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Social Return to Education in Indonesia: Evidence from District Panel Data

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Acknowledgement

To the Way, the Truth and the Life:
I stand amazed in Your presence.

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List of Acronyms

MONE: Ministry of National Education
MORA: Ministry of Religious Affairs
Susenas: *Survey Sosial Ekonomi Nasional* (National Socioeconomic Survey)
BPS: *Badan Pusat Statistik* (Statistics Indonesia)

Abstract

The research aimed at establishing causal effect relationship for district level social return to education by examining the relationship between years of education and educational composition of labour force to district per capita GRDP. The research used district panel data covering 261 Indonesian districts during the period of 1993-2003. Fixed effect estimation was employed to tackle permanent differences in district unobserved heterogeneity, while GMM estimation was used to tackle the reverse causality from per capita GRDP to educational variables.

The Generalized Model of Moments estimation declares that a 1 increase in year of education indeed gives rise to 8.27% increase in district per capita income. In long term perspective, the social return to education is 11.84%. Further examination using share of certain educational level of labour force provides strong tendency that pattern of the social return to education is higher for higher level of education. The long term social return to education for higher education graduates is 5.56 times stronger than primary school's, 3.51 times stronger than junior secondary education's and 2.21 times stronger than senior secondary education's. Meanwhile, the short term return to education for higher education graduates is 3.69 times higher than primary school's, 3.10 times stronger than junior secondary education's and 2.07 times stronger than senior secondary education's. That the social return to education goes hand in hand with the increasing level of education is contrary to the social return from full-cost method of Psacharopoulos (1981; 1982) and Kawuryan (1997).

Relevance to Development Studies

Indonesia is witnessing almost half of its population living under monetary and non monetary poverty. Indonesian government is seeking for educational policy that can bring sustainable economic as well as social development. This research examine the importance of education of labour force not from what they got as individual labour but from what the whole society earn because of certain educational composition of labour force.

Keywords

Social return to education, dynamic panel data, district panel data, Susenas, Indonesia

Chapter 1
INTRODUCTION

In November 2006, the World Bank reported that Indonesia is witnessing around 108 million or 49% of its population living under the international poverty line ($2/day) and 34.08% of these 108 million poor people live under the national poverty line ($1.55/day). Those who live between the national and international poverty lines are in vulnerable circumstances as they easily fall back beneath the national poverty standard when hit by income or price shocks. This financial incapability and these risks are exacerbated by the high incidence of non monetary poverty, as reflected in seven indicators. *First*, a quarter of Indonesian children below the age of five are malnourished. *Second*, maternal mortality rate is 307 per 100,000 births and it is three to six times higher than Vietnam, Malaysia and China. *Third*, 52% of the rural lowest quintiles have no access to safe water which causes long term health problems. *Fourth*, 80% of the rural poor and 78% of the urban poor do not have access to a septic tank. And *fifth*, education outcome is weak as indicated by the high gap (44%) of junior high school completion between the poorest quintile and the richest quintile, with a 45% completion rate among the poorest group but 89% for the richest group (World Bank 2006). *Seventh*, more than a quarter of individuals reported that they had experienced illness in the month prior to an annual socio-economic survey in the period 2000-2006 (Susenas 2000-2006, BPS, 2008).

About 33 years before that World Bank report, in 1973 the government of Indonesia initiated a long term massive investment in Indonesian primary education (Duflo, 2001). It was then followed up by a cheap labour policy in an attempt to create comparative advantages in attracting foreign investments. Together these policies brought an increase in the education of the Indonesian labour force which was absorbed into formal employment, resulting in a reduction of the national poverty headcount from 40.1% in 1976 to 13.7% in 1993. However, unanticipated by the country policy makers was that competing countries like China, Thailand, Malaysia and India were also improving their labour productivity at a faster rate than Indonesia was. In fact, in 1993, four years prior to the economic crisis, per labour output in Indonesia was lower than most Asian competing neighbours: China (7.14 times), South Korea (5.27), Malaysia (4.11) and Thailand (1.39 times). Soon after the crisis, this inferiority of labour productivity had contributed to an investment flight to other Asian countries as well as to the halt of new investments, and hence unemployment increased. Being less competitive in finding new jobs in a more labour-technology complementary era, they were pushed to work in subsistence smallholder agriculture areas in rural Java, with much riskier income (Betcherman & Islam, 2001). Realising the weaknesses of the cheap labour policy and that the main antecedent to low productivity of labour is lack of education, the government shifted its labour policy to skilled labour enforcement. It is the education sector that the government relies on, especially by investing in quality education and by uplifting the current achievement of close-universal primary school enrolment to close-universal junior secondary school enrolment (Arze del Granado, 2007; World Bank, 2006).

However the causal effect relationship between the education of the labour force and Indonesia's economic growth has not been fully empirically examined. For instance seven out of 10 previous studies on the economics of Indonesia's education focus more on the individual benefit of education, while the three macroeconomic studies either do not have an adequate sample or are unable to employ a sufficiently econometric approach for unbiased estimation. More specifically, the studies of Simanjuntak (1983), Psacharopoulos (1982), Bishry (1990), Berhman & Deolalikar, (1993), Kawuryan (1997), Bedi and Garg (2000), Duflo (2001) try to establish the schooling–earning relationships within the domestic labour market. With some variation due to the year of data, sample coverage and method employed, these studies reveal that education does go hand in hand with individual labour market rewards, though the individual return decreases overtime. The study of Psacharopoulos and Kawuryan provides additional insight on the benefit of government subsidies for different educational levels. They found that the benefit (termed as 'social return'[1]) decreases when educational level increases. It is good to know that individual education has a bearing on their income, but the education sector is not performing fully unless education has a bearing beyond the personal income.

On the macroeconomic approach, the study of Bishry (1990) examines the role of a highly educated versus a less educated labour force in determining growth. Nevertheless, due to sample inadequacy, he failed to take into account the unobserved heterogeneity in growth regressions, and came with an unsupported conclusion that higher education has a negative impact on economic growth. The study of Resosudarmo & Viddyatama (2006) and the study of Tjahjono & Anugrah (2006) use panel data fixed effect estimation on an augmented Solow model with human capital (Mankiw, Romer & Weil, 1992). Both studies however have two similar limitations: in educational variables and in methodology. First, they use a limited definition of human capital which is the proportion of the labour force with secondary school education. Second, both studies fail to establish an unbiased estimation for causal effect from the labour force to provincial economic growth because, as Resosudarmo & Viddyatama mention in their paper: they were unable to deal with bidirectional causalities[2] between these two variables.

Regarding this, the focus of my paper to solve the problems of data and methodology arise in the three last mentioned studies. My study is a kind of combining these three papers but with several advantages.

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1 This is different to the definition I use as I follow Canton (2004) that (monetary) social return is the composite returns to macroeconomic performance

2 Econometrically termed as endogeneity; see (Wooldridge 2002) and (Gujarati 1992) for detailed explanation

First, by working with district panel data covering 261 districts[3] from 1993 to 2003, I come up with a richer variation in the data set. Such richer data set is important when using regression methods (Gujarati 1992)

Second, I use five broader choices on educational variables: (1) average years of schooling, (2) proportion of labour force completed primary school education, (3) proportion of labour force completed with junior secondary education, (4) proportion of labour force completed with senior secondary education, and (5) proportion of labour force completed with higher education.

Third, compared to cross-country regressions, for example Canton (2004), Torres (2001), Allesina and Rodrick (1994) and MRW (1992), I use more consistent measured on educational attainment. My data comes from only one definition and one source so that it has unitary interpretation. Meanwhile cross country education data comes from mixed data sources i.e. survey, census and enrolment reports, such that it suffers from mixed definition. Furthermore, the cross-country comparison of education measures is difficult to interpret. For instance, a similar year of education among labour forces in two countries should not be interpreted as the two countries having an equal quality of labour, partly due to the variation in educational policies and systems (Portella, Allesie & Teulings, 2004; Krueger and Lindahl, 2001).

Finally, from a methodological aspect, the features of the data allow me to run not only random and district fixed effect but also to solve the endogeneity problems caused by employing a generalized method of moment and instrument regional income and education variables by its own lags (Arellano, 2003). This enables a more unbiased estimation compared to OLS and fixed effect methods.

The results give support that, even after taking into account the growth inertia, variation in developmental stages, average vitality and/or ageing of society, potential socioeconomic barriers on female and degree of activity of labour market education does have a bearing on Indonesia's regional income.

The Generalized Model of Moments estimation declares that a 1 increase in year of education indeed gives rise to 8.27% increase in district per capita income. In long term perspective, the social return to education is 11.84%. Further examination using share of certain educational level of labour force provides strong tendency that pattern of the social return to education is higher for higher level of education. The long term social return to education for higher education graduates is 5.56 times stronger than primary school's, 3.51 times stronger than junior secondary education's and 2.21 times stronger than senior secondary education's. Meanwhile, the short term return to education for higher education graduates is 3.69 times higher than primary school's, 3.10 times stronger than junior secondary education's and 2.07 times stronger than senior secondary education's. That the social return to education goes hand in hand with the increasing level of education is contrary to the social return from full-cost method of Psacharopoulos (1981; 1982) and Kawuryan (1997).

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[3] There were more than 70 district splits during the period of 1993 to 2003. To construct the panel I keep using 1993 definition. Later I test the robustness of estimation when effect of district splits (due "decentralization") is considered

Detailed elaboration on the dynamics of Indonesia's education, performances, my estimation and policy discussion are presented in the four following chapters. Chapter II presents socio-economic and political transition in Indonesia during the period of analysis, with emphasize on educational sector. Chapter III develops the theoretical framework and estimation strategy for social return to education. Chapter IV reports the econometric estimates and its interpretation, followed with discussion on its policy implication for the country future development. Finally, Chapter V summarizes the main conclusions.

Chapter 2
INDONESIA IN TRANSITION

This chapter[4] briefly highlights the notion of Indonesia's transition in socioeconomic and political spheres, with an emphasis on the educational sector. To fit my study period, I have limited my discussion on Indonesia's conditions during 1993 to 2003. Understanding Indonesia's transition at that time is essential because this will give insight into which econometric model –the random effect, fixed effect or dynamic model– is appropriate to estimate social return to education in Indonesia. The first subchapter discusses the overall socioeconomic and political change. The second subchapter presents the education system, policies and performances. I close the second subchapter with literature surveys on private and social return to education in Indonesia from 1976 to 2002, which leads to the discussion on methodology in Chapter III.

2.1 Socio-economic and Political Change

2.1.1 Government and Politics

Indonesia is the most populous and most ethically diverse country in Southeast Asia. It is also the home of the largest democratic Islamic communities in the world, though the country is run under a republican system, administered by a president. Under the national government, Indonesia has provincial (*propinsi*) and district (*kabupaten/kota*) governments. Since the country's independence from The Netherlands and Japan in 1945, the presidents had been elected by representatives of the people, and so had the governors and district heads (The 1945 Constitution, Law on General Elections No. 3/1999). However starting in 2004 the President, governors and district heads are elected via general election where every Indonesian adult votes directly (Law on General Elections No. 12/2003). Between the Asian financial crisis (in 1998) to year 2003, Indonesia underwent political turmoil reflected in three times change of presidents and shift in political power from longstanding political majority of one nationalist party (the *Golkar* party) to scattered power amongst a few nationalist democratic as well as Islamic and Christian parties. The change in political sphere has shifted the country management from a more national centralized government into a more decentralized government with provinces and districts. Among others, this is reflected into more power sharing to district level, from before on national and provincial level (Law of Regional Autonomy No. 20/1999). The notion of

[4] I borrow the title from the book of Manning & van Diermen (2000): Indonesia in Transition. The phrase triggers my search for proper dynamic which put foundation on the use of random and fixed effect estimations on understanding Indonesia education-growth relationships.

decentralized government brings about demand for split of districts[5], sometimes according to the ethnicity of the people, making the number of district increase dramatically as more district imply more development fund received (Manning and van Diermen, 2000; Statistics Indonesia, 2008). For instance, in my sample there are 261 districts in 1993, but this jumps to 335 in 2003. I will incorporate this dynamic of decentralization when analysing social return to education by using the number of split of districts for robustness check of the baseline regressions.

2.1.2 Socio-Economic Dynamic

Part of Indonesia's change in policies mentioned above are resultants of the economic crisis. Prior to economic crisis (data 1993) the poverty head count is 13.7%. However, soon after it was hit by the economic crisis, the poverty head count doubled to 23.4% (data 1999), similar to poverty condition back in 1980 to 1984. However, perceiving the crisis as price and income shocks, its impact varies across income quintiles and regions. The eastern and south-eastern parts of the country have more poverty incidence than other parts of the country. Having islands with forest and mineral resources do not always translate into regional income and household welfare. For example, poverty head count in the forest and mineral rich island of Kalimantan is four times lower than the other mineral rich island of Papua (World Bank, 2006); mirroring the gap of the people of the two islands in educational attainment (BPS, 2008).

In an attempt to secure the education of the poor during the crisis, Indonesia run social safety net program in education, resulting in significant protection for the primary educational enrolment of the poor (Sparrow 2006). It was also at the same time that government initiated health protection for the poor, leading to increase in outpatient care and reduction in health expenditure among the poor (World Bank, 2007). The education and health protection scheme covered all the provinces, but due to budget limitation, not necessarily all poor people. Probably due to externalities between health and education (Straus & Thomas, 1998) and possibility for intra-household expenditure adjustment (Jacoby & Skoufias, 1997), the poverty head count according to national poverty line reduced back to below 20%. The government's social safety net does benefit the poorest of the poor, but not necessarily the second poorest quintile or in World Bank word: the near poor category. The near poor categories are those who between Indonesia and international poverty lines which in Indonesia's case are the second and the third bottom quintiles. These quintiles are "left-over" in pro-poor policies as they have not yet been included in government health insurance scheme, making them exposed to health shocks leading to income deprivation.

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[5] In Indonesian it is well known as "pemekaran", a term literally means the blossom process of flowers

2.2 Educational Development

Indonesia's main supplier of education is the government. The motive behind public funding support for education is due to the expectation that its graduates is capitalized with advanced skills which are then transferred to the society via labour market activities, hence benefiting not only the diploma holders but to the wider society around them (Junge, 1973). For instance, university graduates such as medical doctors, teachers and nurses can contribute through enhancing human capital of other people. Meanwhile university trained engineers and economists can provide direct assistance in optimizing resource utilisation within certain society.

2.2.1 System, Policies and Learning Quality

Since the year 1973 Indonesia has invested massively in primary education hence close to achieving universal primary education. In year 2002[6] Indonesia reached a 93% net primary school enrolment. At the same time net enrolments for junior secondary and senior secondary schools were at 60.9 and 36.8% respectively (World Bank, 2006). Net enrolment in higher education was between 10 to 15% (World Bank database 2008, UNDP, 2007). Most recently, for schooling ages children and youth (7 to 25 years old), those who are in school are dominated by pre and primary school students (64%), junior secondary school students (17%) and then senior secondary school students (13%). The university students follow, making the last 6% of the children and youth in formal education.

From curriculum and institutional point of view there are two type of primary and secondary education: the general education and Islamic education. General education *(Sekolah)* is under the supervision of Ministry of National Education (MONE) while the *Madrasah* education is under the supervision of Ministry of Religious Affairs (MORA). The central subject in *Madrasah* system is the Islamic teaching, while the central subject in general education is science, both natural and social sciences. Originally, the general system is an evolution from European school system[7], while the *Madrasah* system is an alternative education self provided by Islamic community to combat the penetration of non-Islamic dogma brought by Dutch (then national) educational system. However, Education Law No. 20/2003 has equalized Islamic school into national education system by enforcing comparability of level of education between the two (see Table 2.1). Graduates from *Sekolah Menegah Atas* as well as *Madrasah Aliyah* are both admitted at Indonesia higher education, also Islamic (under MORA or non-Islamic (under MONE), but it is logical to think that *Madrasah* graduates prefer

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[6] I was unable to get the data for year 2003 (the last year of my analysis), so I use year 2002 instead

[7] The "Indonesian" first European school was established in 1538 by Portuguese missionaries, followed by Dutch school in 1607. Both started in Mollucas and then spread to western part of today's Indonesia (Kroeskamp, 1974)

higher education institutions under MORA which adopt the same Islamic ideology.

Table 2.1
Level Equalization between *Madrasah* and General Education

Level	**General System**	***Madrasah* System**
Primary	*Sekolah Dasar*	*Madrasah Ibtidaiyah*
Junior Secondary School	*Sekolah Menengah Pertama*	*Madrasah Tsanawiyah*
Senior Secondary School	*Sekolah Menengah Atas*	*Madrasah Aliyah*

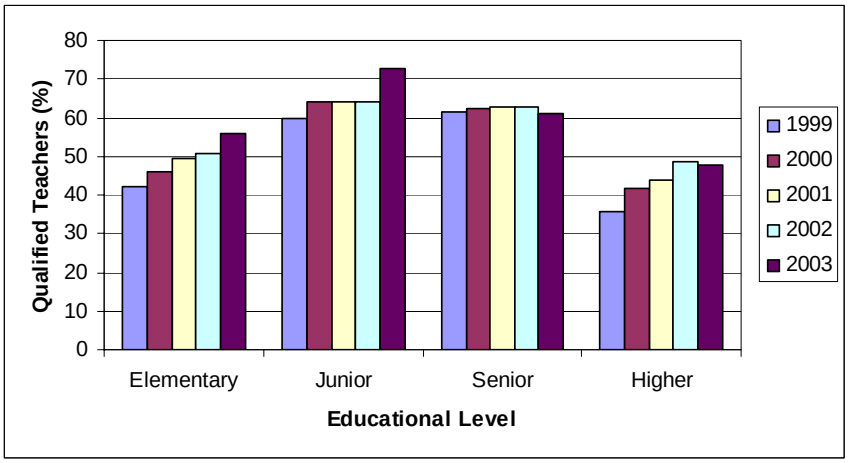
Uniquely, Islamic organizations that run general national education - like the Al Azhar schools in Jakarta and the Muhammadiyah schools around the country - are under the oversight on MONE, and not MORA. Although they hold fast to Islamic teachings, schools like Al Azhar and Muhammadiyah have similar curriculum structures to general schools, and reach out to growing rich (secular) Islamic society in the country.

In both educational systems, there is public and private participation. Public (state) participation is usually a direct participation where state invests and run general schools and Islamic schools. Private participation comes usually from religious groups, but later on from business communities[8]. If education is viewed as economic decision, this mixed of participation makes it possible for the society to some extent sort the type of education (Islamic vs. general) and school management (public vs. private) and school quality (high versus average versus low) to match children and/or household intention for future life. To put it into Bedi and Garg (2000) words: there are school sorting in Indonesia education.

One main problem of Indonesia's education is the lack of qualified teachers. As seen in Figure 2.1, the proportion of qualified teachers in year 1999 to 2003 tends to increase but at very slow speed. On average, qualified teachers for primary school and higher education are less than 50%, while at secondary school it is between 60 to 70%.

[8] There is exists international schools like the Jakarta International School, British School, Korean School and Japan school to serve expatriate or highly rich Indonesian communities; but this is beyond the context of my research.

Figure 2.1
Qualified Teachers by Level of Education and Academic Year



Source: MONE (2005) in Arze Del Granado et al. (2007)

Probably a more visible insight on the lower quality of teacher can be seen by the increasing number of out-of-school courses and exam preparations. Most of students who want to pass national school exams and university entrance exams should go through out-of-school exam preparations (Djunaedi, Alghofari & Rahayu, 2008). These exam preparation courses such as Primagama and Ganesha are actually more costly than formal education, implying that the courses must be at the preference of the income rich.

In Indonesia, Laws of Education 1989 state that elementary to secondary school teachers are university graduates from faculty of education. This means that lack of quality of the school teachers are reflection of quality of university, especially for faculty of educations.

Looking back to history, the first Indonesian higher education institution, *Technische Hogeschool* (now Institut Teknologi Bandung) is established in 1928 (Junge 1973)., so it is less than one century old. Compared to European, American and Middle East higher education system, the Indonesia universities can be considered as young, hence it is still looking for establishing the system and its role to the country development. Trying to expand to serve the demand for national educated labour, in year 2004 there are about 2692 higher education institutions (HEIs) in Indonesia: 2081 under supervision of Ministry of National Education (MONE), 523 HEIs under the supervision of Ministry of Religious Affairs (MORA) and 88 others fell under technical ministries such as Ministry of Interior, Ministry of Defence, Ministry of Finance, Ministry of State Administration and Indonesia Statistics Bureau. Unfortunately, the high number of HEIs does not pull considerable freshmen, as seen from low enrolment in

Indonesia university ages compared to low and middle income Asian countries (World Bank 2005).

Excess demand of higher education has somewhat created moral hazard for both private and public education suppliers by providing higher education services with inadequate quality. By national standard from Indonesia National Accreditation Body for Higher Education (*Badan Akreditas Nasional Pergurtuan Tinggi*), only 9.1% out of 4925 undergraduate study program receive excellent rating (A rating). From international standards, only 4 Indonesia HEIs made it to Asianweek's 2000 ranking for top multidisciplinary universities in Asia, the higher rank is 61 of 77 best Asian universities, and one institute is place at 21 out of 39 top science and technology schools in Asia.

Regarding HEIs under MONE, during the period of 1996 to 2005, its graduate composition are 67% social sciences and education, 20 percent engineering and 13 percent natural sciences including heath and agricultural studies. This composition is perceived as not pro-development such that it is suggested increase in proportion of engineering and natural sciences graduates in 2020 with 24 percent engineers and 14 percent natural sciences (Sihombing and Joko 2001). Beside this graduates composition problem, there also exists the problem of quality of lecturers. MONE teacher data reveals that in academic year 2003/04, only 47.6 percent university lecturers are qualified to teach undergraduate education, usually because they only hold bachelor (Indonesia: *Sarjana*) degree. Related to this research topic, this may lead to low competence incremental between university graduates and high school graduates such that the two become closer substitutes. Consequently, the presence of university graduates will reduce potential earnings of high school graduates, and provide negative social return to lower educated labour within specific labour market.

Apart from the low competence transferred by less qualified lecturers, Education Law also contribute to the close substitution between university graduates with teacher education school graduates (Indonesia: *Sekolah Pendidikan Guru*). In effort to improve primary and secondary school quality, Education Law 1989 request that new recruited teachers should have university graduates, making the teacher education school graduates be substituted perfectly by university graduates. Again, the presence of university graduates, in static condition, may threaten the competitiveness of secondary school graduates.

Beside human resources and regulatory aspects, funding capacity of government is also seen as inadequate to serve the needs of national HEIs development. World Bank (2005) informs that public expenditure per student as percentage of GDP per capita is only 12.3%; it is 2.5% lower than Philippines's and times lower than Thailand's, times lower than Malaysia's and times lower than India's. Yet, pouring government budget on higher education may not be sufficient on improving labour productivity if the management of public higher education (whose 95% of their expenditure expensed by government) misbehaves by taking advantageous of availability of public fund but unable or unwilling to

capitalize students with market demanded skills. On the other hand, growing from society with strong feudalistic classes, higher education degree (which is only is has become a new instrument of credential, as it provided the graduates with the *sarjana* degree. Degree alone, and not necessarily the skill it signals, is an important feature of "utility function" among Indonesian households.

Apart from the quality problem mentioned above, it is important to realise that though growing with quality problems, there are insight on the potential impact of education on the country's development. I highlight five reasons for my optimistic view. *First*, on primary and secondary levels, the national and PISA international score test on Indonesian students are improving (Arze del Gnado et al, 2007) and there has been shift been shift to competence base curriculum that may give rise to labour-technology compatibility (MONE, 2003). *Second*, on tertiary level, university students are keen in social mobilization. For instance, it was the Indonesian students association who mobilized social and political support such that the Indonesian reformation in 1998 which led to changing in government and hence bring about change in political and economic policies took place (Manning & van Diermen, 2000). If this ability is then transferred into mobilizing social movement for economic development, it is more likely that growth in regional development is accelerated. For instance, better farming group will lead to close optimal resource allocation and better profits for farmers. *Third*, government regulates new appointed medical doctors (after 6 years in medical schools), nurses and midwives to work in less developed areas, especially in the periphery of the country (Ministry of Health, 2008). Better health services will bring about change in people's health, lower maternal mortality rate and children mortality rate. Improved health condition may have positive externalities to education and together they shape economic performances (Strauss & Thomas, 1998; Johnes & Johnes, 2008). *Fourth*, the gaps of enrolment rate for female and male students are diminishing (World Bank database, 2008). This will give rise to ability of female to compete in labour markets. Ford & Parker (1008) highlight that Indonesian women are keen at work, and they with higher education are facing lesser social barrier to participate actively in labour market. *Fifth*, increase in youth enrolment to secondary and higher education contribute to the increase of reservation age for marriage. This will likely to lead to decrease in population growth. From developed country experiences, low population growth had contributed to the country human capital improvement, as family with smaller household size will more likely to put their children in secondary and higher education (Johnes & Johnes, 2008).

2.2.2 Unemployment by Labour Force Educational Attainment

The latest update on unemployment by education of labour force is presented in Table 2.3. As seen in Table 2.2, there is an increase in proportion of educated unemployment for university graduates from 5.71% (year 2004) to 12.20% of unemployed labour force (year 2008). Although the number of unemployed university graduates is still smaller than unemployed primary secondary and primary schools, this is still worrying some because higher education is costly. Fail

to work after having higher education degree is a waste of country and household financial resources.

Table 2.3
Change in Unemployment Proportion by Educational Attainment in 2004 to 2008

Educational Attainment	Frequency		Percentage	
	2004	2008	2004	2008
Under Primary School	1,004,296	528,195	9.80	5.62
Primary School	2,275,281	2,179,792	22.19	23.21
Junior High School	2,690,912	2,166,619	26.25	23.07
Senior High School	3,695,504	3,369,959	36.05	35.89
Higher Education	585,358	1,146,069	5.71	12.20
Total	10,251,351	9,390,634	100.00	100.00

Source: author analysis based on BPS Employment Statistics (2008)

2.2.3 Survey on Microeconomic Literatures

In global update of return to investment in education (published regularly by the World Bank), the pattern than primary education has higher private return is maintained across countries and across continents. Taking the data from lower income, lower middle income, upper middle income and high income countries together, the descending order of return according to Psacharopoulos (1994) is primary education, higher education and secondary education. Return for primary education is 30.7% and is almost as twice as return to secondary education (17.7%) and secondary education (19.0%). The performance of different education in Indonesia labour market have been examined by Simanjuntak (1983), Psacharopoulus (1982), Bishry (1990), Behrman & Deolalikar (1993,), Kawuryan (1997), Bedi and Garg (2000), and Duflo (2001). Estimation methods, years of data and magnitude of private returns to education are summarized in Table 2.4. Contrary to international trend that lower education provides higher return (Psacharopoulos 1981), results from Kawuryan (1997) and Behrman & Deolalikar (1993) for data in year 1976, 1986 and 1989 indicate that return to higher education is consistently higher than return to secondary and primary education.

As presented in Table 2.4, in year 1976 the private return to primary education is between 9.2 to 12.5%, and is lower than return to secondary and higher education. One decade later, in 1986, the pattern of return stay the same, although with decreasing magnitude within each educational level. Three years later, in 1989 the trend that return is improving with increasing educational level but decreasing with the time is preserved (see Behrman & Deolalikar, 1993; Kawuryan, 1997; Duflo, 2001). Behrman & Deolalikar (1993) and Kawuryan (1997) separate the Mincerian equation for female and male. Both studies consistently endorse that return to education female is higher than for male even after taking into account variation in schooling levels, partly due to low participation rate of uneducated female in paid-job market. One additional feature in Behrman and Deolalikar (1993) is that household fixed effect estimation made higher correction to return for female compare to male regression.

Table 2.4
Summary of Private Return to Education in Indonesia (Labour Market in 1976 – 1995)

No	Year of data	Estimation & sample	Study by	Rate of Return (%)			
				Primary	Secondary	Higher	Years of schooling
1	1976	OLS	Simanjutak (1983)[9]	n/a	14.5	19.7	n/a
2	1976	OLS; Female	Kawuryan (1997)	9.2-11.4	14.7 - 16.2	14.9-16.2	14.6-15.6
3	1976	OLS; Male	Kawuryan (1997)	11.8-12.5	12.6 - 13.7	13.3-14.6	13.6-14.8
4	1977	OLS	Psacharopoulus (1982)[10]	25.5	15.6	n/a	n/a
5	1982	OLS	Bishry (1990)	14.2		13	n/a
6	1986	OLS; Female	Behrman & Deolalikar (1993)	6.4-7.8	7.8-9.2	9.2-10.7	n/a
7	1986	Household fixed effect; Female	Behrman & Deolalikar (1993)	3.2-5.2	5.2-7.3	7.3-9.3	n/a
8	1986	OLS; Male	Behrman & Deolalikar (1993)	6.7-10.0	10.0 - 13.3	13.3-16.6	n/a
9	1986	Household fixed effect; Male	Behrman & Deolalikar (1993)	5.3-9.8	9.8 - 14.3	14.3-18.8	n/a
10	1987	OLS	Bishry (1990)	12.6		14.3	n/a
11	1989	OLS; Female	Kawuryan (1997)	3.7-8.2	11.6-13.3	12.1	14.0
12	1989	OLS; Male	Kawuryan (1997)	3.5-6.8	7.8-.8.1	8.4-9.4	9.6-.9
13	1993	OLS; Public school	Bedi & Garg (2000)	dW/dS = 0.7DJunior + 50.1DSenior			n/a
14	1993	2SLS; Public school	Bedi & Garg (2000)	dw/dS= 0.7DJunior + 49.9DSenior			n/a
15	1993	OLS; Private non-religious school	Bedi & Garg (2000)	dW/dS = 6.0DJunior + 30.7DSenior			n/a
16	1993	2SLS, private non-religious school	Bedi & Garg (2000)	dW/dS = 6.1DJunior + 30.1DSenior			n/a
17	1993	OLS, Islamic Schools	Bedi & Garg (2000)	dW/dS = 60.6DJunior + 88.3DSenior			n/a
18	1993	2SLS, Islamic Schools	Bedi & Garg (2000)	dW/dS = 60.4DJunior + 88.7DSenior			n/a
19	1993	OLS, Christian schools	Bedi & Garg (2000)	dW/dS = -25.2DJunior + 47.3DSenior			n/a
20	1993	2SLS, Christian schools	Bedi & Garg (2000)	dW/dS = -27.0DJunior + 48.0DSenior			n/a
21	1995	2 SLS, IV	Duflo (2001)	n/a			6.75-10.6
22	1995	OLS	Duflo (2001)	n/a			6.67-7.77

Source: summarized and analysed from sources mentioned in Table 2.4.
Note: DJunior: dummy for Junior high school (grade 7 to 9); DSenior: dummy for Senior high school (grade 10 to 12); n/a: data is not available

[9] in Behrman and Deolalikar (1993)
[10] ibid

This may imply that that controlling for household heterogeneity is more important when considering gender empowerment in economic of education. However, in absolute term, the higher return and higher correction for female should not be equated as female having reward advantageous in labour market. Indeed, there is common perception that for low skilled labour where physical strength is more valued, the earning of male is higher than for female (Ford and Parker 2008).

Another variant of estimation is to employ instrumental variable in order to break the endogeneity between wage and schooling, used by Bedi and Garg (2000). Using this instrumental variable approach resulted in slight downward correction for return for senior secondary school graduated from public (0.2 point) and private non-religious schools (0.6 point). The same method provides slight upward correction for senior secondary school graduated from Islamic school (0.4 point) and Christian schools (0.7 point). However, both studies were unable to deal with unobserved individual heterogeneity which is, according to human capital theory, more important in determining schooling-earning relationships.

Related to the research focus on social return to education, Psacharopoulos (1982) and Kawuryan (1997) indeed compute the regression for social return to education. However they used subsidy disadvantageous definition instead of externalities definition. Though important for country financial allocation, the subsidy definition has limited interpretation on the role of education subsidy itself on country economic growth. In country developmental context, the benefit of subsidizing education should be measured to its impact on wider communities, not limited to the relative monetary benefit (i.e. social accounting of cost benefit analysis) expensed by government for the education of children and youth.

2.2.4 Survey on Macroeconomic Literatures

Studies on the relationship between Indonesia's education and regional and country macroeconomic performance are published by Bishry (1990), Resosudarmo & Vidyattama (2006) and Tjahjono & Anugrah (2006). The summary of these three studies is presented in Table 2.5. The study of Bishry explore the how highly educated labour, lowly educated labour and physical capital interacts. Pioneering the analysis on macroeconomic education in Indonesia, he employed two models -Cobb Douglas and nested-CES model. However, he found that the results are contradicting. He addressed the problem of lack of availability of data (it was 1990) that inhibit him from employing proper estimations.

Table 2.5
Summary of Social Returns to Education in Indonesia from Growth Regressions (Data: 1960-2004)

No	Years of data	Study by	Estimation & sample	Education variable is proportion of labour force with:	Social Return to Education (%)	Return to Capital investment
1	1960-1986	Bishry (1990)	Nested CES Production Function, OLS	labour force with primary & secondary education	19	9.7
				labour force with primary & secondary education	-1	
2	1960-1986	Bishry (1990)	Cobb-Douglas Model, OLS	labour force with primary & secondary education	4.5	12.5
				labour force with primary & secondary education	19	
3	1992-2002	Resosudarmo & Viddyatama (2006)	Solow Model with Human Capital, OLS	labour force with secondary school education	0.7	0.11
4	1992-2002	Resosudarmo & Viddyatama (2006)	Solow Model with Human Capital, Provincial fixed effect	labour force with secondary school education	0.34	0.84
5	1985-2004	Tjahjono & Anugrah (2006)	Solow Model with Human Capital, Provincial fixed effect	labour force with secondary school education	5	34

Source: summarized from sources mentioned in Table 2.5

The recent study of Resosudarmo & Vidyattama (2006) focused on regional income disparities in Indonesia. Analysing provincial panel data from 1992 to 2002, they conclude that the variation in physical capital (measured as provincial investment output ratio and ratio of government investment expenditure to GDP) and mineral and oil resources are the strongest predictors of regional income differences in the country. Using provincial fixed effect to correct for permanent differences in unobserved heterogeneity, the study found that return to physical capital investments is 0.84, while the (social) return to human capital, measured in secondary education enrolment, has lower magnitude (0.34). However, the use of limited variables of human capital (following MRW, 1992) makes the study less relevant for educational planning as a whole. As they have truncated the distribution of labour force and leaving those with primary and higher education out of their analysis, we are unable to predict the impact of certain educational composition of labour force to regional income.

The study of Tjahjono & Anugrah (2006) has similar tone to the provincial fixed effect estimation of Resosudarmo & Vidyattama (2006). The main differences between these two researches are that Tjahjono & Anugrah use longer time period (1985 to 2004), while Resosudarmo & Vidyattama control for more variables on regional financial capability, income inequality, regional dependency on oil and mining industry and regional advantageous from international trade. Insight from cross-country analysis on growth determinants provide support to the richer framework of analysis used by Resosudarmo & Viddyatama (2006), but with risk of interpretation. For instance Rodrik (2006) supports the idea that poor geographical and low human capital and financial risk give rise to economic growth failure while Easterly & Levine (2003) support the role of endowment abundance in pushing economic growth. However, Auty & Gelb (2001) and Mursheed (2004) warn the endowment lead growth strategy as a boomerang to country development if there is no proper distributive policy take place. In other word, endowment can turn into curse. Indeed, in Indonesia's context, as I have mentioned before, two endowment-rich islands of Kalimantan and Papua experience different economic performance (the poverty head count in Papua is 2 to 4 times of Kalimantan's). This has also contributed to the ongoing fight for independence by Papuan guerrillas (versus Indonesian army) who want indigenous Papuan to benefit more from their "own" resources. One of the important insight of this endowment problem in Papua is that most of indigenous people are less educated (compared to average Indonesian), hence could not be absorbed by formal labour markets. Again in the case of Papua, high wages in the mining industries have attracted highly educated labour from outside the region, providing example of the reverse causality of regional income to educational composition of labour. This reverse causality, however, is not tackled in the study of Resosudarmo & Vidyattama (2006). Unable to deal with endogeneity problem, their results should be interpreted with cautious as it may have potential biased estimation

Chapter 3
METHODOLOGY

The previous chapter presented some internal problems on educational sector such as lack of quality teachers/lecturers as well as some positive insights which potentially bring about economic benefit to regional development. In addition to that, having understood from previous studies about the advantageous provided by panel data and problem of reverse causality from regional income to education of labour force, I now propose a framework of analysis and estimation strategy for unbiased estimation of social return to education in Indonesia during the period 1993-2003 .

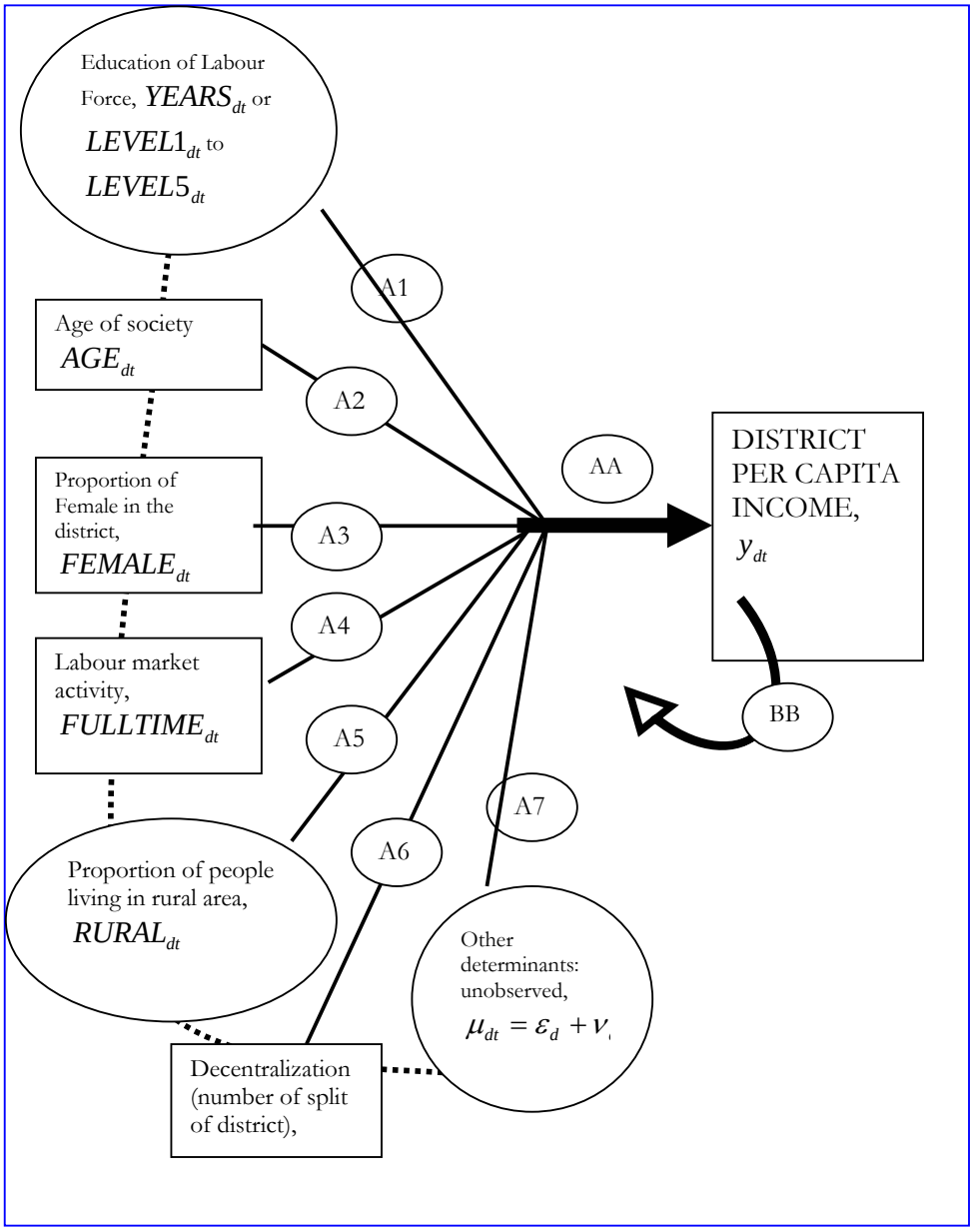
3.1 Theoretical Framework

First of all, I define social return to education as macroeconomic received by the whole society due to certain educational composition of labour force in district level[11]. I employed theoretical framework that established causal effect relationship between education of labour force to district per capita income, taking into account differences in developmental stages, average vitality and/or ageing of society, potential socioeconomic barriers on female and degree of activity of labour market. I develop my approach assuming no spill over effect across unit of analysis i.e. across districts. I will show later that the data provide support that the cross-districts spill-over within Indonesian provinces does not have significant distribution (see section 4.6 for the test results).

Suppose there are two districts with identical features except the education of their labour forces. In addition, assume that these two districts are not economically integrated such that there is no spill over effect between them. If higher educational attainment signals higher skill (Johnes & Johnes, 2008), the district with higher educational attainment will eventually experience higher per capita GRDP. Education of labour force is represented by two widely used of educational status: years of education ($YEARS_{dt}$) which is more as quantity measure; and completed education level ($LEVEL1_{dt}$ to $LEVEL5_{dt}$) which are more as quality measure with differentiated level of education attainment.

[11] Cantonn (2007) use almost same definition, but apply it on national level.

Figure 3.1
Analytical Framework



The latter category is further divided into five sub-categories, so the education is now represented by six sub-variables. These six categories (name of variables in brackets) are: (1) Average years of education of labour force within certain district which is measured from highest years of education attended but not necessarily completed certain educational level, ($YEARS_{dt}$); (2) Share of labour force completed higher education, ($LEVEL5_{dt}$); (3) Share of labour force completed senior secondary education, ($LEVEL4_{dt}$); (4) Share of labour force completed junior secondary education, ($LEVEL3_{dt}$); (5) Share of labour force completed

primary education, ($LEVEL2_{dt}$); and (6) Share of labour force not completed primary school, ($LEVEL1_{dt}$).

A closely linked variable related to district income is the age of society (AGE_{dt}). Lower education attainment would imply lower skill and productivity, but people with lower education will enter labour market quicker than those who go all the way to the higher level. Hence society with higher average of schooling may have higher preservation age for first job. However, early participation in labour market may suffer from low long-term productivity. Hence there are trade off between the years of education and age for first job, but at one point in time labour force should shift from schooling to labour, and other time from labour to schooling in order to update knowledge. Some people do labour and schooling at the same time.

In addition to that, ageing society would imply more expenditure on health care due to illness and other health shocks. Younger society may have better quality of economic investment rather than the ageing one. This is related to the identity of the dependent variables used, the per capita GRDP. The per capita GRDP is measured by dividing the Rupiah value of gross regional domestic product (GRDP) produced within the district to its number of population. within the district. This GRDP is composed of private consumptions of households and non profit organizations, government consumptions, gross fixed capital formation, change in stock and district surplus/deficit of balance of trade (BPS, 2006; van Heemst, 1989). Two districts then may have similar total GRDP per capita, but the composition of GRDP (in relation to age of society) may differs. Different GRDP composition may lead to opposite direction of long term development, such that the one who spends more on health care for old people versus the one who spend more on education and training.

The third variable, the proportion of female citizen ($FEMALE_{dt}$) depicts the potential differences of role of male and female in macroeconomic measure. It is often that labour market give privilege to male, though in total productivity (or GRDP) measure gender may not have bearing on productivity differences. However it is worthwhile to test the direction of the relationship between gender and regional income in order to figure out if male privilege in labour market holds because they are productive in macroeconomic sense.

The fourth variable, proportion of labour force work at least 20 hours per week ($FULLTIME_{dt}$) depicts level of activity in labour market. I use 20 hours as lower limit as this is the common median of per week working hours in Indonesia. The Statistics Indonesia (BPS, 2006) use 35 hours per week as lower limit for fulltime measures; however I found this discriminative toward female labour force that have to allocate half of their time between paid job and unpaid but essential jobs like raring children. Excluding those who work for 20 to 35 hours per week will potentially underestimate the role of people who actually contribute to certain unpaid but developmentally important jobs.

The fifth variable, the proportion of people living in rural area ($RURAL_{dt}$) represents the developmental stage in the region (line A5). It is common in Indonesia that rural areas are transformed into urban when it has more facilities with good roads, daily market for food stuffs, electricity, running water and most

likely good quality of secondary schools or even higher education. The Statistics Indonesia based its categorization for urban/rural using adequacy of public facilities and per square-km population density.

The sixth variable deals with Indonesia dynamics on regional autonomy ($SPLIT_{dt}$). My data is based on 1993 district category. I use 261 districts in 1993, excluding areas with incomplete data of Atjeh, Moluccas, Papua and East Timor[12]. In 2003, these 261 districts have split into 335 districts. To meaningfully capture the dynamics behind this of decentralization, I incorporate the number of split districts into the equation.

The other important determinant is the unobserved part of the socio-economic and political dynamic within district at certain year (μ_{dt}). Policies on social safety net (SSN) and wider regional autonomy apply nationally. However, research suggests that there are variations in the impact across regions. For example, the impact of SSN to protect the education of the poor differs for Java/Bali and the Eastern part of the country (Sparrow, 2006). Law on regional autonomy delegates the implementation of primary and secondary education level to districts and provinces. Differences in levels of regional development as well as in the readiness of local officials can lead to the high variation of performance of the education sector (Akhmadi et al, 2003). Part of the impact of these policies may give impact to educational status of citizen so that it can be absorbed and represented by educational variable, however, there are still unobserved differences across regions which may not be captured by the variable itself.

In my setting, the variation in district income then depends on how these six variables form one meaningful power to give impact to the ups and downs of per capita GRDP during 1993-2003 (*see line AA*). I will then take multivariate regression form where these variables are used together on estimation.

Nevertheless, it is important to recall that socioeconomic and political variables are endogenous as they determine each other in reversal ways (line BB). This is also true for the relationship between per capita GRDP and education as well as with other variables. For instance, I expected that higher proportion of highly educated people in labour force will increase total productivity, hence give raise to per capita GRDP. On the other hand, rich district may have certain wage structure that attract migration from outside the district, and this time it is the per capita GRDP that give raise to share of highly educated labour. This bidirectional causality (*see line BB*) should be tackled such that the endogeneity between education and district richness is turn into single direction causality: from education of labour force to per capita GRDP. Certain portion of endogeneity is eliminated due to the time lag between reported GRDP and educational calendar. The survey is run every February or March, but according to Indonesian education calendar, it is the educational status for June to September last year (for all

[12] East Timor became independent country under UN referendum in 1999. The split of East Timor followed with violence and war has caused more than 140,000 East Timorese take refuge to Southeast Indonesia (Sumba, Timor, Alor, Flores). This is important to notice as this may bring change to demographic structure of Southeastern islands including change in educational status and regional income

educational level), or January that year because sometimes university graduation takes place after the odd semester. In addition to that, it is not unusual that labour force growth is higher than labour absorption, making the waiting for first job is high (Betcherman & Islam, 2001). Meanwhile, the GRDP is computed for January to December that year, providing at least 11 to 17 months time lag between district income and from educational status, hence the reverse impact from GRDP to education is limited. Nevertheless, as I mentioned before, richer district may attract high labour mobility such that the reverse causality is still there. Fail to take this into account will resulted in overestimation or underestimation of the social return to education.

3.2 Econometric Model

Suppose that the per capita GRDP of district *d* in year *t* is determined by an equation of the form:

$$\log(y_{dt}) = \pi S_{dt} + X_{dt}\beta_{dt} + \mu_{dt} \quad (1)$$

where:

S_{dt} is the education of district labour force in year *t*.

X_{dt} is the vector of district characteristics, including age of society within the district (AGE_{dt}), proportion of female ($FEMALE_{dt}$), proportion of labour force working at least 20 hours per week ($FULLTIME_{dt}$), proportion of people living in rural area of the district ($RURAL_{dt}$) and split of districts ($SPLIT_{dt}$).

μ_{dt} is the residual, represents unobserved component of the relationship which may or may not correlated to $\log(y_{dt})$. The residual is the sum of two components: the part that is fixed overtime (ε_d) and the part that is randomly distributed overtime (ν_{dt}):

$$\mu_{dt} = \varepsilon_d + \nu_{dt} \quad (2)$$

The coefficient of interest is π, is the social return to education. It is the estimate of effect of education on average per capita GRDP after controlling for X_{dt}. I will first estimate the value of π using $YEARS_{dt}$. After that I will repeat all procedure using $LEVEL2_{dt}$ to $LEVEL5_{dt}$ together in one regression. The results from using $YEARS_{dt}$ and $LEVEL2_{dt}$ to $LEVEL5_{dt}$ then compared to get insight on the importance of certain educational status.

However, if μ_{dt} is correlated to S_{dt} or X_{dt} (see dotted line in Figure 3.1), the OLS method will lead to biased estimation of π. If the correlation comes from the district fixed differences of unobserved heterogeneity (ε_d), then taking fixed estimation will difference away ε_d and so does the correlation between independent variable with μ_{dt} and hence leads to a more unbiased estimation of π.

Yet, differencing away permanent differences across districts (such as climate, or geographical location or the permanent perception of ethnic majority toward

schooling) may not fully imply that the estimated π is the true effect of education on average per capita GRDP. This is because, as I mentioned before, there are reverse causality from per capita GRDP to education, triggering incoming migration of certain educated labour into the district. T combat these endogeneity, I will employ the Generalized Method of Moments where I use lagged value of per capita GRDP as instrumental variable to per capita GRDP, and lagged value of education as instrumental variable for education. Due to the period of my data (only 11 years) and to maintain high number and high variation of data, I use one year lag for the instrumental variables. In addition to that, suspecting that proportion of labour force working fulltime may also suffer from reverse causality with per capita GRDP, instrument variable is also used.

Under the GMM, I transform the static model into dynamic model where I include the lagged value of per capita GRDP as one of the independent variables, and split the education variable into two types: the lagged value and the annual change. This split will enable the distinction between short term effect (annual change) and the long term effect (effect of initial stock of education).

For the controlling variables, I expect the coefficient for $FEMALE_{dt}$ not to be significant, following Ford & Parker (2008) that though Indonesian female receive labour market discrimination on wages, they are not less productive than male. Furthermore, I expect the coefficient for (AGE_{dt}) to be positive on linear part and to be negative on quadratic part such that the age-regional income relationship is convex, following the argument on the possible relationship between GRDP structure and age of society. The coefficient for $FULLTIME_{dt}$ is more likely to be positive because if more people work for more hours, the regional total productivity will increase. The coefficient for $RURAL_{dt}$ is more likely to be negative due to the fact that rural category imply less development, while improve in GRDP imply more development. The coefficient for $SPLIT_{dt}$ is more likely to be positive due to the availability of General Allocation Fund (*Dana Alokasi Umum*) which may boost overall district government spending, which is part of GRDP identity (BPS, 2006; van Heemst, 1989).

Furthermore, to relax the assumption of no spill-over I mentioned in the first part of my analytical framework, I will add into Eq. 1, the provincial average years of schooling ($YEARS_{pt}$) while district education is represented by $LEVEL2_{dt}$ to $LEVEL5_{dt}$. Due to the dominant role of provincial government on district development prior to Laws of Regional Autonomy, and due to the economic fact that wider regional integration is preferred, I would expect the coefficient of $YEARS_{pt}$ to be positive. This coefficient absorbs the cross-district spill-over effect, and leaves the coefficient for $LEVEL2_{dt}$ to $LEVEL5_{dt}$ merely district level effect without spill-over (see Zhang & Felmingham, 2002 and Moretti, 2004 for examples).

Finally to provide make comparable insight to Bishry (1990), Resosudarmo & Vidyattama (2006) and Tjahjono & Anugrah (2006), I repeat the estimation for Equation (1) using provincial panel data where data on physical capital is available.

Chapter 4
SOCIAL RETURN TO EDUCATION

4.1 Central Tendency and Distribution

Table 4.1 presents arithmetic mean for year 1993 (beginning of analysis period), 1998 (during Indonesia's economic crisis) and 2003 (end period of my analysis). It also presents the change in mean and change in coefficient of variation. Combining the change in mean and in coefficient of variation, it says that 1993 to 2003, real GRDP per capita had increased with increasing variation between districts. However, the increase did not endanger educational investment as well as household expenditure. This is a plausible progress despite some reduction in real household expenditure in year 1998. Within the same timeframe, district average year of schooling increased by 0.1206 per year, making the total increase is 1.2063 in one decade.

From educational composition, the labour force is dominated by those with up to primary school degree (in total: 65.53% in 1993 and 55.59% in 2003). However their proportion is decreasing as people move upward to secondary school and higher education. Together, in 2003 the proportion of secondary school graduates (40.19%) and is 6.27% higher than those with primary school education. At the same time, proportion of college/university graduates increase by 79%, from 2.36% in 1993 to 4.45% in 2003. These achievements are plausible despite the crisis and under-quality problems of Indonesia's education. It seemed that household long term human capital investment via formal education had become household priority, despite the temporary decline in the household purchasing power in 1998. It is important to notice that the increase in years of education as well as in proportion of higher educated and secondary school educated labour has shown that the general educational subsidy and the subsidy social safety net work out.

The proportion of people living in rural areas is decreasing with average 0.75% per year. This is probably due to migration to urban areas for school or work, but also due to improvement in economic performance which transform rural into urban areas. Meanwhile proportion of female is slightly decreasing without change in between district variation. The table also informs that in 2003 the share of labour force working in the past week is 62.06%; 90.11% of them (=100%*55.92/62.06) for fulltime[13].

[13] I use 20 hours per week as lower limit for fulltime work category. See Chapter 3 for the discussion

Table 4.2
Changes in Mean and Coefficient of Variation of district per capita GRDP and other selected variables

Variable	1993	1998	2003	Changes 1993-2003	
	Mean	mean	mean	Change in Mean	Change in CoV
Real GRDP per capita (1993 constant Rp)	1661289	1887462	2502616	841327	0.1273
Average years of education	6.5428	7.2597	7.749219	1.2063	(0.0425)
Average age of district population	25.8289	27.1145	28.07635	2.2474	0.0005
Share district population living in rural area	0.6783	0.6474	0.6033	-0.075	0.0551
Share of females in district population	0.5038	0.5049	0.4989	-0.0049	(0.0000)
Share of population age 15-60 that works at least 1 hour/week	0.6436	0.6238	0.6206	-0.0230	(0.0236)
Share of population age 15-60 that works at least 20 hours/week	0.5551	0.5239	0.5592	0.0041	(0.0164)
Share of adult population not completed primary school	0.2819	0.2751	0.2167	-0.0652	0.1235
Share of adult population completed primary school	0.3734	0.3425	0.3392	-0.03419	0.0575
Share of adult population completed junior secondary school	0.1682	0.1771	0.2046	0.036328	(0.0929)
Share of adult population completed senior secondary school	0.1528	0.1705	0.1973	0.044515	(0.0070)
Share of adult population completed higher education	0.0236	0.0349	0.0422	0.018573	(0.1318)
Average per capita HH expenditure in district (current price)	38693.02	73439.68	197457.7	158764.7	(0.0551)
Average per capita HH expenditure in district (1993 constant price)	38693.02	34062.93	51649.94	12956.92	(0.0551)
N of district (1993 category on panel)	261	261	261		

Source: author analysis

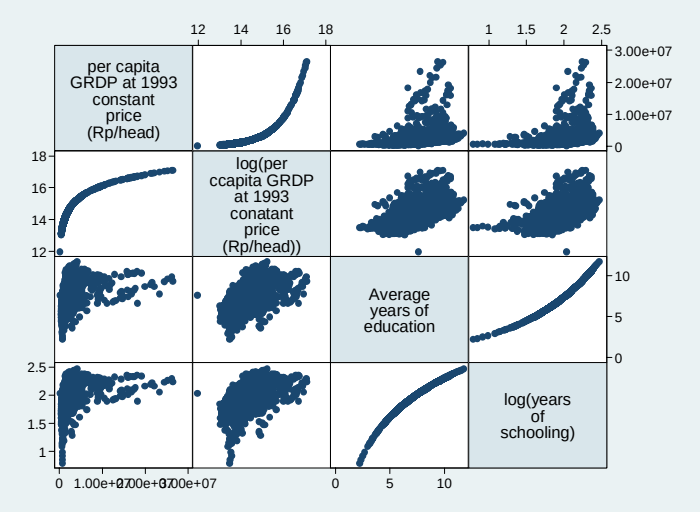
4.2 Bivariate Analysis: Correlation and Pattern of Relationships

The possible association between per capita GRDP and educational variables are graphed in Figure 4.1 to Figure 4.4. It is then followed with the presentation of its simple correlation (see Table 4.2) in order to illustrate possible association (and not yet causal effect relationship) between education and per capita GRDP.

4.2.1 District Years of Schooling and per capita GRDP

As seen in Figure 4.1, there is positive association between district years of education with the level of per capita GRDP as well as to logarithm of per capita GRDP. Numerically, the coefficient of correlation between average years of schooling in Indonesian districts and per capita GRDP is +0.3783. The association is 1.50 times stronger (+0.5677) when logarithm of per capita GRDP is used instead. Examining the log-log association resulted in slightly lower positive correlation.

Figure 4.1
Pattern of Relationship between district per capita GRDP and Years of Schooling



Source: author analysis from panel data

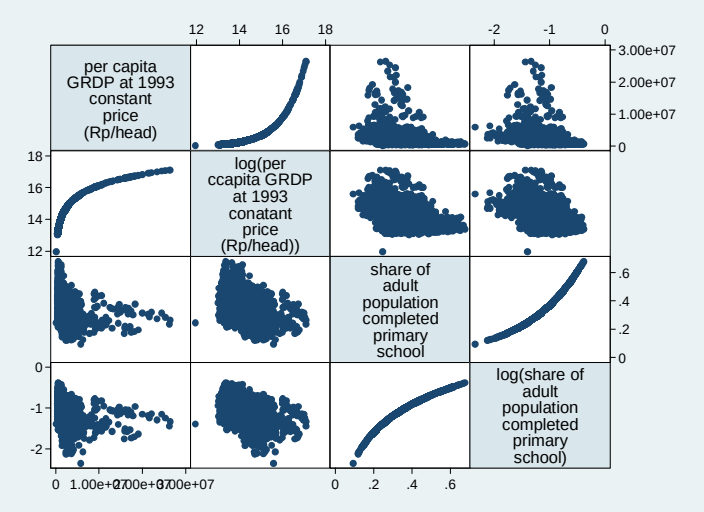
4.2.2 Share of Primary School Graduates and per capita GRDP

As seen in Figure 4.2, there is no clear pattern of association between share of adult competing primary school with level of per capita GRDP as well as to logarithm of per capita GRDP.

However numerical examination using simple correlation provides support of negative association between share adult population competed primary school and per capita GRDP. The degree of association is -0.2909. This negative association is 1.50 times stronger (-0.4368) when logarithm of per capita GRDP is used instead of absolute values of district per capita GRDP. Examining the log-log

association resulted in slightly higher negative correlation, or in other word resulted in slightly lower positive correlation.

Figure 4.2
Pattern of Relationship between district per capita GRDP and Share of Adult Population Completed Primary School



Source: author analysis from panel data

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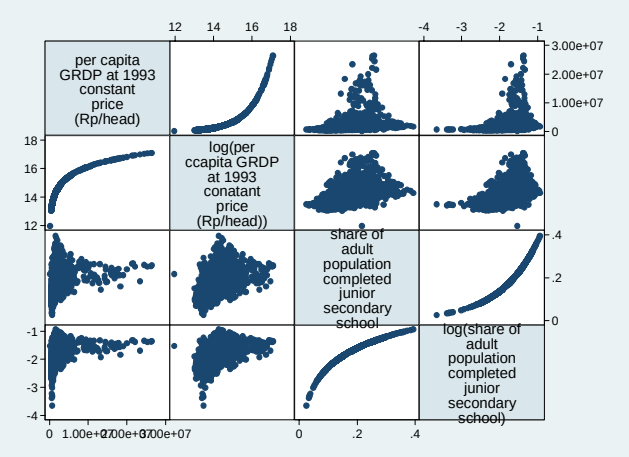
4.2.3 Share of Junior Secondary School Graduates and per capita GRDP

Figure 4.3 pictures a clear pattern that share of adult population completed junior high school is positively associated to per capita GRDP and to the logarithm of per capita GRDP.

Figure 4.3
Pattern of Relationship between district per capita GRDP and Share of Adult Population Completed Junior Secondary School

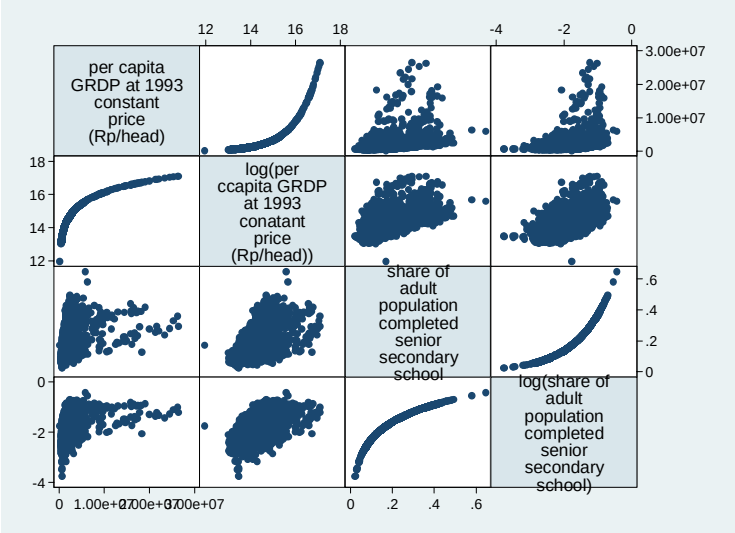


Source: author analysis from panel data

4.2.4 Share of Senior Secondary School Graduates and per capita GRDP

Figure 4.4 presents pattern that share of adult population completed senior high school is positively associated to per capita GRDP and to the logarithm of per capita GRDP. Statistical examination using simple correlation provides support of positive association between the shares of adult population completed senior high school to per capita GRDP. The degree of association is +0.4102. The association is 1.43 times stronger (+0.5875) when logarithm of per capita GRDP is used instead. Similar to the years of schooling and junior secondary school, the log to log association is resulted in slightly lower positive correlation.

Figure 4.4
Pattern of Relationship between district per capita GRDP and Share of Adult Population Completed Senior Secondary School

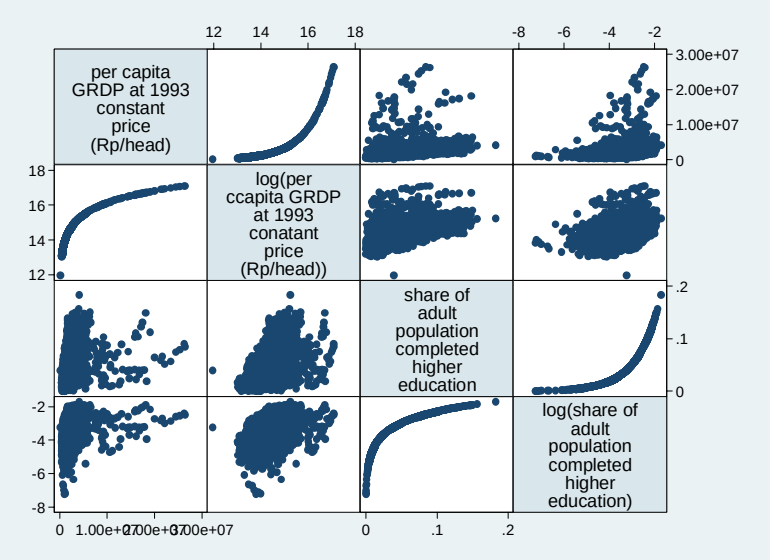


Source: author analysis from panel data

4.2.5 Share of University/College Graduates and per capita GRDP

Figure 4.5 do not clearly presents pattern of relationship between share of adult population completed higher education and per capita GRDP. However, when it comes to the logarithm of per capita GRDP, there is clearer and positive pattern of relationship. The coefficient of correlation between shares of adult population completed higher education to logarithm of per capita GRDP is +0.4872, and is 1.40 times stronger than the correlation between shares of adult population completed higher education to per capita GRDP. Again, similar pattern repeated where the log to log association resulted in slightly lower positive correlation.

Figure 4.5
Pattern of Relationship between district per capita GRDP and Share of Adult Population Completed Higher Education



Source: author analysis from panel data

The correlation coefficients between all educational variables to absolute and logarithm of per capita GRDP is presented in Table 4.2.

Table 4.2
Bivariate Correlation between real per capita GRDP and Educational Variables[14]

	y	log(y)	att1	att2	att3	att4	att5	S district
y	1.0000							
ln(y)	0.8373*	1.0000						
att1	-0.3306*	-0.4809*	1.0000					
att2	-0.2909*	-0.4368*	0.2216*	1.0000				
att3	0.2928*	0.4746*	-0.7646*	-0.5210*	1.0000			
att4	0.4102*	0.5875*	-0.7666*	-0.7548*	0.6934*	1.0000		
att5	0.3473*	0.4872*	-0.6638*	-0.6975*	0.5244*	0.8832*	1.0000	
S district	0.3783*	0.5677*	-0.8575*	-0.6103*	0.8041*	0.9131*	0.8355*	1.0000
S province	0.3171*	0.4516*	-0.4383*	-0.3418*	0.5460*	0.4311*	0.3851*	0.5757*

Source: author analysis
Note: y: district per capita GRDP; att2, att3, att4, att5: share of adult population completed with primary, junior secondary, senior secondary school and higher education. S district: average years of schooling on district level; S district: average years of schooling on provincial level

[14] The correlations among educational variables are highly positive and statistically significant, except when it come to share of adult population without degree and share of adult population completed primary school.

With exception to share of adult without schooling degree and share of adult completed primary education, the overall pattern is that there are positive correlations between education and per capita GRDP. The correlation is stronger when the variables are in log-linear terms i.e. log per capita GRDP to years or schooling, or log per capita GRDP to share of adults completed certain educational level.

Consistently, the log to log correlation resulted in slightly lower positive association. This may imply that educational variables i.e. years of schooling and share of adult population with certain educational levels, are associated more to the change in per capita GRDP rather than to the absolute (Rupiah) values of per capita GRDP. I will use this insight when examining the relationship between education and per capita GRDP from multivariate perspective by employing the log-linear when examining the causal effect relationship. Recall that the Equation (1) is:

$$\log(y_{dt}) = \pi S_{dt} + X_{dt}\beta_{dt} + \mu_{dt} \qquad (1)$$

where:

S_{dt} is the education of district labour force in year *t*.

X_{dt} is the vector of controlling variables; and

μ_{dt} is the residual term of the relationship.

Before examining the relationship using panel data, I now turn first to the panel data summary in order to sense the within and between district variation of the independent as well as dependent variables.

4.3 Descriptive Analysis of the District Panel Data

The panel identifier or the cross section unit is district, and the time variable is year. Recall that the panel data composes of 261 districts for 11 year-period during 1993-2003. Table 4.3 presents the statistical summary of the district panel data.

As seen in Table 4.3, except for $SPLIT_{dt}$, all explanatory variables have had higher variation between district rather than within districts (across years). This is also true for the independent variable, $\log(y_{dt})$. Meanwhile for $SPLIT_{dt}$, the within variation is higher than between variation because there is tendency of multiple split where main district split several times at different period. Majority of the districts in Java did not experience split, while districts outside Java tend to split. As mentioned by Baum (2006), when it comes to fixed effect estimation, higher within panel variation increase the likelihood of identification, while lower variation will make it possible for most of the variation to be differenced away.

Table 4.3
Statistical Summary of the District Panel Data

Variable		Mean	Std. Dev.	Min	Max	Observations
y	overall	1946061	2261036	154923.2	2.64e+07	N = 2871
	between		2160948	489843.4	2.14e+07	n = 261
	within		677389	-4951102	2.12e+07	T = 11
log_y	overall	14.21121	.6384869	11.95068	17.09009	N = 2871
	between		.6173101	13.10135	16.86237	n = 261
	within		.1670976	12.11233	16.35336	T = 11
att2	overall	.3553499	.0932734	.0952615	.6788375	N = 2871
	between		.0867644	.1546768	.602767	n = 261
	within		.0346134	.1797593	.503748	T = 11
att3	overall	.1843689	.0538274	.025933	.3935448	N = 2871
	between		.049551	.0478704	.3510893	n = 261
	within		.0212284	.1032476	.2699926	T = 11
att4	overall	.1760483	.0929929	.0230375	.6477789	N = 2871
	between		.0897821	.0448225	.4485729	n = 261
	within		.0247978	.0414694	.4285369	T = 11
att5	overall	.0345441	.0279271	0	.1828839	N = 2871
	between		.0259419	.0072422	.1326355	n = 261
	within		.0104541	-.0076461	.0885886	T = 11
female	overall	.503376	.0147311	.4467991	.5682597	N = 2871
	between		.0122684	.4734917	.5463322	n = 261
	within		.0081865	.432996	.5745422	T = 11
fulltime	overall	.5413802	.0785777	.3135718	.8692083	N = 2871
	between		.0716103	.3749791	.76379	n = 261
	within		.0326235	.4089341	.6792161	T = 11
rural	overall	.6380376	.3174094	0	1	N = 2871
	between		.3129445	0	.9877996	n = 261
	within		.0561756	.0535087	.8681017	T = 11
age	overall	27.30156	2.656952	21.92146	36.5282	N = 2871
	between		2.438995	23.28221	33.88208	n = 261
	within		1.063685	24.07151	31.47392	T = 11
split	overall	1.092999	.3620351	1	4	N = 2871
	between		.2308021	1	2.181818	n = 261
	within		.2792587	-.0888192	3.183908	T = 11

Source: author analysis

4.4 Impact of Average Years of Schooling of Labour Force on Per Capita Regional Income

In this section I estimate the social return to education using the impact of average year of schooling of a district to its per capita regional income. The estimation procedures take into account variation in developmental stages, average vitality and/or ageing of society, potential socioeconomic barriers on female and degree of activity of labour market. Recall that the independent variable is logarithm of district per capita GRDP.

As presented in Table 4.4, all coefficients have sign which match the expectation, except the coefficient for the share of female in the districts. There are four model presented, (1) random effect for the baseline estimation, (2) fixed effect for the baseline estimation, (3) random effect estimation with robustness check when including number of split districts, and (4) fixed effect estimation with robustness check when including number of split districts.

Table 4.4
Impact of Average Years of Schooling of Labour Force on per Capita Regional Income: Random and Fixed Effect Estimation

Variable	(1)	(2)	(3)	(4)
	Baseline		With number of split districts	
	Random effect	Fixed effect	Random effect	Fixed effect
Average years of education	0.0902**	0.0838**	0.0948**	0.0886**
	[0.0085]	[0.0087]	[0.0086]	[0.0088]
Average age of district population	0.1291**	0.1343**	0.1405**	0.1462**
	[0.0313]	[0.0310]	[0.0315]	[0.0312]
Average age of district population - squared	-0.0018**	-0.0018**	-0.0020**	-0.0020**
	[0.0006]	[0.0006]	[0.0006]	[0.0006]
Share of females in district population	-0.2411	-0.1561	-0.3334	-0.2432
	[0.3727]	[0.3715]	[0.3740]	[0.3721]
Share of population age 15-60 that works at least 20 hours/week	0.1163	0.1091	0.1309	0.1247
	[0.0916]	[0.0924]	[0.0917]	[0.0924]
Share of district population living in rural area	-0.2824**	-0.0985	-0.2747**	-0.0892
	[0.0582]	[0.0650]	[0.0582]	[0.0650]
Number of split districts			-0.0319**	-0.0330**
			[0.0113]	[0.0111]
Constant	11.6574**	11.3775**	11.5349**	11.2417**
	[0.4867]	[0.4826]	[0.4887]	[0.4840]
Observations	2871	2871	2871	2871
Number of District	261	261	261	261
R-squared		0.17		0.17

Source: author analysis
Note: Standard errors in brackets; + significant at 10%; * significant at 5%; ** significant at 1%

The baseline model with random effect estimation informs that a 1 year increase in year of schooling is associated with 9.02% increase in per capita regional income, with strong statistical degree of confidence (at 99%). During the period of 1993-2003, years of education increase by 2.2474 years. According to the random effect estimation, this 2.2474 year increase in education is associated with 20.2715% increase in per capita GRDP for one decade or 2.03% increases per year. The total increase in per capita GRDP at that period is 5.06% per year. This implies that the contribution of return to education is around 4.35% from total regional economic growth. This magnitude gives support that investing in increasing average years of education of the people is relevant for regional development.

The magnitude of the coefficient slightly improves (to 9.48%) when number of split districts is included into the equation. The coefficient for number of split district is negative where 1 split district is associated with a 3.19% reduction in per capita regional income. This is probably link to the political cost of gaining a split district, usually for mass mobilization and negotiation with district, provincial and up to national politicians. Meanwhile differencing away permanent variation between districts slightly reduces the magnitude of the social return to education. For instance, in the baseline model it reduces by 0.64% point, while in the model with number of split, the magnitude of the coefficient drop by 0.62% point.

Comparing the fixed effect estimation and random effect estimation, the Hausman test consistently provides support that the district-level individual effects are correlated to the regressors in the model. The results are consistent for regardless the presence of number of split districts in the equations. Hence, the fixed effect model is more representative for the nature of the data, compared to the random effect estimation. However, as this fixed effect estimation still leaves the possible endogeneity problem within the regression, we shall turn to GMM estimation for validation of results.

Related to GMM estimation, I deliberately run a dynamic panel data model by using the one year lag and one year in the value of average year of schooling. This is done in order to distinguish the effect of initial condition (or stock) of human capital, and the effect of change in human capital. In order to absorb the growth inertia, for instance the one that come from continuous capital investment, I include the lag of the independent variable in the model. I use instrumental variables for three selected variables which may conceptually bear endogeneity. These variables are: per capita GRDP, average years of education and share of labour force work fulltime. Each variable use its own lag on this instrumentation procedure such that the relationship between this three variables has no more reverse causality. The results are presented in Table 4.5. The first model is the baseline, while the second model is for robustness check.

The second model which functions for robustness check does not give different insight to the baseline model. This can be seen from the statistical (or distributional) significance of its coefficient. Based on it robust standard error, the coefficient of number of split has very low confidence interval (only 41.9% out of maximum 100% confidence internal). Because I have I set the standard of rejection at 90% confidence interval, under GMM estimation, the number of split district has not bearing on per capita regional income.

According to the baseline model, a 1 year increase in years of education will increase per capita regional income by 8.27%. This is a bit lower that the one from the base line model with fixed effect presented in Table 4.4. (it is 8.38%). Most likely, from short term view, the 0.11% point difference between the fixed effect and the GMM model with panel data represent the portion of reversal causality from per capita regional income to years of education.

Meanwhile, the from long term point of view, the stock of human capital measured in lag values of logarithm of per capita GRDP have positive bearing on the regional economy. A 1% increase in the initial years of schooling in the past year potentially increases per capita regional income by 11.84%.

Table 4.5
Impact of Average Years of Schooling of Labour Force on per Capita Regional Income: Dynamic Panel Data

Variable	(1) Baseline, GMM	(2) With number of split districts, GMM
L1. log(per capita GRDP at 1993 constant price (Rp/head))	0.1245+	0.1271+
	[0.0674]	[0.0708]
L1. Average years of education in district[15]	0.1184**	0.1068**
	[0.0308]	[0.0383]
D1. Average years of education in district[16]	0.0827**	0.0736*
	[0.0228]	[0.0308]
Average age of district population	0.2860	0.3099
	[0.2310]	[0.2907]
Average age of district population - squared	-0.0048	-0.0052
	[0.0042]	[0.0053]
Share of females in district population	3.3447+	4.3833
	[1.7617]	[3.8142]
Share of population age 15-60 that works at least 20 hours/week	0.4485**	0.4060**
	[0.1379]	[0.1432]
Share district population living in rural area	0.0566	0.0458
	[0.1730]	[0.1715]
Number of split districts		0.0687
		[0.1671]
Constant	5.4142	4.5825
	[3.6831]	[5.4881]
Observations	2610	2610
Number of District ID	261	261
R-squared		

Source: author analysis
Note: Robust standard errors in brackets; + significant at 10%; * significant at 5%; ** significant at 1%. L1 is one year lag, D1 is one year difference

In addition to that, according to the estimation, the short term and long term social return to of years of education is stronger when there are more female participate actively in fulltime occupations in the labour market. A 1% point increase in share of female in the district potentially improves per capita regional income by 3.3447% and a 1% point increase in share of labour force working fulltime will likely to improve per capita regional income by 0.3447%.

The controlling variables like age does have convex pattern, however it has no adequate statistic confidential level. The share of people living in rural areas is positive and provides new insight on the potential of accelerating regional development via rural development. However, its coefficient does not have convincing statistical supports, as it can be accepted only at a very low confidence level (31.1% out of 100% confidence level).

[15] Long term social return
[16] Short term social return

4.5 Impact of Educational Composition of Labour Force on per Capita Regional Income

In this section I estimate the social return to education using the impact of educational composition of labour force within the districts to its per capita GRDP. The estimation procedures take into account variation in developmental stages, average vitality and/or ageing of society, potential socioeconomic barriers on female and degree of activity of labour market. The independent variable is logarithm of district per capita GRDP.

The results for random effect estimation and fixed effect estimation are presented in Table 4.6. There are four model presented, (1) random effect for the baseline estimation, (2) fixed effect for the baseline estimation, (3) random effect estimation with robustness check when including number of split districts, and (4) fixed effect estimation with robustness check when including number of split districts.

Table 4.6
Impact of Educational Composition of Labour Force on Per capita regional income: Random Effect and Fixed Effect Estimation

Variables	(1)	(2)	(3)	(4)
	Baseline		With number of split districts	
	Random effect	Fixed effect	Random effect	Fixed effect
Share of adult population completed primary school	0.1888+	0.1828+	0.1845+	0.1791+
	[0.1021]	[0.1025]	[0.1022]	[0.1024]
Share of adult population completed junior secondary school	0.6840**	0.5935**	0.7530**	0.6621**
	[0.1565]	[0.1569]	[0.1590]	[0.1593]
Share of adult population completed senior secondary school	0.5971**	0.3853*	0.6300**	0.4170**
	[0.1524]	[0.1525]	[0.1529]	[0.1529]
Share of adult population completed higher education	2.1831**	2.2525**	2.1808**	2.2516**
	[0.3642]	[0.3606]	[0.3643]	[0.3603]
Average age of district population	0.1266**	0.1332**	0.1366**	0.1432**
	[0.0316]	[0.0313]	[0.0319]	[0.0315]
Average age of district population – squared	-0.0018**	-0.0017**	-0.0019**	-0.0019**
	[0.0006]	[0.0006]	[0.0006]	[0.0006]
Share of females in district population	-0.5806	-0.4029	-0.6734+	-0.4847
	[0.3743]	[0.3725]	[0.3762]	[0.3737]
Share of population age 15-60 that works at least 20 hours/week	0.0459	0.0212	0.0604	0.0355
	[0.0927]	[0.0934]	[0.0928]	[0.0935]
Share district population living in rural area	-0.3545**	-0.1990**	-0.3499**	-0.1943**
	[0.0582]	[0.0643]	[0.0581]	[0.0642]
Number of split districts			-0.0276*	-0.0273*
			[0.0114]	[0.0113]
Constant	12.1977**	11.8803**	12.1056**	11.7816**
	[0.4869]	[0.4820]	[0.4887]	[0.4832]
Observations	2871	2871	2871	2871
Number of District ID	261	261	261	261
R-squared		0.16		0.17

Source: author analysis
Note: Standard errors in brackets; + significant at 10%; * significant at 5%; ** significant at 1%

In overall review for these four models, for every single independent variable there is not any inconsistency in sign of the coefficient. This implies that the models are probably close to each other. However, the Hausman test skewed it preference to fixed effect model as it found correlation between the district-level individual effects and the independent variables (regressors) in the equations. Again, the results are consistent regardless the presence of number of split districts in the equations. Combining the preference to fixed effect when education is represented by average years of education, we can conclude the fixed effect model is robust for these two alternatives of educational measurements.

Let me start with examining the covariates before discussing the main variables. The sign of the covariates are the same as in the first examination using average years of education, such that these two measurements of education have things in common in the direction of change. However, for the base line with fixed effect estimation, the coefficient for share of female in the district is now 2.58 times negatively stronger than when it uses average years of education. Moreover, the coefficient for share of population living in rural areas is now 2.02 times negatively stronger.

The baseline model of fixed effect estimation informs that a 1% increases in share of primary school graduates will likely to increase per capita GRDP by 0.018%. Meanwhile a 1% increase in share of labour force completed junior high school, senior secondary school and higher education will increase per capita GRDP by 0.05935%, 0.03853 and 0.22525% respectively. When number of split district enters the equation, the magnitude of coefficient for primary school reduces by 0.0037 point and the coefficient for higher education reduced by 0.0009 point. Meanwhile the coefficients for junior and senior secondary education increases by 0.0275 point and 0.0317 point respectively. The reductions in coefficient for the highest and lowest educational levels are very low. On the other hand, the increases in the coefficient for the secondary education categories is 7.43 to 8.57 times change in coefficient for primary school and 30.56 to 35.22 times change in coefficient for higher education. The sign of coefficient for number of split district is negative and can be interpreted that decentralization is costly. However, as the notion of "narrow" decentralization enters the equation, the middle category of educational level does become more productive or more profitable in macroeconomic sense. The channel to this increase of the role of secondary school is most likely because since the launch of regional autonomy, one of its important features is the shift of responsibility for primary and secondary educational planning from central government to regional government. Most likely the regional government have more information on local labour market and hence more able to provide a more realistic educational blueprint for secondary school development. Meanwhile those with primary school education are more likely lost in competition to the secondary school graduates. Provided that higher educational institutions are not available in every district and even if there is, the supervision still comes from central government, the share of labour force completed higher education has poor link to decentralisation. Statistically,

this may be reflected in robustness of coefficient when estimation is run with and without the "narrow" definition of decentralization, which in Indonesia termed as "blossom" (Indonesia: *pemekaran*)[17]. However, the narrow definition of the decentralization - which is represented by number of split districts - lost its statistical significance when a dynamic model is introduced (Table 4.7, Model (2))

Table 4.7
Impact of Educational Composition of Labour Force on Per capita regional income: Dynamic Panel Data

Variables	(1) Baseline, GMM	(2) With number of split districts, GMM
L1. log(per capita GRDP at 1993 constant price (Rp/head))	0.0888	0.0881
	[0.0617]	[0.0591]
L1. share of adult population completed primary school	0.8936+	0.8541
	[0.4908]	[0.6346]
D1. share of adult population completed primary school	0.8987*	0.8696+
	[0.3604]	[0.4678]
L1. share of adult population completed junior secondary school	1.4167	1.7007
	[1.3419]	[1.7108]
D1. share of adult population completed junior secondary school	1.1492	1.3561
	[0.9449]	[1.2858]
L1. share of adult population completed senior secondary school	2.3458	2.1965
	[1.5704]	[1.4285]
D1. share of adult population completed senior secondary school	1.7198	1.6181
	[1.1160]	[1.0107]
L1. share of adult population completed higher education	4.9728+	4.9980*
	[2.5464]	[2.4636]
D1. share of adult population completed higher education	3.5583*	3.5835*
	[1.6603]	[1.5889]
Average age of district population	0.5181*	0.5052+
	[0.2424]	[0.2812]
Average age of district population- squared	-0.0091*	-0.0088+
	[0.0044]	[0.0051]
Share of females in district population	3.7920*	3.4856
	[1.6790]	[2.6781]
Share of population age 15-60 that works at least 20 hours/week	0.2938*	0.3110+
	[0.1321]	[0.1712]
Share district population living in rural area	0.2423	0.2393
	[0.2226]	[0.2219]
Number of split districts		-0.0275
		[0.1661]
Constant	2.2682	2.6110
	[3.7650]	[4.9581]
Observations	2610	2610
Number of District ID	261	261
R-squared		

Source: author analysis
Note: Robust standard errors in brackets; + significant at 10%; * significant at 5%; ** significant at 1%. L1 is one year lag, D1 is one year difference

[17] See Vel (2008) for example on the complexity of narrow decentralization is West Sumba, Southern Indonesia. For example on related performance on educational sector, see Akhmadi et al (2003)

As can be seen be seen in Table 4.7, in absolute term its coefficient is 6.04 times smaller than its standard error of estimation such that the interval estimation is too wide compares to the point estimation, and it covers the values of zero within its distribution. The coefficient is only significance at 23.2% confidence level, making it hardly useful for range estimation or for prediction.

With the insignificance of the coefficient for number of split districts, I now rely only on the baseline model for the meaningful interpretation. Recall that the estimation model is as such that it disentangle the short term effect and long term effect of educational composition of labour force to per capita GRDP. The estimation is also freer from endogeneity because it used instrumental variables.

The short term effect of 1% point increase in share of proportion of adult completed higher education to increase in per capita GRDP is 0.03583%. The impact is decreasing for lower educational level: for senior secondary school 0.001798%; for junior secondary school 0.011492%, and for primary education 0.008987%. The annual change in share of labour force completed higher education is 0.018573%. This change contributes to the increase of per capita GRDP by 0.6609%. With similar calculation, the change in share of labour force with senior secondary, junior secondary and primary school graduates are 0.7656%, 0.4175% and -0.3073% per year respectively (see Table 4.8).

Table 4.8
Economic Significance of Increase in Share of Educated Labour Force

Variable	Coefficient (Table 4.7)	annual change (Table 4.2)	Increase growth (%)
share of adult population completed primary school	0.8987	-0.003419	-0.3073
share of adult population completed junior secondary school	1.1492	0.003633	0.4175
share of adult population completed senior secondary school	1.7198	0.004452	0.7656
share of adult population completed higher education	3.5583	0.001857	0.6609
Total			1.5367

Source: author analysis

Using the change of share educational attainment of labour force during the period 1993-2003, the cumulative impact of change in composition of labour force during that period is 1.5367% per year. Meanwhile 1% point increase in the lagged values of share of labour force completed higher education, senior secondary education, junior secondary education and primary school education will give raise to per capita GRDP for 0.049728%, 0.023458%, 0.014167, and 0.008938% respectively.

Table 4.9 compares the coefficient for lagged values in share of labour force with certain educational attainment. The coefficient for higher education is 5.56 times stronger than primary school's, 3.51 times stronger than junior secondary education's and 2.21 times stronger than senior secondary education's. There is

strong tendency the social return to education (as coefficient for share of certain educational level in last year) is increasing with the improvement of educational composition gained by the society.

Table 4.9
Comparison of Long Term Social Return to Educational by Level of Education of Labour Force

	L1. share of adult population completed primary school	L1. share of adult population completed junior secondary school	L1. share of adult population completed senior secondary school	L1. share of adult population completed higher education
L1. share of adult population completed primary school	1.00	1.59	2.63	5.56
L1. share of adult population completed junior secondary school		1.00	1.66	3.51
L1. share of adult population completed senior secondary school			1.00	2.12
L1. share of adult population completed higher education				1.00

Source: author analysis

Further comparison between coefficients for change in share of labour force with certain educational level is presented in Table 4.10. The coefficient for higher education is 3.96 times stronger than primary school's, 3.10 times stronger than junior secondary education's and 2.07 times stronger than senior secondary education's. There is also a strong tendency that the social return to education - measured as value of coefficients for change in share of certain educational level in last year - is increasing with the improvement of educational composition gained by the society.

Table 4.10
Comparison of Short Term Social Return to Educational by Level of Education of Labour Force

	D1. share of adult population completed primary school	D1. share of adult population completed junior secondary school	D1. share of adult population completed senior secondary school	D1. share of adult population completed higher education
D1. share of adult population completed primary school	1.00	1.28	1.91	3.96
D1. share of adult population completed junior secondary school		1.00	1.50	3.10
D1. share of adult population completed senior secondary school			1.00	2.07
D1. share of adult population completed higher education				1.00

Source: author analysis

4.6 Test of Provincial Spill-Over Effect of Education

Recall that the estimation strategy that I proposed is accurate if districts do not experience educational spill-over effect in significant manner. One of the phenomena that I believe to contribute to cross-district spill over effect is the commuters who stay in one district and work in another district. In this condition, the education of labour force do not fully affect the per capita income of but share the impact between the district they work and the district they live in. I follow the principle suggested by Moretti (2004) on estimating spill-over effect. The results detailed results are presented in Appendix 1, while selected variables are presented in Table 4.11. The variable of interest is the lagged value (L1) of average years of education in province and annual change (D1) in average years of education in province, and the estimation employed GMM estimation..

Table 4.11
Test of Potential Cross-District (within Province) Education Spill-Over: GMM Estimation

Varble	With spill over element	Without Spill over Element (from Table 4.8, Model (1)
L1. log(per capita GRDP at 1993 constant price (Rp/head))	0.0943 [0.0646]	0.0888 [0.0617]
L1. Average years of education in province	-0.0379 [0.1947]	
D1. Average years of education in province	-0.1198 [0.1318]	
L1. share of adult population completed primary school	0.7374 [1.6115]	0.8936+ [0.4908]
D1. share of adult population completed primary school	0.8628 [1.1817]	0.8987* [0.3604]
L1. share of adult population completed junior secondary school	2.2840 [2.3535]	1.4167 [1.3419]
D1. share of adult population completed junior secondary school	1.9279 [1.6794]	1.1492 [0.9449]
L1. share of adult population completed senior secondary school	2.3211 [1.4658]	2.3458 [1.5704]
D1. share of adult population completed senior secondary school	1.8036+ [1.0308]	1.7198 [1.1160]
L1. share of adult population completed higher education	6.4412 [4.3870]	4.9728+ [2.5464]
D1. share of adult population completed higher education	4.7423 [2.9636]	3.5583* [1.6603]
Observations	2610	2610
Number of District ID	261	261

Source: author analysis. Only presented variables on education. See Appendix 1 for detailed results
Note: Robust standard errors in brackets; + significant at 10%; * significant at 5%; ** significant at 1%. L1 is one year lag, D1 is one year difference

There are two important results:

First, the average years of education in provincial level does not have adequate statistical significance. In absolute terms, both the lagged values and the annual change of years of education in provincial level have coefficient which

magnitudes are smaller than its standard error of estimation. This would imply that the estimation does not have high precision. Indeed, those coefficients are rejected as true when I use the 90% confidence interval. This is because the lagged values of years of education in provincial level could only passed at maximum 21.3% confidence level, while the annual change in years of education in provincial level could only passed at maximum 64.7% confidence level.

The second result is that even if their statistical significance is not considered (Mccloskey and Ziliak 1996), the values of those mentioned coefficients are negatives, and with those negative coefficient there is no signal of positive spill-over taking places.

Taking into account these two results, we can conclude that the assumption of no spill-over effect of education holds, and the estimation strategy that emplyed in this chapter is trustworthy. There are two possible reasons for the absence, on average, of within province educational spill-over.

First, the country is composes of more than 15000 islands with differences in developmental stages. Some island may not really connect to other districts.

Second, on the era of regional autonomy since year 2000, the district has become more disintegrated rather than integrated. For instance the demand to split the district according to ethnicity is very strong after the "reformation" era (Vel 2008). Third, as mentioned by Manning and van Diermen (2000), the country is in transition into a democratic country. Supported by the notion of people centered development, the document of Long Term Development Plan is decided by each and every district without close integration to provincial and national development plan. Though good in accommodating local people's voice, there is no guarantee that the voice of the people is in line with the principles of sustainable development.

Chapter 5
CONCLUSIONS

Examining the social return to education in Indonesia using district panel data for the period of 1993-2003, several findings need to be highlighted:

First, the educational composition of labour force is changing. Labour force completed primary school education decreased by 0.003419% point per year, while labour force completed junior secondary school education increased by 0.003633% point per year. On the higher level, labour force completed senior secondary school education increased by 0.004452% point per year and those with university degree increased by 0.001857% point per year.

Second, the average years of education increased by 2.2474 years of schooling for the decade of 1993-2003, and according to fixed effect estimation the 2.2474 years increase in associated with total of 20.2715% district per capita GRDP growth in one decade or equals to 2.02715% per year.

Third, based on GMM estimation on dynamic panel data model, the short run social return to education measured as coefficient for average years of schooling is 8.27%, while its long run social return is 11.84%.

Fourth, based on GMM estimation on dynamic panel data model, the short run return to education measured as coefficient for share of labour force completed higher education is 3.5583, implies that a 1% increases in share of labour force completer higher education will give raise to per capita GRDP by 0.035583%. This return is 2.07 times stronger that the return for senior secondary education, 3.10 times stronger than the return for junior secondary education and 3.96 times stronger than the return for primary school education.

Fifth, also on GMM estimation on dynamic panel data model, the long run return to education measured as coefficient for share of labour force completed higher education is 4.9728, implies that that a 1% increases in share of labour force completer higher education will give raise to per capita GRDP by 0.049728%. This return is 2.12 times stronger that the return for senior secondary education, 3.51 times stronger than the return for junior secondary education and 5.56 times stronger than the return for primary school education.

Sixth, there is tendency that long term social return is higher than short term social return.

Seventh, because the estimation strategy is more trustworthy when the presence or the absence of educational spill-over across district within province is taken into account, the test proof that there is not enough support for the presence of the spill-over of education across district within province.

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Appendix

Appendix 1
Test of Potential Cross-District (within Province) Education Spill-Over:
GMM Estimation

Variable	Baseline	With number of split districts
L1. log(per capita GRDP at 1993 constant price (Rp/head))	0.0943	0.0932
	[0.0646]	[0.0595]
L1. Average years of education in province	-0.0379	-0.0433
	[0.1947]	[0.1933]
D1. Average years of education in province	-0.1198	-0.1241
	[0.1318]	[0.1335]
L1. share of adult population completed primary school	0.7374	0.6402
	[1.6115]	[1.7848]
D1. share of adult population completed primary school	0.8628	0.7935
	[1.1817]	[1.3019]
L1. share of adult population completed junior secondary school	2.2840	2.7921
	[2.3535]	[3.6625]
D1. share of adult population completed junior secondary school	1.9279	2.2973
	[1.6794]	[2.6481]
L1. share of adult population completed senior secondary school	2.3211	2.0986
	[1.4658]	[1.5414]
D1. share of adult population completed senior secondary school	1.8036+	1.6520
	[1.0308]	[1.0770]
L1. share of adult population completed higher education	6.4412	6.6494
	[4.3870]	[4.6090]
D1. share of adult population completed higher education	4.7423	4.8981
	[2.9636]	[3.1563]
Average age of district population	0.5888*	0.5756*
	[0.2344]	[0.2417]
Average age of district population – squared	-0.0104*	-0.0102*
	[0.0042]	[0.0044]
Share of females in district population	5.8386**	5.3955+
	[2.1070]	[2.9878]
Share of population age 15-60 that works at least 20 hours/week	0.2569+	0.2858
	[0.1468]	[0.1972]
Share district population living in rural area	0.3107	0.3159
	[0.3558]	[0.3500]
Number of split district		-0.0434
		[0.1632]
Constant	0.3467	0.7956
	[3.8395]	[4.6697]
Observations	2610	2610
Number of District ID	261	261

Source: author analysis
Note: Robust standard errors in brackets; + significant at 10%; * significant at 5%; ** significant at 1%. L1 is one year lag, D1 is one year difference