. Vidyattama (2006). "Regional Income Disparity in Indonesia." ASEAN Economic Bulletin **23**(1): 31-44.

Revoredo, C. L. and J. P. Morisset. (1999). "Savings and Education: A Life-Cycle Model Applied to a Panel of 74 Countries." World Bank Policy Research Working Paper No. 1504 Retrieved 25 February 2008, from http://papers.ssrn.com/abstract=620680.

Richardson, P. (1997). "Globalisation and Linkages: Macro-structural Challenges and Opportunities." OECD Economics and Department Working Papers.doi:10.1787/807377186466 Retrieved 21 February 2008, from http://titania.sourceoecd.org/vl=3355586/cl=15/nw=1/rpsv/cgi-bin/wppdf?file=5lgsjhvj8626.pdf.

Romer, P. M. (1986). "Increasing Returns and Long-Run Growth." The Journal of Political Economy **94**(5): 1002-1037.

Romer, P. M. (1990). "Endogenous Technological Change." The Journal of Political Economy **98**(5): S71-S102.

Rosenhouse-Persson, S. and G. Sabagh (1983). "Attitudes Toward Abortion among Catholic Mexican-American Women: The Effects of Religiosity and Education." Demography **20**(1): 87-98.

Sacerdote, B. and E. L. Glaeser (2001). "Education and Religion." NBER Working Papers No. 8080 **January**.

Sachs, J. D. and A. M. Warner (1997). "Fundamental sources of long-run growth." American Economic Review **87**(2): 184.

Saeed, A. (1996). Islamic Banking and Interest : A Study of the Prohibition of Riba and Its Contemporary Interpretation. Leiden, The Netherlands ; New York, E.J. Brill.

Sarel, M. (1995). "Growth in East Asia: What We Can and What We Cannot Infer From It." IMF Working Paper No. 95/98 Retrieved 25 February 2008, from http://ssrn.com/abstract=883245.

Sawkins, J. W., P. T. Seaman, et al. (1997). "Church attendance in Great Britain: An ordered logit approach." Applied Economics **29**(2): 125 - 134.

Scheepers, P., M. T. Grotenhuis, et al. (2002). "Education, Religiosity and Moral Attitudes: Explaining Cross-National Effect Differences." Sociology of Religion **63**(2): 157-176.

Schieman, S., K. Nguyen, et al. (2003). "Religiosity, Socioeconomic Status, and the Sense of Mastery." Social Psychology Quarterly **66**(3): 202-221.

Schneeweis, N. and R. Winter-Ebmer (2007). "Peer effects in Austrian schools." Empirical Economics **32**(2): 387-409.

Schultz, T. W. (1961). "Investment in Human Capital." <u>American Economic Review</u> **51**(1): 1.

Shorrocks, A. F. (1980). "The Class of Additively Decomposable Inequality Measures." <u>Econometrica</u> **48**(3): 613-625.

Shorrocks, A. F. (1984). "Inequality Decomposition by Population Subgroups." <u>Econometrica</u> **52**(6): 1369-1385.

Siddiqi, M. N. (2004). "Riba, Bank Interest and the Rational of its Prohibition." <u>Islamic Development Bank Visiting Scholars' Research Series</u>.

Smith, T. W. (1998). "A Review of Church Attendance Measures." <u>American Sociological Review</u> **63**(1): 131-136.

Soesastro, H. (2000). "Indonesia's Crisis: Implications for the Region." <u>Asian-Pacific Economic Literature</u> **14**(1): 23-35.

Solow, R. M. (1957). "Technical Change and the Aggregate Production Function." <u>Review of Economics and Statistics</u> **39**(3): 312-320.

Stark, O. (2006). "Inequality and migration: A behavioral link." <u>Economics Letters</u> **91**(1): 146-152.

Stark, R., L. R. Iannaccone, et al. (1996). "Religion, Science, and Rationality." <u>The American Economic Review</u> **86**(2): 433-437.

Steenbrink, K. A. (1990). "The Study of Comparative Religion by Indonesian Muslims: A Survey." <u>Numen</u> **37**(2): 141-167.

Steven, N. D., K. Andros, et al. (2006) "Is God in the Details? A Reexamination of the Role of Religion in Economic Growth." **Volume**, DOI:

Stock, J. H. and M. Yogo (2002). "Testing for Weak Instruments in Linear IV Regression." <u>NBER Working Paper No. T0284</u>.

Stroombergen, A., D. Rose, et al. (2002). Review of the Statistical Measurement of Human Capital. Auckland, Statistics New Zealand.

Sullivan, D. H. (1985). "Simultaneous Determination of Church Contributions and Church Attendance." <u>Economic Inquiry</u> **23**(2): 309-320.

Suryadarma, D., A. Suryahadi, et al. (2006). "Improving Student Performance in Public Primary Schools in Developing Countries: Evidence from Indonesia." <u>Education Economics</u> **14**(4): 401-429.

Syahyuti (1999). "Penelusuran Aspek Ekonomi Pada Pondok *Pesantren* dan Peluang Pengembangannya." <u>FAE</u> **17**(2): 28-37.

Syukur, F. (2008). "*Madrasah* dan Pemberdayaan " Retrieved 20 January 2008, from [http://pendis.depag.go.id/*Madrasah*/Insidex.php?i_367=at02100033](http://pendis.depag.go.id/Madrasah/Insidex.php?i_367=at02100033).

Tamney, J. B. (1979). "Established Religiosity in Modern Society: Islam in Indonesia." <u>Sociological Analysis</u> **40**(2): 125-135.

Tamney, J. B. and S. D. Johnson (1985). "Consequential Religiosity in Modern Society." <u>Review of Religious Research</u> **26**(4): 360-378.

Tan, J. H. W. (2006). "Religion and social preferences: An experimental study." <u>Economics Letters</u> **90**(1): 60-67.

Thomas, D., K. Beegle, et al. (2004). "Education in a crisis." <u>Journal of Development Economics</u> **74**(1): 53-85.

Thomas, D., J. Strauss, et al. (1991). "How Does Mother's Education Affect Child Height?" <u>The Journal of Human Resources</u> **26**(2): 183-211.

Thomas, R. M. (1988). "The Islamic Revival and Indonesian Education." <u>Asian Survey</u> **28**(9): 897-915.

Todd, P. E. and K. I. Wolpin (2003). "On the Specification and Estimation of the Production Function for Cognitive Achievement." <u>The Economic Journal</u> **113**(485): F3-F33.

Tomes, N. (1984). "The Effects of Religion and Denomination on Earnings and the Returns to Human Capital." Journal of Human Resources **19**(4): 472-88.

Tomes, N. (1985). "Religion and the Earnings Function." The American Economic Review **75**(2): 245-250.

Turmudi, E. (c2006). Struggling for the Umma Changing Leadership Roles of Kiai in Jombang, East Java. Canberra, A.C.T, Co-published by ANU E Press and Asia Pacific Press.

Vaus, D. d. (1982). "The Impact of Geographical Mobility on Adolescent Religious Orientation: An Australian Study." Review of Religious Research **23**(4): 391-403.

Verardi, V. (2005). "Electoral systems and income inequality." Economics Letters **86**(1): 7-12.

Vermunt, J. K. and J. Magidson (2005). Factor Analysis With Categorical Indicators: A Comparison Between Traditional and Latent Class Approaches. New Developments in Categorical Data Analysis for the Social and Behavioral Sciences. L. A. v. d. Ark, M. A. Croon and K. Sijtsma. Mahwah, Erlbaum**:** 41-62.

Veverka, F. B. (2004). "Practicing Faith: Negotiating Identity and Difference in a Religiously Pluralistic World." Religious Education **99**(1): 38-55.

Vidyattama, Y. (2008). Patterns of Provincial Economic Growth in Indonesia. Division of Economics-RSPAS. Canberra, Australian National University. **PhD:** 300.

Wallis, J. L. (1990). "Modelling Churches as Collective Action Groups." International Journal of Social Economics **17**(1): 59-72.

Wan, G. (2008). Regional Income Inequality in Rural China, 1985-2002: Trends, Causes and Policy Implications. Understanding Inequality and Poverty in China: Methods and Applications. G. Wan. New York, Palgrave McMillan**:** 89-114.

West, E. and H. Palsson (1988). "Parental Choice of School Characteristics: Estimation Using State-wide Data." Economic Enquiry **26**(4): 725-40.

White, J. (2004). "Should Religious Education be a Compulsory School Subject?" British Journal of Religious Education **26**(2): 151-164.

Wikipedia. (2008). "Pancasila." Retrieved 4 July 2008, from http://en.wikipedia.org/wiki/Pancasila_(politics).

Winters, C. A. (1984). "Contemporary Trends in Traditional Chinese Islamic Education." International Review of Education / Internationale Zeitschrift fur Erziehungswissenschaft / Revue Internationale de l'Education **30**(4): 475-479.

Winters, C. A. (1987). "Koranic Education and Militant Islam in Nigeria." International Review of Education / Internationale Zeitschrift fur Erziehungswissenschaft / Revue Internationale de l'Education **33**(2): 171-185.

Witkowski, T. H. (1999). Religiosity and Social Meaning in Wearing Islamic Dress. Seventh Cross-Cultural Consumer and Business Studies Research Conference, Cancun, Mexico.

World Bank (1993). Overview: The Making of Miracle. The East Asian Miracle: Economic Growth and Public Policy. New York, Oxford University Press**:** 1-26.

Xiaolei Qian, R. S. (2008). "Measuring regional inequality of education in China: widening coast-inland gap or widening rural-urban gap?" Journal of International Development **20**(2): 132-144.

Yeom, M., C. Acedo, et al. (2002). "The reform of secondary education in indonesia during the 1990s: Basic education expansion and quality improvement through curriculum decentralization." <u>Asia Pacific Education Review</u> **3**(1): 56-68.

Yitzhaki, S. (1979). "Relative Deprivation and the Gini Coefficient " <u>The Quarterly Journal of Economics</u> **93**(2): 321-324.

Zaleski, P. A. and C. E. Zech (1995). "The Effect of Religious Market Competition on Church Giving." <u>Review of Social Economy</u> **53**(3): 350 - 367.

Zborovskii, G. E. and N. B. Kostina (2004). "On the Interaction between Religious and Secular Education under Current Conditions." <u>Religious Education</u> **46**(9): 63-75.

Zhang, J. and T. Li (2002). "International Inequality and Convergence in Educational Attainment, 1960–1990." <u>Review of Development Economics</u> **6**(3): 383-392.

Zuhdi, M. (2005). "The 1975 Three-Minister Decree and The Modernization of Indonesian Islamic Schools." <u>American Educational History Journal</u> **Vol. 32, No. 1, 2005**37(1): 36-43.

Zuhdi, M. (2006). "Modernization of Indonesian Islamic schools' curricula, 1945–2003." <u>International Journal of Inclusive Education</u> **10**(4-5): 415-427.