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Endowments, Location or Luck?

Evaluating the Determinants of Sub-National Growth in Decentralized Indonesia

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Abstract

Indonesia's "big bang" decentralization in 2001 shifted much of the responsibility for local economic development from central government to district and city governments, which today number more than 450. But the performance of these districts has varied widely. This paper attempts to understand the determinants of sub-national (district/city) growth in Indonesia and map how these determinants have changed since before the 1997/98 economic crisis. The authors exploit a rich dataset that includes a wide range of district-level characteristics, including education, population, cultural, economic, and infrastructure variables, as well as a set of variables relating to distance, to try to explain growth. The analysis finds that, after accounting for differences in other variables, poorer districts tend to grow faster than better off districts. Similarly, there is evidence of spatial divergence, in the sense that districts tend to grow faster if their neighbors are growing quickly. However, the quality of the existing district-level data makes it difficult to identify whether endowments or factors related to distance are systematically associated with growth.

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ENDOWMENTS, LOCATION OR LUCK?

Evaluating the Determinants of Sub-National Growth in Decentralized Indonesia[1]

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1. INTRODUCTION

Indonesia is a very diverse and geographically dispersed country. An archipelago of more than 17,000 islands, it stretches over 5,000 kilometers and across three time zones. The geography of the country ranges from rainforest and agricultural plains to deserts and alpine mountains (World Bank, 2007). It is the home for more than 500 different ethnic groups who speak 742 different languages.[4] But alongside this diversity exists strong concentrations of population — 60 percent of Indonesia's 245 million people (BPS, 2007) live on the island of Java, which covers only 6 percent of Indonesia's land area. Socio-economic conditions vary greatly across the country. The per capita regional GDP of Riau and East Kalimantan, two oil and gas producing regions, is almost 20 times higher than that of Maluku or East Nusa Tenggara (NTT). In some cities such as Denpasar, in Bali, and Bekasi, in West Java, poverty rates are below three percent, while in Manokwari and Puncak Jaya, both in Papua, they are in excess of 50 percent (World Bank, 2007).

Indonesia underwent a "big bang" decentralization in 2001, and administrative, fiscal and political control over many policies has been devolved to (now) 33 provinces and over 450 district/city level governments. Thirty-six percent of government expenditure is now conducted by regional (provincial and district) governments, with very large increases in district government budgets in the past few years (World Bank, 2007). Each province and district now has its own parliament (DPRD) with representatives elected by the general population, as well as the direct election of the district heads.[5] Provincial governments coordinate and perform strategic functions that affect more than one district government. District level governments are responsible for most service delivery, local road building and much regulation of the local economy.

Given its substantial decentralization of economic policy-making to the district level, the large number of regions, and the diversity of their endowments, Indonesia provides a particularly interesting opportunity to explore the determinants of sub-national growth. The objective of this paper is to identify whether the differences in economic performance observed at the district level are due to the different endowments of districts (whether of natural resources, human capital or physical infrastructure); or whether they stem primarily from spatial factors (e.g. proximity to large cities, or distance from the capital). A large recent literature has emphasized the importance of spatial factors in development,[6] but much of this literature looks at these factors in a cross-country context, making it necessary to also account for differences in the institutional and legal structures of different countries. By contrast, local governments in Indonesia share the same

[4] Gordon, 2005.
[5] Governors for a province; *bupati* for rural districts called *kabupaten*; *walikota* for urban districts, or cities, called *kota*.
[6] See World Bank, forthcoming; Kim (2008) provides a review of the literature on spatial inequality; also see Hill (2008), which provides an overview of the economic geography of Indonesia, and Arze del Granado (2008), which describes the economics of concentration in Indonesia, both published in the World Development Report companion volume titled "Reshaping Economic Geography".

institutional and legal framework, providing the potential to differentiate more clearly between the impact of endowments and spatial factors on economic growth.[7] The vast diversity, geographic disparity and socio-economic differences across more than 450 autonomous districts and cities provide enough units of observation to test for the determinants of growth. Furthermore, Indonesia has economic data that cover several years before the East Asian crisis of 1997/98, the crisis and immediate post-crisis period, as well as the first five years of decentralization, thus making it possible to explore whether the determinants of sub-national growth have changed over time.

This paper uses districts rather than provinces as the unit of analysis. Most previous studies on Indonesia have used provincial level data (Garcia and Soelistianingsih, 1998; Wibisono, 2003), although recently some other researchers have started using district level data (Landiyanto et al, 2005; Fitrani, 2005). This paper builds on the work done by Fitrani (2005), who looked at the growth performance of Indonesia's districts from 1993 to 2003, finding conditional growth convergence after decentralization. This paper extends Fitrani's work in three ways. First, it covers a longer time period (1993-2005) allowing a longer period of analysis of the decentralization period which started in 2001; second, it extends the range of growth determinants to include new data on economic geography; and, finally, it briefly explores the determinants of changes in sub-national growth, i.e. "growth accelerations and decelerations" and estimates the characteristics associated with districts that experienced such accelerations.

The paper is structured as follows: In Section 2, we describe the large database of district level characteristics that has been constructed for this research. Section 3 explores the spatial pattern of economic activity in Indonesia and how it has changed over time, whilst Section 4 undertakes a descriptive analysis of Indonesia's sub-national pattern of growth from 1993 to 2005. In Section 5 we discuss the estimation approach and provide empirical analysis of the determinants of growth at the sub-national level. We also identify the pattern of growth accelerations (or decelerations) and attempt to explain these changes. The conclusions and some policy implications are presented in Section 6.

2. DATA

Most of the data in this paper are generated from various surveys and censuses conducted by the Central Bureau of Statistics (BPS). The BPS conducts the National Socio-Economic Survey (Susenas) every year, which provides comprehensive socioeconomic indicators at the district level. Every three years, the BPS also conducts the Village Potential Census (Podes). This covers all villages in Indonesia, collecting data on basic infrastructure and socioeconomic conditions. We have also drawn budget data from the Regional Finance Information System (SIKD-Ministry of Finance), investment data from the Regional Investment Coordinating Boards (BKPMD), and

[7] Districts do, however, vary politically and this may also influence growth.

electoral data from the Ministry of Home Affairs, the General Election Commission (KPU) and The Asia Foundation (TAF).

To calculate per capita growth we have used the Gross Regional Domestic Product (GRDP) and the population data from the BPS.[8] The BPS calculates GRDP data at the provincial and district levels, but there is a two-year lag in producing the latter. Thus the latest available district level GRDP data are from 2005.[9] The measure of growth used throughout is the geometric growth rate over the period.[10]

It is important to recognize that there are some significant weaknesses in the district level GRDP data produced by BPS. GRDP calculations are conducted separately by the BPS offices at the national, provincial and district levels and, although all offices are supposed to follow a common methodology, this can result in variations in the quality with which the data are compiled. Moreover, BPS offices at the provincial and national levels do not ensure that the lower level figures add up to the provincial and national aggregates. As a result, the sum of the published district GRDP varies from 91 percent to 105 percent of the published provincial GRDP depending on the province.[11] These weaknesses in the district level GRDP data do not necessarily create problems in the analysis of growth over time, although they are likely to add noise and make it harder to identify systematic influences on growth. Nonetheless, to account for potential biases we also conducted our analysis using average consumption from the household survey data in the place of GRDP growth.

One of the main challenges in constructing the database is in dealing with splitting districts. Enthusiasm for decentralization at the local level (coupled with strong fiscal incentives) has resulted in many districts splitting to form new, smaller districts. Over the years observed, the number of district governments in Indonesia grew by more than 50 percent. In 1999, the BPS recorded 299 districts in Indonesia. Within two years the number had increased rapidly such that the number of district governments receiving the General Allocation Fund (DAU) from the central government in 2001 was 336.[12] In 2005, Indonesia had 32 provinces and 434 districts that

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[8] There are in fact three different sources of population data: interpolations from the Population Census; Susenas data; and the population measures used by the Ministry of Finance to calculate fiscal transfers. In this analysis we use the first one because these are the official figures published by the BPS.

[9] The BPS calculates the real GRDP data using two base years. Data from 1993 to 2003 are based on 1993 prices, whilst data from 2000 to 2005 are based on 2000 prices. Initially, we attempted to calculate a complete series for real GRDP in 2000 prices by inflating the figures for real GRDP prior to 2000 by the average ratio of real GRDP in 2000 prices to GRDP in 1993 prices for the overlapping years (2000-03). Unfortunately, inconsistencies in the re-basing process make this impossible. Consequently, we use 1993 as the base year for analysis for the periods 1993-97, 1999-2001, and 1993-2003, and the year 2000 as the base year for analysis of the period 2001-05.

[10] Sensitivity tests using the average annual growth rate and the logarithmic growth rate give qualitatively the same results.

[11] District GRDP sums to 98 percent of the provincial GRDP for the median province.

[12] The number of districts is not consistent across sources of data. For example, BPS's Susenas and Podes surveys do not always have the same number of districts even when they are conducted in the same years. This is because of different sampling frame used at different times of the year. In addition the *de jure* and *de facto* status of a new district

received DAU.[13] In order to avoid spurious changes in per capita growth rates resulting from the splitting of districts, we have used GRDP data as our reference point. GRDP data for the pre-decentralization era are only for 292 districts. We therefore collapsed the post-decentralization data in order to provide data for exactly the same set of 292 districts throughout.[14]

We have also compiled a wide range of variables that can be used to explain district level economic growth. Specifically our data include three types of variables:

Factor endowments – We follow the neoclassical Solow growth model (Barro and Sala-i-Martin, 1994) by interpreting capital in a broad sense including measures of population and human capital as well as the availability of physical capital or land. Following Barro (1991), we use education as a proxy for human capital under the assumption that for a given starting value of GRDP per capita, a country's subsequent growth rate is positively related to this human capital. Good measures of physical capital are difficult to obtain at the district level. However, we do have data on the share of households with telephone connections, which we use as an indication of the development of physical capital.

Geography – Geographical location and topography may be as important for district growth as natural resource endowments. For example, Krugman (2007) emphasizes that transaction costs across distance play a crucial role in shaping a pattern of trade that can induce growth. We therefore include some proxies for remoteness and topography in the data. Specifically, we measure distance by calculating the straight line distance from the main town of the district to the provincial capital and to the largest five cities in the country.[15] We also incorporate dummy variables for whether these destinations are separated from the district town by sea.

A district's growth performance is also affected by the growth performance of its neighbors. We calculate the weighted growth of neighboring districts using the following formula (Catin et al, 2005):

$$GAW_{it} = \sum_{q=1}^{m_i} \left(ga_{qt} \times w_{qt} \right)$$

where $GAW_{i,t}$ is the weighted average growth performance of the districts that are neighbors to district i at time t. We use GDP weights for importance i.e. $w_{,q,t} = GDP_{q,t} / {}^{mi}\Sigma_{q=1} GDP_{q,t}$. Growth

is recorded differently by different institutions. To be consistent, we have used the definition of the Ministry of Finance — an autonomous province/district is the one that receives DAU in the beginning of fiscal year.

[13] Since 2001, the number of districts in Indonesia (excluding six non-autonomous district level governments in Jakarta) is: 2001 = 336, 2002 = 348, 2003 = 370, 2004 = 410, 2005-07 = 434, 2008 = 459.

[14] Our database has data for 292 districts. However, regression results do not always show this number of districts because data are missing for some observations.

[15] Ideally actual road distance would be a better measure of remoteness than straight line distance but unfortunately these data were not available.

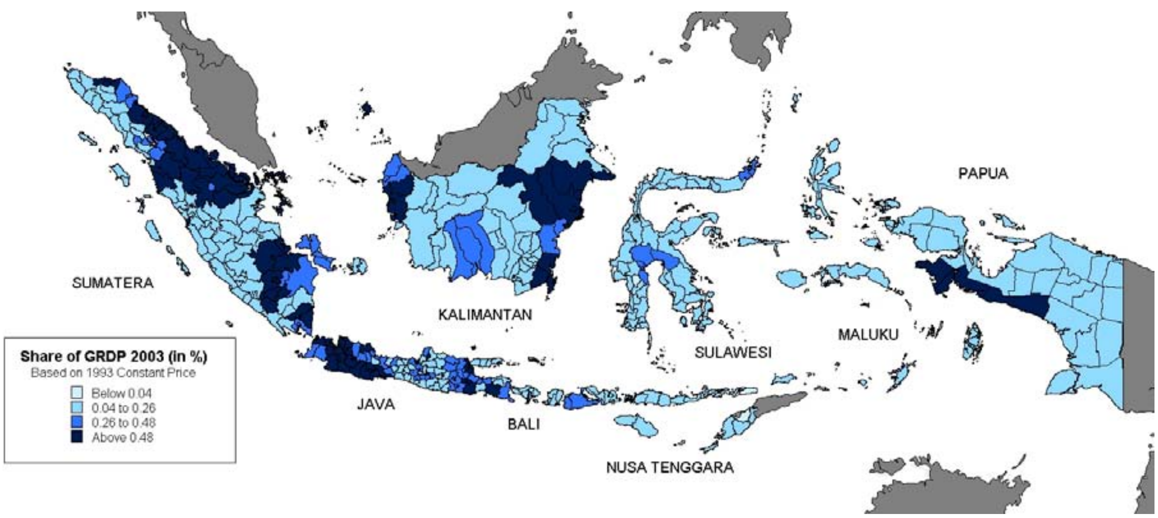
is calculated as $ga_{q,t} = \ln(y_{q,t}) - \ln(y_{q,t-1})$ where $y_{q,t}$ stands for the real GRDP of neighbor district *q* in time *t* and m_i is the number of neighboring districts of district *i*.

Institutional and policy variables – Ideally, we would also like to be able to reflect the potential growth impact of district level politics and local policies by including data on local parliamentary elections, as well as the direct elections of local mayors and district heads. Unfortunately, because these elections are relatively new, these data are only available for the most recent years and are therefore unlikely to be exogenous to the growth process themselves. We do however include the Ethno-linguistic Fragmentation Index as a proxy for the extent of cultural and linguistic homogeneity, which has been shown to influence growth in the African context (Easterly and Levine, 1997). A complete list of data and descriptive statistics are available in Appendix 1.

3. THE SPATIAL INEQUALITY OF ECONOMIC ACTIVITY IN INDONESIA

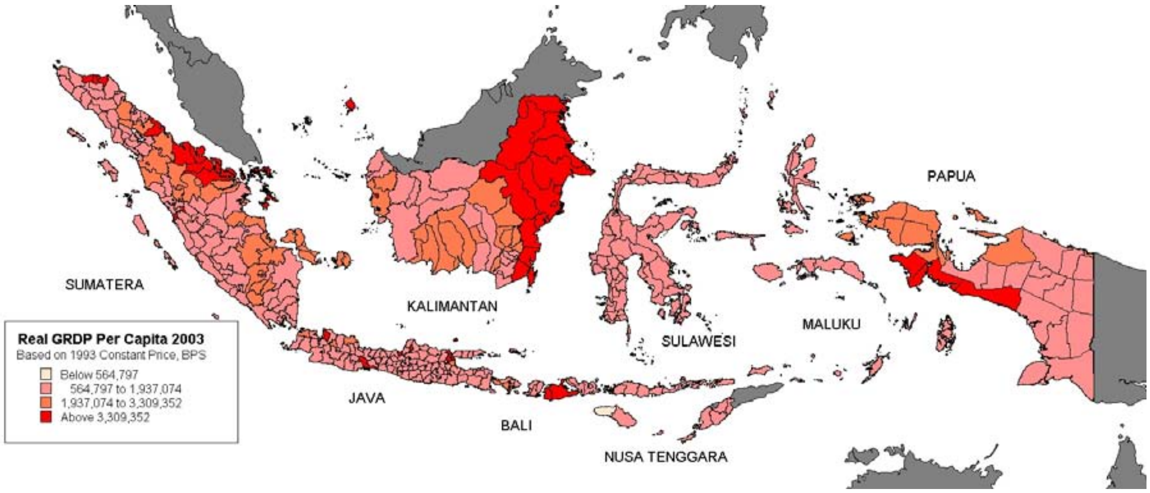
As in most countries, economic activity is very concentrated in Indonesia. Figure 1 shows a map of district GRDP. The share of national GRDP is much higher for districts near the major cities of Jakarta, Medan and Surabaya and also much higher in the natural resource rich locations of East Kalimantan, Riau and Papua.

Figure 1: District share of national GRDP in Indonesia, 2003



This concentrated pattern of GRDP does not, however, translate into an equally concentrated patter of per capita GRDP (Figure 2). This is because economic activities tend to locate in districts with higher populations and, conversely, because people tend to move to locations with better economic opportunities. The main exception to this is in more remote natural resource abundant locations, particularly those involving capital intensive point-source resources, such as oil and gas. In these locations, the GRDP per capita is often very large since this measure simply divides the substantial value-added of the resource extractive activity by a relatively small population. Generally, GRDP per capita is a poor indicator of average welfare in such locations — indeed many of these locations have high levels of poverty. The correlation between mean district per capita expenditure and district per capita GRDP jumps from 0.39 to 0.63 simply by excluding five oil-rich districts.

Figure 2: District per capita GRDP in Indonesia, 2003



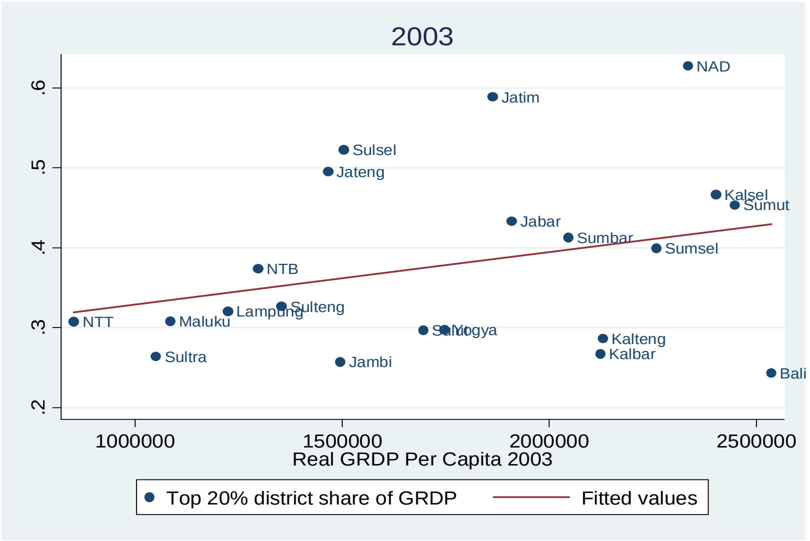
It is also interesting to explore economic concentration at the provincial level. The left panel of Figure 3 shows the share of provincial GRDP made up by the top 20 percent of districts within it[16] against the per capita GRDP of the province. There is a clear positive relationship, with richer provinces tending to have a more concentrated distribution of economic activity. However, as with the national picture, this relationship disappears when considering the distribution of per capita GRDP. The right panel of Figure 3 shows the Gini coefficient of district per capita GRDP for each province. It is not generally the case that per capita GRDP is more unequally distributed in richer provinces. This is because richer provinces also have substantially more concentrated populations than provinces with lower per capita GRDP.

The pattern of spatial inequality of economic activity changed substantially between 1993 and 2003. Figure 4 shows the evolution of inequality between provinces and between districts over the period. Inter-provincial inequality of per capita GRDP has been falling steadily throughout the period.[17] At the same time, prior to the crisis, inter-district inequality was increasing, but has fallen since. This seemingly contradictory evolution of spatial inequality can be explained by the rise in inequality between districts within provinces prior to the crisis.

[16] Ranked by share of provincial GRDP.

[17] This is the continuation of a longer trend. Garcia et al., 1998, show that, from 1975 to 1993, Indonesia experienced a significant decrease in the disparity of provincial GRDP.

Figure 3: Concentration of economic activity by province



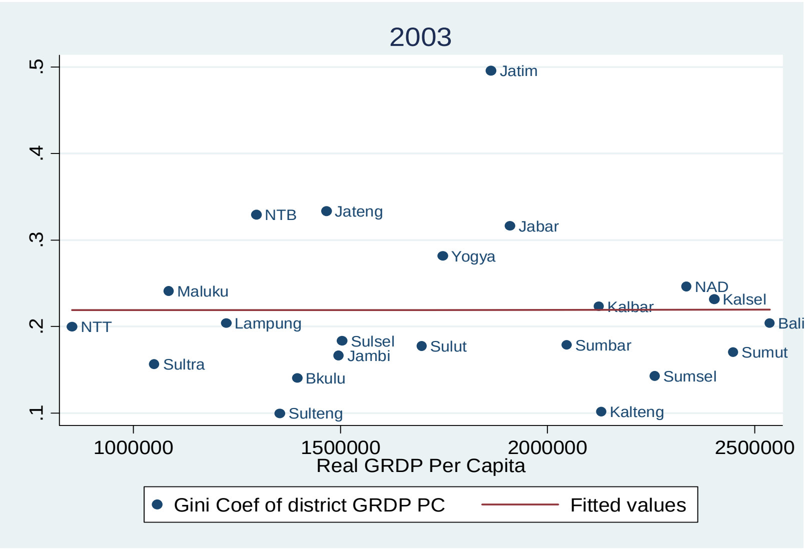
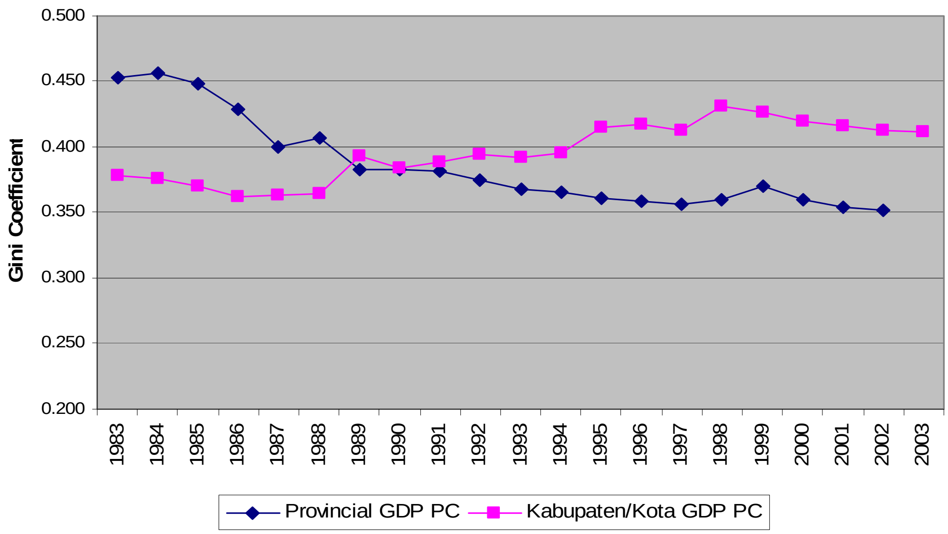


Figure 4: Evolution of inter-province and inter-district inequality[18]



The pattern of increasing inequality across districts varies by province and island group. Table 1 shows the Theil and Gini inequality measures for each of the major island groups in the country. The general pattern of an increase in inequality across districts at the national level is confirmed by the large increase in both inequality measures between 1993 and 1999. However, the national increase is driven by increasing inequality across districts in Sumatra, Java and Bali, Sulawesi, and Papua, with inequality across districts in Kalimantan, Maluku and Nusa Tenggara falling during this period.

Table 1: Inequality of GRDP per capita across districts by island group

	Theil Index				Gini Coefficient			
	1993	1999	2001	2005	1993	1999	2001	2005
Sumatra	0.14	0.20	0.13	0.15	0.26	0.31	0.27	0.27
Kalimantan	0.28	0.27	0.28	0.38	0.38	0.37	0.39	0.42
Java & Bali	0.26	0.33	0.38	0.35	0.35	0.38	0.40	0.39
Sulawesi	0.04	0.07	0.06	0.09	0.16	0.20	0.19	0.23
Maluku + Nusa Tenggara	0.10	0.07	0.20	0.17	0.23	0.20	0.32	0.29
Papua	0.75	1.15	0.80	0.76	0.57	0.68	0.57	0.57
Total	**0.31**	**0.43**	**0.35**	**0.35**	**0.37**	**0.41**	**0.39**	**0.39**
Eastern Indonesia	0.56	0.92	0.52	0.45	0.41	0.49	0.41	0.40
Western Indonesia	0.24	0.29	0.30	0.31	0.34	0.37	0.38	0.38
Java	0.28	0.35	0.41	0.38	0.36	0.38	0.41	0.40
Off Java	0.33	0.47	0.32	0.33	0.38	0.42	0.38	0.38

Source: Authors' calculation based on GRDP data from BPS. Gini coefficient of real GRDP per capita across districts.

[18] Provincial GDP data based on 1993 prices are only available from 1993 to 2002, while *kabupaten/kota* GDP data based on 1993 prices are available from 1993 to 2003.

Although the disparities in GRDP per capita across districts have declined since 1999, they are still higher after the crisis than before, with a Gini coefficient of real GRDP per capita across districts of 0.39 since 2005, compared with 0.37 in 1993. Table 1 shows that this is driven by a large decline in inequality between districts in Papua and, to a lesser extent, Sumatra, whilst inequality within the other major island groups has remained constant or increased. Although, almost every island group experiences a long-run increase in inequality across districts, the national increase is driven by widening disparities between districts in Java, with little change in the overall level of inequality across districts off Java.

But the recent decline in inter-district inequality is mostly due to the continued decline in inter-provincial inequality. This seemingly contradictory evolution of spatial inequality can be explained by decomposing inequality into two components: that due to the change in inequality between provinces; and that due to the change in inequality between districts within provinces. Interestingly, the decline in inter-district inequality since 1998 shown in Figure 4 does not result from improvements in the within-province distribution of per capita GRDP. Table 2 decomposes the change in national inter-district inequality[19] into changes in between-provincial inequality and changes in within-province inequality. Within-province inequality barely changes between 1998 and 2003, with almost all of the change in inter-district inequality being driven by the continued decline in inequality between provinces.

Table 2: Decomposition of changes in inter-district inequality

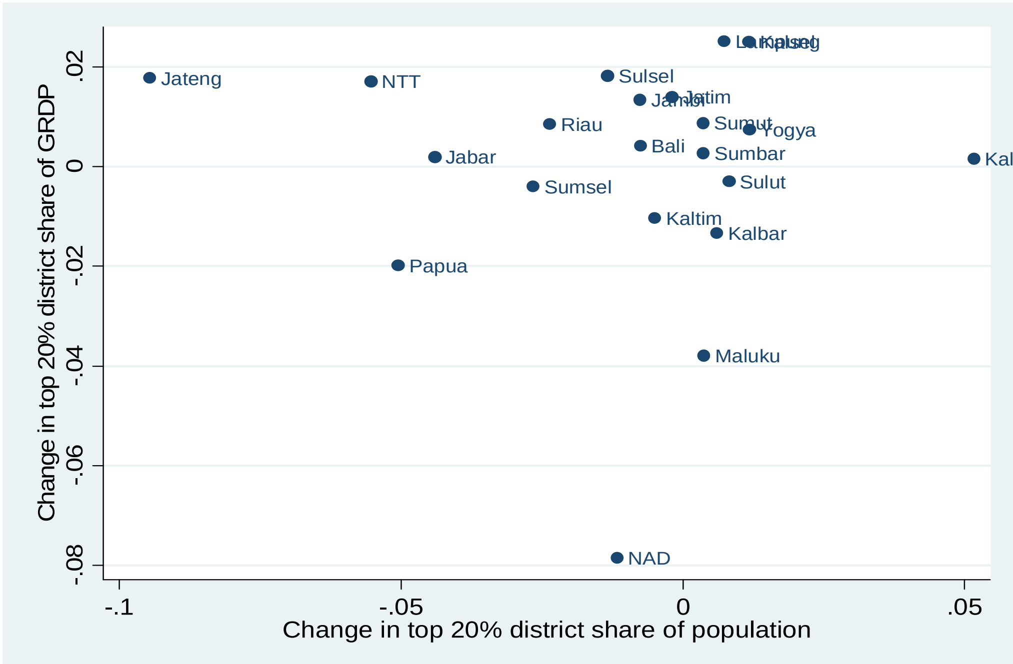
	GRDP PC			GRDP non oil&gas PC		
	1998	2000	2003	1998	2000	2003
GE(0)	0.297	0.263	0.242	0.26	0.229	0.213
within province	0.168	0.165	0.157	0.157	0.154	0.147
between province	0.129	0.098	0.085	0.103	0.075	0.066

Source: Authors' calculations based on GRDP data from BPS.

The results in Table 2 imply that poorer provinces have generally grown faster than richer ones. But large investments tend to be localized so that, if there were no compensating movements of people, they would tend to increase within-province inequality. The fact that there has been little change in within-province inequality suggests that changes in district GRDP within a province and changes in population have gone together. Figure 5 confirms this. Provinces that experienced increases in the share of their population in the top 20 percent of districts (by population) also tend to experience increases in the share of provincial GRDP coming from the top 20 percent of districts (by GRDP). Thus, as the economy becomes more concentrated spatially, so does the population and vice versa, with the result that within-province distribution of per capita GRDP has remained relatively stable.

[19] Using the Generalized Entropy class of decomposable inequality measures. Similar results were obtained using other measures.

Figure 5: Changes in population share and economic concentration by province

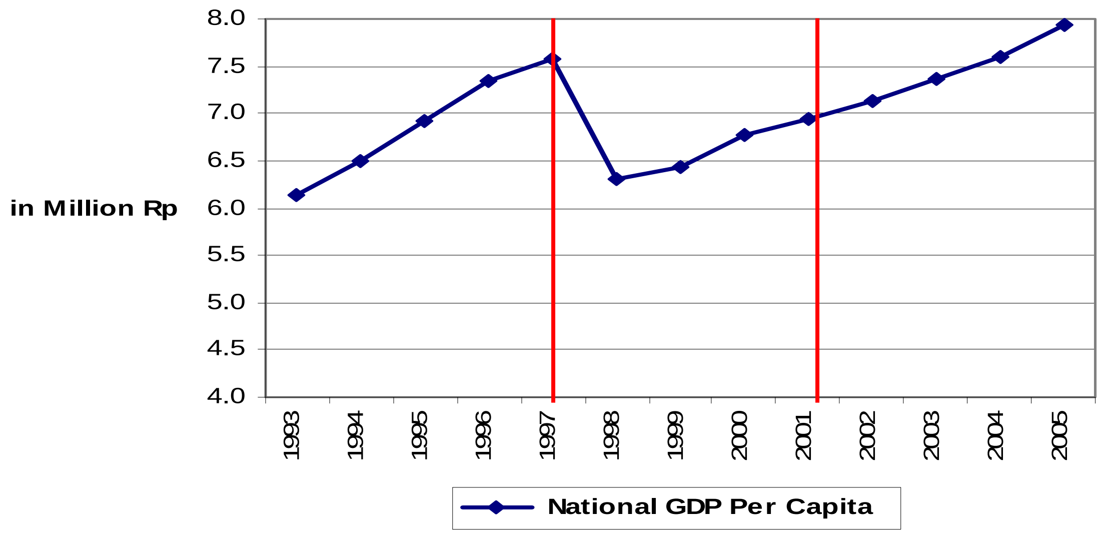


In order to explain what gives rise to these changes in the spatial pattern of inequality, it is necessary to understand the sub-national pattern of growth.

4. INDONESIA’S SUB-NATIONAL PATTERN OF GROWTH

Indonesia’s growth performance before the 1998 crisis was strong. The crisis dramatically reduced growth such that growth is only now recovering to near pre-crisis levels. For two decades before the Asian financial crisis in the late 1990s, Indonesia’s economic growth averaged 7 percent per annum. This was substantially higher than the average growth rate for all developing countries of 3.7 percent (Balisacan et al, 2003). At the end of 1997, the Asian crisis hit. Indonesia’s GDP per capita dropped 10 percent in 1998. After the crisis, following the fall of President Suharto’s New Order regime, growth resumed but at a much lower level (2 percent per annum between 2001 and 2005). Only during the past few years have annual growth rates begun to approach those prior to the crisis (Figure 6). We therefore undertake our analysis for three separate periods: pre-crisis (1993-97); post-crisis pre-decentralization (1999-2001); and post-decentralization (2001-05). This helps to identify whether the determinants of growth are significantly different in these three periods.

Figure 6: Indonesia's real per capital GDP 1993-2005: shock and recovery after decentralization



Source: Authors' calculations based on GRDP data from BPS. Real data (constant 2000 prices).

Economic activities and resources are concentrated in Java (Box 1). Java, Bali and Sumatra in general have relatively more advanced economic activities than other parts of the country, with manufacturing, trade and services dominating the economies on these three islands. Sulawesi, Maluku and Nusa Tenggara, on the other hand, are much less industrialized, with agriculture making up the main sector of their economies. Indonesia's population is heavily concentrated on Java, and Java generally has relatively better infrastructure compared with the rest of the country.

Box 1: **Uneven distribution of resources and economic activity across Indonesia**

- Java represents only six percent of the country's land area but accommodates almost 60 percent of the population.
- Java dominates the Indonesian economy producing 52 percent of the GDP; Sumatra produces 28 percent of GDP and Kalimantan 11 percent. Eastern Indonesia (Sulawesi, Nusa Tenggara, Maluku and Papua) collectively account for only 10 percent of GDP.
- Eastern Indonesia is lagging behind in terms of the quantity of its infrastructure as measured by access to electricity and telephones. In Papua, Maluku and Nusa Tenggara, less than 10 percent of households have access to a telephone and less than 40 percent of households have access to electricity.
- Java dominates all sectors except for oil, gas and mining. Sumatra and Kalimantan contribute 18 percent and 22 percent to this sector respectively.
- Manufacturing is the dominant sector in western Indonesia whilst agriculture is the dominant sector in eastern Indonesia.

Appendix 2 presents some facts and figures on the distribution of resources and economic activities across Indonesia.

The economic crisis marked a structural break in the growth performance of Indonesia's districts (Table 3). District-level growth before the economic crisis was fast, with the median district between 1993 and 1997 growing by 5.6 percent. In 1999-2001, the median growth rate across districts fell dramatically to 3.5 percent, and the variation of growth rates across districts was much greater, probably reflecting the differential impact of the crisis, as well as data issues in the immediate aftermath of crisis. The post-decentralization period saw a further decline in the typical district growth rate, with the median district growth in 2001-05 falling to only 3 percent.

Table 3 : Regional GDP per capita of Indonesia's districts

	(Median) Growth Rate in %		
	1993-97	**1999-2001**	**2001-05**
Sumatra	5.8	5.5	3.5
Kalimantan	5.7	6.2	2.7
Java & Bali	5.7	1.3	3.1
Sulawesi	5.3	5.5	3.0
Maluku + Nusa Tenggara	5.2	3.7	2.8
Papua	4.5	5.3	3.1
Total	**5.6**	**3.5**	**3.0**
Eastern Indonesia	5.2	4.8	2.9
Western Indonesia	5.7	2.9	3.1
Java	5.6	1.4	3.2
Off Java	5.5	5.0	3.0

Source: Authors' calculation based on GRDP data from BPS.
Note: Growth rates use real GDP in 1993 prices for 1993-97 and 1999-2001 and in 2000 prices for 2001-05.

Districts outside Java bounced back faster than districts in western Indonesia after the crisis. Prior to the crisis, median growth rates of districts in Java and off-Java were about the same, at 5.5-5.6 percent. However, districts off-Java recovered from the crisis far faster than those in Java. Median growth between 1999 and 2001 was 5 percent off-Java, compared with a typical growth rate of only 1.4 percent on Java. The same was true of eastern Indonesia,[20] which recovered from the crisis far faster than districts in western Indonesia. For example, the median growth rate in real GRDP per capita for Sulawesi was 5.5 percent. This relatively high growth in eastern Indonesia was triggered by growth in the agricultural and mining sectors. This is consistent with Alisjahbana and Yusuf (2004), who state that during the crisis the government tried to increase foreign investment by expanding oil, gas and mining exploitation.

Other factors also appear to be associated with district level growth. For example, cities (*kota*) have grown far faster than districts (*kabupaten*) since decentralization. Table 4 shows the median growth rate of *kota* and *kabupaten* for the three time periods. Cities bounced back far faster from the economic crisis (in part because they were much harder hit), but this faster growth rate has continued after decentralization, averaging 3.6 percent in cities compared with 3.0 percent in districts.

[20] Papua, Sulawesi and Nusa Tenggara.

Table 4 : Cities grow faster than regencies

	1993-97	1999-2001	2001-05
Regencies *(Kabupaten)*	5.4%	2.5%	3.0%
Cities *(Kota)*	6.2%	7.3%	3.6%

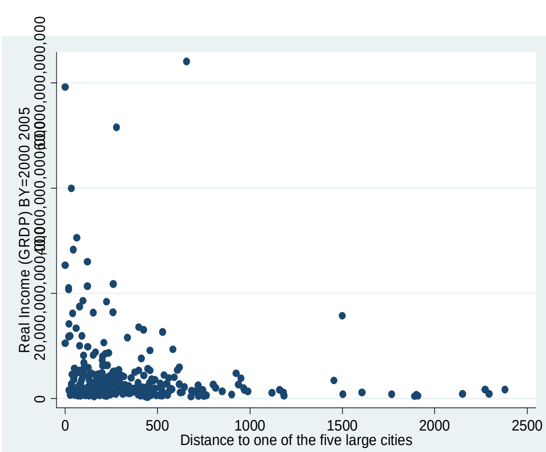
Source: Authors' calculations based on GRDP data from BPS. Real data (constant 1993 prices).

By contrast, being landlocked and having poor roads does not always mean slow growth. Contrary to the often cited disadvantages of landlocked countries, the growth rate of landlocked districts does not appear to be systematically lower than that of coastal districts. More surprising still is that the (perceived) quality of roads is not related to growth rates. Districts where villages report worse perceptions of road quality do not have slower growth rates than those that report higher quality roads, and having a higher share of villages with asphalt roads is only very weakly associated with higher growth.

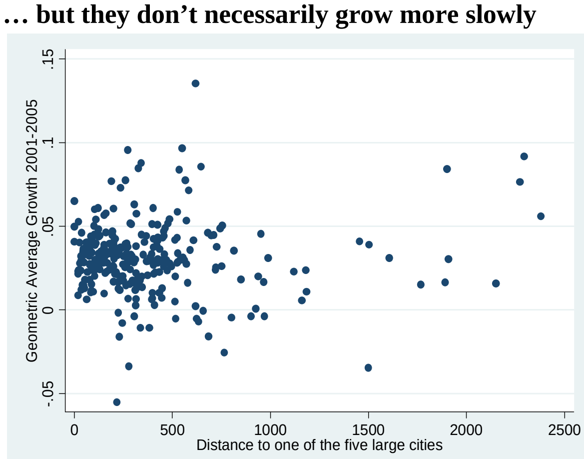
While there is a very strong relationship between being poor and being far from a large city, there is no obvious connection between remoteness and growth**.** There are no districts with a GDP larger than Rp 2 trillion (around US$222 million) that are more than 1,000 km from one of Indonesia's five large cities. On average, the growth rates of these smaller and more remote districts are no lower than those of districts far closer to the main economic centers of the country (Figure 7).

Figure 7: Does distance matter?

Further away places are poorer…



… but they don't necessarily grow more slowly



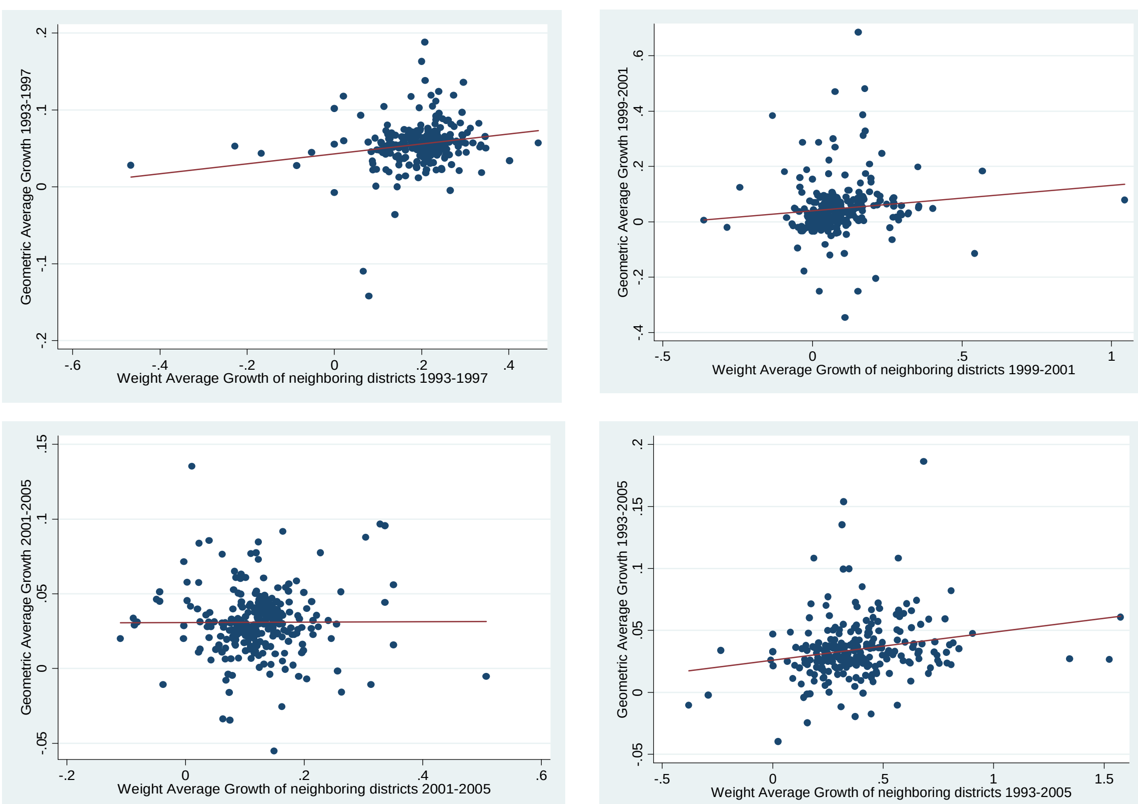
Source: Authors' calculations based on GRDP data from BPS. Real data (constant 1993 prices).

Districts' growth rates do, however, appear to be positively correlated with their neighbors' growth rates. Figure 8 shows the correlation between districts' growth rates with those of their neighbors. During the pre-crisis (1993-97) and post-crisis (1999-2001) periods there appears to be a positive association between the per capita growth of a district and that of its neighbors. After decentralization, however, this relationship appears rather weaker, although a positive relationship is also apparent for the period as a whole. Landiyanto et al. (2005), in their study of East Java, also found that districts surrounded by wealthy neighbors tended to grow faster.

Topography can also make a difference to growth. Districts that have many villages on the coast or in the hills (as opposed to in valleys or on plains) tend to be poorer. Between 2001 and 2005, they also tended to have lower growth rates, too. However, this relationship does not appear to hold prior to the economic crisis.

The possession of significant oil and gas resources does not necessarily boost district growth. Prior to the crisis, districts that relied heavily on oil and gas resources grew almost 2 percentage points more slowly than districts without oil and gas. The same is also true for the immediate post-crisis period and for the decentralization era, although the gap in growth rates has narrowed. Interestingly, this is only the case for districts in which oil and gas is always the largest sector; the growth rates of districts that have some oil and gas in their GRDPs are generally similar to those of districts that do not have oil and gas.

Figure 8: District growth is positively correlated with the growth of neighboring districts



Source: Authors' calculations based on GRDP data from BPS. Real data.

Note: Graphs for 1993-97 and 1999-2001 use constant 1993 prices; graph for 2001-05 and 1993-2005 use constant 2000 prices.

There is a strong association between the level of GRDP and the sectoral composition of a district's economy, but the sectoral distribution of GRDP is not closely linked to *growth* rates. The GRDP of districts with oil and gas is more than double that of those without these resources. The same is true for districts with a high (more than 10 percent) share of mining in their GRDP. Conversely, districts with a high share of agriculture in their GRDP (more than 20 percent) tend to have less than half the GRDP of those districts less dependent on agriculture. However, neither prominent oil, gas and mining resources, nor a high level of agriculture are significantly and systematically associated with higher or lower district-level growth rates.

There is no consistent tendency for districts with higher populations to grow faster. Between 1999 and 2001, an additional one million people raised the growth rate by 2 percentage points. This is consistent with standard growth theory: areas with higher amounts of labor per unit of capital will tend to grow faster towards an equilibrium steady-state growth rate. However, this may be a consequence of the recovery of cities hard hit by the crisis. There is no clear association between population and growth rates between 1993 and 1997, or between 2001 and 2005.

Growth is also associated with better education. Districts with higher net or gross enrollment ratios grow faster, with the association particularly strong for junior and senior secondary schools. Some cultural variables also appear to have an influence on growth. Interestingly, ethno-linguistic fractionalization is not directly associated with slower growth. But regions with higher religious fragmentation appeared to have higher growth prior to the crisis, but this immediate association disappears after the crisis.

The bilateral associations presented above make one important point clear: factors that are typically associated with higher GRDP per capita are not necessarily associated with higher growth. However, such bilateral associations can also be misleading. What is needed is a multivariate model of the determinants of growth, to which we now turn.

5. METHODOLOGY AND ESTIMATION

The initial exploration of the data in the previous section suggests that surprisingly few factors are decisively associated with economic growth at the district level. However, the analysis only looked at bivariate associations. In order to explore the determinants of growth in a multivariate context, we draw on the large economic literature on the determinants of growth (Barro and Sala-i-Martin, 1991, 1994; Barro, 1991) to construct a simple growth model. Specifically, we adopt three approaches to econometric estimation.

First, neoclassical growth theory suggests that poorer countries and poorer regions should converge towards their long-run steady state growth. We therefore examine the evidence in each of the three time periods (1993-1997, 1999-2001, and 2001-2005) of absolute income convergence, both with and without dummies for the different island groups, by estimating the convergence model provided by Barro and Sala-i-Martin (1991, 2004):

$$\gamma_{i,t,t+T} = \beta_0 + \beta(\ln y_{it} - \ln y_i^*) + \varepsilon_{it} \qquad (1)$$

where $\gamma_{i,t,t+T}$ is a per capita RGDP growth rate of region i between time t and t+T, y_{it} is region i's per capita RGDP at time t and y_i^* region i's steady state value, β is the coefficient that represents convergence rate and ε_{it} the error term. We extend this to incorporate possible spatial divergence by including the weighted growth of the neighboring districts as outlined above.

Second, we explore relative convergence, adding a set of variables representing the initial conditions of each time period. As noted above, these include measures of human and physical capital (population size, level of education, quality of pre-existing infrastructure); location and geography (whether on or off Java, the extent of urbanization, the topography of the region and its distance from major cities); economic structure (the share of different sectors, and the presence of terms-of-trade effects); and socio-cultural institutions (religious and ethno-linguistic fragmentation).

Third, we take into account the possibility of unobserved heterogeneity determining growth by estimating a fixed-effects panel estimate of annual growth. By definition, this approach excludes variables that are invariant over time.

5.1 CONVERGENCE OR DIVERGENCE?

OLS estimates of absolute convergence

Table 5 shows the OLS results testing for absolute convergence during the three time periods. There is little evidence for absolute convergence before the economic crisis. However, neighborhood effects do appear to have an influence, with the weighted average growth of the neighbors of each district having a significant positive effect on the growth rate of that district. The same conclusion holds even when island dummies are added to take into account possible different growth trajectories in different parts of the Indonesian archipelago.

In the immediate post-crisis period, there does appear to be strong absolute income convergence, but this probably simply reflects the fact that better-off areas of Indonesia were harder hit by the economic crisis. The evidence for spatial divergence disappears, as does income convergence, when island dummies are included.

During the decentralization era, the pattern of growth changes again. There is now evidence for absolute income convergence, but the growth of neighboring areas is no longer significantly associated with district level growth. The island dummies also indicate that growth in Sumatra was higher in the post-decentralization period, whilst at the same time growth in Nusa Tenggara and Maluku fell significantly behind that of the rest of the country (Java is the excluded island).

Table 5: Absolute convergence of real per capita GRDP growth

	Geometric average growth in real per capita GDP							
	1993-97	**1999-2001**	**2001-05**	**1993-2005**	**1993-97**	**1999-2001**	**2001-05**	**1993-2005**
Ln per capita real GDP, 1993	0.006			-0.009	0.004			0.011
	-0.004			(0.003)**	-0.005			(0.005)*
Weighted average growth of neighboring districts 93-97	0.059				0.051			
	(0.023)*				(0.022)*			
Ln per capita real GDP, 1999		-0.025				-0.027		
		(0.012)*				-0.015		
Weighted average growth of neighboring districts 99-01		0.092				0.032		
		-0.047				-0.047		
Ln per capita real GDP, 2001			-0.006				-0.008	
			(0.003)*				(0.003)**	
Weighted average growth of neighboring districts 01-05			-0.002				-0.008	
			-0.026				-0.027	
Weighted average growth of neighboring districts 93-05				0.021				0.017
				(0.007)**				(0.008)*
Dummy Sumatra Island					-0.008	0.051	0.005	0.007
					-0.005	(0.017)**	(0.003)*	-0.005
Dummy Kalimantan Island					-0.004	0.055	0.004	0.001
					-0.006	(0.021)**	-0.007	-0.005
Dummy Sulawesi Island					-0.012	0.037	0.000	0.005
					(0.006)*	(0.014)**	-0.005	-0.003
Dummy Nusa Tenggara & Maluku Island					-0.016	0.046	-0.010	0.011
					-0.010	-0.039	(0.005)*	-0.009
Dummy Papua Island					-0.003	0.033	0.006	-0.008
					-0.012	-0.030	-0.010	-0.008
Constant	-0.043	0.390	0.117	0.156	0.001	0.403	0.154	-0.143
	-0.058	(0.170)*	(0.039)**	(0.050)**	-0.066	-0.207	(0.044)**	-0.076
Observations	244	268	277	243	244	268	277	243
R-squared	0.05	0.04	0.03	0.09	0.08	0.09	0.06	0.12

Note: all variables are for the base year of the regression shown unless otherwise indicated. 1993-97 and 1999-2001 growth rates are in constant 1993 prices; 2001-2005 and 1993-2005 growth rates are in constant 2000 price.

5.2 DETERMINANTS OF INDONESIA'S SUB-NATIONAL GROWTH

Period OLS regressions

We now broaden the model to incorporate a wide range of potential determinants of district growth from each of the categories outlined above. Table 6 shows our preferred model for each time period.

The results confirm the lack of income convergence, even in a relative sense, except during the immediate post-crisis period. However, measurement error in the GRDP data could give rise to a reduction in the size and significance of this variable. We also estimated the regression using mean per capita consumption expenditure as an instrument for per capita GRDP. Doing this increases the size of the income convergence effect in the 2001-05 period and it approaches statistical significance. We interpret this as weak evidence for conditional income convergence in the decentralization period. However, there no evidence from this estimation of spatial convergence even in the first period.

Surprisingly, having a population with a higher share of people who have completed junior secondary school appears to make very little difference to growth performance. This is in marked contrast both to the bilateral association between growth and education found above and to typical country-level growth regressions, which tend to show a strong association. We tested this finding using a variety of other measures for educational performance (e.g. primary schooling and senior secondary schooling) but the results were broadly similar.

Similarly, having a larger labor force and a higher urban share of the population does not significantly affect the growth rate except in the most recent period. [21] Between 2001 and 2005, districts with larger labor forces and those with more urban populations did have significantly higher growth rates, suggesting an urban concentration to the pattern of growth post-decentralization.

The inclusion of the sectoral profile of the local economy shows some sectoral biases to growth. Districts with a higher share of GRDP in manufacturing tended to have higher growth rates in the earlier two periods, although this effect has disappeared since 2001. By contrast, districts that were heavily dependent on oil and gas had slower growth rates prior to the crisis. Due to substantial multi-collinearity between sectoral shares (even after omitting one category), we do not estimate with all the sectoral shares. However, to obtain an impression of the effect of the concentration of economy activity on growth we constructed a Gini coefficient of sectoral shares of employment for each district. This shows a positive, but not statistically significant, relationship with growth. Similarly, in order to explore whether changes in the agricultural

[21] We use labor force in preference to population size to avoid potential correlation with GRDP per capita.

terms-of-trade are responsible for growth, we include the Indonesian government's Farmer Terms of Trade index.[22] Again, this has no statistically significant association with growth.

Table 6: OLS regression of real per capita GDP growth on selected variables

	-1 1993-97	-2 1999-2001	-3 2001-05
Ln per capita real GRDP, initial year	-0.002	-0.073	-0.005
	(0.48)	(4.91)**	(1.53)
Weighted average growth of neighboring districts during the period	0.037	0.048	0.011
	(1.80)	(0.93)	(0.60)
Share people ever/being in junior secondary school per total population	0.045	0.028	0.012
	(1.03)	(0.16)	(0.32)
Share of population that is urban	0.019	0.019	0.031
	(1.90)	(0.59)	(3.56)**
Labor force, initial year	0.003	0.006	0.005
	(1.49)	(0.85)	(2.74)**
Share of non-oil and gas manufacturing to total GRDP, initial year	0.034	0.105	-0.019
	(2.85)**	(2.37)*	(1.77)
Oil and gas is the main sector	-0.034	0.053	-0.011
	(2.37)*	(1.43)	(1.28)
Gini coefficient of sectoral employment	0.050	0.010	0.015
	(1.73)	(0.12)	(0.70)
Farmer's terms of trade index	0.032	-0.029	0.002
	(1.25)	(1.39)	(0.49)
Distance district to province's capital	0.000	-0.000	0.000
	(0.76)	(1.83)	(1.04)
Have to get on a boat to get to province's capital	-0.005	-0.018	-0.009
	(0.87)	(0.86)	(1.75)
Share of households with telephone connections	-0.051	0.248	-0.044
	(0.59)	(2.09)*	(1.73)
Ethno-linguistic Fragmentation Index	0.003	0.037	-0.003
	(0.59)	(1.85)	(0.64)
Java dummy	0.001	-0.047	-0.008
	(0.21)	(2.86)**	(1.98)*
Constant	-0.039	1.001	0.026
	(0.52)	(4.01)**	(0.47)
Observations	128	167	219
R-squared	0.25	0.29	0.14

Note: Robust standard errors in parentheses.

* significant at 5%; ** significant at 1%.

Note: all variables are for the base year of the regression shown unless otherwise indicated. 1993-97 and 1999-2001 growth rates are in constant 1993 prices; 2001-2005 growth is in constant 2000 prices.

+ Data for 1999-2001 is from Podes 2000.

[22] This is an index of output prices to input prices and consumption prices.

To assess the impact of remoteness, we include the distance from the provincial capital,[23] as well as a dummy variable to indicate whether sea transport was necessary to make this journey. The latter variable attempts to indicate the higher costs faced by more remote islands. Interestingly, none of these variables are statistically significant (and the distance variable even has the opposite sign from the one expected in some periods).[24]

To measure whether pre-existing infrastructure has an important impact on growth we include a variable on the number of telephones per household in the district.[25] Although this variable was significantly associated with growth in the immediate post-crisis period, it is not statistically significant in any other period and has the opposite sign from the one expected.

We also include a variable measuring the degree of ethno-linguistic fragmentation, which was found in other studies to be significantly (negatively) associated with growth. Again, this variable is both economically and statistically insignificant.

One variable that is highly significant and negatively associated with growth is the Java dummy. As shown above, growth was much slower in Java than outside Java during the immediate post-crisis period after controlling for the other variables. Interestingly, this appears to still be the case in the decentralization era although the economic significance of this effect is much reduced.

Finally, it could be argued that, since we are estimating a long-run growth model, we should estimate the model for the entire period of 1993-2005. Although we attempted this, there is clearly a large structural break in the model around the crisis period of 1998, with the influence of variables on growth being quite different before and after this break. Indeed, the results of the pooled model are clearly driven by the rather unusual dynamics around the crisis period. As a result, we do not present the results of the combined model in Table 6.

The single most remarkable "finding" from these results is the lack of findings! This is not for a lack of trying alternative specifications. The results presented in Table 4 represent findings that were typical of the many alternative specifications tried, since our dataset has alternative measures for most of the dimensions of interest. Nor does it represent multi-collinearity, since some care has been taken to ensure that the variables are not strongly collectively correlated. Some alternative model specification did provide more "significant" results, but in general these were driven by a handful of highly influential observations or variables. The results that we present in Table 6 are robust in the sense that they are not highly sensitive to minor changes in the

[23] Unfortunately this distance is the straight line distance. Data on the actual road distances are not available.
[24] A number of alternative distance related variables were tried including the distance from the district capital to the nearest of the five largest cities in Indonesia (Jakarta, Surabaya, Medan, Makassar, and Batam) as well as the distance to Jakarta. None of these variables were statistically significant.
[25] Again other infrastructure related variables were tried in different specifications of the model including perceptions regarding road quality and the share of villages in the district that have asphalt roads. These variables were generally statistically insignificant.

choice of sample or variables. Moreover, they pass all the commonly applied tests for misspecification, including tests for omitted variables and heteroskedasticity.

The general lack of statistically significant results probably reflects the extremely noisy nature of the GRDP data and the fact that, in the interests of avoiding problems with endogeneity, we have only used information about the initial conditions in each period as our explanatory variables. Since our panel contains a rich source of information about how both GRDP and explanatory variables change over time, we now turn to estimations that better exploit the panel nature of the data.

Fixed-effect panel regressions

One possible problem with the above model is the potential presence of unobserved heterogeneity in the dataset. In other words, there may be factors specific to each district that determine the growth rate but that are not included within our dataset. If these factors are fixed over time, this unobserved heterogeneity can be removed using fixed-effects panel estimation. Thus, it is possible to obtain a less biased estimate of some of the parameters of key interest.

The disadvantage of fixed-effect panel estimation, of course, is that by removing factors that are fixed over time it automatically excludes all the geographical determinants of growth. Furthermore, some variables have very little variation over time and so one must not rely too heavily on variables where the estimation results may be driven by spurious changes in explanatory variables. We therefore arrive at the parsimonious model shown in Table 7.

Table 7: Fixed effects panel regression of annual per capita GRDP growth

	-1 **1993-97**	**-2** **2001-05**	**-3** **1993-2003**
Ln per capita real GRDP, initial year	-0.374	-0.403	-0.210
	(0.026)***	(0.026)***	(0.015)***
Weighted average growth of neighboring districts during the period	0.375	0.001	0.368
	(0.030)***	(0.025)	(0.023)***
Share people ever/being in junior secondary school per total population	-0.240	0.445	-0.100
	(0.187)	(0.106)***	(0.113)
Labor force, initial year	0.116	0.083	0.022
	(0.032)***	(0.019)***	(0.009)**
Gini coefficient of sectoral employment	0.028	-0.038	0.031
	(0.096)	(0.042)	(0.052)
Constant	3.876	5.163	2.708
	(0.476)***	(0.441)***	(0.241)***
Observations	1130	1163	2048
Number of groups	240	297	250
R-squared	0.42	0.23	0.25

Robust standard errors in parentheses. * significant at 5%; ** significant at 1%.

Note: Growth rates for 1993-97 and 1993-2003 are based on constant 1993 prices; growth rate for 2001-05 is based on constant 2000 prices.

The most striking characteristic of Table 7 is the strong income convergence. In both the pre-crisis and decentralization periods, poor districts grow faster than better off districts conditional on the other variables. Prior to the crisis, this was coupled with substantial spatial divergence: fast growing districts had a strong positive effect on their neighbors. However, this association appears to be absent in the period after 2001, consistent with the absolute convergence results in Table 5.

Surprisingly, prior to the crisis, the educational level of the population does not seem to influence growth rates. After decentralization this changes, with a strong and statistically significant effect of junior high school education on local level growth. However, a larger labor force does appear to be statistically significantly associated with higher growth in both periods. Finally, the sectoral concentration of labor does not appear to be statistically significant in either period.[26]

5.3 GROWTH ACCELERATIONS

The large change in the average growth rate between 1993 and 1997 and the period since 2001 masks a huge amount of variation in growth rates. Figure 9 shows the very wide range of growth rates experienced by districts for both periods. The central lines in each axis indicate the mean growth rate, whilst the lines on each side indication one standard deviation above and below the mean.

What explains these changes in growth rate between the two periods? If the growth model above is correct then changes in the growth rate between the two periods will only be explained by changes in the explanatory variables and not by their levels. We therefore estimate a regression of the change in the growth rate between these two periods against the change in the other explanatory variables and their initial values, to explore the characteristics of districts whose growth accelerated (or decelerated). The results are shown in Table 8.

The main finding from Table 8 is the strong impact of initial income on the *change* in growth rates. This suggests that districts that had a higher GRDP per capita before the crisis, tended to experience a somewhat smaller increase (or a larger decrease) in their growth rates between the two periods than districts that started with lower GRDP per capita. The results also confirm strong income convergence. Interestingly, the results also suggest that districts that saw a larger increase in their share of manufacturing GRDP, tended to experience a greater slowdown in their growth rates. Similarly, districts that were further from the provincial capital tended to experience greater reductions in their growth rates.

[26] Again, a large number of alternative specifications were tried and tested for robustness. These are available from the authors on request.

Figure 9: District growth rates, 1993-97 and 2001-05

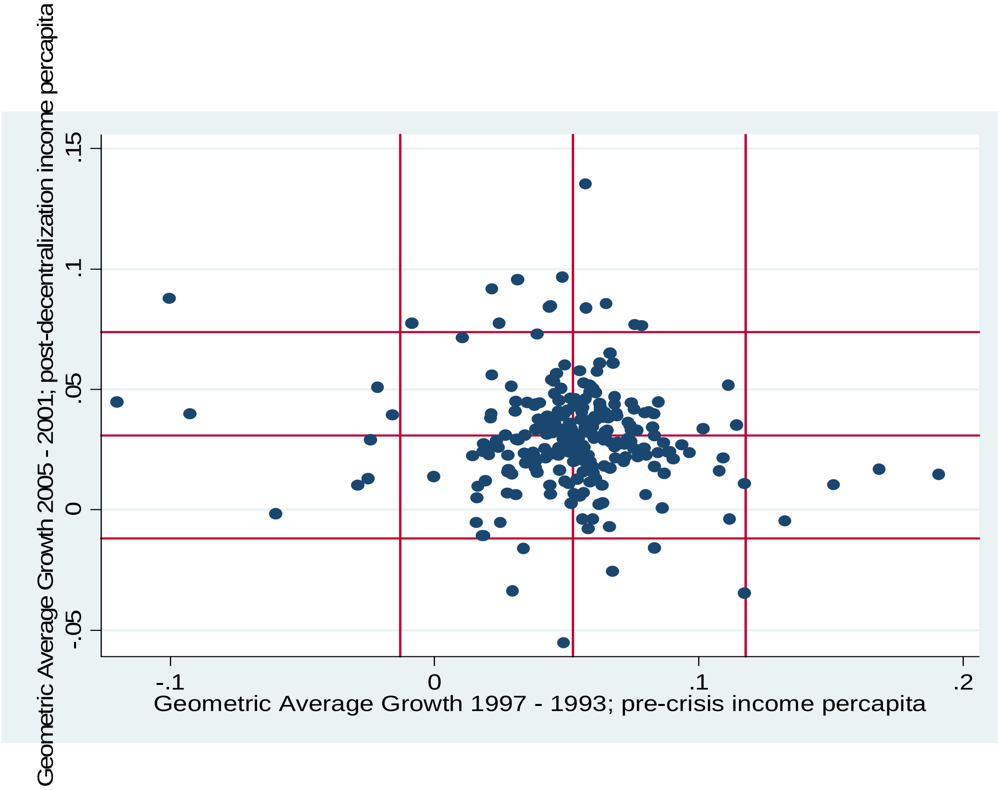


Table 8: Regression of change in growth rates between 1993-97 and 2001-05

Dependent variable **Change in average per capita real GRDP between 1993-97 and 2001-05**	
Ln per capita real GRDP, initial year	-0.012
	(0.005)*
Weighted average growth of neighboring districts during the period	-0.009
	(0.014)
Share people ever/being in junior secondary school per total population	0.041
	(0.082)
Labor force (log), initial year	-0.001
	(0.012)
Share of manufacturing	-0.004
	(0.023)
Distance to provincial capital	-0.0000459
	(0.0000198)*
Change in per capita real GRDP	-0.058
	(0.011)**
Change in share of junior secondary schooling	0.114
	(0.127)
Change in (log) labor force	-0.061
	(0.041)
Change in share of manufacturing	-0.037
	(0.011)**
Constant	0.167
	(0.072)*
Observations	210
R-squared	0.23

6. CONCLUSIONS

We draw four conclusions from our results:

First, there does appear to be a general process of relative income convergence: poor districts are growing faster than better off districts after taking into account their other characteristics. The difference regression also shows that poorer districts may have been relatively protected in the general decline of growth between 1993 and 1997, and between 2001 and 2005.

Second, there also appears to be some evidence of spatial divergence, at least before the crisis. Thus, if a district is near to another district that is growing, it may be more likely that that district will grow faster too. This makes intuitive sense given the production and expenditure linkages between adjacent areas, although it will result in an increasingly concentrated pattern of economic development in Indonesia. Note, however, that there has been no evidence for this spatial divergence since 2001.

Third, the effect of the sectoral composition of a district may matter but, perhaps because different factors appear to matter at different points in time, it is difficult to identify any systematic sectoral bias to growth. To identify this better would require data on terms-of-trade changes (other than those in agriculture), but unfortunately these data are not available. Moreover, there is no systematic evidence that a more or less concentrated distribution of sectors gives rise to faster or slower growth, although there is some evidence that reliance on the oil and gas sector weakened district growth prior to the crisis.

Fourth, having a larger labor force is positively associated with growth. Also, having a better educated labor force appears to be strongly associated with growth, but only since 2001.

Despite compiling a comprehensive dataset of potential factors associated with district level growth, the models above still struggle to explain most of the variation in growth rates that we observe across the country. In part, this is likely to be because GRDP data at the district level are extremely noisy. Further work will need to identify in more detail the variations in the manner in which the district GRDP data are compiled and to reconcile the inconsistencies with provincial and national level data.

However, it may also be that idiosyncratic institutional factors play an important role in determining growth. For example, having a politically strong and visionary district head/major may have a large impact, since they can pursue policies that stimulate investment and growth. These political and institutional policy factors have not been well measured in the past, but efforts are currently underway to collect more accurate data on these variables. Moreover, data are available on the political composition of local parliaments and the votes received by directly elected district heads/mayors. Such data have not been used in this analysis because local parliaments were only elected in 2004, whilst direct elections for local leaders only occurred in 2005 and 2006. Thus, the potential exists for future analysis using these political data to obtain a clearer picture of the determinants of district growth.

6. REFERENCES

Arze del Granado, Francisco J. (2008). ”Spatial Considerations on Decentralization and Economies of Concentration in Indonesia” in World Development Report East Asian Companion Volume, World Bank, Washington D.C.

Akita Takahiro, and Armida S. Alisjahbana (2002). “Regional Income Inequality in Indonesia and the Initial Impact of the Economic Crisis”. *Bulletin of Indonesian Economic Studies*, 38(2), pp. 201-222.

Alesina, Alberto and Dani Rodrik (1994). “Distributive Politics and Economic Growth”. *The Quarterly Journal of Economics*, vol. 109, no. 2, pp. 465-490.

Alisjahbana, Armida S., and Arief Anshory Yusuf (2004). Assessing Indonesia’s Sustainable Development: Long Run Trend, Impact of the Crisis, and Adjustment during the Recovery Period,” *ASEAN Economic Bulletin*, December 2004, 21(3), pp.290-307

Balisacan, Arsenio M., Ernesto M. Pernia, Abuzar Asra (2003). Revisiting Growth and Poverty Reduction in Indonesia: What Do Sub-National Data Show?. *Bulletin of Indonesian Economic Studies*, 39(3), pp. 329-51.

Barro, R.J (1991). Economic Growth in a Cross Section of Countries. *The Quarterly Journal of Economics*, vol. 106, no.2, pp. 407-443.

Barro, R.J. and Xavier Sala-i-Martin (1991). Convergence Across States and Regions. Brookings Papers on Economic Activity, 1991, (1), pp.107-182.

Barro, R.J. and Xavier Sala-i-Martin (1994). Economic Growth. New York: McGraw-Hill.

Catin, Maurice, Xubei Luo and Christophe Van Huffel (2005). Openness, Industrialization and Geographic Concentration of Activities in China. World Bank Policy Research Working Paper 3706, September 2005.

Da Mata, Daniel, Uwe Deicmann, J. Vernon Henderson, Somik V. Lall and Hyoung Gun Wang (2005). Examining Growth Patterns of Brazillian Cities. World Bank Policy Research Working Papers 3724, September 2005.

Clark, Gordon L., Maryann P. Feldman and Meric S. Gertler (2000). The Oxford Handbook of Economic Geography. Oxford University Press.

Drennan, Matthew P. and Sidney Saltzman (1998). Regional and Spatial Econometric Analysis. Methods of Interregional and Regional Analysis (Isard et al). Regional Science Studies Series. Ashgate : London.

Easterly, William and Ross Levine (1997). Africa's Growth Tragedy: Policies and Ethnic Divisions, *The Quarterly Journal of Economics*, 112 (4), pp 1203-1250

Fitrani, Fitria (2005). Sub-National Growth Performance in Indonesia: Economic Crisis, Decentralization and Convergence. Unpublished Master Thesis. University of Freiburg, Freiburg, Germany.

Fujita, Masahisa (2002). Economics of Agglomeration: Cities, Industrial Location and Regional Growth. Cambridge University Press.

Fujita, Masahisa (2007). Regional Integration in East Asia: From the Viewpoint of Spatial Economics. Palgrave MacMilla : New York.

Garcia, Jorge and Lana Soelistianingsih (1998). Why Do Differences in Provincial Income Persist in Indonesia?. *Bulletin of Indonesian Economic Studies*, 34(1), pp. 95-120.

Gordon, Raymond G., Jr. (ed.) (2005). Ethnologue: Languages of the World, Fifteenth edition. Dallas, Tex.: SIL International. Online version: **http://www.ethnologue.com/**.

Hill, Hal, Budy P. Resosudarmo and Yogi Vidyattama (2008), "Economic Geography of Indonesia: Location, Connectivity, and Resources", in World Development Report East Asian Companion Volume, World Bank, Washington D.C.

Kim, Sukkoo (2008). Spatial Inequality and Economic Development: Theories, Facts, and Policies. Commission on Growth and Development, Working Paper No. 16, World Bank, Washington D.C.

Krugman. The'New' Economic Geography: Where Are We? (2007). Regional Integration in East Asia: From the Viewpoint of Spatial Economics (Fujita, M). Palgrave MacMilla : New York.

Landiyanto, Erlangga Agustino, Rumayya and Wirsya Wirdaya (2005). Growth in East Java: Convergence or Divergence?. Airlangga University, Economics Faculty, Surabaya, Indonesia.

Luo, Xubei (2004). The Role of Infrastructure Location in China's Western Development. World Bank Working Paper 3345, June 2004.

Rodrik, Dani (2005), Why We Lean Nothing from Regressing Economic Growth on Policies. Paper presented at the Kennedy School Lunch Group.

Wibisono, Yusuf (2003). Konvergensi di Indonesia: Beberapa Temuan Awal dan Implikasinya. *Ekonomi dan Keuangan Indonesia*, Maret 2003, 51(1), pp. 53-80.

World Bank (2006). Making the New Indonesia Work for the Poor. World Bank Office Jakarta, Indonesia

World Bank (2007). Spending for Development: Making the Most of Indonesia's New Opportunities. World Bank Office Jakarta, Indonesia.

World Bank (2008). Reshaping Economic Geography, World Development Report 2009, Washington D.C., USA.

Appendix 1 : List of variables	
gy (year T) (year t)	Geometric average growth rate of real GRDP per capita from year t and year T. The base year for the real GRDP data is 1993
Ln_PCY(year t)	Log value of real GRDP per capita.
GAW (year T) (year t)	Weighted average growth of neighboring districts from year t and year T.
PRIM(year t)	Share people ever/being in primary school per total population (Susenas)
SECJ(year t)	Share people ever/being in secondary junior high school per total population (Susenas)
SECH(year t)	Share people ever/being in secondary senior high school per total population (Susenas)
sh_urban(year t)	Share of people who live in urban area (Susenas)
shagr	Share of agriculture sector to total GRDP
shmin	Share of mining sector to total GRDP
shman	Share of manufacture sector to total GRDP
shenr	Share of electricity, gas, water supply sector to total GRDP
shcon	Share of construction sector to total GRDP
shtrd	Share of trade, restaurant, hotel sector to total GRDP
shtrs	Share of transportation and communication sector to total GRDP
shfin	Share of financial sector to total GRDP
shser	Share of service sector to total GRDP
MIGAS2	Dummy variable for district that has oil & gas as main sector in all years
jarak_prop / big	Distance to provincial capital / one of the five big cities (Jakarta, Surabaya, Medan, Batam and Makassar)
dlaut_prop / big	Dummy if need to use boat to get to provincial capital / one of the five big cities (Jakarta, Surabaya, Medan, Batam and Makassar)
TELPHH(year t)	Share of households with telephone connection in year t (Podes)
SH_road_asphalt (year t)	Share of villages with asphalt road in year t (Podes)
NTP (year t)	Farmer’s Terms of Trade year t (base year 1993)
D_island	Dummy for big island group
GOVEXP (year t)	Ratio of government expenditure to total GRDP
ELF	Ethnic Linguistic Fragmentation
RF	Religion Fragmentation
Demind (year t)	Dummy if head of district is democratically indirectly elected

Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
gy0593	256	0.02097	0.03672	-0.07932	0.31421
gy0501	336	0.02293	0.03567	-0.12381	0.20887
gy0199	283	0.07738	0.20676	-0.47664	1.44190
gy9793	256	0.05647	0.03137	-0.03361	0.18449
lnPCY_1993	266	14.15078	0.57476	13.08029	16.61269
lnPCY_1999	283	14.14987	0.59867	12.58044	16.78585
lnPCY_2001	336	14.33425	0.72321	13.02808	18.35805
GAW9305	314	0.25814	0.33591	-0.78676	2.32605
GAW0105	314	0.09693	0.12142	-0.52870	0.63099
GAW9397	314	0.18246	0.09336	-0.08555	0.47072
GAW9901	314	0.13758	0.21467	-0.43588	1.24946
PRIM93	280	0.49817	0.08607	0.23958	0.68224
PRIM99	260	0.46089	0.09214	0.20518	0.66932
PRIM01	322	0.45068	0.09378	0.19753	0.65017
SECJ93	280	0.12153	0.03987	0.02238	0.22781
SECJ99	260	0.14560	0.03444	0.02864	0.23713
SECJ01	322	0.14909	0.03549	0.03119	0.27372
SECH93	280	0.10913	0.06109	0.01850	0.30000
SECH99	260	0.14747	0.07026	0.02090	0.33486
SECH01	322	0.14421	0.07141	0.00560	0.34774
sh_urban93	280	0.30278	0.30117	0.00000	1.00000
sh_urban99	260	0.37053	0.30600	0.00000	1.00000
sh_urban01	322	0.37786	0.32119	0.00000	1.00000
shagr1993	303	0.32275	0.17931	0.00373	0.82762
shagr1999	328	0.34991	0.20512	0.00203	0.82550
shagr2001	336	0.32816	0.19088	0.00103	0.72787
shmin1993	291	0.04449	0.11745	0.00001	0.96308
shmin1999	314	0.06578	0.16313	0.00003	0.97836
shmin2001	336	0.06503	0.15940	0.00000	0.96543
shman1993	303	0.13820	0.14352	0.00023	0.90138
shman1999	328	0.14385	0.15345	0.00016	0.95099
shman2001	336	0.14796	0.15772	0.00022	0.96047
shenr1993	303	0.00816	0.00944	0.00007	0.06181
shenr1999	329	0.00836	0.00910	0.00016	0.07429
shenr2001	336	0.00825	0.00981	0.00013	0.10015
shcon1993	303	0.06725	0.03847	0.00520	0.27043
shcon1999	329	0.05144	0.03273	0.00113	0.22068
shcon2001	336	0.05205	0.03314	0.00112	0.17089
shtrd1993	303	0.16395	0.07336	0.00358	0.44753
shtrd1999	329	0.17147	0.08166	0.00258	0.44579
shtrd2001	336	0.17203	0.07915	0.00716	0.44215
shtrs1993	303	0.07262	0.05897	0.00327	0.37948
shtrs1999	329	0.06464	0.05757	0.00215	0.36203
shtrs2001	336	0.06254	0.05207	0.00195	0.30397
shfin1993	303	0.05535	0.03498	0.00094	0.21105
shfin1999	329	0.04093	0.03069	-0.01146	0.23960
shfin2001	336	0.04090	0.02785	0.00087	0.16653
shser1993	303	0.12900	0.06231	0.00339	0.32613
shser1999	329	0.10814	0.06219	0.00190	0.38893
shser2001	336	0.12309	0.06688	0.00240	0.39120
MIGAS2	336	0.05060	0.21950	0.0000	1.00000
jarak_prop	336	138	151	0.0000	1063
dlaut_prop	336	0.11310	0.31718	0.0000	1.00000
jarak_big	336	405	406	0.0000	2381
dlaut_big	336	0.55060	0.49818	0.0000	1.00000
TELPHH93	280	0.02328	0.03301	0.0004	0.21787
TELPHH96	288	0.03853	0.04706	0.00210	0.24122
SH_road_a~93	280	0.60891	0.25546	0.01873	1.00000
SH_road_a~96	288	0.62913	0.26106	0.02890	1.00000
NTP_99a	216	110.78980	21.27693	75.20000	179.30000
Dsumat	336	0.28571	0.45243	0.00000	1.00000
Djawa	336	0.33929	0.47417	0.00000	1.00000
Dkalim	336	0.11310	0.31718	0.00000	1.00000
Dsulw	336	0.13393	0.34108	0.00000	1.00000
Dnusa	336	0.08631	0.28124	0.00000	1.00000
Dpapua	336	0.04167	0.20012	0.00000	1.00000
GOVEXP99	328	0.04788	0.03938	0.00000	0.25114
GOVEXP01	335	0.11694	0.10230	0.00000	0.73284
ELF	330	0.45163	0.33042	0.00437	0.99757
RF	330	0.18430	0.20043	0.00134	0.77217
demind_99	258	0.32946	0.47093	0.00000	1.00000
demind_01	334	0.71257	0.45324	0.00000	1.00000

Appendix 2[27]

Island	Land Area* (in km^2)	Population (in %)		GDP (in %)		Infrastructure					
						% of villages with asphalt road		% of HH with phone		% of HH with electricity	
		1993	2005	1993	2005	1993	2005	1993	2005	1993	2005
Sumatra	24.86	21.84	21.77	24.73	27.66	51.27	51.10	2.13	9.51	37.78	66.21
Java & Bali	6.80	59.12	58.91	54.35	51.81	62.27	71.19	1.60	11.30	47.19	71.98
Kalimantan	27.28	5.56	5.69	10.98	10.89	29.95	36.32	2.52	11.69	42.60	67.35
Sulawesi	10.52	7.42	7.48	5.31	5.00	53.76	54.48	1.99	10.22	38.55	62.62
Maluku + Nusa Tenggara	9.51	5.04	4.96	2.62	2.19	42.55	46.05	1.19	4.40	28.97	36.40
Papua	21.03	1.02	1.19	2.00	2.44	12.57	19.02	4.12	9.47	26.26	37.98
Total	100.00	100.00	100.00	100.00	100.00	51.97	55.62	1.79	10.52	43.45	67.73
Eastern Indonesia	41.05	13.48	13.63	9.94	9.64	42.49	44.80	1.86	7.98	33.79	50.75
Western Indonesia	58.95	86.52	86.37	90.06	90.36	54.15	59.04	1.78	10.91	44.77	70.32
Java	6.50	57.53	57.28	52.07	50.34	61.38	70.43	1.54	11.20	46.57	71.91
Off Java	93.50	42.47	42.72	47.93	49.66	46.20	47.45	2.16	9.54	38.56	61.68

Distribution of national GDP by main sector and by main island, 1993 and 2005 (%)

	Agriculture		Oil, Gas, Mining, Quarrying & Oil & Gas Manufacture		Non Oil & Gas Manufacture		Electricity, Gas & Water Supply		Construction		Trade, Restaurant & Hotel		Transportation & Communication		Financial Service		Service	
Island	**1993**	**2005**	**1993**	**2005**	**man_1993**	**man_2005**	**enr_1993**	**enr_2005**	**con_1993**	**con_2005**	**trd_1993**	**trd_2005**	**trs_1993**	**trs_2005**	**fin_1993**	**fin_2005**	**ser_1993**	**ser_2005**
Sumatra	27.47	31.61	38.95	40.39	17.21	20.95	12.02	11.54	25.39	26.86	20.76	20.89	26.98	27.10	25.63	25.79	28.13	27.26
Java & Bali	49.49	44.53	18.70	14.04	73.28	71.83	79.57	79.31	53.38	46.84	65.74	64.18	52.70	51.67	55.71	55.51	51.89	50.75
Kalimantan	8.51	8.90	34.65	33.25	6.01	4.07	3.48	4.04	7.30	12.42	7.17	8.03	10.29	9.70	7.69	8.40	5.86	7.74
Sulawesi	9.19	9.49	0.69	2.43	2.68	2.45	3.67	3.96	7.85	8.83	4.02	4.32	6.57	7.23	8.16	7.43	8.96	8.56
Nusa Tenggara & Maluku	3.53	3.68	0.43	2.17	0.52	0.43	0.88	0.74	3.12	2.89	1.73	1.96	2.34	2.77	2.15	2.23	3.56	4.09
Papua	1.82	1.80	6.58	7.72	0.31	0.28	0.36	0.41	2.96	2.16	0.58	0.62	1.13	1.52	0.67	0.62	1.59	1.61
Indonesia	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**

[27] These are an updated version of tables in Fitrani, 2005.

Distribution of main island GDP by main sector, 1993 and 2005 (%)

	Agriculture		Oil, Gas, Mining, Quarrying & Oil & Gas Manufacture		Non Oil & Gas Manufacture		Electricity, Gas & Water Supply		Construction		Trade, Restaurant & Hotel		Transportation & Communication		Financial Service		Service		Total	
Island	**1993**	**2005**	**1993**	**2005**	**man_1993**	**man_2005**	**enr_1993**	**enr_2005**	**con_1993**	**con_2005**	**trd_1993**	**trd_2005**	**trs_1993**	**trs_2005**	**fin_1993**	**fin_2005**	**ser_1993**	**ser_2005**	**1993**	**2005**
Sumatra	24.18	22.64	21.77	22.48	13.66	17.92	0.40	0.50	5.73	4.42	14.39	14.09	5.37	5.94	4.70	3.81	9.80	8.21	100.00	100.00
Java & Bali	20.63	16.75	4.95	4.10	27.55	32.27	1.25	1.81	5.70	4.05	21.57	22.72	4.97	5.95	4.83	4.31	8.55	8.03	100.00	100.00
Kalimantan	17.07	15.29	44.16	44.38	10.88	8.36	0.26	0.42	3.76	4.90	11.33	12.99	4.67	5.10	3.21	2.98	4.65	5.59	100.00	100.00
Sulawesi	38.14	33.90	1.81	6.76	10.03	10.46	0.58	0.86	8.36	7.25	13.14	14.52	6.17	7.90	7.06	5.48	14.72	12.86	100.00	100.00
Nusa Tenggara & Maluku	39.88	32.10	3.07	14.70	5.31	4.44	0.38	0.39	9.02	5.80	15.42	16.13	5.97	7.41	5.05	4.02	15.89	15.01	100.00	100.00
Papua	21.32	17.11	48.98	57.12	3.24	3.14	0.16	0.24	8.91	4.74	5.36	5.56	3.01	4.44	1.63	1.22	7.39	6.44	100.00	100.00
Indonesia	**22.48**	**19.47**	**14.27**	**15.13**	**20.28**	**23.26**	**0.85**	**1.18**	**5.76**	**4.48**	**17.70**	**18.33**	**5.09**	**5.96**	**4.68**	**4.02**	**8.89**	**8.19**	**100.00**	**100.00**