

**School of Economics and Finance
Curtin Business School**

**Public Sector Efficiency of Decentralized Local Government in
Indonesia: A Political and Institutional Analysis**

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**This thesis is presented for the Degree of
Doctor of Philosophy
of
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Declaration

To the best of my knowledge and belief this thesis contains no material previously published by any other person except where due acknowledgement has been made.

This thesis contains no material which has been accepted for the award of any other degree or diploma in any university.

Signature : 

Date : 30 May 2012

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List of Abbreviations

ATI	:	Annual new tuberculosis incident
DEA	:	Data envelopment analysis
DFA	:	Deterministic frontier approach
DP	:	Democratic Participation
FD	:	Fiscal decentralization
FDH	:	Free disposable hull
FE	:	Fixed effect estimator
FEVD	:	Fixed effect vector decompositions
HH	:	Herfindahl-Hirschman
HT	:	Hausman Taylor estimator
IMR	:	Infant mortality rate
MDG	:	Millennium development goals
MMR	:	Mother mortality rate
NPE	:	Net primary enrolment rate
NSE	:	Net secondary enrolment rate
OLS	:	Ordinary least square
PF	:	Political fragmentation
PSE	:	Public sector efficiency
PSP	:	Public sector performance
RE	:	Random effect estimator
SFA	:	Stochastic frontier approach
TFP	:	Total factor productivity

Abstract

This thesis investigates public sector efficiency (PSE) of decentralized local governments in Indonesia. Based on the literature review improved efficiency is considered as the main outcome expected from a decentralized system of public service provision. Hence analysing public sector efficiency provides the de facto measure of the ability of decentralized local government in internalizing the benefits of fiscal and political decentralization. In order to identify the significance of the effect of 2004 electoral contest, the first democratic election in the decentralized Indonesia, efficiency in the public sector is investigated in a period from 2005 to 2008. The 2004 electoral contest is considered as an important phase of democratization and decentralization in Indonesia as it was the first election where voters directly chose leaders at every level of government. Political and institutional features which emerged as a result of the 2004 election were expected to have an impact on a decentralized system of public service provision.

This thesis employs a two-stage method. In the first stage, non-parametric data envelopment analysis (DEA) is used to generate the efficiency scores of all local governments. Several outcome indicators in the education and health sectors, infrastructure, poverty mitigation as well as macroeconomic performance are taken as a measure of the flow of services that arise from public spending. Hence, public sector efficiency is defined as the flow of services per unit expenditure.

The second stage of the method aims to investigate public sector efficiency against non-discretionary variables involving a measure of fiscal decentralization, political and institutional variables, as well as total factor productivity growth as a control variable. In order to do so, this thesis employs an econometric analysis using fixed effect vector decomposition (FEVD). The FEVD is adopted as the political and institutional variables are characterised as time-invariant variables.

In the first stage of the method, the DEA estimate reveals that public sector efficiency scores vary across local governments, corroborating the general pattern of the regional disparity in Indonesia. That is, poorly developed regions have relatively inefficient governments. The DEA calculation locates local governments on Java Island at the frontier indicating that these local governments are benchmarking others. On the other hand, Papua and Papua Barat emerge with the lowest efficiency score over the observation period with a large divergence from the frontier. The results also show that the average and the median efficiency scores are drifting downwards, while the distance from the lowest score to the frontier is increasing. This indicates that the regional disparity in the public sector efficiency was increasing over the observation period.

The second stage of the method reveals that the ability of a decentralized local government to generate local own-revenue is significant in improving public sector efficiency. The estimation results show that the degree of fiscal decentralization as measured by the ratio of local own-revenue to total public spending has a significant positive impact on the PSE. However, given that the growth of total factor productivity also has a significant and positive impact on the PSE, the result should be seen as a caution that improved PSE might result from overall total productivity in the economy. A local jurisdiction that has higher total factor productivity will present greater public sector efficiency regardless the degree of fiscal decentralization.

The second stage estimate also reveals that the formation of the new government as an outcome of the first electoral democracy in the decentralized Indonesia has nothing to do with the PSE improvement. The lost hegemony of Golkar in the decentralized democratized Indonesia, measured as the ratio of seats held by Golkar to total seats in the local assembly, does not show any significant impact on the PSE. The first electoral democracy might have resulted in a new democratic government in Indonesia; however, the new democratic government might be merely a continuation of an old structure with new rules on the limits of democratization. Accordingly, the new democratic government did not impact on improved efficiency in the public sector.

Another significant feature of the formation of the new government in the decentralized democratized Indonesia is the rebirth of *politik aliran* (political parties rooted to a particular socio-ideology). *Politik aliran* is represented by Islamic based political parties. These parties held a significant number of seats in the legislative councils. The estimation results reveal a negative association between political Islam and PSE, even when PKB (Nation Awakening Party) and PAN (National Mandatory Party) are included in the measure. Both parties do not set Islam as their platform, but affiliate to NU (*Nahdlatul Ulama*) and *Muhammadiyah*, the two largest socio-religious organizations in Indonesia. The result may also stand as a confirmation that patron-client affiliation in Indonesia's electoral democracy fails to leverage accountability and hence fails to result in improved PSE.

The second stage estimate finds evidence that democratic participation did not have an impact on the PSE. This contradicts the general representation claiming that greater democratic participation is associated with better economic performance. The estimates reveal a negative impact of democratic participation on the PSE. In the setting of *politik aliran*, the coefficient estimate is statistically significant. It implies that while political Islam may have increased electoral participation, the participation has nothing to do with improved PSE. This may not be surprising in the case of electoral democracy in Indonesia where electoral participation is characterised by money politics, patron-client political relationship and unbalanced electoral participation.

Many parties flourish in the decentralized democratized Indonesia escalating political fragmentation. Using a Herfindahl-Hirschman index as a measure of the size-political fragmentation this study finds evidence that while citizens may have more options to select parties/politicians to best represent their preferences, higher political fragmentation shows ambiguous impact on PSE.

The quality of institutional governance and its impact on PSE is represented by a corruption perception index and an infrastructure perception index. The estimation results reveal evidence that public sector efficiency is positively associated with the infrastructure perception index, but fail to find

evidence of an effect for the corruption perception index. This indicates that the outcome of decentralization is not contingent with a perception about corruption as it is prevalent in the decentralized Indonesia. It occurs almost in all levels of government and institutions. Thus if decentralization results in improved efficiency, it is not due to a corruption lessening but rather due to variations in the level of infrastructure.

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Chapter 1

Introduction

1.1. Background

The theoretical literature on multi-level government from Tiebout (1956) and Oates (1972) to Weingast (2009) emphasizes the advantages of fiscal decentralization. Among those advantages are that fiscal decentralization promotes competition among sub-national governments to provide attractive tax and public service options, promotes political legitimacy and accountability for public service provision, and subsequently, promotes public sector efficiency. Given these advantages, many countries adopt decentralized public management as their public service provision approach. Accordingly, decentralization of fiscal activities has become popular in the last two decades and has been widely adopted not only by developed countries, but also developing countries.

In reality, decentralization is adopted by different countries within different perspectives and needs. There is no common approach among countries in its implementation. In many cases, over-centralized administration has caused dissatisfaction among sub-national governments and decentralization was adopted as a reaction. Examples include Indonesia, Mexico and Peru. In other cases, the dissatisfaction with centralized administration has strengthened pressures on ethnical, historical or political separatist movements. Thus, decentralization was adopted as an attempt to stop ethnically motivated pressures for secession in Nigeria, political pressures from sub-national governments in Russia, and post-conflict countries like the Democratic Republic of Congo and Kosovo. Some cases of decentralization are induced by a specific motive such as establishing fiscal discipline at the state level as in India, improving quality of local service delivery by giving more fiscal discretion to local governments in Tanzania, and combating poverty by local governments as in Bolivia and Colombia (See Bahl 2006; IMF Fiscal Affairs Department 2009).

The fact that decentralization in practice is adopted within different contexts, institutional arrangements and objectives has caused pessimism with respect to decentralization. Among opponents to decentralization is Tanzi (1996) who considers it as a road to wrecks and ruins and Prud'homme (1994) who emphasizes that decentralization is harmful rather than helpful. These disagreements primarily arise from perspectives on the potential impact of such policies in the institutional environment of developing countries.

Therefore, the outcome of decentralization does not always fit with the theoretical claims. First, there are always externalities arising from spillovers between localities that should be taken into account and set against improved accountability as a result of decentralization. In political science, it has long been familiar that there is a trade-off between accountability and policy coordination under centralization (See Seabright 1996; Koethenbueger 2008; Besley and Coate 1999). Second, decentralization may paradoxically diminish accountability in a situation where local governments enjoy a degree of cohesiveness with central government (Seabright 1996), cohesiveness of interest groups at the local level is high and local voter ignorance is also high (Bardhan 2000). In this case, local governments are less accountable to marginalised local interests. Third, lack of democratic institutions and norms that essentially complement electoral democratization have been an obstruction to improved accountability. This happens particularly in young democratized countries (See Weingast 2009).

The recent literature on decentralization is growing into a second generation theory. With the groundwork of public choice theory, this literature emphasizes on political institution and politicians' behaviour in its analytical framework (See Seabright 1996; Besley and Coate 1999; Qian and Weingast 1997). Besley and Coate (1999) emphasize the importance refocussing attention on the role of decision making institutions rather than the assumption of uniform centralized provision in shaping the trade-off between taste heterogeneity and inter-jurisdictional externalities. Qian and Weingast (1997) emphasize the incentive problem as a critique to the traditional theory of decentralization.

In conjunction with a growing literature on decentralization, a number of studies have been carried out to empirically investigate the impact of decentralization in various countries. These studies attempt to investigate the impact of decentralization on various economic variables including economic growth (Zhang and Zou 1998; Xie, Zou and Davoodi 1999; Lin and Liu 2000; Akai and Sakata 2002; Iimi 2005; Jin and Zou 2005; Thornton 2007) and corruption (Fisman and Gatti 2002; Fan, Lin and Treisman 2009).

Unfortunately, these studies do not find consistent results but conflicting arguments on how decentralization affects economic growth and, for example, corruption. Dealing with the impact of decentralization on corruption, it is clear that there is no simple and general relationship that holds in different contexts and different settings. By looking at a cross country analysis, Fisman and Gatti (2002), found evidence that decentralization in government expenditure is strongly and significantly associated with lower corruption. On the contrary, Fan, Lin and Treisman (2009) found evidence that bribery is more frequent in countries with a larger number of governments or administrative tiers and a larger number of local public employees; and bribery is less frequent when local or central governments receive a larger share of GDP in revenue. In general, the results suggest the danger of uncoordinated rent-seeking as government structures become more complex.

With regard to decentralization and economic growth, Zhang and Zou (1998) found evidence that higher degrees of fiscal decentralization of government spending is associated with lower provincial economic growth in China. Xie, Zou and Davoodi (1999) found evidence that further decentralization in public spending in the United States may be harmful for economic growth. In contrast, Lin and Liu (2000) found evidence that decentralization has made a significant contribution to economic growth in the mid-1980s China. Akai and Sakata (2002) found evidence that decentralization contributes to economic growth in the United States. Iimi (2005) found evidence that decentralization has a significant positive impact on per capita GDP growth. Using the instrument variables technique and the latest cross-country data for the period from 1997 to

2001, Iimi argues that when the focus is placed on the latest information on the economic situation in the latter 1990s, decentralization, particularly on the fiscal expenditure side has contributed to economic growth. Jin and Zou (2005), found divergent evidence of the effect of decentralization on economic growth that depends on institutional arrangements that prevailed during the observation period. A recent study on decentralization and economic growth by Thornton (2007) found evidence that the impact of decentralization on economic growth depends on the extent of the independent taxing powers available to sub-national governments. Using a dataset of 19 OECD member countries, he found evidence that when the measure of fiscal decentralization is limited to the revenues over which sub-national governments have full autonomy, its impact on economic growth is not statistically significant.

Several issues have been addressed with respect to the conflicting results on the correlation between decentralization and economic growth. Among those issues are possible misspecification in the empirical estimation model and the measurement of decentralization. Another issue dealing with the decentralization and economic growth relationship is a lack of knowledge on how decentralization promotes economic growth that results in problems in testing its relationship (See Martinez-Vazquez 2003).

Despite the lack of any consistent knowledge of the impact of decentralization on economic growth, it is safe to argue that better governance with improved public service provision is the main outcome expected from decentralized public service provision. The literature on fiscal federalism has associated the case of improved public service provision with the more efficient resource allocation. Thus decentralized government will lead to the more efficient public service provision. Therefore efficiency should become the main focus in empirical studies concerning the outcome of decentralization.

In the economics literature, efficiency is defined as a condition in a resource allocation where no one will be made better off without making anyone else worse off. This condition is well known as the Pareto efficient condition. In managerial practice, efficiency is often used in parallel with effectiveness. Both

are used in performance benchmarking including the performance of decentralized governments (See O'Dwyer and Ziblat 2006). Both efficiency and effectiveness link inputs and outputs. However, they have different meanings although they are not always easy to isolate and measure. Accordingly, they are often used interchangeably. While acknowledging the difference, this study focuses on improved efficiency as the outcome of decentralization as in standard fiscal federalism theory.

- **The Nature of Decentralization in Indonesia**

Spreading out geographically over 5,000 km and 17,000 islands, with more than 300 identified languages and 20 distinct cultural groups; Indonesia is diverse in its geographic, cultural, natural, and human resources endowment. This diversity signifies that a decentralized system may be as the appropriate way to deliver some public services.

Although decentralization has long been accepted as part of the governmental system in Indonesia, there was no serious effort to implement decentralization. Centralization was long viewed as a way of maintaining the national unity of the Republic of Indonesia under President Suharto's administration. Any genuine desire to decentralize was suspected as a movement toward regional separatism away from the Republic of Indonesia.¹

A serious attempt to implement decentralization was started in 1999 following the fall of President Suharto. Dissatisfaction with the long standing centralized system during more than 30 years of the Suharto regime motivated the call for decentralization. Strengthening separatist movements in several natural resource rich regions, such as Aceh, Papua, and East Kalimantan also amplified

¹The decentralization policy in Indonesia can be traced back historically to the colonial period, starting with the formation of municipalities in 1905, districts in 1910, and provinces in 1920. After proclamation of independence, the formation of governmental structures experienced several changes which lately returned back to Republic of Indonesia Unity following a presidential decree in 1959. The governmental structure of the Republic of Indonesia is split into three tiers comprising provincial governments, local governments of kabupaten/kota, and a central government at the national level. Regional autonomy issues had been raised by law 5/1974 of regional government. However there was no serious effort at its implementation until the fall of President Suharto (see the details in Hofman and Kaiser 2004).

pressures to achieve broader autonomy for local regions. For that reason, in the early period of setting up decentralization, the policy was mostly driven by political motives leading to a “big bang” approach in its implementation. The enactment of Law 22/1999 and Law 25/1999 as the legal basis for decentralization was finalised within less than one year, and the implementing regulations were set up within one and a half years before the decentralization policy was effectively implemented in January 2001.

The “big bang” approach to establishing decentralization has rapidly changed the Indonesian governmental system from a centralized to a decentralized one. Law 22/1999 devolved most functions of government to local government except national defence, international relations, justice, police, monetary policy, regulation and development planning. However, the two laws apparently provide delegation mainly for expenditures but not for revenues. Law 34/2000 on regional taxation provides unclear additional tax discretion to local government without any assignment of a broad-based tax to local government. Even the new law of regional taxation number 28/2009 does not provide a broader local tax authority to local governments in administering local taxes. Tax bases and tax rates are mostly still determined by central government. Hence, there is no tax competition among local jurisdictions. From a theoretical perspective, tax competition among local jurisdictions might be expected to play a vital role in inducing optimal provision of public goods (See Ihori 2009).

Law 22/1999 was amended by Law 32/2004, transforming inter-governmental relations in Indonesia toward further democratic transition. The first electoral contest in the decentralized Indonesia was conducted in 2004 where voters directly chose the President. Since then, the leaders of local government, the governor at the provincial level and the bupati/mayor at the kabupaten/kota level are now chosen directly by voters.² In the 2009 electoral contest, not only were leaders in every level of government chosen by voters but also legislatures in every level of government. This transformation symbolizes a significant phase of

²By Law 22/1999 local government leaders are chosen by respective elected legislatures. Law 22/1999 has been amended by law 34/2004 altering the local government leaders’ election system to direct election where the leaders are directly chosen by voters.

decentralization as well as democratization in Indonesia. Not only have public services been decentralized to local government but also the authority to select local leaders through local elections.

Decentralization has a wide range of interrelations with democratization. Inman and Rubinfeld (2008) argue that decentralization is essential to the democratic transition as it helps make democracy self-enforcing. The idea of shifting public service provision to the lower level of government necessarily needs a power delegation. The power delegation is essential for decentralization as local citizens and politicians are supposed to be more informed and involved in the local provision of public goods such as education, health, water, poverty eradication, and local economic performance, independent of national performance. However, an empirical study on decentralization and patterns of democracy in Indonesia by Baswedan (2007) found that power and fiscal delegation to lower level government does not directly increase local participation though such delegation shifts the focus from national to regional political issues.

Political decentralization along with fiscal decentralization allows localities to independently carry out local elections selecting politicians to hold local office. Therefore, local electoral contests play an important role in shaping the construction of government in each local jurisdiction, independent of central government (See Weingast 2009). Decentralization should also allow local citizens to have more control over government in regard to public service provision. This idea is based on a comparative accountability between central and local government where voters are assumed to be more vigilant in local than in national government activities (See Khemani 2001; Seabright 1996). Therefore, decentralization should theoretically improve accountability and thus increase efficiency of public spending within a more compact political process.

In the case of Indonesia, electoral democracy that has been advanced along with decentralization may present “new government” formation in a democratic setting. Within a multi-party and proportional representation system, numerous political parties have flourished to participate in the electoral contest, leading to extensive choices voters can make to shape government. However, whether the

formation of new government in the more democratic setting has presented vital groundwork for decentralization in favour of improved public sector efficiency is not proven.

Numerous political studies on post-Suharto Indonesia address several institutional obstacles that are crucial for political accountability in regard to the expected public sector efficiency improvement. Money politics and “politik aliran” are the major issues. Money politics refers to a condition where voters will exchange their vote for money rather than vote for candidates who will best act in their interests. Meanwhile, “politik aliran” refers to a situation where voters select a political party on the basis of ideological affiliation. Given the large ideological diversity in Indonesia, a number of parties were established on an ideological basis leading to a so called “politik aliran” with high political fragmentation. In this situation and where democratic norms and institutions are weak, local provision of public services might be judged based on the political relationship with those in power not by virtue of citizenship. Within these institutional obstacles, improved local accountability as an expected result from local electoral democracy is uncertain. Eventually, whether decentralization results in improved public sector efficiency becomes a big question.

1.2. Objectives

Given the above background, this study aims to investigate public sector efficiency as the outcome of decentralization and democratization in Indonesia. It measures efficiency of local jurisdictions in Indonesia from 2005 to 2008 and is expected to capture the outcome of the 2004 political contest, the first election in the decentralized Indonesia. Specifically the objectives of this study are as follows:

1. To measure public sector efficiency (PSE) across local jurisdictions. Several indicators in the most relevant public sector category such as education, health, poverty mitigation, and infrastructure as well as macroeconomic performance are taken as outcome indicators of service flows that arise from local public spending.

2. Given advanced electoral democracy in Indonesia, this study then investigates political and institutional determinants as well as a decentralization measure (own-source revenue as a proportion of total revenue) that is expected to have an impact on public sector efficiency.
3. Based on the results, the study then formulates policy recommendations. The PSE score, along with its determinants, provides a guide for local government authorities to achieve greater public sector efficiency.

1.3. Significance of the Study

This is the first cross sectional study of Indonesia's local jurisdictions that comprehensively measures the link between public sector efficiency and decentralization policy. Since decentralization and democratization are correlated, this study also investigates whether political and institutional variables as a result of electoral democratization in Indonesia have had a significant impact on public sector efficiency. Specifically, this study is significant for two reasons:

1. Whether decentralization results in better public service provision is judged by improved efficiency of public service provision. Hence, using efficiency measures across local jurisdictions provides evidence of the de facto measure of the ability of local jurisdictions to internalize the benefit of fiscal and political decentralization.
2. The theoretical literature on decentralization is shifting toward second generation theorems emphasizing political structure, and politician's behaviour as the basis for the success of decentralization. While political studies characterise Indonesia as a protracted democratization and decentralization process, this study investigates empirically whether political and institutional variables as well as decentralization measures are factors in increasing public service efficiency at the local level.

1.4. Outline of the Thesis

The objectives are achieved in a series of chapters. Chapter 2 contains a review of the literature on decentralization policy. The evolving theory of decentralization from a traditional standpoint toward the recent generation of decentralization

theory is discussed in this chapter. The chapter also reveals a significant literature that identifies political incentives as the crux in the political agency relationship with regard to fiscal and political decentralization. Chapter 2 also considers the literature on improved efficiency as the main outcome of decentralization policy. Several empirical studies in relation to public sector efficiency are also discussed in this chapter as well as issues in empirical studies concerning methods used in accessing and explaining public sector efficiency.

Chapter 3 discusses issues and progress in selected public services in the decentralized Indonesia including education, health, basic infrastructure, as well as poverty mitigation. The discussion aims to motivate the significance of the efficiency estimate.

Chapter 4 contains the theoretical framework for the empirical research. Based on the literature review, this chapter formalizes efficiency outcomes as the main objective of decentralization. Chapter 4 also highlights political institutions as a framework for analysis. In particular, political accountability and political agency relationships are put forward as a framework. A micro-foundation model for the local government optimization is also discussed in this chapter.

Chapter 5 sets out the empirical model. First, the chapter explains the data envelopment analysis used in the first stage method. The chapter then provides the underlying empirical used model in explaining public sector efficiency. The chapter also discusses selected variables used in the second stage with regard to the issues in concept and measurement in the context of decentralization and political reality in Indonesia. Chapter 5 also discusses in more detail the econometric techniques employed in the second stage. Since the data is structured in panels, the discussion starts with common approaches to estimating a panel data model. However, given that idiosyncratic variables are used in this study, the deficiencies in the common approaches to estimating the model are put forward. The discussion concludes with the Fixed Effect Vector Decomposition (FEVD) to serve as a reliable estimation technique.

Results from estimating the empirical model are presented in Chapter 6. This chapter also provides an interpretation of the results.

Finally, Chapter 7 provides the major findings of the research and draws out policy implications. The contributions of the study, as well as its limitations, are discussed in this chapter with the intention of highlighting scope for further research.

Chapter 2

Literature Survey

2.1. Introduction

The literature on decentralization is large. It is growing into a body in line with the world-wide adoption of decentralization policy over the last two decades. Coupled with this, decentralization has strong supports from international institutions such as The World Bank and IMF. The literature covers theoretical, empirical, related issues, as well as policy guidance on practical implementation. The literature typically supports decentralized systems of public service provision. A decentralized system of public service provision provides a better environment for economic development and hence promotes welfare. On the contrary, the opponents emphasize the dangers of decentralization in the institutional environments in developing countries. Among these opponents are Prud'homme (1994) and Tanzi (1996).

In the theoretical literature, there is a growing “new” literature extending and enriching the traditional theory of fiscal decentralization. The new literature is wide ranging in terms of its foundations and directions with significant contributions not only from the field of economics but also from political science and sociology. It is growing towards a second generation theory of fiscal decentralization that explicitly accounts for political processes in a setting of asymmetric problems of collective decision making and their impact on the outcome (Qian and Weingast 1997; Oates 2005; Weingast 2009).

This chapter discusses the most relevant literature underpinning this study. The discussion starts with the evolution of the decentralization theory from the traditional theory to the second generation theory (Section 2.2). Given that improved efficiency is considered as the main objective of decentralized public service provision, Section 2.3 provides a review of empirical studies on public sector efficiency. Section 2.4 considers literature on the methodological issues in

measuring and explaining public sector efficiency. Specifically the section reviews the adoption of the two-stage method used in the efficiency studies.³

2.2. The Evolving Decentralization Theory towards the Second Generation

Tiebout's (1956) inter-jurisdictional competition and Oates's (1972) fiscal federalism theorem are considered as the groundwork of the decentralization theory. According to Tiebout (1956), each jurisdiction competes with others to provide tax and public service options which are attractive to people to live in. Thus peoples' decisions where to live determines the formation of a jurisdiction and creates a market-analogue mechanism for public service provision. Thus migration between jurisdictions will lead to an efficient public service provision by matching supply and demand.

Empirical investigations to Tiebout's (1956) inter-jurisdictional competition are provided by Brueckner (1982) and Deller (1990). They use residential property values as a proxy variable in identifying whether fiscal differentials across jurisdictions leads to migration. They argue that a jurisdiction that offers the most comfortable tax and public service options attracts more residents. Hence, it leads to an increase in residential property values. However, both tests suggest that an optimal provision is induced by rational voting behaviour rather than peoples' decision on where to live, and if preconditions for migration exist, it does not prove that migration will lead to an efficient public service provision.

According to Oates (1972), public services should be provided by the government closest to the citizen as the closer the government to the citizen the better the government in internalizing the benefits and costs of the provision. The proposition assumes that the closer the government to the citizens, the better the government in able to understand the concerns of the citizens. Thus local decision making is more responsive to the people for whom the services are intended, and

³Other literature names it as a semi-parametric method given it combines non-parametric and parametric methods (See Khan and Lewbel 2007; Simar and Wilson 2007).

hence encouraging fiscal responsibility and efficiency.⁴The theory assumes that preferences across regions are diverse. With no inter-jurisdictional spillovers, a decentralized public service provision results in better outcomes than centralized, uniform provision.⁵

The traditional theory of decentralization assumes that governments are benevolent social planners which always attempt to maximize social welfare. On the contrary, the public choice literature views governments as not social welfare maximisers, but public officials who have their own objectives induced by political institutions that often diverge from maximizing social welfare (Oates 2005; Weingast 2009; Persson and Tabellini 2000). The public choice tenet becomes a major critic of the traditional theory of decentralization and concurrently makes significant contributions to the theoretical development.⁶

The new approaches of the emerging decentralization literature are established on the groundwork of public choice theory. In this approach, the outcome of decentralization is not only appraised within a trade-off between taste heterogeneity and inter-jurisdictional spillovers, but also within different political institutions where accountability becomes a critical point determining the relative merit of decentralization and centralization. Seabright (1996) suggests that the relative merits between decentralization over centralization depend crucially on improved accountability. He argues that centralization allows government to reap benefits from inter-jurisdictional policy coordination. However, centralization diminishes accountability as localities have no way to reward or punish a central government as a consequence of non-verifiable information. Centralization reduces the probability of a region electing or rejecting a government/politician at election time purely according to its own view to the government's performance.

⁴ This principle is well known as a subsidiarity principle originating from Catholic religious teaching, and as a general principle of European Union law.

⁵ The theory that puts decentralized provision in favour to uniform centralized provision is well known as economic federalism (Inman 1997).

⁶ In respect to the critic coming from public choice literature, Oates (2005) admits that the traditional view of decentralization has ignored the important contribution coming from public choice.

Then, reduced accountability diminishes the government incentive to act for the interests of that region.

Besley and Coate (1999) provide a model in comparing the welfare effect between centralization and decentralization. Parallel to the traditional theory of decentralization, the welfare outcome depends on the trade-off between inter-jurisdictional spillovers and taste heterogeneity. With no spillovers and identical districts, a decentralized system results in greater welfare. With spillovers and identical districts, a centralized system is superior. In the case of spillovers and non-identical districts, the welfare effect depends on the comparison of the magnitude of the two effects. They suggest the role of the decision making institutions is important. Using a model where a central legislature is composed of locally elected representatives and the centralized outcome is a vector of local outputs, they argue that the inefficiency effect of a centralized public provision depends on how the central legislature functions. As a conclusion, they suggest that the relative merits between centralized and decentralized provision depend on the trade-off between inefficiencies from resource misallocation associated with a centralized system and the losses under a decentralized system when localities ignore the spillovers associated with their decision.

The terminology of the second generation theory was first introduced by Qian and Weingast (1997). They offer a new approach which appeals to the theory of the firm. The approach is proposed as a critique of the traditional theory that ignores incentive problems; why do government officials have incentives to behave as prescribed by the theory? In the theory of the firm, managers have their own incentives; they do not behave in the interests of shareholders. The incentives for managers and the interests of shareholders are then aligned through the market. Similar to the theory of the firm, public officials have no reasons to advance the interests of citizens. The incentives of government officials and the interests of citizens are aligned through appropriate political institutions.⁷

⁷This is typically an agency theory.

The new literature discusses various issues and their implications within different political institutions. Weingast (2009) discusses the second generation theory and its implication on taxation and the design of the transfer system. He suggests the importance of the fiscal incentive approach. Acknowledging that public officials have their own objectives, the fiscal incentive approach emphasizes how fiscal institutions create incentives for public officials that affect their policy choices to foster local economic performance. Thus, the taxation and the transfer system should be designed to induce market preserving decentralization.

Kessing (2010) discusses accountability losses caused by distorted elections. He argues that random factors such as weather and economic shocks may result in accountable politicians being voted out by mistake, leading to a decreased accountability of incumbent politicians. Additionally, he claims that the uniformity of service provision in a centralized system is not always considered as a factor that reduces efficiency. Whether uniformity of provision reduces efficiency or not depends on the origin of how citizens decide their votes. If citizens in each region vote on the basis of the level of provision in all regions, then uniformity of public service provision is better for reasons of inter-regional equity. If citizens vote on the basis of the level of public good provision in their own region, the discriminatory regime can reduce accountability.

Hatfield and Miquel (2008) provide a decentralization framework where spillovers and taste heterogeneity are not taken as significant factors. They suggest a partial decentralization that depends on a balance between the desire to redistribute and the need to avoid highly distortive taxes. Central public goods provision becomes redistributive in favour of capital-poor citizens if funded by capital taxes as relatively poor citizens prefer to shift the burden of taxation to large capital owners. They suggest that centrally provided public goods should be funded by capital taxes as a redistributive goal. Koethenbueger (2008) provides a model where the welfare trade-off between decentralization and centralization depends on how the policy choices are able to internalize spillovers in public consumption. He argues that although spillovers may exist, a decentralized

system, if it is welfare enhancing, may promote welfare better than a centralized system.

Hindriks and Lockwood (2009) illustrate the role of political institutions in the extent to which voters can control or hold accountable incumbents under decentralization and centralization. They show that citizen welfare is lower in a centralized system compared to a decentralized system. The reason is that bad incumbents can pool with the good ones at a lower cost to themselves under centralization. They also show that uniformity under centralization allows voters to prevent selective rent diversion, but at the cost of a greater risk of appropriation by bad incumbents. In contrast, decentralization provides better circumstances to discipline politicians and select good over bad incumbents and hence promote better quality of government.

Other new literature on decentralization discusses the yardstick competition mechanism. The competition is induced by inter-jurisdictional spillovers in information where citizens are able to benchmark their own local jurisdiction using the performance of other jurisdictions. Thus the ability of citizens to benchmark is considered as a mechanism to discipline incumbents, select good over bad politicians and thus increase accountability (Besley and Case 1995; Belleflamme and Hindriks 2005; Persson and Tabellini 2000). Khemani (2001) provides evidence in the case of India, that local citizens are more vigilant in monitoring local government than national government as citizens are more able to benchmark, reward, and punish local incumbents. Revelli and Tovmo (2007) provide evidence in the case of Norway that comparative performance evaluation generates positive spatial auto-correlation in local efficiency indicators.

Table 2.1 summarizes the difference between the first generation theory and the second generation theory of decentralization. The first generation theory assumes that government is a benevolent social welfare maximiser. The merits of a decentralized system over a centralized system depend on the trade-off between taste heterogeneity and spillovers among local governments. The first generation theory stands on Tiebout's (1956) inter-jurisdictional competition where each jurisdiction competes with others to provide attractive tax and public service

options for people. From the perspective of first generation theory, inter-regional transfers function to correct vertical and horizontal imbalances.

Extending the traditional theory, the second generation theory stands on the assumption that public officials and politicians are rent seekers who always attempt to advance their own objectives and that these often diverge from citizens' welfare objectives. The merits of decentralization depend on a set of political institutions where political incentives and social welfare are aligned. Competition among jurisdictions is induced by informational spillovers across jurisdictions where politicians and citizens are able to benchmark the performance of their own jurisdiction using information of other jurisdictions' performance. Hence citizens vote on the basis of informational spillovers.

Table 2.1: Summary of the differences between the first and the second generation theories of decentralization

	First generation theory of fiscal decentralization	Second generation theory of fiscal decentralization
Type of government	Benevolent social planner	Leviathan
Goals of government	Common objectives-maximizing social welfare	Different objective function – rent seeking
The merit of decentralization	Trade-off between taste heterogeneity and spill over among localities	Political institutions, political incentive, politicians behaviour, and yardstick competition
Competition among jurisdictions	Tiebout's vote with one's feet	Yardstick competition
Coping with vertical and horizontal imbalance	Intergovernmental transfers	Fiscal incentive approach
The function of intergovernmental transfers	Mitigate vertical imbalance	Induce market-preserving federalism

2.3. Empirical Studies on Decentralization and Public Sector Efficiency

The empirical literature on public sector efficiency generally exhibits a typical pattern. Efficiency scores are constructed using non-stochastic or stochastic approach. Subsequently, an efficiency analysis is employed using descriptive statistics, correlation or regression against selected non-discretionary inputs. Some are cross-country analyses (Afonso and Aubyn 2005, 2006; Herrera and Pang 2005; Adam, Delis and Kammas 2008; Enikolopov and Zhuravskaya 2007; Afonso, Schuknecht and Tanzi 2005, 2006; Hauner and Kyobe 2008) and some are cross-local governments within a country (De Borger et. al 1994, De Borger and Kersten 1996; Worthington 2000; Worthington and Dollery 2000; Hauner 2008; Barankay and Lockwood 2007; Borge, Falch and Tovmo 2008; Balaguer-Coll, Prior and Tortosa-Ausina 2007; Afonso and Fernandes 2006, 2008; Alexander, Haug and Jaforullah 2010). An empirical study carried out by Angelopoulos and Philippopoulos (2008) takes the efficiency estimate as an explanatory variable for economic growth.

Among these studies, empirical investigations on the impact of decentralization on public sector efficiency are provided by Barankay and Lockwood (2007) and Adam, Delis, and Kammas (2008). Barankay and Lockwood (2007) investigate the correlation between expenditure decentralization and efficiency outcomes. Using a panel regression, they find evidence in the case of the Swiss education sector that more decentralized expenditure, measured by share of local expenditure to total consolidated expenditure (central + local), is associated with higher educational attainment. Adam, Dellis, and Kammas (2008) investigate public sector efficiency and fiscal decentralization in the case of OECD countries. They find evidence that public sector efficiency is increasing with fiscal decentralization.

Empirical studies on the political economy of decentralization are limited. Among this small number of contributors are Enikolopov and Zhuravskaya (2007), Adam, Delis and Kammas (2008) and Borge, Falch and Tovmo (2008). Enikolopov and Zhuravskaya (2007) investigate whether the outcome of the

decentralization depends on the level of political centralization. Using cross-section and panel data from 75 developing countries over 25 years, they provide evidence that the strength of national political parties significantly improves the outcomes of decentralization, such as economic growth, quality of government and public service provision. They also find evidence that administrative subordination does not improve the outcome of decentralization.

Adam, Dellis and Kamas (2008) investigate public sector efficiency against a measure of fiscal decentralization and political variables for 21 OECD countries. In the first stage, they use data envelopment analysis (DEA) to obtain a public sector efficiency (PSE) score following the method used by Afonso, Schucknecht, and Tanzi (2005). In the second stage, they perform an econometric analysis to explain the PSE on selected non-discretionary inputs including fiscal decentralization measures, coalitions, number of spending ministers, total factor productivity growth, dependency ratio, the degree of openness, index of government regulation and ethno-linguistic fractionalization. They find evidence that fiscal decentralization has a positive and significant effect on public sector efficiency. Coalition governments and large government have a negative impact on public sector efficiency.⁸

The Enikolopov and Zhuravskaya (2007) and Adam, Delis and Kamas (2008) studies are cross-country analyses. Accordingly, these studies are not able to capture local political dynamics. In addition, a cross country study suffers from different political and fiscal institution bias which is not the case with cross-local governments studies (Borge, Falch, and Tovmo 2008).

Borge, Falch and Tovmo (2008) investigate whether public sector efficiency of local government is affected by political and budgetary institutions, fiscal capacity and democratic participation. In the first stage, they estimate public sector efficiency in Norwegian local governments using several alternative measures. Subsequently, using panel data regression with efficiency as the

⁸ They use tax revenue decentralization and revenue decentralization as proposed by Stegarescu (2005) as an alternative measure to the common measure of fiscal decentralization used in Government Financial Statistics.

dependant variable, they find evidence that a high degree of party fragmentation and high fiscal capacity contribute to low efficiency. They also find evidence that greater democratic participation contributes to greater efficiency, and a centralized top-down budgetary process contributes to low efficiency.

The literature on decentralization in the case of Indonesia is growing. The literature mainly discusses the policy implementation and evaluation. More specifically it highlights the context, background, institutional arrangements, obstacles and its potential impact of such policies in Indonesia (See for example Alm, Aten and Bahl 2001). Other literature highlights Indonesia as a case study of the policy adoption in comparison with other countries (See Bahl 2006; IMF Fiscal Affairs Department 2009).

Evaluations of the decentralization policy in relation to particular issues in Indonesia are also found in the literature. Corruption is an example. It is one of the crucial issues along with power delegation from central to local governments. Within weak institutional arrangements in the early stages of the implementation of decentralization, corruption was widespread at the local levels (See Rinaldi, Purnomo and Damayanti 2007). They reported that in 2006 there were 265 corruption cases in the local legislatures with almost 1,000 suspects prosecuted by Prosecutorial Offices across Indonesia. Not only in the legislatures does the corruption occur but also in the executive offices. There were 46 corruption cases in 2006 with 61 Governors/Mayors prosecuted.

Other literature highlights potential outcomes of decentralization in a particular sector following the policy adoption such as in forest management (Palmer and Engel 2007; Barr et al. 2006), fisheries management (Satria and Matsuda 2004) and education (Arze del Granado et al. 2007; Behrman, Deolalikar and Soon 2002; Toyamah and Usman 2004). These studies draw attention to the gap between the beliefs that decentralization will result in better outcomes as theoretically prescribed and its implementation in the context of Indonesia's institutions.

Given that fiscal decentralization in Indonesia takes place parallel to political decentralization and democratization, many scholars draw attention to the relationship between decentralization and democratization. They illustrate the ambiguity of the relationship between decentralization and democratization in Indonesia. Decentralization and democratization in Indonesia have witnessed the emergence of new patterns of highly diffuse and decentralized corruption, rule by predatory local officials, *politik aliran*, patron-client affiliation, the rise of money politics and the consolidation of old oligarchic powers (See Sulistyono 2002; Hadiz 2004; Ufen 2006; Tomsa 2008; Chua 2009). In such institutional environment decentralization and democratization in Indonesia is characterised as a protracted transition rather than a consolidated phase of transition (Malley 2000; Bunte 2009) and a period of the agony of the decentralization with a gap between professional optimism and realistic pessimism (Van Klinken 2007).

Despite a growing literature on decentralization in the case of Indonesia, there has been little attention to the investigation of the decentralization outcome. Any investigation of this matter will be beneficial, not only for its contribution to the literature, but also for local government benchmarking. Several publications regarding the performance of decentralized local governments have been published by the Regional Autonomy Implementation Watch Commission (*Komisi Pemantauan Pelaksanaan Otonomi Daerah*, KPPOD). The performance indicators such as investment climate index, business climate index and governance index are established on the basis of surveys.

2.4. Methodological Issues

2.4.1. Measuring Public Sector Efficiency

There are four different approaches which are usually used in measuring efficiency; deterministic frontier approach (DFA), stochastic frontier approach (SFA), data envelopment analysis (DEA) and free disposable hull (FDH). Both DFA and SFA are developed on the basis of econometric analysis underlying production or cost functions. Once the production or cost function is determined, the production frontier can be used as an efficiency benchmark. The difference between actual behaviour of an observed unit and the frontier determines the degree of the efficiency. The DFA assumes that the difference between actual behaviour of an observed unit and the frontier is all due to inefficiency. SFA assumes that the difference between actual behaviour and the frontier is due to inefficiency and noise. The SFA, first introduced by Aigner, Lovell, and Schmidt (1977) has become a standard of econometric based efficiency analysis (Greene 2008; Coelli et. al 2005; Worthington 2000).

A comparative efficiency measurement between non-parametric and parametric approaches was investigated by De Borger and Kerstens (1996) and Worthington (2000). De Borger and Kerstens (1996) provide comparative efficiency measurement using DEA, FDH and econometric based techniques in the case of Belgian local government. They find large differences in mean efficiency scores due to various reference technologies among those techniques. They argue that as long as the problem of choosing the best reference technology has not been resolved, the ability to accurately measure public sector efficiency is still limited. However, they find that despite variability in the efficiency scores, the explanatory analysis yields robust results.

Worthington (2000) examines efficiency measurement between a non-parametric and a parametric approach in the case of Australian local government. Given the advantages and the drawbacks of each different technique, he emphasizes the need to be aware of different questions, purposes, and informational requirements in choosing an appropriate efficiency technique. He

advocates both techniques that should be thought of as complementary in the analysis of public sector efficiency.

In contrast to an econometric based DFA and SFA, the DEA and FDH are developed on the basis of mathematical programming. The difference between the actual behaviour of an observed unit and the frontier measures relative efficiency within a sample. As a non-parametric analysis, DEA and FDH are unable to accommodate the probability of the errors due to variable selection and measurement. Therefore, efficiency scores obtained through DEA and FDH are sensitive to variable selection and measurement. Any inaccuracies in the selection and measurement of output and input variables will be incorporated in the efficiency estimates.⁹

Both DEA and FDH are computationally simple and have advantages in that they can be implemented without knowing the algebraic form of the relationship between outputs and inputs (Coelli et. al 2005). Both DEA and FDH are also able to handle multiple outputs which is impossible to do with econometric based efficiency techniques. Additionally, DEA is powerful in the case where output and input variables are in the form of an index and when price data are unavailable or irrelevant as in the case of the public sector (Coelli et. al 2005).

Given its advantages, non-parametric techniques have become popular in measuring public sector efficiency. Both DEA and FDH have been widely adopted in studies measuring efficiency in a specific public sector category such as education or health (Afonso and Aubyn 2005, 2006; Herrera and Pang 2005; Hauner and Kyobe 2008; Alexander, Haug and Jaforullah 2010) or in comprehensive indicator containing several sub-categories in the public sector (Afonso, Schucknecht and Tanzi 2005, 2006; Hauner 2008; Adam, Delis and Kammass 2008; Afonso and Fernandes 2008).

⁹ An important development regarding the statistical issue of DEA efficiency is the work of Banker (1993). He provides statistical foundation by identifying conditions under which DEA estimators are statistically consistent and maximize likelihood.

The underlying assumption that the production technology is homogenous becomes one of the drawbacks in the efficiency analysis using DEA or FDH. The assumption of a homogenous production technology implies that each unit uses the same kind of inputs. Consequently, an omission of an important input will result in a high efficiency score for a unit that intensively uses the omitted input. It also assumes that the quality of the inputs is more or less the same. Hence, the efficiency scores will be biased in favour of a unit where the quality is of higher grade. Clustering samples with the same characteristics is a common technique applied to minimize the input heterogeneity bias as done by Herrera and Pang (2005) and Afonso and Fernandes (2008).

Table 2.2: Summary of studies measuring public sector efficiency

Author	Sample	Methodology	Indicators Input	Output
De Borger, et al. (1994)	589 Belgian Municipalities	FDH	The number of white and blue collar workers Surface area of buildings owned by municipalities	The surface area of municipal roads The number of beneficiaries of minimal subsistence grants The number of students enrolled in local primary schools The surface area of public recreational facilities A proxy variable for the services delivered to non-residents: the logarithm of the number of non-residents working in the municipality divided by the logarithm of the total employment in the municipality
De Borger and Kerstens (1996)	589 Belgian Municipalities	FDH, DEA and SFA	Total current expenditure	The number of beneficiaries of minimal subsistence grants The number of students enlisted in local primary school The surface area of public recreational facilities Total population The fraction of population older than 65
Worthington (2000)	166 Australian Municipalities	DEA, SFA	Number of full time equivalent employees, Other physical expenses Financial expenses	Population, properties receiving DWMS Properties receiving sewerage services Properties receiving water services Length of urban roads Length of rural roads (sealed) Length of rural roads (unsealed)

Afonso, Schucknecht, and Tanzi (2005)	23 Industrialized countries	FDH	Total public spending	Administrative: Corruption, red tape, quality of judiciary, shadow economy Education: Secondary school enrolments, education achievement Health: Infant mortality, life expectancy Public infrastructure: Quality of communication, transportation infrastructure Distribution: Income share received by 40% households of the lowest income group Stability: Stability of GDP growth, inflation Economic performance: GDP growth, GDP per capita, unemployment
Afonso and Aubyn (2005)	OECD countries	DEA, FDH	Education: The total intended instruction time in public institutions in hours per year for those 12–14 year old, and the number of teachers per student in public and private institutions for secondary education, calculation based on full-time equivalents. Health: In-patient beds, medical technology indicators, health employment	Education: The performance of 15 year old on PISA reading, mathematics and science literacy scale in 2000 Health: Life expectancy, infant and maternal mortality
Afonso and Aubyn (2006)	Educational System of OECD Countries	DEA	Number of teachers per student Time spent at school	Student performance, the 2003 results from the Programme for International Student Assessment (PISA), launched by the OECD

Afonso and Fernandes (2006)	51 Municipalities in Lisbon Region and Vale do Tejo (Portugal)	DEA	Total per-capita municipal expenditures	<p>General administration: Total resident population, present population divided by the total resident population, resident population that came from other municipalities divided by the total resident population</p> <p>Education: School buildings per capita, education attainment</p> <p>Social activity: Local resident > 65 years old</p> <p>Basic sanitation and environment protection: Percentage of the population with clean water, percentage of the population with draining water system, percentage of population with water treatment stations, percentage of population with solid waste collection, percentage of the buildings with solid waste collection, recycled materials given or sold</p>
Herrera and Pang (2005)	140 developing countries	FDH and DEA	Expenditure on education and health.	<p>Education: Primary school enrolments (gross and net), secondary school enrolments (gross and net), literacy of youth, average years of school, first level complete, second level complete, and learning scores</p> <p>Health: Life expectancy at birth, immunization (DPT9 and measles), and the disability-adjusted life expectancy (DALE)</p>

Afonso, Schucknecht, and Tanzi (2006)	New EU member states and emerging markets	DEA	<p>Socio-economic Indicators: Public consumption as proxy for input to produce administrative outcomes, Health expenditure (for health performance/outcome indicators), Education expenditure (for education performance).</p> <p>Musgravian Indicators: Transfers and subsidies as proxies for input to affect the income distribution, Total spending as proxy for the input to affect economic stabilization (given that larger public sectors are claimed to make economies more stable), Total spending also as a proxy input for economic efficiency and the distortive effects of taxation needed to finance total expenditure</p>	<p>Socio-economic indicators: Administrative(Corruption, red tape, quality of judiciary, shadow economy), Education (Quality of math and science), Health (Infant survival rate and life expectancy)</p> <p>Musgravian Indicators: Distribution (Gini coefficient), Stability (Stability of GDP growth, inflation), Economic performance (GDP real growth, unemployment)</p>
Balaguer-Coll, Prior and Tortosa-Ausina (2007)	Local Governments in the Comunitat Valenciana (Spain)	FDH and DEA	<p>Wages and Salaries Expenditure on goods and services Current transfers Capital transfers Capital expenditure</p>	<p>Number of lighting points, Total population, Tons of waste Street infrastructure surface area Registered area of public parks Quality (categorical variables)</p>
Hauner and Kyobe (2008)	Education and health sector of 114 countries	DEA	Health and Education expenditure	<p>Education: Primary enrolment rate, secondary enrolment rate Health: DPT immunisation rate, physicians to population ratio, share of public spending in total health spending</p>

Hauner (2008)	89 regions in Russia	DEA	Expenditure in health, education, and social protection	<p>Infectious and parasite diseases per 1000 population</p> <p>Complication during pregnancy or postnatal periods, per 1000 population</p> <p>Infant mortality rate</p> <p>Life expectancy at birth in years</p> <p>Pre-schooling coverage of children in percentage of applicable age of children</p> <p>Primary professional education coverage</p> <p>Secondary professional education coverage</p> <p>General education coverage</p> <p>Poverty, Income inequality</p>
Afonso and Fernandes (2008)	308 Municipalities in Portugal, clustered in 5 NUTS-2 regions	DEA	Total municipal expenditure per inhabitant	<p>Social services: Local inhabitants > 65 years old as a percentage of the total resident population</p> <p>Basic education: School buildings per capita and gross primary enrolment ratio</p> <p>Cultural services: Number of library users in a percentage of total resident population</p> <p>Sanitation: water supply</p> <p>Territory organisation: The number of licenses for building construction</p> <p>Roads infrastructure: The length of road per population maintained by municipalities</p>
Adam, Delis and Kammas (2008)	21 OECD countries	DEA	Total public spending	<p>Economic performance: GDP per capita, unemployment rate, GDP growth rate</p> <p>Economic stability: Standard deviation of GDP growth rate and inflation rate</p>

2.4.2. Explaining Public Sector Efficiency

Much of the empirical literature on public sector efficiency attempts to explain public sector efficiency using a regression analysis. The efficiency score obtained through DEA that includes only controllable inputs in the first stage is regressed against non-discretionary inputs in the second stage.¹⁰ In the DEA literature, the adoption of the two-stage method to handle non-discretionary inputs is the most recommended among other approaches (See Coelli et. al 2005). However, it is imperative to note that given the nature of regression analysis, it requires correct specification of the functional form of the regression model. Any misspecification of the regression model will potentially distort the result (Thanassoulis et. al 2008).

In conjunction with the wide adoption of the two-stage method, recent critical developments embracing this method include the work of Simar and Wilson (2007, 2008), Banker and Natarajan (2008) and McDonald (2009). Simar and Wilson (2007, 2008) address several problems which potentially cause the results to be invalid. First, the DEA efficiency score as a dependent variable is a biased estimator for efficiency. As a consequent, the regression parameters may also be biased. Second, the efficiency scores obtained from DEA are serially correlated and hence standard approaches to inference are invalid. Third, in some cases, if the input-output variables used in assessing DEA efficiency are correlated with the independent variables, the error term is also correlated. Thus, the result may tell nothing about efficiency. Additionally, it is argued that the application of the two-stage method in most studies does not describe the data generating process (DGP) for which the second stage would be sensible. Coping with these problems, Simar and Wilson suggest a double bootstrap procedure to permit valid inference and to improve statistical efficiency.¹¹

As far as can be determined, only a few studies explaining DEA efficiency scores through a regression model have taken the issues raised by Simar and

¹⁰Other literature names it as an environmental variable or exogenous variable or non-physical input.

¹¹Wilson (2003) provides several tests for the independence. Once the independence is hold, the bootstrap methods could be simplified, reducing computational burden.

Wilson (2007) into consideration. Among these are Afonso and Aubyn (2006) and Adam, Delis and Kammass (2008). A recent paper that employs the double bootstrap method suggested by Simar and Wilson (2007) can be found in Alexander, Haug and Jaforullah (2010). They employ a two-stage double bootstrap method in explaining efficiency differences in secondary schools in New Zealand.

Given that the DEA efficiency scores are limited to the interval from 0 to 1, the Tobit model is typically used in the second stage. In many cases, OLS regression is also found. Banker and Natarajan (2008) provide statistical foundations and a Monte Carlo Simulation to compare the performance of the different approaches used in the second stage. They show that a DEA-based efficiency followed by OLS or maximum likelihood yields consistent estimators of the impact of non-discretionary variables. Based on a Monte Carlo Simulation they show that OLS, maximum likelihood and even Tobit for the second stage DEA efficiency analysis are sufficient. Hoff (2007) also advocates Tobit and OLS regression models for the second stage DEA compared to the Papke and Wooldridge approach (1996) and the unit-inflated beta model.

In contrast to the Tobit regression model, McDonald (2009) argues that OLS yields unbiased estimators for the second stage DEA efficiency. He argues that the DEA efficiency scores are a particular kind of fractional data or proportional data, and thus a fractional OLS model is sufficient. On the contrary, a Tobit model for the second stage is not appropriate as the DEA efficiency score is not generated by a censoring or corner solution (DGP). A recent study that uses fractional regression models for the second stage DEA is provided by Ramalho, Ramalho and Henriques (2010).

In contrast to the parametric application for the second stage DEA, Ballaguer-Coll, Prior and Tortosa-Ausina (2007) use a non-parametric smoothing approach in the second stage. They argue that though non-parametric regression and non-parametric density estimation are less powerful in terms of prediction, they are extremely informative for explanatory purposes.

Table 2.3: Summary of studies explaining public sector efficiency

Authors	Sample	Method		Explanatory variables	Main findings
		First Stage	Second Stage		
Adam, Delis and Kammas (2008)	OECD countries	DEA	Tobit with SW single and double bootstrap procedure.	Fiscal decentralization measures, dependency ratio of population, total factor productivity, openness indicator, economic freedom, ethno-linguistic fractionalization, number of spending ministers, coalition.	Strong positive impact of the degree of fiscal decentralization (in several alternative measures) to the PSE
De Borger, et al. (1994)	589 Belgian Municipalities	FDH	Standard Tobit Model	Population, number of parties in municipal coalition, the ruling party, average personal income, grants, share of the adult population holding a higher education degree.	
Afonso and Fernandes (2008)	308 Municipalities in Portuguese, clustered in 5 NUTS-2 regions	DEA	Standard Tobit model	Purchasing power, educational level, geographical distance between the municipality and its capital district, population.	
Afonso, Schucknecht, and Tanzi (2006)	New EU member states and emerging markets	DEA	Standard Tobit model	Secondary school enrolment, the competence of the civil officials (survey results presented in the Global Competitiveness Report), per capita GDP, property rights indicator, trade openness (exports and imports as a share of GDP), transparency in public policy ,other more direct indicators of political accountability (such as civil liberties, political rights or checks and balances)	

Afonso and Aubyn (2006)	Educational System of OECD Countries	DEA		Tobit with SW single and double bootstrap procedure.	GDP per capita and parent educational attainment	Inefficiency in educational system was strongly related to GDP per capita and adult educational attainment.
Balaguer-Coll, Prior and Tortosa-Ausina (2007)	Local Governments in the Comunitat Valenciana (Spain)	FDH DEA	and	Non parametric smoothing technique	Fiscal policy variable (tax revenue, grants, or financial liabilities, own revenue, deficit), Political variable (the percentage of vote attained by ruling party in each municipality)	
Hauner (2008)	89 regions in Russia	DEA		OLS	Social and environmental conditions (income per capita, fuel industry, consumption of alcohol and tobacco, above working age population, under-working age population) Relationship to the federal government (distance from Moscow, population, transfer) Quality of governance (investment risk, share of the shadow economy) Democratic control (academic attainment, urbanism, press freedom index, competitiveness of election) Public and private expenditure Initial conditions	

Hauner and Kyobe (2008)	Education and health sector of 114 countries	DEA	OLS	<p data-bbox="1294 298 2112 459">Economic determinants: Education spending and health spending, income per capita, country classification as commodity exporter or developing country (dummy), inflation, trade liberalization, openness.</p> <p data-bbox="1294 491 2112 619">Institutional determinants: Accountability and corruption control, democracy, durable regime, social infrastructure, schooling (specific for health efficiency).</p> <p data-bbox="1294 651 2112 766">Demographic and geographic determinants: Population >65 and population <14, population density, fractionalization, malaria, climate.</p>
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2.5. Conclusion

The discussion in this chapter has considered the literature which is considered relevant for constructing a theoretical foundation for an empirical model tested in Chapters 4 and 5. First, the discussion reviews the literature on fiscal federalism which is well recognized as the traditional theory of decentralization. The discussion then reviews the new literature that extends and enriches fiscal federalism literature. The new literature is identified as the second generation theory of decentralization and has motivated the objectives of this study as the literature emphasizes political institutions and politicians' behaviour in a setting of asymmetric information that affects the outcome of decentralization.

The discussion also provides some empirical studies in measuring and explaining public sector efficiency. In particular, the discussion clarifies methodological issues based on previous studies. The issues are then taken as a consideration in constructing the empirical model and the estimation technique discussed further in Chapter 5. Public sector efficiency is estimated using nonparametric data envelopment analysis at the first stage. Subsequently the efficiency estimate is regressed against selected explanatory variables in a panel data structure.

There are two central issues in selecting an appropriate estimation technique. First, several explanatory variables are characterised as time-invariant variables. As a consequence, a standard fixed effect estimator is not able to yield coefficient estimates; and thus, fixed effect vector decomposition is chosen. Second, the dependent variable is limited to an interval from 0 to 1. However, it is considered as a fractional data, not as a censored data generating process. Accordingly an ordinary least square (OLS) is chosen as opposed to Tobit.

Chapter 3

Issues and Progress in Selected Public Services in Decentralized Indonesia

3.1. Introduction

The literature survey discussed in the preceding chapter reveals that Data Envelopment Analysis (DEA) is popular as a method used to generate public sector efficiency scores. DEA is appropriate to measure efficiency in the case of the public sector where price information is unavailable or even irrelevant. It is also suitable to measure efficiency where output and input variables are in the form of an index. In addition, it is applicable in the case of a production process that involves multiple outputs which is a situation where econometric based efficiency analysis is impossible.

However, as a non-parametric method, the efficiency score obtained through DEA is sensitive due to errors in the input-output selection and measurement. Hence, the selection and measurement of the input-output variables is critical. One should be aware of the intention and condition to which DEA is adopted. More input and output variables involved in the computation may not achieve better results. The substance of the selection stands on the relevance of the input-output to a particular circumstance. A calculation with different types of input-output variables as well as different techniques will generate different efficiency scores. However, this does not have an effect on the robustness of the explanatory analysis (See De Borger and Kerstens 1996).

In order to motivate the significance of the input-output variables used in the efficiency calculation in this study, this chapter discusses issues and progress in selected public categories and associated indicators. The public sector categories selected in this study involve education, health, water supply (basic

infrastructure), and poverty mitigation. The substance of the discussion generally reveals a variation in public sector performance across decentralized local governments in Indonesia.

3.2. Education: Targeting “Basic Education for All”

Like most of Indonesia’s public sectors, the education sector was centralized. This occurred under the Ministry of Education and Culture of the Republic of Indonesia. Educational policy was set at the national level and financed through the national budget, including spending on educational staff salaries for all levels of government. The delegation to sub-national governments was conducted under a so-called “deconcentration” system where the central government delegated particular management responsibilities to branch offices at provincial or district levels. In this sort of delegation system, local government officials conducted the administration on behalf of central offices.

Based on Law 22/1999 dealing with Regional Government, the education sector is among the sectors delegated to local governments as an obligatory function.¹² How the decentralized education sector is applied is defined in Education Law 20/2003. The Law mandates Kabupaten/Kota district governments to deliver basic and secondary education.¹³ Provincial governments are responsible for conducting inter-local government coordination concerning educational attainment, teacher skill development, and inter-local service provision in the education sector. The central government determines national education standards and policy (Article 50 Law 20/2003). However, the implementation of a decentralized education sector has encountered several problems as a result of unclear, incomplete, and inappropriate assignment of governance and management functions, as well as a shortage of management and technical skills needed to operate such a decentralized education system (See Arze del Granado et. al 2007; The World Bank 2004a).

¹²The law was enacted as the legal basis for decentralization policy. It is now amended by Law 32/2004.

¹³ The law defines basic education (9 years grade compulsory) comprising the first 6 grades of primary school and 3 years of junior secondary school.

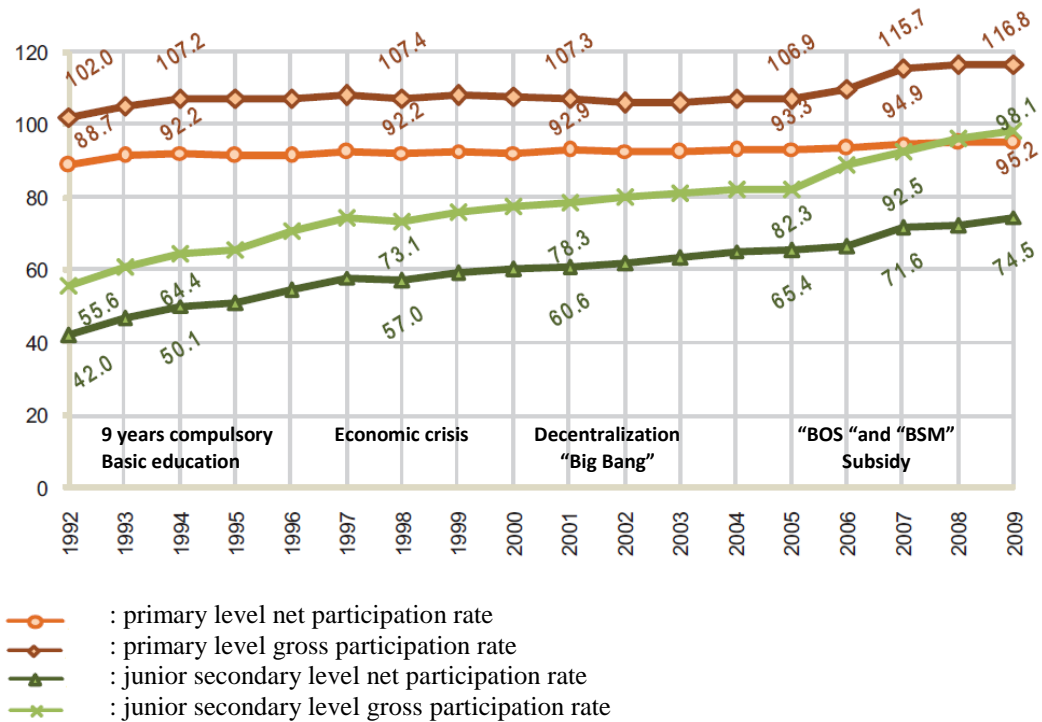
Indonesia has a commitment to achieve education for all. The 9 years compulsory basic education program was launched in 1994 to achieve the “education for all” goal. The program targets 7-15 year old children to achieve basic education to the junior secondary level. The program aimed to reach 100% participation rate at the primary level and 96% participation rate at the junior secondary level by 2009. By the end of 2015, the program aims to achieve 100% realization of 9 years compulsory basic education (Indonesia Millennium Development Goals Progress Report 2010).

Figure 3.1 illustrates progress in the school participation rate. As a result of a consistent drive to build schools across the country since before decentralization, the participation rate shows a consistent increase at every level of education.¹⁴ The gross participation rate at primary level education has achieved full coverage. However, the participation rates in junior and senior secondary levels remain low which presents a challenge to the goal of education for all and 9 years compulsory schooling.

In 2005, the central government launched a “Bantuan Operasional Sekolah (BOS)” subsidy program. The program is intended to finance school operations so that tuition fees that burden parents/carers could be eliminated. In conjunction with BOS, the central government also launched a “Bantuan Siswa Miskin (BSM)” scholarship for the poor that aims to minimize the school drop-out rate. The BOS subsidy program has been adopted by several local governments, financed through their local budgets. As a result, a number of local governments have been able to operate 9 years compulsory basic education with free tuition.

¹⁴The budget allocation aimed to build primary school buildings across country was administered specifically in a so called “Instruksi Presiden (INPRES)” policy.

Figure 3.1: Progress in school participation rates in Indonesia

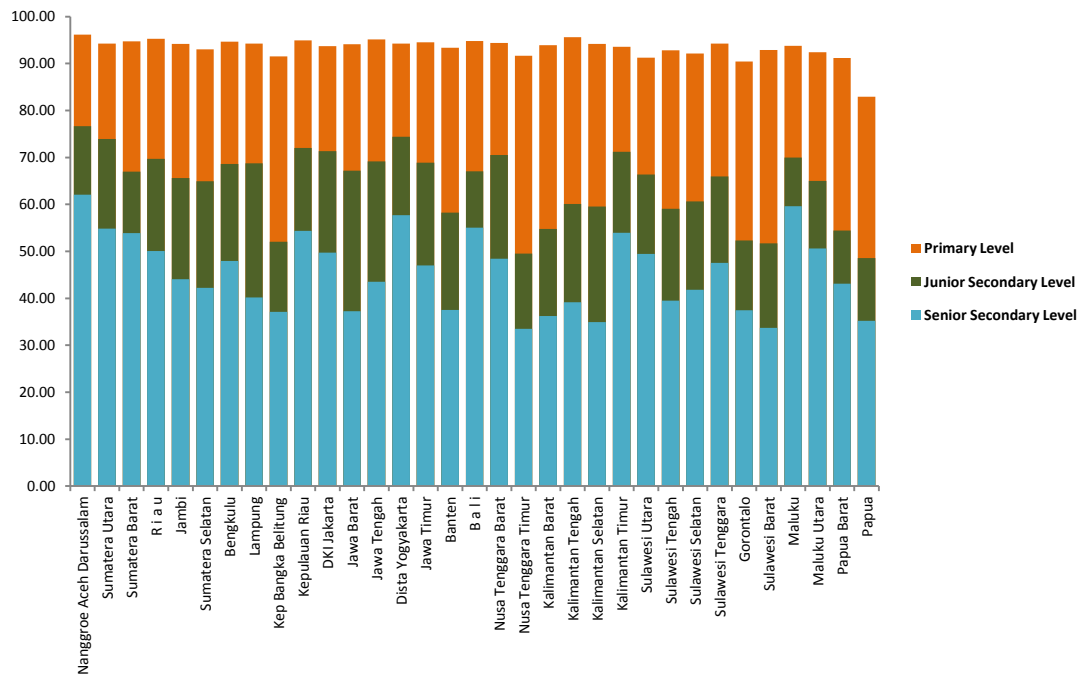


Source: BPS (Centre Bureau of Statistics), Susenas (National Socio-Economic Survey), and Ministry of Education the Republic of Indonesia.

As a country with a large population and wide geographic dispersion, inequality across income groups and regional gaps remain as a fundamental issue. In 2008, with Papua as an exception, all provinces had achieved net participation above 90% in the primary level education. Net participation of primary level education in Papua was 82.9%. While the difference between the primary level participation rates across provinces is small, the difference in the secondary level participation rates is still high. The regional participation rate ranged from 48.6% to 76.7% at junior secondary level and 33.5% to 62.1% at senior secondary level. Indonesia’s MDG claims that socio-economic factors have been a cause of participation rates remaining low. Many children from poor families drop out of school as they have to work. Lack of educational infrastructure, irrelevant curriculum, underqualified teachers, as well as an unbalanced teacher distribution across regions, have also been sources of the low participation rate (Indonesia Millennium Development Goals Progress Report 2010). Therefore, under the decentralized system, the education sector is targeted, mainly to achieving

universal participation of 9 years compulsory basic education, eliminating regional and income group gaps, improving the quality and relevance of schooling, and improving the education management system (See Behrman, Deolalikar and Soon 2002; Toyamah and Usman 2004; The World Bank 2004).

Figure 3.2: School participation rate, provincial level



Source: BPS (Centre Bureau of Statistics).

The commitment to improve education performance results in a significant increase in the budget allocation for education. Moreover, the budget allocation for the education sector is explicitly specified in the 2002 amended constitution. The constitution mandates all levels of government to devote at least 20% of the budget (central + provincial + local) to the education sector. Starting from 2003, teacher salaries are excluded from the 20% allocation leading to pressure on every level of government to increase discretionary spending in the education sector. Nevertheless, although spending in the education sector tends to be consistently increased, it never achieves the 20% minimum requirement. This had led to a national debate on the budget legitimacy. The debate was carried to the constitutional court to review the budget spending as to whether it is in line with the constitution or not. The debate continued until 2008, when the court mandated

all levels of government to fully complete the 20% minimum requirement starting from 2009. Otherwise, the budget will be considered as unconstitutional.¹⁵ Table 3.1 shows an upward trend in spending on the education sector that reached 16.8% of total spending in 2007. The upward trend is continuing as a consequence of the 20% minimum requirement on spending for education.

Table 3.1: National public spending on education in trillions Rupiah (central + provinces + districts)

	2001	2002	2003	2004	2005	2006*	2007**
Nominal National Education Expenditures	42.3	53.1	64.8	63.1	78.6	114.7	131.0
National Education Expenditures (2001 constant price)	42.3	47.4	54.3	49.8	56.2	72.7	78.1
Growth real national education expenditure	40.3	8.5	18.4	-8.4	12.8	29.4	7.5
Education Expenditures (% to total national expenditures)	12.0	15.7	16.0	14.2	14.7	15.7	16.8
Education Expenditures (% to GDP)	2.5	2.8	3.2	2.8	2.9	3.5	3.9
Total Nominal national expenditures	352.8	336.5	405.4	445.3	535.8	728.2	778.2
Total real national expenditures (2001 price)	352.8	300.8	339.9	351.6	382.9	461.3	464.0
Government Size (total exp. As % of GDP)	21.0	18.1	19.8	19.6	19.6	22.0	22.0

Source: World Bank staff calculation based on Ministry of Finance and SIKD (Regional Finance Information system).

Note: * = budget, ** = estimated

3.3. Health: Improving the Level of Health Status

A number of indicators are available to portray the level of health status. A proportion of indicators depict performance measures in the process of health service delivery. These indicators usually deal with the quantity and the quality of health infrastructures such as the ratio of available doctors, nurses, hospitals and other health providers per resident in a particular region. Other indicators deal with particular health services in a specific area. Examples are coverage of a particular immunization or contraception. Other indicators can take the form of health outcome performance measures such as a life expectancy index, an infant mortality index, a maternal mortality index or even a prevalence indicator of the incidence of specific diseases such as HIV or tuberculosis.

This study takes the infant mortality Rate (IMR) and the annual tuberculosis index (ATI) as outcome indicators to portray health sector performance. Both indicators are pertinent with regard to the objectives of the study. The selected indicators should reflect the flow of services that arise from

¹⁵Constitutional Court No: 013/PUU-VI/2007,date 13 Agustus 2008.

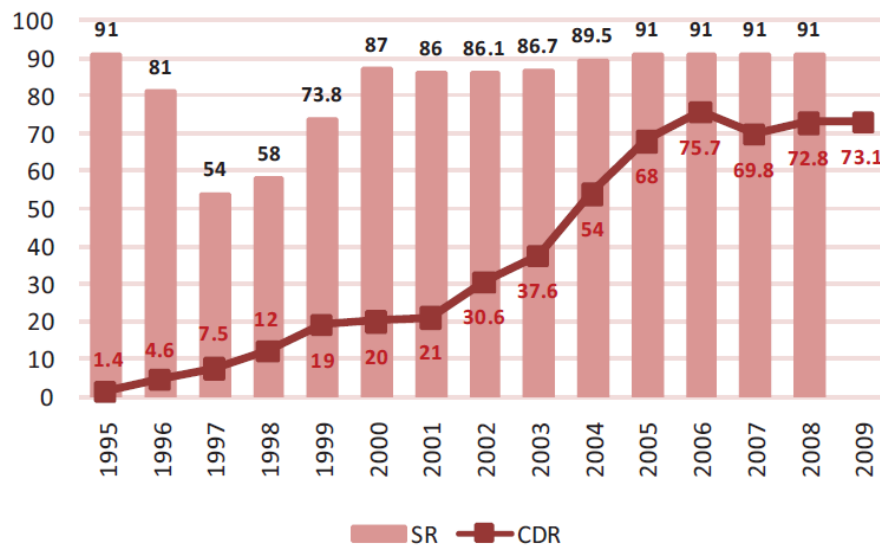
public spending. In addition, both indicators are selected as numerous programs as well as MDG takes them as targets and hence they are commonly used as indicators to portray the level of Indonesia's health status (See Profil Kesehatan Indonesia 2004, 2005, 2006, 2007, 2008). Indonesia's MDG documented goals to achieve by 2015 including a decrease the infant mortality rate (IMR) and combating HIV/Aids, tuberculosis, malaria and other contagious diseases (Indonesia Millennium Development Goals Progress Report 2010).

Indonesia is among South East Asian countries that have a high incidence of tuberculosis (TB). Therefore, Indonesia's MDG specifically targets to reduce by half the incidence of tuberculosis by 2015. It also targets to achieve at least 70% of TB sufferers are detected and treated by the direct observed treatment short cure chemotherapy (DOTS) program or the direct monitoring medication program (PMO), and achieve at least 85% success rate (Profil Kesehatan Indonesia 2008). Figure 6.3 shows progress in the case detection rate (CDR) and the success rate (SR) in tuberculosis medication.

A consistent drive to increase health status since before decentralization has been able to improve several important health indicators. The infant mortality rate decreased from 46 to 35 per 1000 birth lives from 1997 to 2003. Life expectancy increased from 65.8 years in 1999 to 66.2 years in 2003. Underweight prevalence of children fell from 37.5% in 1989 to 25.8% in 2002 (Mid-Term Development Planning 2004-2009). Nevertheless, several problems still remain and become significant issues to deal with in the decentralization. The first problem is the disparity of health status across socio-economic groups, regional, and rural-urban. The infant and child mortality rate of the lowest income household group was 61 per 1000 live births, four times higher than the highest income group which was 17. The maternal mortality rate (MMR) and IMR in rural areas are higher than those in urban areas. In addition, the IMR and MMR in the Eastern Indonesia are higher than in Western Indonesia and higher for the less educated group than the higher educated group. The prevalence of underweight children in rural areas is higher than that in urban areas. Birth assistance services in high income groups are twice that in low income groups. That is 82.3%

compared to 39.1%. Immunization coverage in low income groups is lower than that of high income groups.

Figure 3.3: Success rate (SR) and case detection rate (CDR) of tuberculosis medication (percentage)

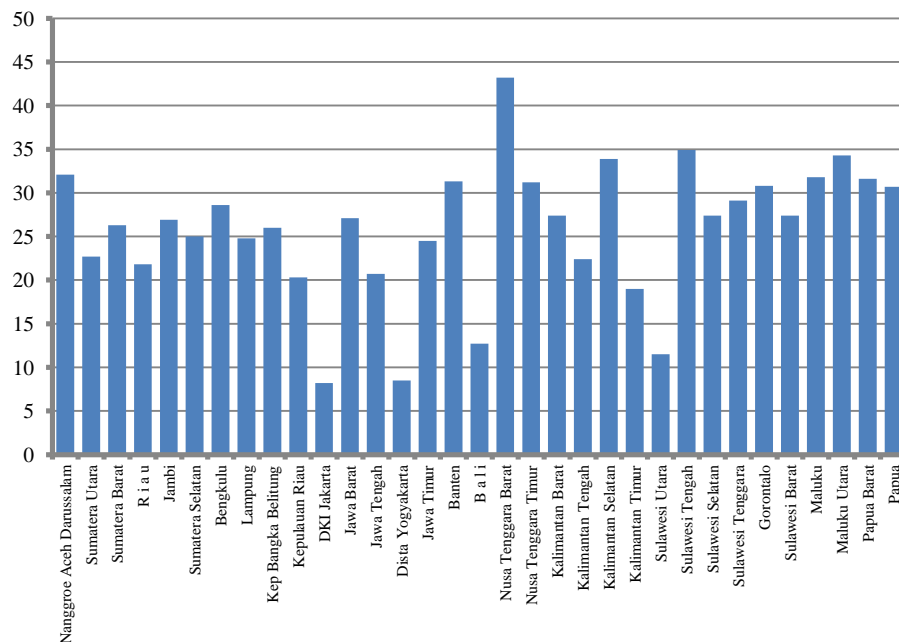


Source: (Indonesia Millennium Development Goals Progress Report 2010).

A low level of health service performance also emerges as a crucial issue. The coverage of birth assistance service was just 67.7% in 2001 varying from only 41.39 % in Maluku to 100% in Bali. Measles immunization for 12-13 month old babies covered only 71.6% in 2002 varying from 44.1% in Banten to 91.1% in DIY Province. In 2002 there were only 3.5 puskesmas (sub-district based health services) for every 100,000 people, with low service quality. Meanwhile the ratios of doctors, dentists, specialists and nurses per 100,000 pupils were 7.7, 2.7, 3.0, and 8.0 respectively. More than two-thirds of medical specialists were located in Java and Bali. Eighteen provinces had the doctors per person ratio lower than the national average. The survey on Indonesia’s demographic and health (SDKI) illustrates that financial problems, distance and transportation were among the causes of the unbalanced health services. Meanwhile, health insurance coverage that guarantees health services was only 18.74% in 2001, dominated by those on high income.

Lack of quantity and low quality as well as inequality of health services are crucial issues in the health sector development under the decentralization system. In the mid-term development planning (RPJM) 2004-2009, health development is intended to increase community access to health services. It targets an increase in life expectancy from 66.2 to 67.9 year, a decrease in the infant mortality rate from 35 to 25 per 1000 live births, a decrease in the maternal mortality rate from 307 to 226 per 100,000 live births, and a decrease in child-underweight prevalence from 25.8% to 20%. Figure 3.4 shows that more than half of all provinces are still resisting with the infant mortality rate higher than 25 in 2008.

Figure 3.4: Infant mortality rate (IMR), 2008



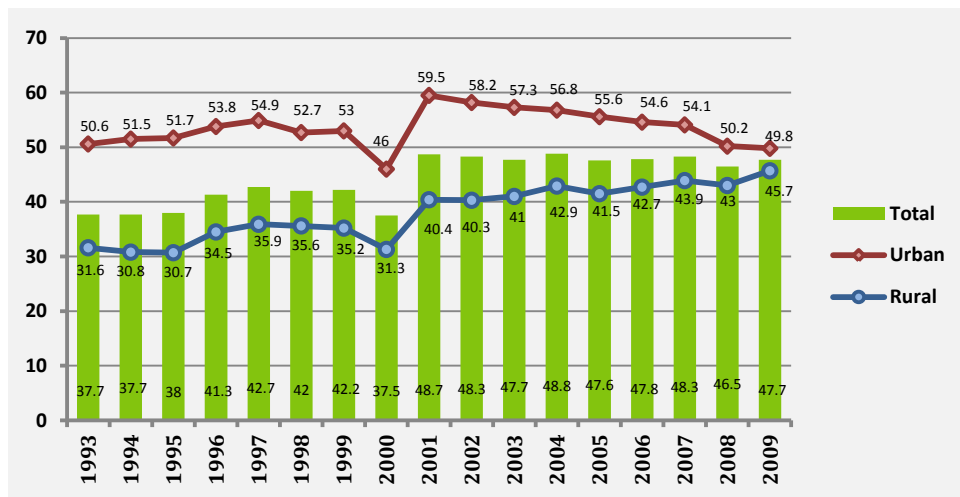
Source: (Profil Kesehatan Indonesia 2008).

3.4. Basic Infrastructure: Widening Water Supply Coverage

Water consumption as a basic need will always be a crucial issue in a large population country like Indonesia. In fact, according to Susenas (National Socio-economic Survey) in 1993 only 37.73% of households in Indonesia had access to a government provide, safe reticulated water supply; and only 24.81% of households had access to basic sanitation. These conditions have contributed to the low level of health status in Indonesia.

Departing from the reality of low access to water, Indonesia Millennium Development Goal has documented a target to decrease by a half the number of households that do not have access to water and basic sanitation by 2015. The target is very crucial for local jurisdictions to achieve since fiscal decentralization delegates water supply responsibility to the local jurisdictions. How decentralized water supply responsibility applies has been confirmed in Government Regulation PP. No. 16/2005 on the developing water supply system. The responsibility to provide water is critical for local government since the capacity of local government to manage water supply and basic sanitation is lacking. At the same time, the performance of PDAM as the local government-owned water enterprises is poor (Indonesia Millennium Development Goals Progress Report 2010).

Figure 3.5: Percentage of households that have access to a safe water supply

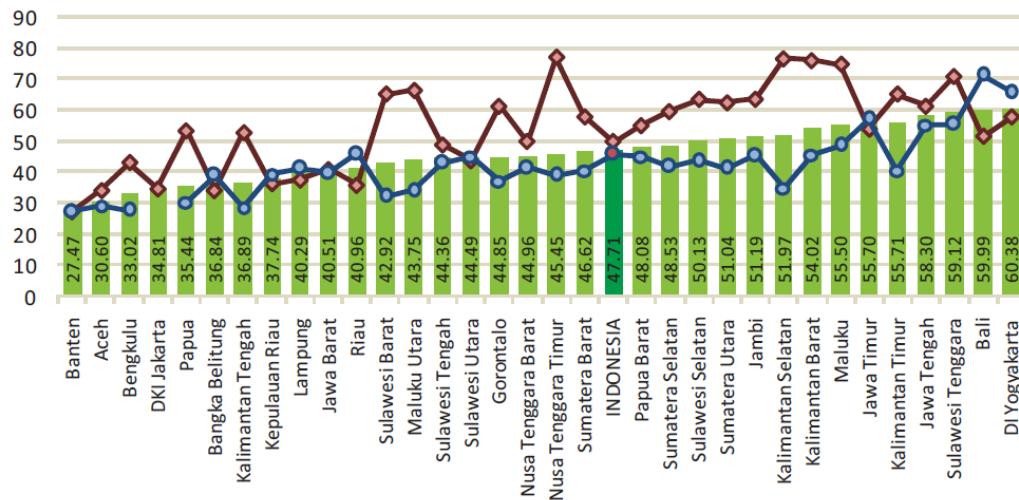


Source: BPS (Centre Bureau of Statistics), and Susenas (national socio-economic survey) (Indonesia Millennium Development Goals Progress Report 2010).

By 2009, households who are able to access water increased to 47.71% and basic sanitation increased to 51.19%. Although the access has increased, there are several challenges to overcome. The first challenge is the access disparity across rural and urban areas. Households in rural areas have less access than those in urban areas. The regional water access disparity is also high with high access as in DIY, Bali and North Sulawesi provinces and low access as in Banten, Aceh and Bengkulu Provinces. Second, the expansion of water supply infrastructure is less than the population growth, especially in urban areas. Meanwhile, the built-in

infrastructure is poorly maintained that will potentially hinder the continuity of the supply (Indonesia Millennium Development Goals Progress Report 2010).

Figure 3.6: Percentage of households that have access to a safe water supply, provincial level



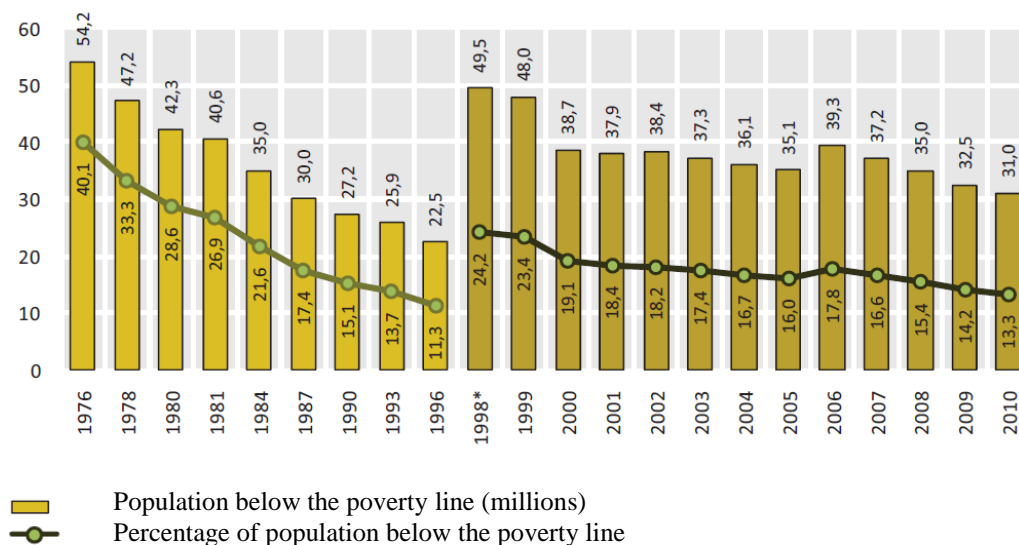
Source: BPS (Centre Bureau of Statistics), and Susenas (national socio-economic survey) (Indonesia Millennium Development Goals Progress Report 2010).

3.5. Poverty Eradication

Poverty is a major issue in Indonesia’s development. It arises from inequalities between income groups, regions and sectors. Much focus on economic growth in the early stages of development has put a priority on the industrial sector ahead of agriculture, urban areas ahead of rural areas, and Java-oriented development ahead of outer Java Island. As a consequence, despite success in speeding up economic growth, income inequalities emerges as a serious problem.

A number of programs to reduce poverty had been systematically introduced in 1975-1976. The trilogy of Indonesia development since the second “Repelita” (mid-term development planning) targeted equity as the first priority ahead of growth and stability. In 1993, the IDT program (assistance program for backward villages) was launched on the basis of community-based development. This consistent drive to combat poverty has succeeded in reducing the proportion of Indonesians below the poverty line from 40% in 1976 to 11.3 % in 1996.

Figure 3.7: Population below poverty line, persons (millions) and percentage



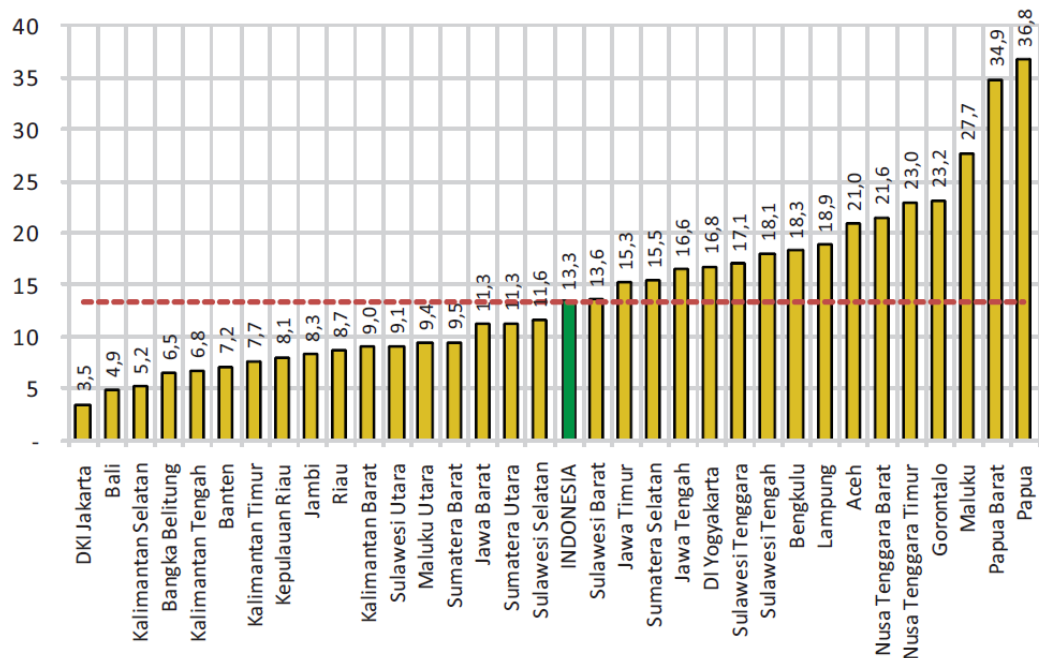
Source: BPS (Centre Bureau of Statistics), and Susenas (national socio-economic survey) (Indonesia Millennium Development Goals Progress Report 2010).

The poverty line measure was adjusted in 1998 particularly in non-food expenditure. It now takes into account: expenditure on education until junior secondary high school, expenditure on health adjusted from “puskesmas” services to general practitioner services and expenditure on transportation adjusted from within-district to inter-district transportation expenditure. These adjustments resulted from an unexpected monetary crisis that hit Indonesia mid-1997 plunged Indonesia into a deep economic crisis followed by political turmoil. The economy contracted and the industrial sector collapsed. As a result, the unemployment rate increased leading to a significant increase in the number of poor people. The number of poor people below the poverty line more than doubled to 24.2% in 1998 and 23.4% in 1999, just in the year when decentralization system was firstly introduced. Therefore, poverty is one of the crucial issues to deal with in the decentralized system. The failure in the safety-net program in response to the crisis was believed not to be the result of the scarcity of natural resources, but the result of the central-planned program across localities. Therefore, decentralization is supposed to result in poverty eradication programs which better match the local conditions and better reach the poor people. Thus, assuming that local governments have better understanding of local issues, decentralization is

expected to have a bigger impact on poverty eradication. As shown in the Figure 3.7, the number of poor people after decentralization tends to decrease with a slight increase in 2006 as a result of a significant cut in subsidies.

However, the disparity across provinces remains a serious problem. The poverty level in 17 provinces is larger than the national average. This indicates a large variation in the poverty issue across regions. Papua, Papua Barat and Maluku are among provinces that have poverty levels twice the national average.

Figure 3.8: Percentage of population below poverty line, by Province, 2010



Source: BPS (Centre Bureau of Statistics), and Susenas (national socio-economic survey) (Indonesia Millennium Development Goals Progress Report 2010).

3.6. Conclusion

The discussion in this Chapter provided issues and progress in selected public sector categories with associated indicators. These indicators are considered pertinent for decentralized local governments in Indonesia and accordingly taken in the measurement of public sector performance index which will be discussed in Chapter 5. Different indicators used in the measurement will obviously result in different index. However, as it was already argued that this has no effect on the robustness of the explanatory analysis. More indicators used in the calculation

may also not achieve better results. By showing the background of selected indicators, the discussion in this chapter has driven the significance of the public performance index used as a measure of the flow of services that arise from local spending.

Chapter 4

Theory

4.1. Introduction

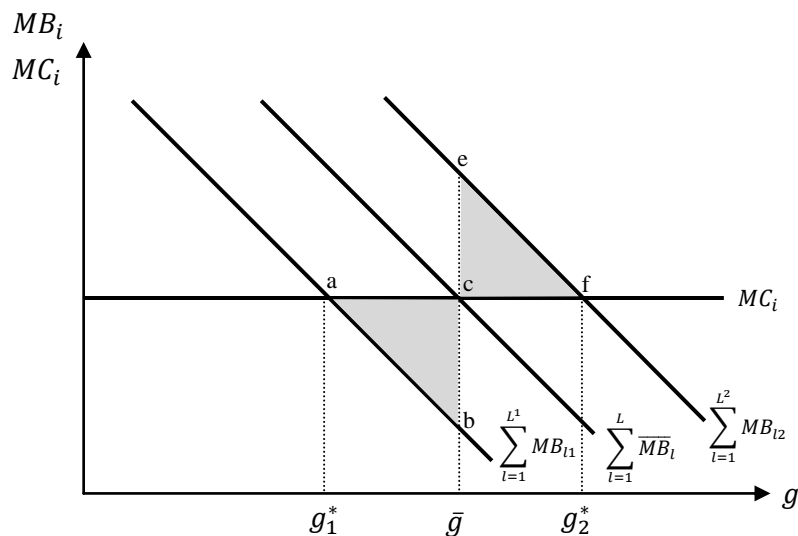
This chapter presents some of the theoretical foundations for the empirical model developed in Chapter 5. It does this by setting out by way of background the benefits and costs of decentralized versus centralized provision of public goods. The arguments presented in this discussion are standard and can be found in the fiscal federalism literature. Following this the Chapter sets out an optimizing model of a region that chooses a single local public good to maximize the welfare of its citizens while adopting least cost behaviour. The point of developing the model is to show that the degree of decentralization of revenue raising powers directly affects the optimizing choices of sub-national governments and hence the flow of services per unit of jurisdictional expenditure which is the measure of local efficiency used in the empirical model of Chapter 5. Finally, the Chapter presents a discussion of other variables that might be expected to influence this ratio (e.g. democratization and local accountability). These variables are also included as explanatory variables in the empirical model.

4.2. Decentralization versus Centralization

Suppose an economy with two regions $i=1,2$. Figure 4.1 illustrates the provision of a pure local public good under centralization versus decentralization. The vertical axis in the figure depicts marginal benefit (MB) and marginal cost (MC); and the horizontal axis depicts the quantity of pure public goods (g). Suppose i denotes regions, and there are two regions with population L^1 and L^2 . Each region determines the level of public service provision that maximizes the net benefit. Thus, region 1 characterised with low aggregate demand determines the optimum level of public service provision at g_1^* where $\sum_{l=1}^{L^1} MB_{l1} = MC_i$; and region 2 characterised with low aggregate demand determines the optimum level of public service provision at g_2^* where $\sum_{l=1}^{L^2} MB_{l2} = MC_i$. Here, it is shown that under

decentralization, each region has authority to determine the optimum level of each public service provision where the sum of marginal benefit of the population equals marginal cost. In other words, public service provision in both regions is consistent with the Samuelson condition.

Figure 4.1: Central versus local provision of a public good



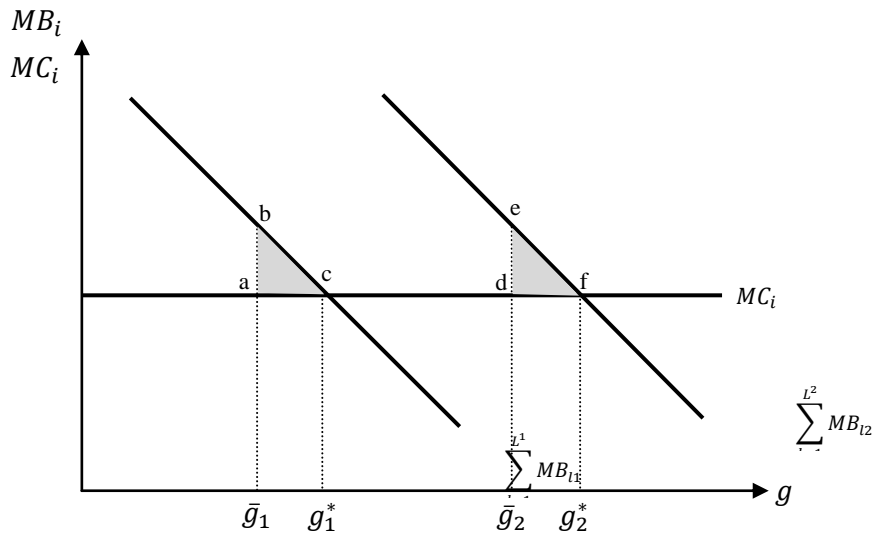
Assume instead that public good provision is undertaken by a central government that determines a single level of public service provision, say \bar{g} . Here, we assume the uniformity of public service provision by a central government for both regions because this is a feature of federalism that is observed in practice.¹⁶ Under central government provision, we see that region 1 gets “too much” public good provision, while region 2 gets “too little” public good provision. Thus, assuming uniformity of centralized provision, each region gets the level of provision away from its optimum level, which in turn causes inefficiency. The inefficiency under centralized provision is illustrated by the dead weight loss abc for region 1 and cef for region 2. We can conclude that decentralized public service provision is superior on efficiency grounds. Here, we assume that there are

¹⁶If a central government wishes local governments to provide a particular local public good to a standard, a central government can mandate local governments to provide uniform provision. For example the provision of basic education is decentralized to local governments in Indonesia. However, the central government sets a national standard curriculum to pursue and 9 years compulsory basic education to accomplish. The mandate is stated in the constitution of which each level of government must at least allocate 20% of its’ total budget to the education sector.

no externalities among regions and the central government is not able to diversify its provision to match each region's preferences.

Figure 4.2 illustrates local public good provision with the presence of externalities. Thus, the sum of marginal benefits in each region is now inclusive of externalities. If each region ignores these externalities (pursues self-interest), each will under-provide local public goods, for example \bar{g}_1 and \bar{g}_2 . At these levels, local public good provision creates an additional social cost illustrated in figure 4.2 by the deadweight loss abc for region 1, and the dead weight loss def for region 2.

Figure 4.2: Local public good provision with externalities



The problem of inter-jurisdictional externalities in local public good provision becomes a central issue confronting decentralized public service provision. The presence of externalities, if ignored by regions, can undermine efficiency.¹⁷ For example, emission from factories in region 1 contributes to acid pollution in region 2; or public expenditures on education in region 1 can benefit employers in region 2. The case of water management can be mentioned as a real case example of externalities in Indonesia. Decentralization delegates the responsibility to provide a safe water supply to kabupaten/kota governments.

¹⁷ Under-provision of a local public good is often characterized as a prisoners' dilemma game in which states free ride on each other's provision.

Several local governments source their safe water supply from streams that flow through other local jurisdictions. The fact that the stream flows across local jurisdictions often causes inter-jurisdictional externalities problems especially poor water condition and stream conservation. Government regulation PP. No. 16/2005 on the developing water supply system has delegated provincial governments to harmonize this issue. However, it does not work well as in Indonesia's multi-level government system, provincial governments do not have the political power to control local governments.

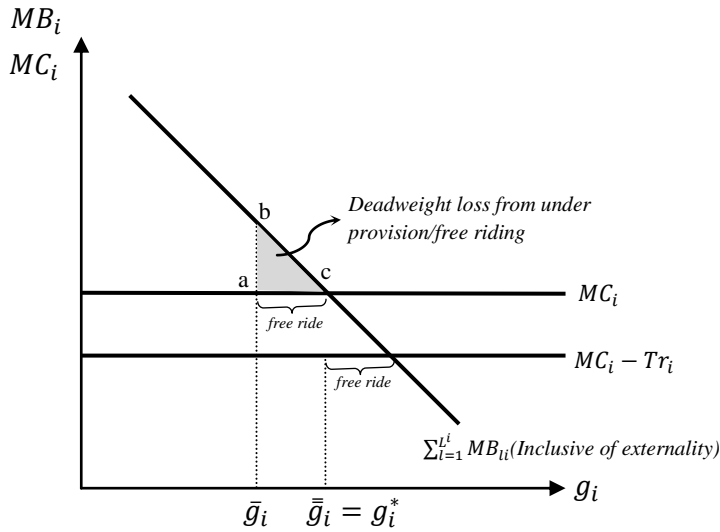
Another example of externalities in Indonesia is found in marine fisheries management. Prior to decentralization, marine fisheries management was centralized and accordingly the marine environment was open access for all local fishermen. Decentralization delegates marine fisheries management to local governments allowing local governments to set up fisheries management systems at the local level. This often causes externalities problems across local jurisdictions. Conflicts between fishermen often happen with fish-stock depletion as a central issue (See Satria and Matsuda 2004).

The introduction of transfers from higher levels of governments to lower levels of governments can eliminate inefficiency arising from inter-jurisdictional externalities. This kind of transfer is often called a matching grant. The rationale of this transfer is different from transfers aiming to correct a fiscal gap.¹⁸

Figure 4.3 illustrates the introduction of transfers to correct for externalities. Here, $\sum_{i=1}^L MB_{li}$ is the sum of marginal benefit inclusive of externalities. Assuming that regions are free riders, the level of public good provision is at \bar{g}_i which is less than provision at g_i^* . The introduction of a transfer Tr_i reduces MC_i to $MC_i - Tr_i$. Thus, it can be seen that although the regions are still free riders, the provision of local public goods increases to $\bar{\bar{g}}_i$ which is now equal to g_i^* ; and eliminates the deadweight loss abc .

¹⁸ Fiscal gaps often arise as a consequence of the assignment of tax and spending powers. It is believed that taxation cost at the lower level of government is higher than that at the higher level of government. Accordingly decentralization applies only to spending power, while taxing power is still centralized, resulting in substantial fiscal gaps. As a result, fiscal gap transfers should be made for lower level governments.

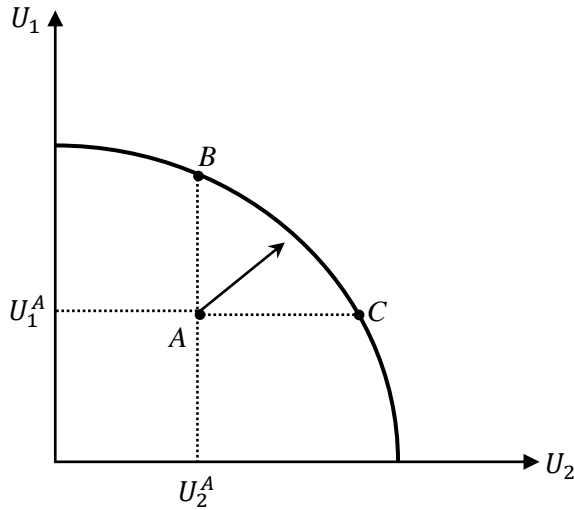
Figure 4.3: Correcting local externalities using a central grant



The optimal transfer rate should be determined by the size of externalities. Figure 4.3 illustrates that external benefits will not be taken into account by any particular local government in deciding how much public good should be provided. Thus, too little externality-generating activity will be undertaken unless the local government receives a fixed unit of subsidy just to equal the value of marginal benefit inclusive of externalities. In Figure 4.3 it is assumed that all local governments have the same price elasticity of demand for local services (assuming no cross-price elasticity effects). Therefore, all local governments receive the same fixed unit of transfer. In the case where price elasticity of demand for local services varies across local governments, the correct transfer rate differs inversely to the price elasticity of demand for local services.

As an alternative to a central grant it might be argued that if the regions cooperate voluntarily, they can both be made better off. However, there is always a coordination problem as a result of the prisoners' dilemma where cheating on the cooperative solution to the game is rewarded. The prisoners' dilemma problem can be illustrated by Figure 4.4 that depicts the utility possibility frontier of regions 1 and 2.

Figure 4.4: Potential surplus from cooperation



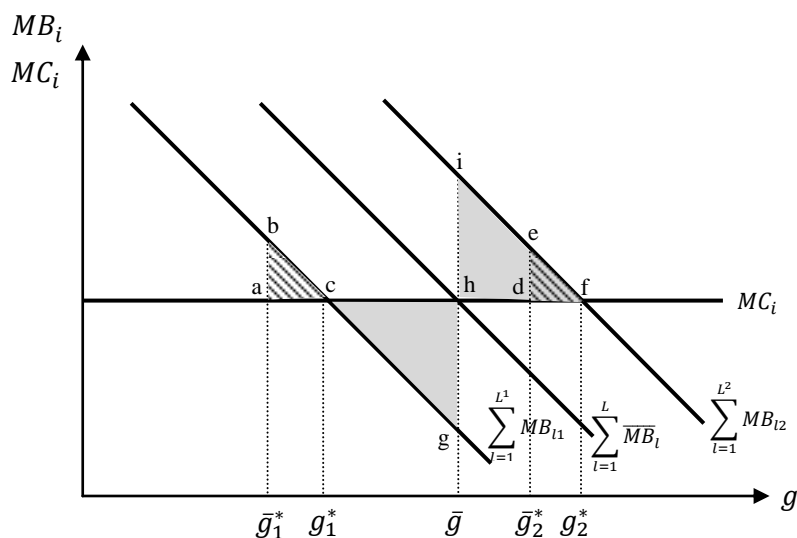
Suppose the decentralized outcome with under provision is at point A , such that per capita utility in each regions are U_1^A and U_2^A . If each region commits to cooperate and not to cheat, each region can raise their per capita utility. The potential increase in per capita utility of each region is illustrated at any point between B and C . The agreement may be self-enforcing or centrally coordinated, but the underlying prisoners' dilemma problem remains. Alternatively, central government may enforce an agreement with contracts to make the agreement works. However, though inter-jurisdictional agreement is legally enforceable, in practice, the enforcement mechanism is often very costly.

We have seen that inter-jurisdictional externalities become a central issue undermining efficiency with decentralized public good provision. In addition, economies of scale as an advantage of centralized public service provision have to be considered as an opportunity cost of decentralized provision. Thus, decentralized public provision promotes efficiency only if regions are able to internalize externalities in the local public good provision and preferences across regions are diverse. Clearly, there is a trade-off between decentralized and centralized public service provision. Figure 4.5 illustrates this.

The losses from local provision by free riding regions is the deadweight loss $abc + def = L_f$. The losses from "one size fits all" central provision are the

deadweight losses $chg + hif = L_c$. Thus, the merits of decentralized over centralized public service provision depend on the degree of preferences heterogeneity and the extent of externalities. With no externalities and non-identical preferences, decentralized public service provision is superior. With externalities and identical preferences, centralized provision is preferred. With externalities and non-identical preferences, decentralized public service provision is preferred if $L_f < L_c$ and vice versa if $L_f > L_c$. Given this trade off, the public economics literature advocates partial decentralization where central government is assigned responsibility for public service provision with significant externalities, while local government is assigned for those activities for which such externalities are limited or absent, and preferences are diverse. This is known as “subsidiarity”.

Figure 4.5: Trade-off between centralized and decentralized public service provision



If the centre is well informed and concerned about preferences diversity and hence able to differentiate public service provision to match each region’s preferences, an efficient outcome could be attained through centralized public service provision without any fiscal and power delegation to local government. This is the case of that Oates (1999) declares as “decentralization in spirit”. In reality, especially in a country with high geographical, cultural and ethnical diversity like Indonesia, central government is unlikely to have better information

than local governments. Moreover, political pressures and intuitional obstacles might limit the capacity of central government to provide higher level of public services in some jurisdictions than others.

4.3. Optimizing Model

Using Section 4.2 as a background this section develops a simple optimization model for decentralized local governments in a setting where decentralization policy mainly delegates expenditure or the provision of local goods to local jurisdictions.

Suppose that the economy has $i=1, \dots, N$ sub-national jurisdictions each with L^i citizens who are identical in terms of income and preferences. It is assumed that there is no factor mobility across jurisdictions. Local governments are assumed to be benevolent and choose the provision of a single pure public good to maximize citizen welfare. Since all citizens in a particular jurisdiction are assumed to be identical, this is equivalent to choosing the provision of the public good to maximize per capita welfare and the analysis can be conducted from the perspective of a representative citizen.

Now consider jurisdiction i where for convenience the remainder of the discussion dispenses with the subscript. The utility function of a representative citizen in the jurisdiction is $u = x \cdot h(g)$ where x is per capita consumption of a private good and g is consumption of a pure local public good.¹⁹ The *flow* of services from provision of the local public good is defined by the function $h(g)$ where $h(g) > 0$. Note that citizens are interested in the flow of services rather than the production of the public good per se. The jurisdiction is also assumed to have the production technology $y = f(\chi, g)$ where χ is a fixed vector of inputs such as capital and materials. Notice that it is assumed that the public good is a variable input to jurisdictional output. The price of the *numeraire* output is assumed to be one for convenience so $y = f(\chi, g)$ also defines the value of jurisdictional output. With this set up the government of the jurisdiction solves the following optimization problem:

¹⁹Assuming no spillovers between jurisdictions.

$$\underset{g}{\text{Max}} u = x \cdot h(g) \quad (4.1)$$

Subject to:

$$\begin{aligned} (i) \quad & L \cdot x + c(g) = y + T_r \\ (ii) \quad & y = f(\chi, g) \end{aligned} \quad (4.2)$$

where $c(g)$ is a *least cost* function for the public good and T_r is a given transfer from the central government. The budget constraint tells us that total expenditure on private consumption and the public good $L \cdot x + c(g)$ must be equal to the value of output in the jurisdiction $y = f(\chi, g)$ plus the central government transfer T_r . Hence $f(\chi, g) + T_r$ is a *numeraire* that is transformed into the public and private good via the equation described by the budget constraint. The set up implies that per capita consumption is

$$x(g|\chi, T_r, L) = \frac{f(\chi, g) + T_r - c(g)}{L} \quad (4.3)$$

Notice that per capita consumption is a function of g *conditional* on the values of the parameters of the model, χ , T_r and L . The local jurisdiction's optimization problem now becomes

$$\underset{g}{\text{max}} u = \left[\frac{f(\chi, g) + T_r - c(g)}{L} \right] \cdot h(g) \quad (4.4)$$

The first order necessary condition is

$$\left[\frac{f_g(g|\chi) - c_g(g)}{L} \right] \cdot h(g) + x(g|\chi, T_r, L) \cdot h_g(g) = 0 \quad (4.5)$$

With rearrangement this yields

$$\underbrace{Lx(g|\chi, T_r, L) \cdot \frac{h_g(g)}{h(g)}}_{MB(g|\chi, T_r, L)} + \underbrace{f_g(g|\chi)}_{MC(g)} = c_g(g) \quad (4.6)$$

The optimal level of public good provision is the value of g , from now on denoted as g^* , that solves the first order necessary condition (4.6), *conditional* on the

values of the parameters for local population, the central government transfer and the vector of fixed inputs. One can show that (4.6) is a Samuelson condition for the optimal provision of a public good where the public good is provided to the point where marginal benefit $MB(g|\chi, T_r, L)$ is equal to marginal cost $MC(g)$ in equilibrium. Notice that while the marginal benefit is a function of the parameters, the marginal cost is not. Since the solution is conditional on the parameters of the problem one can define optimal public good provision as a function of these parameter, namely,

$$g^*(L, T_r, \chi) \tag{4.7}$$

Thus, *conditional* on (i) the jurisdiction being benevolent and choosing public good provision consistent with the Samuelson condition and (ii) producing the public good at least cost, the choice of public good is a function of the jurisdiction's population L , the transfer T_r from the central government and the vector χ of fixed inputs employed.

The flow of services and spending on the public good in equilibrium can be defined as

$$h^*(L, T_r, \chi) = h(g^*(L, T_r, \chi))$$

and

$$c^*(L, T_r, \chi) = c(g^*(L, T_r, \chi)) \tag{4.8}$$

respectively. The flow of services per unit of public good expenditure in equilibrium, denoted as PSE^* , is

$$PSE^*(L, T_r, \chi) = \frac{h^*(L, T_r, \chi)}{c^*(L, T_r, \chi)} \tag{4.9}$$

Thus the equilibrium PSE is a function of population, the central transfer and the vector fixed inputs. Since the jurisdiction adopts cost minimizing behaviour and is benevolent, in equilibrium the value of the PSE is at its highest feasible value and is consistent with a Pareto optimum. If however the jurisdiction did not engage in least cost behaviour and/or chose public good provision inconsistent with the Samuelson condition (4.6), then any equilibrium g^* will not

be Pareto optimal and the resulting *PSE* value will no longer be at its maximum value for given parameter values. This is more likely to be the case in practice where jurisdictional choices will be influenced by non-benevolent behaviour and the production of the public good is likely to be other than least cost. That said we know from the above that an efficient and benevolent jurisdiction can achieve the maximum feasible *PSE* ratio which serves in the empirical work of Chapter 5 as a standard or benchmark against which to compare the actual performance of Indonesia's sub-national jurisdictions.

The transfer parameter T_r is a proxy for the degree of decentralization in the system of public finance being modelled. One would expect a highly decentralized system to have a relatively low T_r and a centralized system to have a relatively high T_r with jurisdictions heavily dependent on the centre for funding. It should also be noted that theory alone is inconclusive as to the precise functional relationship between PSE^* and T_r implied by (4.9). On the one hand the ability of a local jurisdiction to pay for its public good from own revenues with less reliance on central transfers may play a crucial role in improving the flow of local services per unit of local spending or jurisdictional efficiency (See Weingast 2009). This might be because greater local financing is associated with more accountability as citizens are vigilant and concerned about local government performance. Relying on central financing may also mean that local jurisdictions are more likely to increase spending without any efforts to generate their own revenue and hence there will be less incentive to improve the efficiency of local government and more limited innovation in delivering public services. As a result of increased accountability and transparency local own tax revenue may also be less costly in terms of its distorting effects on economic activity. Against these arguments one must weigh the potential for economies of scale associated with central revenue raising; indeed, such economies of scale are often raised as a factor in favour of central income and consumption taxes. Having said this we will find the relationship between central financing and jurisdictional efficiency from the empirical model developed in Chapter 5. There it will be shown that the greater the reliance on central transfers the lower is the level of local efficiency as measured by the *PSE* score.

One must also recognize that there are other variables that might be considered to be important in explaining the PSE ratio for any particular jurisdiction including democratization. These variables, partly non-economic in nature, are extremely difficult to derive from an underlying theoretical model. Yet one would like to test using empirical methods whether they have had an impact on the PSE measure for local jurisdictions in Indonesia, given that country's recent experience with apparent political change. Therefore to complete the discussion of the variables that are used in Chapter 5 to explain the PSE variable in Indonesia we now discuss issues such as the potential influence of democracy and political accountability on the PSE value for a particular jurisdiction.

4.4. Democracy

Shifting public service provision closer to citizens requires local political accountability. Hence, decentralization typically involves political power delegation that allows citizens to shape their own local jurisdiction through local electoral contest. The executive and legislature that constitute governments are elected through competitive electoral contest. Through an election, citizens express and delegate their preferences among alternative policies to political representatives. Therefore, decentralization involves democratisation and empowerment processes. It does not simply stand as an opposed to centralization. Decentralization comes as an alliance to democratization. Bahl (2006) explicitly defines decentralization as a process of local citizens' empowerment with regard to democratization.

In the political economic model of an electoral democracy system, how votes are transformed into public policies to some extent is nonfigurative. It copes with inter-related driving forces where correlation between citizens and politicians are shaped in a particular political institution and regime. Persson and Tabellini (2000) categorize an electoral contest model into a probabilistic voting and legislature bargaining. Both assume some form of representative democracy where policy choices are delegated to political representatives. In the probabilistic

voting model, competing candidates or parties commit to specific and detailed policy promises before the elections. Citizens vote for preferred policy. Thus the winning politician or party has complete control over the decision making process. This is the most case found in the literature of political analysis of decentralization (See Seabright 1996; Besley and Coate 1999; Besley, Persson and Sturm 2005, Besley and Smart 2007; Hatfield and Miquel 2008).

On the other hand, legislature bargaining model assumes that competing candidates or parties cannot commit to policies in the advances of the elections. In this model, citizens do not vote among alternative policies, but rather among alternative agents to be appointed and play policy formation games. This model has brought attention to the much of post-election bargaining over economic policy that goes on in actual political system, particularly if there is no single party holds a majority in the parliament. In this case, the legislature bargaining takes place in the government formation, as well as in the budgetary process. The legislature bargaining model also opens the eyes to Indonesia's political institution where multi-party takes part in the electoral competitions without any clear differentiated platforms and policies among them. In addition, the model corresponds to a situation where citizens do not have enough rational information as a basis to vote rather than a patron-client affiliation relationship.

In both models, an election plays its role as a market-like mechanism. A political equilibrium is obtained as a result of an interaction between politicians/parties offering policies and voters demanding preferred policy. It assumes as it is found in the public choice literature that the motive of the rent seeker politicians is only to hold office. Thus politicians do not care the policy to be implemented as they do not have partisan preferences. They offer policy choices, in order to maximize the probability of victory. On the other hand, voters select policies that best match their preferences.²⁰

The efficiency of political equilibrium depends on available information for voters to decide their vote. The more information voters have dealing with

²⁰ Another alternative assumption is that politicians do have partisan preferences (See Persson and Tabellini 2000).

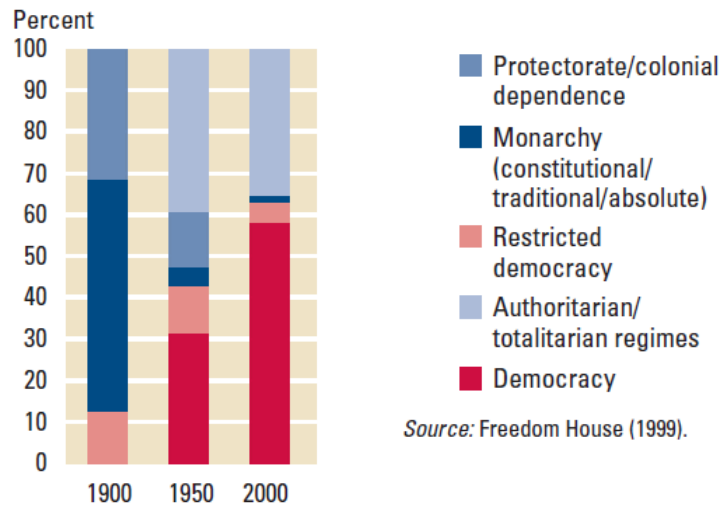
detailed platform of competing parties and politicians' track record, the more influential is the voices to drive politicians in and out of a "political market" resulting in a greater political efficiency.²¹ Thus, an electoral contest is considered as a way to select good over bad politicians. In addition, an electoral cycle is an effective driving force to discipline politicians resulting in improved quality of politicians and greater economic performance (Besley and Coate 2000; Besley, Persson and Sturm 2005) and less corruption (Fisman and Gatti 2002).

However, the dramatic increase in the number of countries adopting electoral democracy has elevated a fundamental question concerning the variation of the impact of democratization on economic performance. Why do some other democracies show less performance than others? Keefer and Vlaicu (2005) show that 40% of countries that have competitive elections scored no better on a common measure of corruption than 50% of countries that do not have competitive election. In the World Development Report 2004, The World Bank claims that over the last century, the percentage of people living in democracies with competitive multi-party elections has increased dramatically. In 1974 only 39 countries (one in four) were electoral democracies. By the end of 2002, this had grown dramatically to 121 governments (three in five). However the rapid democratization with representation and liberties does not bring rapid improvements in services for poor people.²² Electoral democracy in developing countries might even create pathology of democracy and decentralization. In a situation where required norms and series of institutions that complement elections are absent, electoral democracy may serve as a mechanism of social control rather than citizens' choices (Weingast 2009).

²¹ The principle of assessable information voters can attain and the ability of voices to drive in and out politicians as political sanction are known as "answerability" and "enforceability" principles (See The World Bank 2004b).

²² Democracy is defined as political system whose leaders are elected in competitive multi-party and multi-candidate processes in which opposition parties have a legitimate chance of attaining power or participating in power (Freedom House Annual Report 2002).

Figure 4.6: Trend in democratization



Source: *World Development Report, 2004*.

Dealing with political decentralization and corruption, Fan, Lin and Treisman (2009) argue that there is no simple and general explanation dealing with the relationship between decentralization and corruption that holds in different contexts and geographical settings. Whether countries have elections or not seems not to matter for public perceptions about corruption.

4.5. Accountability

The accountability relationship between citizens and politicians to some extent is complex. Both are linked by voice. Through voice citizens express their preferences and influence politicians. Voice as an accountability relationship is complicated as it links many citizens with many politicians with different interests. Therefore, it potentially creates unbalanced political pressures. A small group of elite citizens or even a single elite might be able to put sturdy political pressures to influence public service provision to better match their preferences. On the other hand, a large group of citizens may be voiceless and vulnerable. They have problems in the political mechanism to voicing their preferences, though they are largest voters. They are generally poor people.

The complexity of voice for the accountability relationship between citizens and politicians causes problems in the political and institutional mechanism. Voice takes place at the first point of departure on the flow of accountability. Its impact on the outcome is conditional to a process through which voice is realized into public goods and services provision. Whether the provision of public goods and services matches to the citizens' preferences depends on the quality of governance. A sceptic expression to the political mechanism underpinning the efficiency outcome of decentralization is seen in the statement of Prud'homme (1994):

“Preferences are complex and manifold. They relate to the importance of the local public sector output (that is, the total amount of local tax paid), and to the structure of this output, to the set of regulations that will be locally imposed, to the supply efficiency is expected, to the distributional implications of the tax-expenditure package that will be decided. How could all that be expressed in a single vote? Local elections, when they exist, are usually decided on the basis of personal loyalties or of political party loyalties.”

Whereas traditional literature on fiscal decentralization focuses on improved efficiency as a result of inter-jurisdictional competition, recent literature emphasizes more explicitly on the electoral mechanism, political accountability and the relationship between decentralization and democratization. There is an emerging theoretical literature emphasizing on the outcome of a political contest in relation with public sector policy determination. Hatfield and Miquel argue that the outcome of a political contest in a decentralized system determines the outcome of decentralization. Neither the governments are benevolent or rent-seeking agents they implement policies determined through a political contest. Seabright (1996) suggests that the political contest plays an important role for efficient public service provision as election increases control and government accountability. He argues that political decentralization may also be valuable in improving government accountability even without preferences diversity between

localities. Thus, political decentralization promotes an efficient public service provision. Belleflamme and Hindriks (2005) claim that election is a way for sorting good over bad incumbents though elections may not work well in controlling and sorting politicians as a result of an agency problem.

Weak institutional governance may hinder potential outcomes of the local political contests. Besley and Smart (2007) claim that the quality of government plays a crucial role for voters to deal with principal agent problems they face vis a vis public officials. In a political agency model, Besley and Smart (2007) explore moral hazards and adverse selection as a source of incredible politicians. They argue that political contest is a way to discipline incumbents who may act against public interests. Their explanation is based on the tradition of the public choice literature assuming that government is populated by rationally self-interested actors who may use the state to advance their private interests.²³ Keefer and Vlaicu (2005) argue that democratization in developing countries results in a variation of public goods provision performance. They argue that the variation is caused by low credibility of political competitors' promises in immature democratized countries. In line with Keefer and Vlaicu (2005), Hofman and Kaiser (2004) states:

“The potential benefits of decentralization depend crucially on governance. By all accounts, the jury on the link between decentralization and prospects for improve governance at local level is still out, and there are several concerns about the prospects of decentralization/devolution in developing countries. On the one hand government closer to the people reduces monitoring costs of the electorate, and competition among governments could drive out corruption. On the other hand, local governments seem to be more prone to elite capture.”

²³The rent seeking-motivated government is a normative tradition of the Public Choice theory assuming that government is a rent seeker actor.

4.6. Political Agency Considerations

A political accountability relationship is typically an agency relationship involving agents and clients/principals.²⁴ Citizens as clients delegate their interests over the use of their own resources to agents who receive compensation for their efforts to carry out political preferences on behalf of the clients. There is an accountability problem between agents and clients in the contractual transactions. The problems emerge as a result of the key assumptions underlying the agency theory. First, there are always at least partially conflicts of interests between actors. Second, there is always asymmetric information between agents and clients.²⁵ Subsequently, the asymmetric information causes latent opportunistic behaviours. Agents tend to exploit information they have over clients in order to advance their interest even at the expense of the clients.

The opportunistic behaviours as a result of asymmetric information include adverse selection and moral hazard. Both are recognized as a general problem which is inherent in the contractual relationship. The adverse selection takes place when there is unobservable information, belief and value of which principals select incapable agents to carry out their preferences. This is a type of pre-contractual opportunistic behaviour where asymmetric information is exploited by opportunistic politicians so that they are selected. Moral hazard opportunistic behaviour takes place when selected agents deviate from a contractual concord. This is a type of post-contractual opportunistic behaviour of which principals do not know the actual behaviour of agents due to the asymmetric information.²⁶

Since clients are not sure that agents really act on behalf of their interests, clients arrange incentives to align agents' interests with their own, and undertake activities to monitor agents' behaviour. The activities carried out by principals in

²⁴Agency theory was first introduced in the economic literature by Ross (1973) and Jensen and Meckling (1976) and Mitnick (1975) in political science.

²⁵Thesetwo assumptions are well known as preference divergence or incentive incompatibility principles (Eckardt 2008).

²⁶In the democratic politics, these two types of opportunistic behaviours are expected to be eliminated by two principles of answerability and enforceability. In relation to decentralization and political accountability, yardstick competition is considered as a way to discipline politicians.

monitoring agents' behaviour result in agency costs. Jensen and Meckling (1976) define the agency costs as the sum of monitoring expenditures by principals, the bonding expenditures by agents, and the residual loss due to a welfare reduction.

The political agency framework seems to be the same as that in the classic version.²⁷ In this case, the agency relationship contains contracts, incentives, monitoring devices, bonding, and other forms of social control undertaken to minimize agency costs constitute the element of the contract (Shapiro 2005).

Nevertheless, the principal-agent relationships in the political framework emerge in a more complex relationship within and across political organizations. A major problem that causes complexity in the political agency relationship is a collective action problem. Through votes, different citizens express different preferences to many politicians/parties in the election. At this arena, different clients delegate their preferences to the competing agents. Politicians/parties compete with others to triumph an electoral competition. The winning politicians/parties that hold office act on behalf of citizens and carry out policies which are considered in a compliance of the interests of citizens. Collective action problem arises as a result of difficulties on how every single principal is sure that his preferences are well represented by agent's action. Another source of the problem is difficulties on how agents do understand and bring together the duties delegated to them when they are receiving mixed delegations, conflicting orders and incentives from multiple principals. Shapiro (2005) in his review on the agency theory states:

“...Political scientists assume multiple agents and principals; heterogeneous preferences or goal conflict and competition among principals and among agents as well as between them; problems of collective actions; a more complicated palate of interests and therefore different incentives mobilized to control them; varying sources of and mechanism to mitigate informational asymmetries; an active role for third parties

²⁷Shapiro (2005) claims that the conception of agency theory in the political science adopts from the economics paradigm rather than the more sociological conception offered by Mitnick (1975).

(interest groups, regulated parties, etc.); and a dynamic playing field on which relationships unfold and are transformed”.

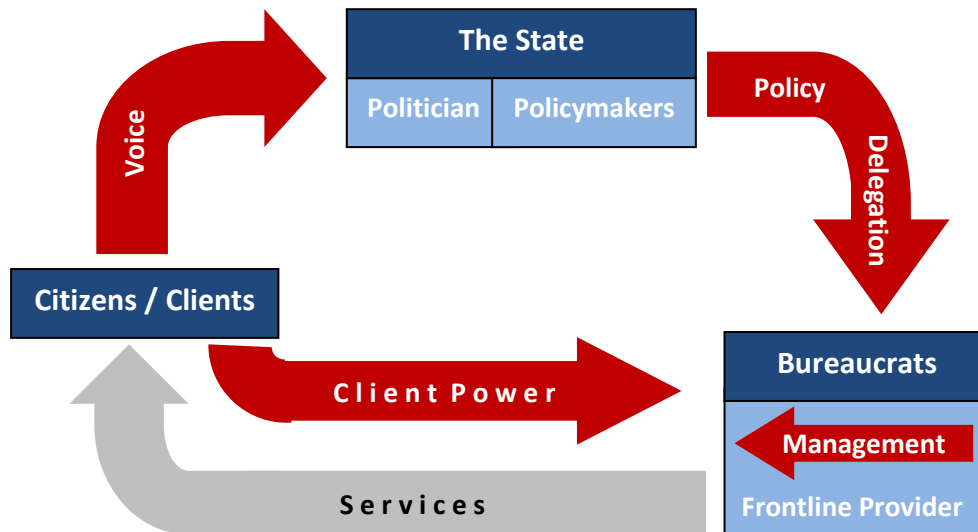
In the provision of public goods, the complexity of the political agency relationship involves multiple relationship between citizens, politicians, bureaucrats, and frontline actors such as doctors, nurses, and teachers, etc., who directly provide public goods and services to the citizens. At the point of departure, citizens are the principals who delegate their mandate to politicians. Politicians as agents then set policies. Afterward, politicians delegate the authority to bureaucrats to implement the policy and provide public goods and services. At this stage, politicians are the principal, and bureaucrats are the agent. Bureaucrats then delegate the authority within the organization to their branch offices, or departments who manage frontline providers delivering services directly to the citizens as ultimate principals. This multiple principle-agent relationship is expressed by Moe (1984) as follows:

“Democratic politics is easily viewed in principal-agent terms. Citizens are principals, politicians are their agents. Politicians are principals, bureaucrats are their agent. Bureaucratic superiors are principals, bureaucratic subordinates are their agents. The whole politics is therefore structured by chain of principal-agent relationships, from citizens to politician to bureaucratic superior to bureaucratic subordinates and down the hierarchy of government to the lowest-level bureaucrats who actually deliver services directly to the citizens”

Figure 4.7 illustrates the flow of accountability relationship in the provision of public goods and services. The figure provides a micro-foundation of contractual transactions in order to pursue collective objectives and public resources mobilization to meet the objectives of citizens. The accountability relationship between citizens and politicians is linked through voice. Voice is a point of departure on the flow accountability relationship. Through voice citizens delegate their preferences to politicians. Within a particular political institution,

how the voice containing preferences is realized into services is conditional to the politicians-bureaucrats and bureaucrats-frontline providers accountability relationships.

Figure 4.7: Accountability relationship in the provision of public services



Source: Adapted from The World Bank(2004)

Taking an agency relationship into a political economy analysis was introduced by Niskanen (1975). He discusses the agency relationship between vote maximising politicians and budget maximising bureaucrats. Instigated by Niskanen (1975), the agency relationship has been adopted in the public choice analysis (See Moe 1984; Breton 1998; Bendor, Taylor and Gaalen 1987; Alesina and Tabellini 2008) and public administrative and management (See Guy Peters and Pierre 2001; Guy Peters 2002).

Seabright (1996) and Besley and Coate (1999) introduce a decentralization model with voters-politicians agency relationship as a framework. The merit of decentralization thus depends on the behaviour of political agents with their diverged interests. The analysis assumes that there is no political market imperfection in the local level. Local citizens are completely able to express their preferences through their votes in the electoral contest. On the other hand, elected politicians in the executive and legislative act to ideally represent and satisfy citizen's preferences. Hence, the political mechanism is completely accountable

for a contractual transaction between citizens and politicians. Thus, local governments are always able to provide optimum level of public goods. The Seabright (1996) and Besley and Coate (1999) frameworks have embarked the rise of the second generation theory of fiscal federalism with an agency relationship as a framework (Oates 2005).

Political imperfection is prevalent in the real world because of asymmetric information, social polarization and lack credibility of politicians. Accordingly, political incentives fail to provide optimal public goods and services, even under a decentralized system (See Keefer and Khemani 2005). With the political agency relationship as a framework, the second generation theory emphasizes the role of sufficient political incentives for politicians that affect policy choices and economic performances that will satisfy citizens' welfare (Weingast 2009).

4.7. Clientelism

Clientelism or patron-client relationship is generally viewed as a factor undermining political accountability. It causes political competition fail to induce optimal provision of public goods and services (Keefer and Valicu 2005; The World Bank 2004). It is defined as a special case of dyadic (two-person) ties involving a largely instrumental friendship where an individual of higher socio-economic status (patron) uses his own influence and resources to provide protection or benefits, or both, for a person of lower status (client) who, for his part, reciprocates by offering general support and assistance, including personal services to the patron (Scott 1972). Clientelism is typically prevalent in developing nations as it is considered rational for redistributive coalitions and effective as strategies for achieving the goals of powerful constituencies within the coalitions. Hence, democratization in developing nations cannot eliminate patron-client politic.

However, clientelism may increase accountability in the short run. In the absence of credibility, politicians' reliance on patrons may improve outcomes relative to a situation where politicians can do nothing to make them credible. Hence, patron-client can function as an intermediary between politicians and

citizens. It may improve accountability in a circumstance where populations are polarized around non-service issue such as religious, ethnic, caste or tribal background (Keefer and Vlaicu 2005).

4.8. Conclusion

The discussion in this Chapter has provided the theoretical foundation for the empirical work to be undertaken in Chapter 5. It has done this by first providing an overview of some of the theoretical benefits and costs of centralized versus decentralized provision of public goods. Using this as background the discussion then developed a simple optimizing model of a local jurisdiction and suggested that PSE, the flow of local services per unit of expenditure, is determined by the level of output of local public services and the degree of decentralization in the system of public finance being studied. The precise relationship between PSE and decentralization was left unspecified as this will be determined, at least for Indonesia, in the empirical work of the next Chapter.

The discussion also provided some rationale as to why other mainly non-economic variables might be important determinants of the PSE for any particular jurisdiction. These factors included the influence of democracy and accountability of local politicians. They too will be measured in the empirical work of the next Chapter and used to attempt to explain variations in the PSE variable across the jurisdictions of Indonesia and hence come to some conclusions about their statistical importance in determining the PSE for Indonesian jurisdictions.

Chapter 5

Empirical Model

5.1. Introduction

Chapter 4 set out the theoretical foundation for the empirical work. The discussion there showed that fiscal decentralization, through its potential impact on the cost of providing government services, is expected to influence the PSE variable for a particular local jurisdiction, though from a theoretical perspective alone the exact nature of this relationship is difficult to determine. We also know from the discussion in Chapter 4 that other non-economic variables may have an influence on PSE, including democratization and accountability.

This Chapter develops the empirical model to test these relationships for Indonesian local jurisdictions. Following on from the discussion of alternative empirical methodologies in the Literature Survey a two stage data envelopment analysis (DEA) is selected on the basis that this is the most-accepted method to handle non-discretionary inputs that affect efficiency in the public sector.²⁸ In the first stage a non-parametric method using DEA is employed to construct a PSE score for each local jurisdiction in Indonesia. Only discretionary inputs are considered in this stage, that is, inputs over which local jurisdictions have control. Since the variables used in constructing the PSE score are in the form of an index the Chapter explains the process by which the index is created. In the second stage a regression analysis is used to analyse the importance of fiscal decentralization and the non-economic political variables in explaining jurisdictional PSE scores. The results form the basis for the conclusions reached in later Chapters.

A major advantage of the two-stage method is that the difference between the efficiency score from the first stage and the estimated value from the second stage can be used as an index to measure pure technical efficiency which could be attributable to management (De Borger and Kerstens 1996). In other words, the

²⁸ Non-discretionary inputs are those which are exogenously determined and could not be influenced by management. Ruggiero (1996) suggests to take non-discretionary variables as uncontrolled variables into a single stage DEA procedure following Banker and Morey (1986).

second stage can be used to correct the efficiency scores for environmental variables by using the estimated regression coefficients to adjust all efficiency scores to correspond to a common level of the environment. However, if the variable used in the first stage is highly correlated with the second stage variables, then the results are likely to be biased (Coelli et. al 2005).

5.2. Constructing PSE Scores

It is well known that public sector output is extremely difficult to measure. Nevertheless one can construct a public sector outcome index which we define from now on as the Public Sector Performance (PSP) index. Following Afonso, Schucknecht and Tanzi (2005, 2006) the PSP index is measured as follows:

$$PSP_i = \sum_{j=1}^J PSP_{ij} \quad (5.1)$$

where $i = 1, \dots, N$ regions and $j=1, \dots, J$, public sector categories. One can think of *PSP* as being a proxy for the function $h(g)$ developed from the theoretical model of Chapter 4. As a composite indicator the value of PSP_{ij} depends on the values of certain socio-economic indicators used in public sector category $j(S_{kj})$. Hence, an improvement in public sector performance depends on an improvement in the values of those socio-economic indicators:

$$PSP_{ij} = f(S_{kj})$$

$$\Delta PSP_{ij} = \sum_{k=1}^K \frac{\partial f}{\partial S_{kj}} \Delta S_{kj} \quad (5.2)$$

where $k= 1, \dots, K$ socio economic indicators. The *PSP* index is calibrated by various socio economic indicators for selected public sector categories involving education, health, infrastructure, poverty mitigation as well as macro-economic goals. Those categories are selected based on Indonesia-specific public sector issues (discussed in Chapter 3). Thus the *PSP* can be interpreted as the flow of services arising from public spending and should reflect the objectives (or alternatively the tasks) of the government. Table 5.1 shows selected public sector categories and associated indicators.

Table 5.1: Outcome indicators used to generate public sector performance (PSP_i) in region i .

Public Services (j)	Selected Socio-Economic Indicators(S_k)
Education	- Net primary enrolment rate (NPE) - Net secondary enrolment rate (SPE)
Health	- Infant mortality rate (IMR) - Annual new tuberculosis incident (ATI)
Infrastructure	- Percentage of household provided water supply by PDAM ^{a)} (HPW)
Poverty	- Percentage of population below poverty line (PPL)
Macroeconomic goals ^{b)}	- Economic growth (GRT) - Unemployment rate (UER)

a) PDAM is a local government-owned enterprise that is in charge to provide tap water to residents. The coverage of the water supply by the PDAM signifies the capacity of local government to conform the duty stand on Law 23/2004 and the achievement of the millennium development goal target.

b) Macroeconomic goal is incorporated as an indicator of economic performance.

The indicators in each category are compiled into a single public sector performance index (PSP) by giving equal weight to each following the method used by Afonso, Schucknecht, and Tanzi (2005). Public Sector Efficiency for local government i (PSE_i) is then defined as:

$$PSE_i = \frac{PSP_i}{PEX_i} \quad (5.3)$$

where $PSP_i = \sum_{j=1}^J PSP_{ij}$ and $PEX_i =$ expenditure which is a proxy for $c(g)$ developed in Chapter 4. Thus PSE_{ij} defined above in (5.3) is a proxy for the PSE variable derived from the theoretical model: see equation (4.9) in Chapter 4. Positive but declining marginal productivity of public spending would imply:

$$\frac{\partial PSE_i}{\partial PEX_i} > 0; \frac{\partial^2 PSE_i}{\partial PEX_i^2} < 0 \quad (5.4)$$

Data Envelopment Analysis (DEA) is now employed to estimate the efficiency score in Equation (5.3). In this case the application of DEA is essential with regard to the situation where there is more than one output: econometrically-based efficiency analysis would not suffice in this case. In addition, DEA is suitable in cases where the output variables are in the form of outcome indicators and the price data are either not available or irrelevant, as in the case of the public sector (Coelli et. al 2005).

The DEA model is employed with constant returns to scale to generate the efficiency score defined in Equation (5.3). Let us use x to represent input costs PEX , and y to represent output PSP . Let the subscripts r and j represent particular inputs and outputs respectively. Hence, x_r represents the r th input and y_j represents j th output of an observed unit. Let the total number of inputs and outputs be represented by R and J where $R, J > 0$.

Multiple inputs and outputs are linearly aggregated using weights. Define v_r as the weight assigned to input x_r and u_j as the weight assigned to output y_j where $v_r, u_j > 0$. Given these weighted inputs and outputs the efficiency of the public sector in region i is obtained as a ratio of the linearly weighted outputs to the linearly weighted inputs as follows:

$$PSE_i = \rho_i = \frac{\sum_{j=1}^J u_j y_{ij}}{\sum_{r=1}^R v_r x_{ir}} \quad (5.5)$$

The assessment of weights as defined in Equation (5.5) becomes the central issue. DEA tackles this by assigning a unique set of weights for each region. The weights for a region are determined using mathematical programming, as those weights that maximize its efficiency subject to the condition that the efficiencies of other regions (calculated using the same set of weights) is restricted to values between 0 and 1. Here there are 33 regions whose efficiencies to be compared so $N=33$. Let a region being measured for its' efficiency using Formula (5.5) be the

m th, where m th = 1 th,..., N th. The m th region is the reference region. The mathematical program for an observed unit m is defined as follows:²⁹

$$\max_{(u,v)} \rho_m = \frac{\sum_{j=1}^J u_{mj} y_{mj}}{\sum_{r=1}^R v_{mr} x_{mr}} \quad (5.6)$$

subject to:

$$0 \leq \frac{\sum_{j=1}^J u_{mj} y_{ij}}{\sum_{r=1}^R v_{mr} x_{ir}} \leq 1 \quad ; \quad i=1,2,\dots,N$$

$$u_{mj}, v_{mr} \geq 0 \quad ; \quad j=1,2,\dots,J; \quad r=1,2,\dots,R$$

where

ρ_m is the efficiency of the m th region,

y_{mj} is j th output of the m th region,

u_{mj} is the weight of that output,

x_{mr} is r th input of the m th region,

v_{mr} is the weight of that input, and

y_{ij} and x_{ir} are j th output and r th input, respectively of the i th region, $i=1,2,\dots, N$.

Here, i includes m . The mathematical model illustrated above is used to calculate output oriented efficiency based on the Charnes, Cooper and Rhodes (1978). In order to calculate the input oriented efficiency model, the formula is defined in a reciprocal version.

$$\min_{(v,u)} \rho_m = \frac{\sum_{r=1}^R v_{mr} x_{mr}}{\sum_{j=1}^J u_{mj} y_{mj}}$$

Subject to:

$$\frac{\sum_{r=1}^R v_{mr} x_{ir}}{\sum_{j=1}^J u_{mj} y_{ij}} \geq 1 \quad ; \quad i=1,2,\dots,N$$

$$u_{mj}, v_{mr} \geq 0 \quad ; \quad j=1,2,\dots,J; \quad r=1,2,\dots,R$$

²⁹The fundamentals of the mathematical aspects of this frontier analysis are provided by Charnes, Cooper and Rhodes (1978).

5.3. Estimation Model

The discussion in Chapter 4 indicated that key factors determining a jurisdiction's *PSE* include the degree of decentralization and political variables which capture for example the degree of democratization and accountability. On the basis that the political and institutional variables are characterised as time-invariant the following empirical model in a panel data structure is therefore postulated:

$$\rho_{it} = \alpha_0 + \beta Z_{it} + \gamma X_i + \mu_{it} \quad (i = 1, \dots, N; t = 1, \dots, T) \quad (5.7)$$

where

$$\rho_{it} = PSE_{it}$$

$$Z_{it} = \begin{bmatrix} FD \\ TFP \end{bmatrix},$$

$$X_i = \begin{bmatrix} DP \\ PF \\ NG \\ IST \end{bmatrix}, \text{ and } \mu_{it} = \text{error term.}$$

where i denotes an individual cross-section unit, and t denotes time.

Z_{it} is a vector of time-variant explanatory variables including a fiscal decentralization measure (*FD*) and total factor productivity growth (*TFP*). X_i is a vector of time-invariant political variables including democratic participation (*DP*), political fragmentation (*PF*), formation of new government (*NG*) as well as institutional variables (*IST*). The formation of new government is represented by the Golkar (*GOL*) and *politik aliran* which is characterised by political Islam (*ISL*). Institutional variables (*IST*) are represented by a corruption perception index (*COR*) and a physical infrastructure index (*INF*) which are expected to capture the impact of the quality of governance on public sector efficiency.

The following discussion provides details on how each of the explanatory variables on the right hand side of Equation (5.7) is constructed.

5.3.1. Decentralization measure (FD)

Due to the complexities of a vertical government structure, a measure to best approximate the degree of decentralization is one of the critical issues in the

empirical studies. An example is in studies concerning the relationship between decentralization and economic growth. The ambiguity of the relationship is claimed to be due to the problems of the degree of decentralization approximation (Martinez-Vazquez 2003; Thornton 2007). Ebel and Yilmaz (2002) also highlight that the substantially different results of the empirical studies concerning the determinant and impact of the decentralization depends on the measure of decentralization used. Moreover, Stegarescu (2005) argues that the measurement errors concerning decentralization as an independent variable are more problematic in the regression analysis than that as a dependent variable.

The conventional measure of the degree of decentralization that has been widely used in the empirical studies is ratio of the total budgetary revenue or expenditure of sub-national governments to the consolidated government revenue or expenditure. Both measures are generally used in the cross-country analysis of the decentralization. A drawback of these conventional measures is that they do not appropriately capture the decision-making structure and the extent of sub-central government autonomy over the allocation of their expenditure and revenue (See Stegarescu 2005).³⁰ Additionally, Boex and Simatupang (2008) argue that the conventional measures are not able to capture the empowerment gain from the power delegation.

The degree of fiscal decentralization is measured as a ratio of local-own revenue to total spending. This ratio measures the degree of a local jurisdiction's ability to manage resources, given tax autonomy and other pure revenue-generating activities of local governments. This shows the ability of a local jurisdiction to internalize the benefits from the delegation of power.

Table 5.2 illustrates the structure of local government revenue in Indonesia. Regional taxation in the decentralized Indonesia is levied under law 34/2000 which is now amended by Law 28/2009. Based on the law, the local tax bases and tax rates are determined by the central government. As a consequence, there is no variation in the tax rates and tax bases between local governments. In

³⁰More details on the conception and measurement of fiscal decentralization could be seen in Ebel and Yilmaz (2002) and Stegarescu (2005).

the case where local governments have no authority to determine the tax base and tax rates, tax competition among local government becomes irrelevant and hence a fiscal decentralization measure may not be able to capture the variation in local decision making concerning local taxation. However, even with centrally imposed common tax rates, the measure may reflect the de facto institutional capacity variation across local governments in administering their tax revenue.

Table 5.2: The structure of Indonesia’s local government revenue

1.	Local government own-revenues (LOR)
a.	Local Tax ^{a)}
b.	Local retribution ^{b)}
c.	Income from regional government owned companies, managing split off regional assets
d.	Others ^{c)}
2.	Transfers
e.	Shared tax and non-tax (STX) ^{d)}
f.	General allocation fund (GAF) ^{e)}
g.	Special allocation fund (SAF) ^{g)}

a) *Provincial tax*
 - vehicle tax
 - vehicle transfer fee
 - fuel tax
 - exploration tax of surface and underground water

Local government tax:
 - hotel tax
 - restaurant tax
 - entertainment tax
 - advertisement tax
 - street lighting tax
 - exploration tax of mine (type C-non-metal and rock)
 - parking tax

b) - general service levy
 - business service levy
 - levy on permit

c) - demand deposit account fee
 - interest income
 - income from exchange rate discrepancy
 - commission, discount and other income from trading

d) *Regional share of the income from land and building tax, land and building right acquisition duties, and from natural resources*

e) *Determined on the basis of fiscal gap and basic allocation*

f) *Technically specific purpose such as reforestation*

Note: The structure of local tax and retributions are based on law 34/2000 which is now replaced by law 28/2009.

Given the definition, the degree of decentralization (*FD*) is measured as follows:

$$FD_i = \frac{LOR_i}{TE_i}$$

where *LOR* is local government own-revenue and *TE* is total expenditure.

5.3.2. Total Factor Productivity growth (TFP)

The discussion in Chapter 4 indicated that a jurisdiction's population, a fixed vector of inputs (capital and materials) and government transfers are key factors determining a jurisdiction's *PSE*. This implies that beside transfers which represent the degree of decentralization, the productivity of resources is also crucial for the *PSE*. In the empirical model, the growth rate of total factor productivity is used as a proxy of local government's resources productivity. In the empirical model, The TFP is also considered as a control variable for the efficiency impact. Local governments with high TFP are expected to present high productivity in the public sector as well regardless of the level of fiscal decentralization, democratization and accountability (See Barankay and Lockwood 2007; Adam, Delis and Kammass 2008).

The TFP growth is measured using the Solow residual which is estimated as the residual of the regression of growth rate of per capita output on the growth rate of per capita capital (Barro and Sala-i-Martin 2004).

5.3.3. Political and Institutional Determinants

The political reform after the downfall of the new order regime has transformed Indonesia into a new democratic nation. A number of parties arose with various platforms to compete in the election. The political and institutional variables used in this study are generated from the 2004 electoral contest, the first election in the decentralized Indonesia. Twenty-four parties competed in the contest, of which twenty-one of them were new parties.

The structure of the political institutions across all jurisdictions is the same. Therefore, the variation in the political variables will de facto reflect voters' political preferences. An illustration is the variation in the number of votes or seats held by a particular party. The variation reflects the de facto variation in local voter's preferences to differentiated parties. When this variation is linked to public sector efficiency, it is expected to exhibit a true association between political preferences and public sector efficiency. On the contrary, cross-country political studies may not be able to capture any valid association between political

variables and public sector efficiency since the association may contain bias in the political structure variation across countries.

5.3.3.1. Democratic Participation (DP)

Democratic participation generally refers to any political activities done by citizens to influence government or take part in the government system. It could take forms from the most formal one with the intention of voting, to informal ones such as protesting, campaigning, petitions, and even community activity. Democratic participation is defined specifically as a number of votes in the election. Thus, democratic participation (DP_i) is defined as the ratio of actual voters (AV_i) to eligible voters in the election (EV_i).

$$DP_i = \frac{AV_i}{EV_i}$$

Democratic participation is associated with elements of democratic government such as rationality, checks and balances, responsiveness, flexibility, legitimacy, and conflict resolution (Kaase and Marsh 1979). Accordingly, higher democratic participation is generally associated with citizen's participation in shaping the profile of government with high accountability (Besley and Coate 2000). However, robust generalization and systematic evidence on how exactly they interrelate are lacking (See Rodrik 2000).

To what extent the democratic participation has an impact on the quality of the democratic process and economy continues to invite discussion among observers. It is generally hypothesized and empirically supported that the upper classes tend to have higher participation rates than the lower classes. Accordingly, low participation in elections may lead to inequality in representation. In addition, the "influence" as a result of low participation in the election is not randomly distributed but systematically biased in favour of those with higher incomes, wealth and better education (See Lijphart 1997).³¹ On the other hand, the class-

³¹ Institutional mechanisms are generally taken in order to increase democratic participation in the election, such as simple registration rules, weekend voting, infrequent elections, and compulsory voting. In Indonesia, the effort to increase democratic participation is institutionalized in the Islamic legal opinion of "*Majelis Ulama Indonesia*" saying that "not to vote" is forbidden.

bias in political participation may lead to a better economic performance as the participation of the uneducated and poor would worsen the quality of the inputs in the political process and thus policies coming out of it (Mueller and Stratman 2003). Li, et al. (1993) provide evidence that in countries with weak democratic institutions, the more privileged classes are able to capture the government and bend its policies to advance their benefit at the expense of the large poor voters. Poor people are generally characterized with powerlessness and voicelessness. Their voices are politically less influential though they represent more votes.

Democratic participation in the decentralized democratized Indonesia has been a subject of some interest among observers since 1999. Baswedan (2007) investigates decentralization and patterns of democracy in Indonesia. He finds evidence that the regional autonomy does not directly increase local participation though regional autonomy has shifted the focus from national to regional political issues. Mujani (2003) more specifically investigates political participation in relation to the Islamic tradition in Indonesia.³² Ufen (2006) investigates “*politik aliran*” in relation to democratic participation in the decentralized democratized Indonesia.

The political reality in Indonesia with the features of “*politik aliran*” and “*money politic*” may distort the significance of democratic participation. “*Politik aliran*” (stream) refers to political parties with strong roots in ethnicity, religion, and socio-ideological institutions.³³ “*Money politic*” refers to a money-driven vote condition where citizens vote in exchange for instant money or jobs offered by particular candidates. In a situation where “*politik aliran*” and “*money politic*” is dominant, the relationship between voters and politicians deviates from a political agency relationship. People do not vote politicians/parties on the basis of rational considerations as principal who delegate their interests to political agents. They vote rather on the basis of ethnic and socio-ideological likeness or in exchange for money.

³² An emergence of political parties which socially-rooted to the Islamic tradition and identity is investigated to empirically provide evidence on the relation between democratization and the Islamic political tradition.

³³ Further discussion on “*politik aliran*”, see Ufen (2006).

5.3.3.2. Political Fragmentation (PF)

The emergence of many political parties in the decentralized democratized Indonesia result in increased political fragmentation. This section briefly discusses concepts and measurement of this political fragmentation as well as its expected impact on public sector efficiency.

In the public choice literature, political fragmentation has evolved into a broader definition, rather than just an ideological aspect. Ricciuti (2004) classifies political fragmentation into four aspects. The first is ideological fragmentation that refers to the importance of ideological differences among political actors. The second is size-fragmentation that refers the number of parties or politicians who are actually involved in the decision making process. The third is institutional fragmentation that concerns a number of issues from the political system in selecting chief executives (presidential or parliamentarian). The fourth concept refers to changes in size and ideological composition of a political landscape overtime, which is known as over-time fragmentation.

This study uses a size-fragmentation concept that measures effective number of political parties involved in the decision making process. However, it is important to distinguish two cases dealing with the deployment of the size-fragmentation concept: (i) the size-fragmentation concept from the perspective of voters and (ii) the size-fragmentation that indicates the level of dispersed political power (Geys 2004). The number of competing parties/politicians indicates the degree of political fragmentation. From the perspective of voters, the more parties or politicians that compete in the election, the higher the degree of choice. Voters decide which of the competing politicians or parties to support. In this case, voters have extensive alternatives among parties or politicians to support that will best represent their preferences. Therefore, the higher the political fragmentation, the better is the political outcome on the ground of citizens' interests, and subsequently, the better is the public sector efficiency.

On the other hand, higher political fragmentation indicates the more dispersed the political power. A number of parties or politicians have to cooperate

and come to a common decision regarding policy issues. Thus, the more politically fragmented the decision making the lower is the likelihood that public sector policy reform will occur (Mierau, Jong-Apin and de Haan 2007) and the lower is the public sector efficiency (Borge, Falch and Tovmo 2008).

Highly dispersed political power in the decentralized democratized Indonesia as a result of political liberalization should have developed a good system of checks and balances and accordingly help improving accountability and public sector efficiency. However, politicians' behaviour in a young democracy such as in Indonesia tends to bend the system of checks and balances. Moreover, the party partnership in the local political structure also exhibits sophisticated patterns as a result of pragmatic party coalitions dealing with local leader elections (Pratikno 2009). In this situation the legislature bargaining in an environment of highly dispersed political power is distorted in respect to improved efficiency. Therefore higher levels of political fragmentation tend to reduce public sector efficiency.

Several measures of political fragmentation have been proposed by many scholars in the literature. Laakso and Taagepera (1979) introduce a measure of the effective number of parties (ENP) that refers to the number of hypothetical equal-size parties that would have the same effect on fractionalization as have the actual parties of unequal-size. Perotti and Kantopolous (2002) use the ENP index to investigate the effect of the degree of government fractionalization on policy outcomes. The *ENP* index is defined as follows:

$$ENP = \frac{1}{\sum_{p=1}^P SH_p^2}$$

where SH_p is share of the seats in the government (assembly) held by party p , and P is the total number of parties.

Another measure of political fragmentation using a Herfindahl-Hirschman index (HH) currently appears in the public choice literature. The HH index is an inverse of the ENP. This measure is adapted from a market concentration measure in the industrial economics literature. Borge, Falch and Tovmo (2008) use the HH index to measure political fragmentation in relation to public sector efficiency.

Another measure of political fragmentation found in the public choice literature is a political fractionalization index (PF). Elgie and McMenam (2008) use a PF index to measure political fragmentation in relation to a tendency to fiscal deficits and political institutionalisation. The fractionalization index is defined as follows:

$$PF = 1 - \sum_{p=1}^P SH_p^2$$

This study uses the size-fragmentation to measure political fragmentation in the legislative body. The political fragmentation is measured using a Herfindahl-Hirschman index (*HH*) defined as follows:

$$HH = 100 \sum_{p=1}^P SH_p^2$$

where SH_p is share of seats in the local assembly held by party p , and P is the total number of parties in the local assembly. The higher the *HH* index, the lower is the political fragmentation in a local parliament. The *HH* index captures the number of seats and parties in the local assembly which can be interpreted as the probability of two randomly drawn members of the parliament belong to the same party (Borge, Falch and Tovmo 2008).

5.3.3.3. The formation of New Government (NG)

The new order era in Indonesia (1968-1998) is characterized as a period of political repression under the President Suharto administration. A number of parties were amalgamated and emasculated, opposition was tightly restrained and administration was centralized and strongly controlled.³⁴ It was almost impossible to set up new political parties (See Ufen 2006).³⁵ In this period, *Golkar* as the

³⁴In 1973, President Suharto simplified the number of parties into three: *Golkar* as the government political vehicle, *Partai Persatuan Pembangunan* (Development Unification Party), a merge of Islamic-rooted parties and *Partai Demokrasi Indonesia* (Indonesia Democracy Party), a fusion of non-Islamic rooted parties.

³⁵Several “parties” were set up by democracy activists, standing in a real opposition against hegemonic new-order government. People Opposition Party (*Partai Oposisi Rakyat*) led by Dita Indah Sari and Democratic People Party (*Partai Rakyat Demokratik*) led by Budiman Sujatmiko were the most phenomenal. Obviously, these party activists were intimidated by the regime and even jailed.

political vehicle for the regime to sustain its political power was always able to maintain the single majority in the parliament, while *Partai Persatuan Pembangunan Indonesia* (PPP) and *Partai Demokrasi Indonesia* (PDI) as rivals were restricted and strongly regulated and hence could not take action as real oppositions (See Tomsa 2008).

Table 5.3: Votes and seats of parties in the elections during Indonesia's new order era

	1977		1982		1987		1992		1997	
	vote	seat	Vote	Seat	Vote	Seat	vote	seat	vote	seat
Golongan Karya	62.11	232	64.34	242	73.16	299	68.10	282	74.51	325
Partai Persatuan Pembangunan	29.29	29	27.78	94	15.97	61	17.01	62	22.43	89
Partai Demokrasi Indonesia	8.6	29	7.88	24	10.87	40	14.89	56	3.06	11

Note: vote as a percentage.

Source: <http://www.tempointeraktif.com/hg/narasi/2004/03/19/nrs.20040319-01.id.html>, accessed 12 July 2010.

The political repression was generally justified by the reason to maintaining national stability as a necessary condition needed for economic development. However, social conflicts were by no means eliminated. Social conflicts caused by separatist movements were reinforced in resource-rich regions such as Aceh, Riau and East Kalimantan and in historically potential separatism such as East Timor, Aceh, Maluku and Papua. Dissatisfactions to the political repression of the long-standing regime amplified several political disputes leading to national instability.³⁶ Internal conflicts in the PDI reached a peak and led to a riot on 27 July 1996.³⁷ Subsequently, President Suharto resigned in May 1998 in response to mass protests of uncontrolled political and economic instability.³⁸

³⁶ East Timor is separated from the Republic of Indonesia as a result of a referendum conducted in 1999 under the administration of President B.J. Habibie, the predecessor of President Suharto.

³⁷ In the 1993 PDI national convention, Megawati Sukarnoputri was elected as the chairperson defeating the regime-backed candidate. In response to the congress's result, the regime brought about an extraordinary convention to select an alternative chairperson. However Megawati still won the battle. Another convention was engineered in June 1996 supported by the regime where Suryadi was designated as the Chairperson. From that moment on there were two leaderships in the PDI that caused a serious political clash. The clash reached its climax on 27 July 1996 when

Political reform emerged as the most urgent agenda soon after the transfer of power from President Suharto to the interim President Habibie in May 1998. As the President in the transition period, Habibie was responsible for preparing an election in 1999 in which he promised to be fair, free and open for new political parties to participate and compete.³⁹ This period is noted as the era of political liberalization. Golkar lost the domination in the parliamentary house. The 1999 election changed the political composition in the parliament with the presence of a mixture of new participating parties. Apart from the changing composition, the new government as an outcome from the successful, free and fair 2009 election might have little to do with the main reform issues such as corruption, the retention of the military's role in politics and human rights violations (See Tomsa 2008).

PDI under Suryadi fought PDI Megawati with violence to take over the PDI's headquarters in Jakarta. The riot is well known as a *kudatuli* case (*kasus dua puluh tujuh juli*). In the 1997 election, PDI Megawati gave their votes to PPP leading to a significant decrease with only 3% votes obtained by regime-backed PDI. Following the downfall of the regime, Megawati declared Indonesian Democratic Party-Struggle (PDI-P) to differentiate from the government-backed PDI.

³⁸ See Sulistyono (2002).

³⁹ Many parties were registered with various platforms ranging from professional groups, backed-Islamic organization groups, ethnic groups, women, old people, and religious minorities groups, etc. Forty eight parties passed an administration process to compete in the 1999 election.

Table 5.4: Seats held by participating parties in the 1999 and 2004 national parliamentary elections.

Participating Parties	1999 Seats (%)	2004 Seats (%)
Partai Golongan Karya	118 (25.76)	128 (23.27)
Partai Demokrasi Indonesia Perjuangan	151 (32.97)	109 (19.82)
Partai Persatuan Pembangunan	58 (12.66)	58 (10.55)
Partai Demokrat		55 (10.00)
Partai Amanat Nasional	34 (7.42)	53 (9.64)
Partai Kebangkitan Bangsa	51 (11.14)	52 (9.45)
Partai Keadilan Sejahtera (1999 : Partai Keadilan)	7 (1.53)	45 (8.18)
Partai Bintang Reformasi		14 (2.55)
Partai Damai Sejahtera		13 (2.36)
Partai Bulan Bintang	13 (2.84)	11 (2.00)
Partai Persatuan Demokrasi Kebangsaan		4 (0.73)
Partai Persatuan Nahdhatul Ummah	5 (1.09)	
Partai Keadilan dan Persatuan Indonesia	4 (0.87)	1 (0.18)
Partai Karya Peduli Bangsa		2 (0.36)
Partai Pelopor		3 (0.55)
Partai Nasional Indonesia Marhaenisme		1 (0.18)
Partai Penegak Demokrasi Indonesia	2 (0.44)	1 (0.18)
Partai Sarikat Indonesia	3 (0.66)	
Others	12 (2.62)	
Total	458	550

Source: [http://ditpolkom.bappenas.go.id/basedir/Politik%20Dalam%20Negeri/1\)%20Pemilu/3\)%20Pemilu%20tahun%202004/Perbandingan%20Kursi%20Parpol%20Pemilu%202004%20vs%201999.pdf](http://ditpolkom.bappenas.go.id/basedir/Politik%20Dalam%20Negeri/1)%20Pemilu/3)%20Pemilu%20tahun%202004/Perbandingan%20Kursi%20Parpol%20Pemilu%202004%20vs%201999.pdf), accessed 12 July 2010.

Although Golkar does not hold a dominant majority, its influence is still significant in post-Suharto Indonesia. Golkar's political infrastructure has long been developed compared to that of the new parties. Given its strong party institutionalization, it was not surprising when Golkar was able to win back the highest number of votes in the 2004 election. Close connection between Golkar and businessmen that have long been established have also contributed to the success of Golkar in continuing its role in the decentralized democratized Indonesia though the multiparty system has created new incentives for the business community to sponsor various parties other than Golkar and hence businessmen may diversify their financial support to other political actors (Chua 2009). Golkar is still believed to remain one of the major recipients of money

from the business community (Tomsa 2008).⁴⁰ Thus, it is hardly surprising that Golkar is still influential in directing the formulation of crucial laws. Moreover, the party was able to win many gubernatorial and mayoral elections in provinces and local Kabupaten/Kota Governments.

Given the power delegation from central to sub-national government, the changing formation of new government stretched out into sub-national governments. However, lack of institutional infrastructures might mean the result of the 1999 election did not result in improved public sector outcome. The euphoria of political liberalization in the sub-national governments caused a serious corruption pandemic where legislative bodies and leaders of sub-national governments were almost uncontrolled (Sulistyo 2002).⁴¹ Besides, the decentralization policy had not been effectively implemented throughout the years up to 2001. Hence, the formation of new government as a result of 1999 election had nothing to do with better public sector performance expected from decentralization.

The early period in the democratic transition of the post-Suharto Indonesia was frequently acknowledged as a protracted transition rather than consolidated phase of transition (Malley 2000). This period was dubbed with the period of decentralization anomaly that causes pessimism the decentralization. Nordholt and Van Klinken (2007) describes it as a period of the agony of the decentralization with a disparity between professional optimism and realistic pessimism. Bunte (2009) also illustrates this phase as a protracted decentralization.

In 2004, the second election was held in post-Suharto Indonesia. It was the first election in the decentralized Indonesia. Several institutional infrastructures

⁴⁰ Since 2004, Golkar has been chaired by prominent Indonesian businessmen. Yusuf Kalla, well-known as a success businessman with Kalla group and Bukaka group, chaired Golkar from 2004-2009. Yusuf Kalla then won the 2004 presidential election as vice president of the Republic of Indonesia. Golkar is now chaired by Aburizal Bakrie, one of the most prominent Indonesian conglomerates with Bakrie business group.

⁴¹ The “little kings” terminology became popular to reflect uncontrolled sub-national government authorities in the executive and legislative bodies. A “little Suharto” terminology was introduced by Aspinall and Fealy, (2003) to address a wide spread patronage.

had been established to support better local budgetary processes. Law 22/1999 on the sub-national government had been amended by Law 32/2004 underpinning better local accountability. An introduction to the direct gubernatorial and mayor election and an abolition of non-elected representatives in the parliament were among the most outstanding achievements of the new law. The performance-based budgeting for local budget management was introduced in government regulation PP 105/2000 which was then updated in PP 58/2005. The legislation of Law 17/2003 on the public finance and Law 1/2004 on the national asset supports better local budget management and corruption prevention. Within these circumstances, one might expect that the outcome of the 2004 electoral contest will yield good elected politicians with good policy outcomes.

The changing political configuration in the parliament is used as a proxy to represent the formation of new government in the decentralized democratized Indonesia. However, the changing political configuration may not be able to really indicate distinctive political behaviour from the previous government. This has been confirmed by several political studies in the post-Suharto Indonesia. The new government in the decentralized democratized Indonesia is more likely to be captured by elites in less differentiated political parties than being held accountable by the general public. Malley (2003) illustrates this situation as a circumstance of new rules, old structures and the limits of democratic decentralization. Robinson and Hadiz (2004) show that the mutual relationship between oligarchic power and business interests are still intact as they have successfully adapted to the new political environment without changing their predatory mentality.

In the public choice literature, the presence of new government in relation to public policy outcomes has been a subject of some interest. Mierau, Jong-Apin and de Haan (2007) investigate the presence of new government using dummy variables in a discrete choice model using panel data from 20 OECD countries. They argue that the presence of new government increases the likelihood that fiscal policy adjustment will occur.

- **Golkar (GOL)**

Golkar in the democratized Indonesia is still influential though it has lost its domination in the multiparty electoral system. Its existence encounters challenges from parties holding seats in the parliament. Among those are three reform pioneers, *Partai Demokrasi Indonesia Perjuangan* (PDI-P), *Partai Kebangkitan Bangsa* (PKB) and *Partai Amanat Nasional* (PAN), and two new emerging parties, *Partai Keadilan Sejahtera* (PKS) and *Partai Demokrat*, as well as *Partai Persatuan Pembangunan* (PPP). Assuming that Golkar politicians represent the status quo that will always maintain and protect political rent, they have benefited from the previous regime. One might expect that the larger the number of seats held by Golkar in the assembly, the lower the propensity for public service reform to occur and the smaller is the improvement in the public sector efficiency.

However, given the strong party institutionalization of Golkar, presumably as an incumbent government, one might also expect that the continuing domination of Golkar will result in better policy outcomes. This is based on Riker's (1964) proposition. According to Riker (1964) only strong national political parties achieve the necessary balance between national and local interests. Enikolopov and Zhuravskaya (2007) support this proposition. They find evidence from a panel study of 75 developing and transition nations that a strong political party significantly improves the outcomes of decentralization such as economic growth, quality of government, and public good provision.

The formation of new government is defined as the ratio of seats held by Golkar to the total seats in the local assembly.

$$GOL_i = \frac{GS_i}{TS_i}$$

where

GS is seats held by Golkar

TS is total seats

- ***Politik Aliran (ISL)***

Another major feature of the political institution in the democratized Indonesia is the rebirth of *politik aliran*.⁴² New parties which rooted in the ethnic or religious groups flourish as a result of political liberalization, and it has resulted in the rebirth of *politik aliran* (ideological stream) (Ufen 2006). Six of the ten largest parties in the 2004 national parliament are Islamic rooted parties and four of them are secular nationalists (Table 5.4).⁴³ Mujani (2003) claims that the Islamic tradition, in the case of Indonesia is not inimical to political participation and democracy. His finding rejects the hypothesis that Islamic tradition is unfavourable to the democracy. It also rejects the hypothesis that the nation-state is alien to the Islamic tradition in the case of Indonesia.

Political institutions rooted in Islamic institutions may have increased electoral participation in a populated country with Islam as a major religion. However, whether the Islamic political institutions result in improved public services is not yet determined. It is interesting to empirically investigate this Indonesia-specific political institution in relation to the public service outcome. This Indonesia-specific political institution is a kind of particular patron-client relationship of a political agency. How this Indonesia-specific political institution is supposed to have an impact on public service outcomes is of interest in the empirical investigation.

In the empirical literatures, an investigation on a particular political institution in relation to the public policy can be found in Mierau, Jong-Apin and de Haan (2007). They investigate the tendency of a political fragmentation under left-wing and right-wing in the 20 OECD countries. They claim that the likelihood

⁴²*Politik aliran* was historically rooted to political parties in 1950s and 1960s where political parties allied with social-religious groups. *Partai Nasionalis Indonesia* represented those who were still set apart by an aristocratic Javanese culture and earned their living mainly as state employees and civil servants or were clients of them. *Partai Komunis Indonesia* was a communist platform party with loyal followers among *abangan* workers in urban and rural areas. The modernists were represented in *Masyumi* including urban intellectuals, traders and artisans on the Outer Islands. *NU* represented traditionalist *santri* including *ulama* and their followers. *Partai Katolik* represented catholic people. The Christian group were represented in the *Parkindo*. See the details in the Ufen (2006).

⁴³PAN and PKB do not explicitly mention Islam as their platform; however both are backed by two largest Islam Organizations in Indonesia.

of the public sector adjustment is lower under left-wing government than under right government. Elgie and McMenamain (2008) investigate ideological fragmentation in relation to fiscal deficits. They find evidence that the more ideologically fragmented parliament, the higher is the tendency to a fiscal deficit.⁴⁴

Politik aliran is defined as the ratio of seats held by Islamic-rooted parties to the total seats in the local assembly:

$$ISL_i = \frac{SISL_i}{TS_i}$$

where

SISL is seats held by Islamic-rooted parties

TS is total seats

5.3.3.4. Institutional Variables

Increased accountability is crucial for improved efficiency outcomes in a decentralized system of public service provision. However institutional obstacles in most developing countries potentially cause corruption becoming wide-spread along with power and fiscal decentralization. Additionally, less political accountability and fewer obstacles to corruption in the lower levels of government compared to the national level emerge as factors undermining public sector efficiency (Prud'homme 1994). In the case of Indonesia's decentralization a wave of corruption swept across newly decentralized local governments. It takes place in various forms, in almost every level of government and institutions of legislatures and executives (See Rinaldi 2007). Fisman and Gatti (2002) argue that political decentralization focusing on coordination of rent seeking appears to influence the spread of corruption alongside decentralization. In a situation where corruption is widespread along with power and fiscal decentralization the outcome of decentralization is supposed to be an anomaly. This study uses a corruption

⁴⁴Both studies are based on OECD countries, where the result is sensitive to the sample selected and the degree of democratic institutionalisation (Elgie 2008). The extent of democratic institutionalisation is expected to be eliminated in this study as it is a local government cross analysis within a country where the democratic institutionalisation is at the same level.

perception index and an infrastructure perception index to capture the impact of the quality of governance on public sector efficiency.

Table 5.5: Explanatory variables and their impact on public sector efficiency

No.	Explanatory Variable	Hypothesis	Expected Sign
1.	Decentralization measure	The higher the ability of a decentralized local government to benefit the decentralization, the greater is the public sector efficiency.	+
2.	Democratic participation	The greater the democratic participation the greater is the public sector efficiency	+
3.	Political fragmentation	The greater the political fragmentation (measured using Herfindahl Hirschman Index), the lower is the public sector efficiency. The higher the HH index, the lower is the fragmentation.	+
4.	The formation of “new government”	The new government as an outcome of the 2004 electoral democracy is expected to result in improved public sector efficiency. However in the setting of Indonesia’s political institutions, whether the new government results in improved public sector efficiency is uncertain.	undetermined
5.	“Politik aliran”	Patron-client affiliation is generally seen as a factor undermining political accountability. Thus it reduces public sector efficiency. However, in young democracies where politicians/parties are not credible, patron-client affiliation can function as a political intermediary. Thus patron-client affiliation can help in improving accountability between politicians/parties and voters.	undetermined
6.	Total factor Productivity growth	The greater the TFP, the greater is the public sector efficiency	+
7.	Institutional variable	The better the institutional quality of local government, the greater is the public sector efficiency.	+

5.4. Data

Local government budget data from 33 provincial governments and more than 400 Kabupaten/Kota governments are observed.⁴⁵ The data are aggregated up to the provincial level as the outcome data in the first stage as well as explanatory

⁴⁵Since the implementation regional autonomy, the number of Indonesian local governments is increasing as a result of regional splitting. Based on internal affair department data base, there were 32 provincial governments and 440 Kabupaten/kota governments in 2005 and 2006, 33 provincial governments and 456 Kabupaten/kota governments in 2007, and 33 provincial governments and 497 Kabupaten/kota governments in 2008.

variables in the second stage are available at the cross-provincial level. This gives the advantage that the spillover problems across local Kabupaten/Kota governments within the same province, and spillover effect from provincial government are contained altogether at the cost of informational loss across Kabupaten/Kota governments. Tables 5.6 and 5.7 summarize the data used in this study.

The local budget data is taken from the regional finance information system (SIKD). Over the observation period, there were several changes in the budgeting system. A performance-based budgeting system was introduced following the Ministry of Internal Affairs (MoIF) decree no. 29/2002 replacing the old regional finance administration manual (MAKUDA) system. In the SIKD 2005 data several local jurisdictions had adopted the new system, while some stuck to the old system. In the SIKD 2006, all local jurisdictions had already adopted the new budgeting system. In the SIKD 2007 and 2008, there were two types of budgeting system based on SAP and MoIF-13/2006 as a consequence of the introduction of Public Accounting Standard (SAP) and MoIF-29/2002 amended by MoIF decree no. 13/2006.

Table 5.6: Description of data used in the first stage of the method

Variable	Measure	Category	Indicator	Description	Source
PSP	$PSP_i = \sum_{j=1}^n PSP_{ij}$	Education	Net primary enrolment rate (NPE)	The number of children of official primary school age who are enrolled in primary education as a percentage of the total children of the official school age population (The Official United Nations Sites for MDG Indicators)	BPS Statistics Indonesia
			Net secondary enrolment rate (NSE)	The number of children of official secondary school age who are enrolled in secondary education as a percentage of the total children of the official school age population (The Official United Nations Sites for MDG Indicators)	BPS Statistics Indonesia
		Health	Infant mortality rate (IMR)	The number of infants dying before reaching one year of age, per 1,000 live births (The Official United Nations Sites for MDG Indicators)	BPS Statistics Indonesia
			Annual new tuberculosis incident (ATI)	Tuberculosis incidence is the estimated number of new tuberculosis (TB) cases arising in one year per 100,000 populations. All forms of TB are included, as are cases in people with HIV (The Official United Nations Sites for MDG Indicators)	BPS Statistics Indonesia
		Infrastructure	Percentage of households who have a safe water supply (HPW)		BPS Statistics Indonesia
		Poverty	Percentage of population below poverty line (PPL)	Head count index of population below the poverty line. The poverty line is calculated using basic need approach comprising of two components; food poverty line of 2,100 calorie per day per capita and non-food poverty line. The poverty line varies among provinces.	BPS Statistics Indonesia
		Macroeconomic Goal	Economic growth (GRT)		BPS Statistics Indonesia
			Unemployment rate (UER)		BPS Statistics Indonesia
PSE	$\frac{PSP_i}{PEX_i} = \sum_{j=1}^n \frac{PSP_{ij}}{PEX_i}$		<i>PEX</i> represents per capita public expenditure, aggregated from total local governments budget in a province plus provincial government budget.	Ratio of <i>PSPs</i> as outcomes to total public expenditure per capita as an input.	Directorate General of Fiscal Balance, Ministry of Finance

Table 5.7: Description of data used in the second stage of the method

	Abbreviation	Measure	Source	Note:
Dependent variable: Public Sector Efficiency	PSE	Stage one calculation	Own calculation	DEA calculation
Independent Variables: Decentralization measure	FD	$FD_i = \frac{ROR_i}{TE_i}$	Own calculation, based on SIKD data	Local governments' budget data are taken from Directorate General of Fiscal Balance, Ministry of Finance.
Democratic participation	DP	$DP_i = \frac{AV_i}{EV_i}$	Own calculation based on data base KPU	seats in local government assembly and votes data are taken from
Political fragmentation	PF	$PF_i = 100 \sum_{p=1}^p SH_{pi}^2$	Own calculation based on database pemilu 2004: peta daerah pemilihan, perolehan suara dan kursi untuk DPR RI, DPRD propinsi, dan DPRD kabupaten/kota se-Indonesia.	seats in local government assembly and votes data are taken from
The formation of "new government" - The struggle of Golkar	GOL	$GOL_i = \frac{GS_i}{TS_i}$	Own calculation based on database pemilu 2004: peta daerah pemilihan, perolehan suara dan kursi untuk DPR RI, DPRD propinsi, dan DPRD kabupaten/kota se-Indonesia.	seats in local government assembly and votes data are taken from
- "politik aliran"	ISL	$ISL_i = \frac{SISL_i}{TS_i}$		
Total factor productivity growth	TFP	Solow residual	Own calculation	Solow residual
Institutional variables	COR	Corruption perception index	Transparency International, Indonesia - USAID .	Survey
	INF	Physical infrastructure index	KPPOD	Survey

5.5. Econometric Method

This section discusses issues in the econometrics used to estimate the empirical model specified in Equation (5.7). The empirical model is structured in a panel data with 33 cross-section units over 4 years period of observation from 2005 – 2008. The discussion starts with the deficiencies of the common approaches in estimating panel data given idiosyncratic variables. First, political and institutional variables are constant over time. It generates a complication in the estimation technique. Second, the DEA efficiency score as dependent variable is limited from 0 to 1. It raises a question whether it is a kind of censoring data or it is a particular kind of fractional or proportional data.

The discussion continues with fixed effect vector decomposition (FEVD) as a chosen estimation technique. However, in order to provide detail clarification to the chosen technique, the discussion departs from fixed effect (FE) and random effect (RE) as common methods in estimating panel data. The Hausman-Taylor estimator (HT) as a popular technique dealing with time-invariant explanatory variables is also discussed. Afterward, the discussion explores why both FE and RE as well as HT are not sufficient to estimate the model.

5.5.1. Panel Data

In political science, it is common to investigate political variables as well as institutional variables that show much variation across units but rarely changing or constant over a particular period (See Plumper 2007). As a result, it causes complications in the panel data estimation technique.

Consider the following empirical model in a panel data structure:

$$\rho_{it} = \beta_0 + \beta'Z_{it} + \alpha_i + \mu_{it} \quad (5.8)$$

ρ_{it} is the dependent variable, Z_{it} is a vector of explanatory variables, β_0 is the common intercept, α_i is unobserved individual effect and μ_{it} is error term which is assumed to be independent and identically distributed $\sim IID(0, \sigma^2)$ for $i = 1, 2, \dots, N$ units for period $t = 1, 2, \dots, T$. β' are the coefficient estimates that have

restrictions upon them. They may represent common (cross section and period), cross section specific, or period specific parameters.

There are two common approaches to estimate Model (5.8): fixed effect (FE) and random effect (RE). The point of interest that distinguishes these two approaches is how to treat the unobserved individual effect, α_i . In FE, α_i is allowed to be correlated with explanatory variables, $E(\alpha_i|Z_{it}) \neq 0$. In RE, α_i is treated as random like μ_{it} and independent to a set of explanatory variables, $E(\alpha_i|Z_{it}) = 0$.

A dichotomy between FE and RE has been an interest in the panel data literature. A decrease of the degrees of freedom is usually considered as the drawback of FE. If there is a large number of cross-section units, estimating α_i as N individual effect consumes a lot of the degrees of freedom. Another drawback is when the model being estimated involves time-invariant explanatory variable for example years of schooling, family background, political and institutional variables. In this case, FE is not able to estimate the model as it will eliminate the time-invariant coefficients (Baltagi 2008; Hsiao 2003).

Since the political and institutional variables in this study are characterised as time-invariant variables, Equation 5.8 is rewritten as follows:

$$\rho_{it} = \beta_0 + \beta'Z_{it} + \gamma'X_i + \alpha_i + \mu_{it} \quad (5.9)$$

where X_i is a vector of time-invariant variables. The chosen model under consideration to estimate Equation (5.9) should be an RE since FE is impotent.

Another alternative method to estimate Equation (5.9) is pooled OLS (Knack 1993; Acemoglu et. al 2002; Elbadawi and Sambanis 2002). In this case, Acemoglu et. al (2002) argues that with attention to the determined set of institutions (which are clearly exogenous), not on the variation of institutions from year to year, the regression does not control a full set of individual dummies.

However, both RE and pooled OLS are considered inconsistent and biased when the individual effects are correlated with explanatory variables (Baltagi

2008). The unobserved individual effect is presumably correlated with explanatory variables. Economic growth for example, is positively correlated with fiscal decentralization, total factor productivity, political and institutional quality of local jurisdiction which is associated with higher public sector efficiency. Therefore, in a situation where unobserved individual effect is modelled as a linear function of Z_{it} , FE yields best, linear, unbiased estimator. On the other hand, RE will result in biased estimators. In addition, the ability of FE to deal with unobserved heterogeneity across units has become one of the advantages of FE. Researchers often pool data just for the purpose of controlling for the potentially large number of unmeasured explanatory variables by estimating FE (Plumper 2007).

An estimation method to deal with time-invariant explanatory variables was introduced into the literature by Hausman and Taylor (1981). Another method labelled as Fixed Effect Vector Decomposition (FEVD) is suggested by Plumper and Troeger (2007) which is similar to the procedure suggested by Hsiao (2003). These methods are helpful in the political science when numerous political and institutional variables which are time-invariant or rarely changing over time are used. The following section discusses these methods.

5.5.1.1. Fixed Effect Estimator (FE)

Consider Equation (5.8) as a common mean corrected model. In this model, the intercept varies across individuals with a common slope,

$$\rho_{it} = \beta_0 + \beta'Z_{it} + \alpha_i + \mu_{it}$$

The coefficient estimates are defined as

$$\hat{\beta}_w = W_{zz}^{-1}W_{z\rho}$$

$$\hat{\beta}_0 = \bar{\rho}_i - \hat{\beta}'\bar{z}_i$$

$$\alpha_i = \bar{\rho}_i - \hat{\beta}_0 - \hat{\beta}'\bar{z}_i$$

where

$$W_{zz} = \sum_{i=1}^N W_{zz_i} = \sum_{i=1}^N \sum_{t=1}^T (z_{it} - \bar{z}_i) (z_{it} - \bar{z}_i)'$$

$$W_{z\rho} = \sum_{i=1}^N W_{z\rho_i} = \sum_{i=1}^N \sum_{t=1}^T (z_{it} - \bar{z}_i) (\rho_{it} - \bar{\rho}_i)'$$

$$W_{\rho\rho} = \sum_{i=1}^N W_{\rho\rho_i} = \sum_{i=1}^N \sum_{t=1}^T (\rho_{it} - \bar{\rho}_i)^2$$

The residual sum of square (RSS) = $W_{\rho\rho} - W_{z\rho}' W_{zz}^{-1} W_{z\rho}$

5.5.1.2. Random Effect Estimator (RE)

The unobserved individual effect α_i in RE exists, but the effect is random. Therefore, Equation (5.8) can be written as follows:

$$\rho_{it} = \beta_0 + \beta' Z_{it} + \alpha_i + \varepsilon_{it} \quad (5.10)$$

where $\alpha_i + \varepsilon_{it} = \mu_{it}$. The composite error term μ_{it} has two components, α_i and ε_{it} .⁴⁶ RE assumes that all error components are uncorrelated with all explanatory variables Z_{it} ,

$$E(\alpha_i | Z_{it}) = 0, \text{ and } E(\varepsilon_{it} | Z_{it}) = 0$$

$$E(\alpha_i \alpha_j | Z_{it}) = \sigma_\alpha^2 \text{ if } i = j$$

$$= 0 \text{ else,}$$

$$E(\varepsilon_{it} \varepsilon_{is} | Z_{it}) = \sigma_\varepsilon^2 \text{ if } i = j \text{ and } t = s$$

$$= 0 \text{ else}$$

$$\text{Var}(\rho_{it} | Z_{it}) = \sigma_\alpha^2 + \sigma_\varepsilon^2$$

An efficient estimator can be obtained by Generalized Least Square (GLS).

⁴⁶ RE is also known as Error Component Model (ECM).

Recall,

$$\rho = \begin{pmatrix} \rho_{11} \\ \vdots \\ \rho_{1T} \\ \vdots \\ \rho_{N1} \\ \vdots \\ \rho_{NT} \end{pmatrix}, Z = \begin{pmatrix} 1 & z'_{11} \\ \vdots & \vdots \\ 1 & z'_{1T} \\ \vdots & \vdots \\ 1 & z'_{N1} \\ \vdots & \vdots \\ 1 & z'_{NT} \end{pmatrix}, \beta = \begin{pmatrix} \beta_0 \\ \beta_1 \\ \vdots \\ \beta_K \end{pmatrix}, \alpha = \begin{pmatrix} \alpha_1 l \\ \vdots \\ \alpha_N l \end{pmatrix}$$

$$\varepsilon = \begin{pmatrix} \varepsilon_{11} \\ \vdots \\ \varepsilon_{1T} \\ \vdots \\ \varepsilon_{N1} \\ \vdots \\ \varepsilon_{NT} \end{pmatrix}, \mu = \alpha + \varepsilon$$

Since the error components are uncorrelated with Z_{it} , the composite error term μ is also uncorrelated with Z_{it} .

$$E(\mu_{it}|z_{it}) = 0.$$

$$\text{var}(\mu|z) = \begin{pmatrix} \sigma_\alpha^2 ll' & & \\ & \ddots & \\ & & \sigma_\alpha^2 ll' \end{pmatrix} + \sigma_\varepsilon^2 I_{NT} = \Omega$$

Where Ω is positive definite.

D is a non-singular matrix such that $\Omega^{-1} = D'D$ and $D\Omega D' = I$.

The model is then transformed as

$$\rho^* = Z^* \beta + \mu^*$$

$$D\rho = DZ\beta + D\mu$$

$$\text{Var}(\mu^*) = D\text{Var}(\mu|z)D' = D\Omega D' = I$$

The RE estimator is then defined as

$$\begin{aligned} \hat{\beta} &= (Z'D'DZ)^{-1}(Z'D'D\rho) \\ &= (Z'\Omega^{-1}Z)^{-1}Z'\Omega^{-1}\rho \end{aligned}$$

$$\Omega = \text{diag}(\Sigma, \dots, \Sigma) = \begin{pmatrix} \Sigma & & & \\ & \Sigma & & \\ & & \ddots & \\ & & & \Sigma \end{pmatrix}$$

5.5.1.3. Hausman-Taylor Estimator (HT)

Hausman and Taylor (1981) proposes a method using instrumental variables that could be applied to deal with time-invariant explanatory variables. With a set of instrumental variables, the coefficient estimate of time-invariant variables can be obtained using two stage least square (2SLS).

Recall Equation (5.9)

$$\rho_{it} = \beta_0 + \beta'Z_{it} + \gamma'X_i + \alpha_i + \mu_{it} \quad i = 1, 2, \dots, N; \quad t = 1, 2, \dots, T$$

The method then finds instruments for those time-variant Z_{it} and time-invariant X_i which are potentially correlated with unobserved individual random effect α_i by pre-multiplying Equation (5.9) by $\Omega^{1/2}$. The instrument variables proposed by HT are generated from within the model with no need to seek external instrumental variables.

To illustrate the application of the HT method in this study, consider Equation 5.9 rewritten as:

$$\rho_{it} = \beta_0 + \beta_1'Z_{1it} + \beta_2'Z_{2it} + \gamma_1'X_{1i} + \gamma_2'X_{2i} + \alpha_i + \mu_{it} \quad 5.11$$

Where Z_{1it} is a vector of exogenous time-variant variables that are not correlated with α_i and μ_{it} , Z_{2it} is a vector of endogenous time-variant variables that are expected to be correlated with α_i and μ_{it} . X_{1i} is a vector of exogenous time-invariant variables that are not correlated with α_i and μ_{it} , and X_{2i} is a vector of endogenous time-invariant variables that may be correlated with α_i and μ_{it} .

The first step of the HT method is to estimate Equation (5.9) using fixed effect and get consistent and unbiased estimate of β' .⁴⁷ The procedure then takes the residual and regresses it on time invariant variables X_i using a set of instruments (deviation from individual mean of the variable Z_{1it} , deviation of

⁴⁷ Note that the within estimate of the Equation (5.10) eliminates the coefficient of time-invariant explanatory variables.

Z_{2it} from associated individual means, means of the variable Z_{1it} , and also variables X_i are used as instruments. This regression is intended to obtain the consistent estimates of γ .

The matrix of instruments takes the following form:

$$[QZ_1, QZ_2, PZ_1, X_1]$$

Where Q is the matrix of projection transforming a vector Z_{jit} into a vector of deviations from group means ($Z_{jit} - Z_{ji}$) and P transforms a vector Z_{jit} into a vector group means Z_{ji} . Then both overall and within residuals are obtained. These residuals are used to estimate the components of variance of the dependent variable. The estimated variance components are used to undertake GLS transform on each of the variables in the second stage (See Also Baltagi 2008).

5.5.1.4. Fixed Effect Vector Decomposition (FEVD)

The key feature of the FEVD method is an individual effect of the time-invariant variables decomposition into an explained and unexplained part. Then, the unexplained part is augmented as explanatory variable in the full model. The FEVD procedure involves three steps. First, the procedure estimates the unobserved individual FE using a baseline model. Second, the procedure splits the individual effect into explained and unexplained parts by regressing the unit effect on the time-invariant explanatory variables of the original model. Third, the procedure performs a pooled-OLS estimation of the baseline model by including all explanatory time-variant, time-invariant and unexplained part of the FE vector. This procedure corrects standard errors for the coefficient of the invariant variables, and at the same time adjusts for serial correlation errors (Plumper and Troeger 2007).

Recall the data generating process (DGP) of FE in Equation (5.9) as follows:

$$\rho_{it} = \beta_0 + \sum_{k=1}^K \beta_k Z_{kit} + \sum_{m=1}^M \gamma_m X_{mi} + \alpha_i + \mu_{it} \quad (5.12)$$

The first stage of FEVD estimates a baseline FE model. The baseline FE model is obtained by first averaging Equation (5.12) over T:

$$\bar{\rho}_i = \beta_0 + \sum_{k=1}^K \beta_k \bar{Z}_{ki} + \sum_{m=1}^M \gamma_m X_{mi} + \alpha_i + \bar{\mu}_i \quad (5.13)$$

Where

$$\bar{\rho}_i = \frac{1}{T} \sum_{t=1}^T \rho_{it}$$

$$\bar{Z}_i = \frac{1}{T} \sum_{t=1}^T Z_{it}$$

$$\bar{\mu}_i = \frac{1}{T} \sum_{t=1}^T \mu_{it}$$

Subtracting Equation (5.13) from Equation (5.12) will eliminate the individual effect α_i and the time invariant variable X_i ;

$$\rho_{it} - \bar{\rho}_i = \beta_k \sum_{k=1}^K (Z_{kit} - \bar{Z}_{ki}) + \gamma_m \sum_{m=1}^M (X_{mi} - X_{mi}) + (\alpha_i - \alpha_i) + (\mu_{it} - \bar{\mu}_i)$$

$$\dot{\rho}_{it} = \beta_k \sum_{k=1}^K \ddot{Z}_{kit} + \ddot{\mu}_{it} \quad (5.14)$$

Equation (5.14) stands for the demeaned transformation of Equation (5.12). The procedure, then estimates Equation (5.14) using FE with intention to obtain individual effect $\hat{\alpha}_i$:⁴⁸

$$\dot{\rho}_{it} = \beta_k \sum_{k=1}^K \ddot{Z}_{kit} + \hat{\alpha}_i + \ddot{\mu}_{it} \quad (5.15)$$

⁴⁸ Note that this individual effect differs from the individual effect α_i in the original model. The estimated unit effects in this equation include all time-invariant variables, the overall constant terms, and the mean effect of time varying variables Z.

The individual effect $\hat{\alpha}_i$ obtained from the FE estimate of Equation (5.15) differs from unobserved individual effect α_i in the original model as $\hat{\alpha}_i$ includes the unobserved unit-specific effects as well as observed unit *specific effects* X , the unit means of the residual $\bar{\mu}_i$, and the time varying variables \bar{Z}_{ki} .

Stage two of the FEVD is intended to obtain the unexplained part of the individual specific effect. This stage regress the individual effect $\hat{\alpha}_i$ on the observed time-invariant variables X_i .

$$\hat{\alpha}_i = \sum_{m=1}^M \gamma_m X_{mi} + h_i \quad (5.16)$$

The unexplained part of the individual effect is captured in the residual of the regression Equation (5.16) as:

$$h_i = \hat{\alpha}_i - \sum_{m=1}^M \gamma_m X_{mi} \quad (5.17)$$

The decomposition of the individual effect of the time-invariant variable into explained and unexplained parts is the key feature of the FEVD. In stage three, the procedure performs a regression of the full model but includes the unexplained part h_i using pooled OLS.

$$\rho_{it} = \beta_0 + \sum_{k=1}^K \beta_k Z_{kit} + \sum_{m=1}^M \gamma_m X_{mi} + \delta h_i + \mu_{it} \quad (5.18)$$

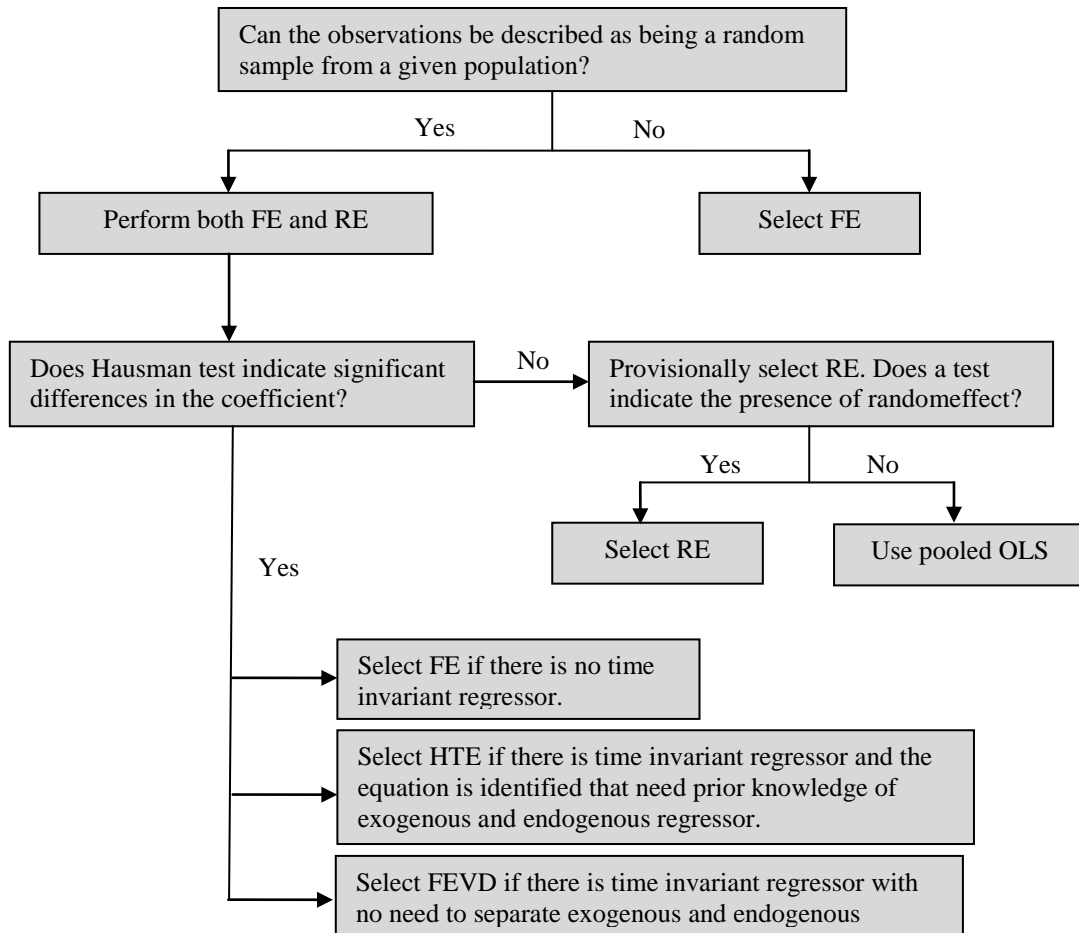
By design, h_i is not correlated with Z and X and hence the OLS estimator produces an unbiased estimate.

5.5.2. Model Selection

The choice between FE and RE depends on how the unobserved variable α_i is treated. RE is chosen when α_i is treated to be independent of Z_{it} . Otherwise, FE should be chosen to avoid unobserved heterogeneity bias (Dougherty 2007). A

standard test that is usually used to select between FE and RE is provided by Hausman (1978). Figure 5.1 summarises the estimation technique in panel data.

Figure 5.1: Summary of the estimation technique in panel data



Source: Summary based on Dougherty (2007), Baltagi (2003, 2008) and Plumper and Troeger (2007).

However, the choice between FE and RE should depend on the objectives and inferences a researcher wants to pursue. FE might be chosen if the researcher wants to make inferences about only this set of cross-section units. Additionally, FE might be used to control potentially large number of unobserved heterogeneity across units. In this case, α_i is treated as fixed. In contrast, RE might be chosen if the researcher wants to make inferences about populations from which these population data came with α_i treated as random (Maddala 1987). On special occasions where there are time-invariant explanatory variables, FE is not sufficient, thus RE should be the chosen model.

5.5.2.1. Hausman Test

The assumption that α_i is independent of Z_{it} is critical in the RE. Under the null hypothesis that $E(\alpha_i|Z_{it}) = 0$, Hausman (1978) suggests to test the difference between FE and RE estimators. If the difference is statistically equals to zero, the null hypothesis is not rejected indicating that RE specification is correct. If the difference is statistically significant, the null hypothesis is rejected indicating that FE is correct. Technically, the test is as following (Baltagi 2008):

$$\widehat{q}_1 = \widehat{\beta}_{REM} - \widehat{\beta}_{FEM}$$

Given that $\widehat{\beta}_{REM} - \beta = (Z'\Omega^{-1}Z)^{-1}Z'\Omega^{-1}\alpha$ and $\widehat{\beta}_{FEM} - \beta = (Z'QZ)^{-1}Z'Q\alpha$, the difference of both estimator is expected to be statistically zero,

$$E(\widehat{q}_1) = 0 \text{ and}$$

$$\begin{aligned} \text{cov}(\widehat{\beta}_{REM}, \widehat{q}_1) &= \text{var}(\widehat{\beta}_{REM}) - \text{cov}(\widehat{\beta}_{REM}, \widehat{\beta}_{FEM}) \\ &= (Z'\Omega^{-1}Z)^{-1} - (Z'\Omega^{-1}Z)^{-1}Z\Omega^{-1}E(\alpha\alpha')QZ(Z'QZ)^{-1} \\ &= (Z'\Omega^{-1}Z)^{-1} - (Z'\Omega^{-1}Z)^{-1} = 0 \end{aligned}$$

Given that $\widehat{\beta}_{FEM} = \widehat{\beta}_{REM} - \widehat{q}_1$, and so $\text{var}(\widehat{\beta}_{FEM}) = \text{var}(\widehat{\beta}_{REM}) + \text{var}(\widehat{q}_1)$ since $\text{cov}(\widehat{\beta}_{REM}, \widehat{q}_1) = 0$.

$$\text{var}(\widehat{q}_1) = \text{var}(\widehat{\beta}_{FEM}) - \text{var}(\widehat{\beta}_{REM}) = \sigma_v^2(Z'QZ)^{-1} - (Z'\Omega^{-1}Z)^{-1}$$

The Hausman test statistic is given by

$$m_1 = \widehat{q}_1'[\text{var}(\widehat{q}_1)]^{-1}\widehat{q}_1$$

H_0 is asymptotically distributed as χ_K^2 and K denotes the dimension of the slope vector β .

5.5.2.2. FE, RE, HT or FEVD?

Baltagi, Bresson, and Pirotte (2003) provide a pre-test estimator based on the Hausman-Taylor estimator. The first Hausman test is employed to select RE or FE. If the test rejects the null hypothesis, FE is chosen. Then the second Hausman test is employed to test the difference between the FE and HT estimators. If the null hypothesis is not rejected, the HT estimator is selected. It indicates that the unobserved individual effect may be correlated with some explanatory variables, but not all. The HT estimator is basically a 2SLS using a set of instruments (Baltagi 2008).

- (1) If the number of exogenous time-variant variables is less than the number of endogenous time-invariant variables, the equation is under-identified. In this case the HT is not efficient.
- (2) If the number of exogenous time-variant variables is equal to the number of endogenous time-invariant variables, the equation is just-identified. In this case the HT is as efficient as FE.
- (3) If the number of exogenous time-variant variables is greater than the number of endogenous time-invariant variables, the equation is over-identified. In this case the HT is more efficient.

Hausman-Taylor estimator has become a popular method among economists. It can be found in most recent econometrics textbooks (Baltagi 2008; Hsiao 2003). The partition of both time-variant and time-invariant variables into exogenous and endogenous requires careful a priori non-correlation assumptions (Hausman 1981). Though such a correlation can be tested as provided by Hausman and Taylor (1981), the test is difficult as individual effects are unobserved and mostly even unobservable (See Plumper and Troeger 2007).

In fact, both fiscal decentralization (FD) and total factor productivity (TFP) in this study are assumed to be endogenous which are expected to be correlated with the unobserved individual effect α_i but not correlated with the error term μ_{it} . The expected impact of the decentralization measure and total factor productivity on public sector efficiency occurs as a result of an efficiency-

enhancement effect of the local jurisdictions' ability to generate local own-tax revenue and expand local economic resources. Consequently, there is no exogenous time-variant variable to serve for instrumentation and hence the model is under-identified. In this case HT is not efficient.

Given the above considerations, FEVD comes as the chosen model. It is basically a fixed effect, but decomposes the individual effect into unexplained and explained parts. It then takes the unexplained parts as an explanatory variable together with time-variant and time-invariant variables. Pooled OLS is then employed to estimate the full model.

5.5.3. Tobit vs OLS

The preceding discussion emphasizes the estimation technique to deal with the presence of time-invariant explanatory variables on the right-hand side of the panel data model. The discussion disregards the DEA efficiency score as a dependent variable.

The characteristics of the DEA efficiency score as a dependent variable attract a deal of attention in the second stage DEA literature. The feature of the DEA efficiency score limited to the interval from 0 to 1 has been considered as a form of censored data. Accordingly, the Tobit model is selected. Nevertheless, OLS regression is also found in the second stage DEA efficiency analysis. There are at least four different estimation techniques for the second stage DEA estimate that are seen in the literature. First, the Tobit regression with or without Simar and Wilson (2007) bootstrap correction method. Second, conventional OLS regression advocated by Banker and Natarajan (2008) and McDonald (2009). Third, the Quasi Maximum Likelihood Estimator (QMLE) using the Papke and Wooldridge (1996) approach, and fourth, the unit-inflated beta model. Hoff (2007) provides a comparison between these approaches for the second stage DEA estimate. He concludes that Tobit and OLS estimator are sufficient in many cases, whilst the QMLE approach and the unit-inflated beta model show less reliability.

5.5.3.1. Second Stage DEA Efficiency with Tobit

The Tobit regression is found in many efficiency studies. The DEA efficiency scores which are limited to an interval of 0 to 1 are considered as a kind of censored data. However, as it is argued by Simar and Wilson (2007, 2008) a conventional Tobit procedure in the two stage DEA efficiency estimate encounters several problems. Such problems emerge as a consequence of an unclear data-generating process (DGP) where a DEA is applied to estimate an unobserved true frontier, conditional on observed discretionary input variables. Furthermore, they argue that DEA efficiency estimates are serially correlated, bringing a consequence that the standard approaches to inference are invalid. For that reason, they propose a single and double bootstrap method to correct estimation bias and to improve statistical inference at the same time. The following argument is adapted from Simar and Wilson (2008).

The underlying idea to employ the two stage method is the fact that there are two types of inputs: discretionary under control inputs, X ; and non-discretionary beyond control inputs, Z , which may be continuous or discrete. With a production set Ψ which is unknown, both inputs influence output Y . A sample $S_n = \{(x_i, y_i, z_i)\}_{i=1}^n$ which assumed is to be independent and identically distributed (*i.i.d*) is observed with probability density function $f(x, y, z)$. Therefore, $\Psi = \{(x, y, z) \in \mathcal{R}_+^{N+M+R}\}$, where $x \in \mathcal{R}_+^N$ is the discretionary inputs vector, $z \in \mathcal{R}_+^R$ is the non-discretionary inputs vector, and $y \in \mathcal{R}_+^M$ is the output vector.

In the first stage, within an unknown production set Ψ , only discretionary inputs x_i are taken to measure efficiency. The input requirement set is defined for all $y \in \mathcal{R}_+^M$ by

$$X(y) = \{x \in \mathcal{R}_+^N | (x, y) \in \Psi\}. \quad (5.19)$$

The efficiency boundary $\partial X(y)$ is defined for a given $y \in \mathcal{R}_+^M$ by

$$\partial X(y) = \{x | x \in X(y), \rho x \notin X(y), 0 < \rho < 1\} \quad (5.20)$$

The efficiency for a given point (x, y) is given by

$$\begin{aligned}\rho(x, y) &= \inf \{\rho \mid \rho x \in X(y)\} \\ &= \inf \{\rho \mid \rho(x, y) \in \Psi\}.\end{aligned}\tag{5.21}$$

Given an output level y and an input mix (a direction) given by a vector x , the efficient level of input is determined by

$$X^\partial(y) = \rho(x, y)x,\tag{5.22}$$

which is the projection of (x, y) onto the efficient boundary $\partial\Psi$ along the ray x and orthogonal to vector y . Hence $\rho(x, y)$ is the proportionate reduction of inputs a unit located at (x, y) could undertake to become technically efficient by construction, for all $(x, y) \in \Psi$, $\rho(x, y) \leq 1$, and (x, y) is efficient if and only if $\rho(x, y) = 1$.

In the second stage, the input oriented efficiency $\rho(x, y)$ is explained by a vector of non-discretionary inputs $z \in \mathcal{R}_+^R$. Hence the condition on $f(\rho_i | z_i)$ is defined through the following mechanism:

$$\rho_i = \rho(x_i, y_i) = \beta z_i + \varepsilon_i \leq 1\tag{5.23}$$

where β is a vector of parameters, and ε_i is a continuous *i.i.d.* random variable independent of z_i .

5.5.3.2. Second Stage DEA Efficiency with OLS

In contrast to the Tobit adoption, McDonald (2009) advocates the use of OLS for the second stage DEA. The reason is that the DEA efficiency score is a kind of fractional data or a percentage data if it is multiplied by 100. DEA efficiency score is not generated by a censoring process. Therefore a suitable data generating process (DGP) for the efficiency score would be the linear unit interval,

$$\rho_i = \beta Z_i + \varepsilon_i\tag{5.24}$$

where ε_i and Z_i are *i.i.d.* with zero means, and $0 \leq \rho_i \leq 1$, with the limit point $\rho_i = 1$ possessing positive probability. Equation 5.24 implies that when $\varepsilon_i = 1$, $\varepsilon_i = 1 - \beta z_i$ with probability $= 1 - \text{probability that } \rho_i < 1$

OLS is a consistent estimate for Equation (5.24). Statistical inference is also valid under heteroskedasticity conditions. Accordingly, the white heteroskedasticity method can be carried out to yield consistent standard errors and covariance. The problem using OLS to estimate Equation (5.24) is the possibility that βz_i lies outside the unit interval. Therefore, the marginal effect for a single explanatory variable is bounded in a unit interval of the dependent variable. McDonald (2009) proposes alternative solutions dealing with this problems. However, it is still unclear whether the solution would be advantageous (See McDonald 2009).

5.6. Conclusion

The discussion in this Chapter has explained the process for estimating the PSE score for each local jurisdiction in Indonesia, and then developed an empirical panel model with the PSE scores as the dependent variable. The Chapter also explained how the independent variables have been constructed, discusses data sources and raised a number of econometric issues that needed to be resolved. The discussion has formed the basis for the results, to be presented and discussed in the next Chapter.

Chapter 6

Results

6.1. Introduction

This chapter discusses the estimation results from the two-stage method described in the preceding chapter. In the first stage, a public sector efficiency (PSE) indicator for local jurisdictions is constructed using Data Envelopment Analysis (DEA). Subsequently, the efficiency score is regressed against selected political and institutional variables using the Fixed Effect Vector Decomposition (FEVD) technique.

The efficiency estimate obtained through DEA generally shows an efficiency variation across local jurisdictions. It shows a substantial gap in the public sector efficiency that corresponds to the general pattern of the regional disparity in Indonesia's economic development. The results from the second stage reveal how political and institutional variables as well the degree of fiscal decentralization impact on the PSE.

6.2. Public Sector Efficiency Score

As previously argued, outcome indicators of education, health, infrastructure and poverty mitigation as well as macroeconomic performance determine the overall public sector performance (PSP) in each local jurisdiction. The PSP index was calculated using a formula defined in Equation (5.1). Public sector efficiency (PSE) was then calculated using an input oriented DEA as defined in Equation (5.6). The score implies that inefficiency in the public sector is due to the failure of each local jurisdiction relative to others to optimally internalize the benefit from spending and taxing delegation to maximize their outcome.

The PSP index and PSE score are presented in Table 6.1 and 6.2 respectively. A PSE score of 100 indicates the local jurisdictions under observation are located on the frontier with maximum feasible efficiency. These jurisdictions provide a benchmark for other local jurisdictions. On the other hand

a score below 100 indicates that the local jurisdictions under observation are inefficient relative to the frontier. The smaller the score the higher is the inefficiency.

In general, local jurisdictions that consistently locate on the frontier are local jurisdictions on the Java Island. Yogyakarta which is not at the frontier in 2005 increased its efficiency in 2006, 2007 and 2008. Local jurisdictions out of Java that show a high PSE score are Sumatera Utara and Bali. Even Sumatera Utara achieves the maximum efficiency score in 2005 and 2006 and Bali achieves the maximum efficiency score in 2005 and 2007. On the contrary, local jurisdictions in Papua and Papua Barat remain in the lowest position over the observation period with a large distance from the frontier. The average score of Papua's efficiency is only 9.42.

The median efficiency score is only 55.89. It indicates a large gap in the public sector efficiency across local jurisdictions in Indonesia. The efficiency gap seems to be larger over the observation period as the median and the average efficiency score decrease. Several local jurisdictions even show consistent efficiency deterioration as in Nanggroe Aceh, Sulawesi Tenggara, Maluku, and Maluku Utara.

Table 6.1: Public sector performance (PSP) index

No.	Province	Education				Health				Infrastructure				Poverty				Macroeconomy			
		2005	2006	2007	2008	2005	2006	2007	2008	2005	2006	2007	2008	2005	2006	2007	2008	2005	2006	2007	2008
1	Nanggroe Aceh Darussalam	2.34	2.23	2.23	2.23	1.70	1.77	1.87	1.74	0.58	0.54	0.69	0.69	0.47	0.52	0.51	0.53	0.06	1.07	0.34	0.13
2	Sumatera Utara	2.18	2.14	2.16	2.16	1.82	1.70	1.67	1.61	1.19	1.28	1.21	1.21	0.92	0.98	0.98	0.99	1.89	1.84	1.94	1.89
3	Sumatera Barat	2.10	2.06	2.07	2.06	1.90	1.95	1.76	1.72	1.07	1.14	1.28	1.28	1.24	1.17	1.14	1.17	1.88	1.87	1.82	1.92
4	R i a u	2.20	2.14	2.12	2.11	2.41	2.54	2.52	2.69	0.19	0.13	0.15	0.15	1.08	1.24	1.21	1.17	1.78	1.78	1.35	1.80
5	Jambi	2.05	2.02	2.04	2.03	1.91	1.75	1.83	1.68	0.83	0.83	0.94	0.94	1.13	1.29	1.32	1.34	2.05	2.33	2.36	2.52
6	Sumatera Selatan	2.00	2.05	2.02	2.01	2.02	2.02	1.90	1.82	0.87	0.94	1.01	1.01	0.64	0.70	0.71	0.70	1.81	1.80	1.79	1.74
7	Bengkulu	1.99	2.04	2.09	2.08	1.72	1.84	1.64	1.69	0.72	0.64	0.63	0.63	0.61	0.64	0.61	0.60	2.36	2.47	2.60	2.42
8	Lampung	2.04	2.04	2.08	2.08	2.38	2.29	2.02	1.98	0.29	0.24	0.23	0.23	0.63	0.64	0.61	0.59	1.97	1.87	2.00	1.96
9	Kep Bangka Belitung	1.99	1.84	1.80	1.79	2.14	2.01	1.82	1.65	0.19	0.20	0.12	0.12	1.38	1.34	1.43	1.45	1.86	1.92	1.89	1.95
10	Kepulauan Riau	2.03	2.12	2.12	2.14	2.92	1.46	2.39	2.74	1.99	1.87	1.44	1.44	1.23	1.20	1.32	1.36	2.20	2.05	2.08	2.03
11	DKI Jakarta	2.21	2.08	2.12	2.12	2.53	3.08	3.51	3.50	2.37	1.96	1.93	1.93	3.73	3.20	2.95	2.91	1.80	1.81	1.72	1.70
12	Jawa Barat	1.94	1.97	2.06	2.06	1.81	1.95	1.80	1.75	0.65	0.63	0.64	0.64	1.03	1.01	1.00	0.96	1.72	1.75	1.69	1.61
13	Jawa Tengah	2.12	2.05	2.10	2.10	2.58	2.69	2.46	2.50	0.75	0.83	0.83	0.83	0.66	0.66	0.67	0.65	2.07	2.09	1.94	1.93
14	Dista Yogyakarta	2.37	2.13	2.17	2.17	3.55	4.33	4.77	4.69	0.45	0.70	0.58	0.58	0.71	0.76	0.72	0.68	2.36	2.08	2.00	2.10
15	Jawa Timur	2.09	2.10	2.10	2.09	2.17	2.30	2.04	2.02	0.85	0.88	0.92	0.92	0.67	0.69	0.68	0.67	2.24	2.19	2.13	2.14
16	Banten	1.99	2.04	1.92	1.91	1.91	1.72	1.57	1.57	0.70	0.64	0.52	0.52	1.52	1.50	1.50	1.53	1.77	1.56	1.53	1.52
17	B a l i	2.14	2.08	2.06	2.06	3.14	3.43	3.59	3.42	2.03	1.89	1.97	1.97	2.00	2.07	2.05	2.02	3.02	2.53	2.78	2.80
18	Nusa Tenggara Barat	2.07	2.09	2.12	2.11	1.32	1.50	1.53	1.46	0.74	0.82	0.83	0.83	0.52	0.54	0.54	0.52	1.27	1.50	1.94	1.67
19	Nusa Tenggara Timur	1.61	1.71	1.76	1.76	2.00	1.78	1.68	1.73	0.99	1.00	0.80	0.80	0.48	0.50	0.49	0.49	2.43	2.97	2.87	2.69
20	Kalimantan Barat	1.83	1.95	1.86	1.86	1.76	1.58	1.57	1.60	0.45	0.46	0.42	0.42	0.94	0.96	1.05	1.13	2.01	2.11	2.17	2.12
21	Kalimantan Tengah	2.12	2.07	1.97	1.96	2.23	1.98	2.23	2.24	0.89	0.84	0.89	0.89	1.25	1.33	1.45	1.43	3.01	2.58	2.56	2.56
22	Kalimantan Selatan	1.94	1.96	1.94	1.94	1.53	1.48	1.41	1.40	1.70	1.71	1.99	1.99	1.86	1.76	1.94	1.92	2.34	1.93	2.07	2.17
23	Kalimantan Timur	2.10	1.98	2.12	2.11	2.41	2.44	2.27	2.23	2.18	2.38	2.69	2.69	1.27	1.28	1.23	1.31	1.52	1.22	0.94	1.48
24	Sulawesi Utara	2.01	1.99	2.01	2.01	1.97	2.24	2.31	2.32	1.19	1.42	1.11	1.11	1.44	1.27	1.19	1.23	1.62	1.70	1.73	1.96
25	Sulawesi Tengah	1.94	1.97	1.92	1.92	1.48	1.50	1.51	1.43	1.13	0.89	0.84	0.84	0.62	0.62	0.61	0.60	2.69	2.40	2.38	2.47
26	Sulawesi Selatan	1.89	1.91	1.94	1.93	1.43	1.60	1.67	1.67	1.22	1.26	1.31	1.31	0.90	1.00	0.96	0.93	1.83	1.97	1.76	2.11
27	Sulawesi Tenggara	2.02	2.11	2.04	2.04	1.41	1.42	1.41	1.38	1.40	1.38	1.15	1.15	0.63	0.63	0.64	0.64	2.38	2.48	2.53	2.47
28	Gorontalo	1.65	1.78	1.79	1.79	1.10	1.37	1.31	1.29	0.80	0.79	1.01	1.01	0.46	0.50	0.50	0.50	2.20	2.39	2.37	2.47
29	Sulawesi Barat	1.89	1.84	1.81	1.80	1.51	1.57	1.69	1.47	0.65	0.63	0.58	0.58	0.90	0.71	0.71	0.75	3.09	2.79	2.89	2.87
30	Maluku	2.10	2.17	2.10	2.10	1.72	1.44	1.54	1.67	1.30	1.17	1.00	1.00	0.42	0.44	0.44	0.42	1.68	1.65	1.56	1.39
31	Maluku Utara	2.00	2.01	2.00	2.00	1.89	2.10	1.76	2.14	1.11	1.11	0.95	0.95	1.02	1.15	1.14	1.11	1.84	2.17	2.10	2.09
32	Papua Barat	1.53	1.78	1.74	1.83	1.89	1.65	1.46	1.79	0.85	1.14	1.53	1.53	0.33	0.35	0.35	0.35	2.25	1.68	1.99	2.13
33	Papua	1.53	1.57	1.63	1.65	1.73	1.51	1.50	1.41	0.70	0.68	0.81	0.81	0.33	0.35	0.33	0.34	1.01	1.46	2.20	1.19

Source: Author's calculation based on Equation5.1

Table 6.2: DEA estimate for public sector efficiency (PSE)

No.	Province	PSE Score				Average
		2005	2006	2007	2008	
1	Nanggroe Aceh Darussalam	33.59	31.26	28.30	22.16	28.83
2	Sumatera Utara	100.00	100.00	90.42	93.75	96.04
3	Sumatera Barat	61.54	63.69	65.43	59.50	62.54
4	R i a u	28.25	30.77	26.28	32.61	29.48
5	Jambi	43.63	47.47	49.23	48.71	47.26
6	Sumatera Selatan	53.61	55.44	54.88	58.24	55.54
7	Bengkulu	51.23	54.94	43.49	37.67	46.83
8	Lampung	72.78	71.50	74.48	84.13	75.72
9	Kep Bangka Belitung	38.66	39.42	34.61	30.87	35.89
10	Kepulauan Riau	55.73	50.70	34.02	41.02	45.37
11	DKI Jakarta	100.00	100.00	100.00	100.00	100.00
12	Jawa Barat	100.00	100.00	100.00	100.00	100.00
13	Jawa Tengah	100.00	100.00	100.00	100.00	100.00
14	Dista Yogyakarta	87.51	100.00	100.00	100.00	96.88
15	Jawa Timur	100.00	100.00	100.00	100.00	100.00
16	Banten	100.00	100.00	100.00	100.00	100.00
17	B a l i	100.00	97.76	100.00	99.58	99.34
18	Nusa Tenggara Barat	67.83	70.42	68.41	70.03	69.17
19	Nusa Tenggara Timur	62.55	75.54	73.34	67.39	69.71
20	Kalimantan Barat	46.46	48.62	52.68	49.63	49.35
21	Kalimantan Tengah	35.22	31.22	33.33	29.96	32.43
22	Kalimantan Selatan	84.51	86.97	91.83	80.53	85.96
23	Kalimantan Timur	29.63	31.45	36.68	34.18	32.99
24	Sulawesi Utara	59.48	67.43	50.03	46.62	55.89
25	Sulawesi Tengah	53.03	45.10	43.87	47.30	47.33
26	Sulawesi Selatan	75.38	74.34	78.26	73.18	75.29
27	Sulawesi Tenggara	70.90	67.72	45.68	45.53	57.46
28	Gorontalo	39.63	44.18	41.93	42.60	42.09
29	Sulawesi Barat	65.30	60.38	48.58	55.57	57.46
30	Maluku	44.13	38.24	36.73	29.97	37.27
31	Maluku Utara	30.11	31.53	27.32	24.90	28.47
32	Papua Barat	11.90	14.28	18.42	14.35	14.74
33	Papua	9.18	9.04	10.33	9.14	9.42
	Minimum	9.18	9.04	10.33	9.14	9.42
	Average	60.96	61.80	59.35	58.46	60.14
	Median	59.48	60.38	50.03	49.63	55.89

Source: Author's calculation based on Equation5.6

6.3. FEVD Estimate and Interpretation

The estimation starts with the choice between Fixed Effect (FE) and Random Effect (RE) to estimate Equation (5.8) specified in Chapter 5. Since the equation involves time-invariant variables, FE is unable to estimate the equation. Therefore RE is chosen. Nevertheless the Hausman test indicates that the unobserved individual effect is correlated with explanatory variables. The test rejects the null hypothesis that the difference between FE and RE estimates is equal to zero (See appendix 1). In this case RE generates biased estimates. On the other hand Hausman-Taylor estimator (HTE) as a popular method to handle time-invariant variables in panel data fails to serve as an efficient technique as the model is under identified (see the discussion in Section 5.5.2.2). The empirical model specified in Equation (5.8) is now estimated using Fixed Effect Vector Decomposition (FEVD) described in Section 5.5.1.4. Table 6.3 shows the FEVD estimates.

Political variables are represented by democratic participation and political fragmentation. How both variables have impacts on public sector efficiency is discussed in Chapter 4 and 5. Greater democratic participation is generally associated with better economic development. Higher political fragmentation as a consequence of the multiparty systems may improve public sector efficiency as it offers alternatives for citizens to select political agents to best represent their interests. However if the size-fragmentation measures the degree of dispersed political power in the parliament, higher political fragmentation may have a negative impact on public sector efficiency. In a young democracy with low accountability and low political credibility like Indonesia, higher political fragmentation in parliament implies a higher political cost in achieving policy decisions.

The formation of new government variables are represented by the ratio of seats held by the Golkar party to the total seats in the local parliament (GOL), and the ratio of seats held by Islamic-based political parties to the total seats in the local parliament (ISL). ISL1 stands for political parties that formally set Islam as their political platform. ISL2 stands for ISL1 plus *Partai Kebangkitan Bangsa*/Nation Awakening Party (PKB) and *Partai Amanat Nasional*/National

Mandate Party (PAN). Both PKB and PAN do not formally put Islam as their political platform, but they affiliate to the largest of Indonesian socio-religious organizations, *Nahdlatul Ulama* (NU) and *Muhammadiyah*. Both ISL1 and ISL2 can either represent a feature of *politik aliran* (ideological-stream politics) or patron-client political relationship. Chapter 5 discusses the features of Indonesia's political realm along with decentralization characterised by an increase in political fragmentation, the support for Golkar, and the rebirth of *politik aliran*. Institutional determinants are represented by a corruption perception index and an infrastructure perception index. Both variables are selected to stand for the quality of institutional governance. This chapter concludes with a discussion of empirical results and related issues.

Table 6.3: FEVD Estimate

	FEVD Estimate					
	1	2	3	4	5	6
Constanta	34.11267 (2.046359)**	-6.473562 (-0.524245)	43.45882 (2.764138)***	15.15374 (1.214059)	34.74179 (2.274926)**	3.305541 (0.287956)
FD	171.3652 (8.293855)***	118.3427 (5.191627)***	185.0505 (10.94341)***	123.4224 (6.246647)***	176.2699 (10.55043)***	112.8623 (5.664893)***
TFP	5.627627 (3.186933)***	6.266941 (3.796844)***	6.367114 (3.656652)***	7.176588 (4.508053)***	5.696007 (3.288582)***	6.400399 (4.030145)***
Political Variables						
DP	-16.49258 (-1.378219)	-13.51304 (-1.211652)	-22.62812 (-1.932689)*	-20.95819 (-1.965224)*	-21.40300 (-1.810060)*	-18.83072 (1.738644)*
PF	0.953061 (2.107779)**	0.130402 (0.295578)	0.446544 (1.149946)	-0.327066 (-0.868281)	0.698480 (1.940623)*	-0.003583 (-0.010256)
Formation of New Government						
GOL	-19.36998 (-0.607880)	4.031531 (0.137147)				
ISL1			-30.47223 (-1.717149)*	-44.43429 (-2.827180)***		
ISL2					-7.741309 (-1.985690)**	-10.11481 (-2.896761)***
Institutional variables						
COR	-2.037593 (-0.954553)		-1.406259 (-0.666310)		-0.967887 (-0.457324)	
INF		6.266941 (5.053312)***		0.938128 (5.406254)***		0.967448 (5.512156)***
Unexplained part of individual effect	1.83E+09 (2.614985)**	1.35E+09 (2.054273)**	2.36E+09 (3.330631)***	1.99E+09 (3.057926)***	1.95E+09 (2.827961)***	1.50E+09 (2.363473)***
R²	0.575573	0.631270	0.598023	0.665322	0.591369	0.658455
R² Adjusted	0.551614	0.610455	0.575331	0.646429	0.568301	0.639175

Number in parenthesis indicates t statistics. ***, ** and * indicate 99%, 95% and 90% level of confidence respectively.

Estimate 1 and 2 stand for the PSE in the setting of new government formation characterised by the lost grip of Golkar domination. Estimate 3, 4, 5, & 6 stand for the PSE in the setting of new government formation characterised by the rebirth of politik aliran. In the model 5 & 6, the variable ISL2 includes seats held by PKB and PAN in the calculation.

The FEVD estimate is basically a fixed effect that assumes individual effects and explanatory variables are correlated. The model then decomposes the individual effect into explained and unexplained parts and takes the unexplained part as an explanatory variable together with time-variant and time-invariant variables. Finally, pooled OLS is performed as an estimation technique to the full FEVD model. The key feature of the FEVD estimate is the unexplained part of the individual effect. The estimation of the model shows that the coefficient estimate of all the unexplained part is significant. The estimate also shows a relatively high degree of the coefficient of determination ranging from 0.575 to 0.658. It indicates that the FEVD model selected as a procedure for empirical investigation is robust.

The estimate shows that public sector efficiency of decentralized local governments in Indonesia is significantly influenced by the degree of decentralization (FD) and the growth of total factor productivity (TFP). All models estimate a positive impact for both determinants of public sector efficiency with a high level of confidence. This shows that the higher the degree of decentralization, the higher is efficiency in the public sector. The estimate confirms the theoretical claims in which the ability of local jurisdictions to generate local own revenue is crucial for improved efficiency.

The growth rate of total factor productivity shows significant and positive impact on the public sector efficiency. As a control variable, this may be an indication that the efficiency variation in the public sector is due to the variation in the total factor productivity growth. Local jurisdictions that present high productivity have high productivity in the public sector as well.

The discussion dealing with political variables begins with the formation of new government that is represented by the changing composition in the local parliament. The first variable investigated is the ratio of seats held by Golkar to the total seats in the local parliament. Golkar as a political vehicle for the previous autarchy regime is assumed to represent the status quo in the democratized Indonesia. Therefore, the higher the ratio of seats held by Golkar that oppose

other parties representing reforms is expected to have a negative impact on public sector efficiency. On the contrary Golkar might represent strong and well experienced legislatures compared to other relatively new legislatures. Hence the higher the ratio of seats held by Golkar can also have a positive impact on public sector efficiency.

The estimate fails to provide evidence for either hypothesis. The coefficient estimates are not significant and have ambiguous sign. This implies that the new government formation with Golkar in the assembly has no significant impact on public sector efficiency. This empirical evidence supports political studies in the democratized Indonesia. The new government may not represent a real new structure of government but a continuation of old structures with new rules within the limits of democratization and decentralization. In this circumstance changing the composition of parliament as a consequence of a multiparty system does not really differentiate political parties when the political structure is likely to be captured by elites unaccountable to citizens. Golkar along the Suharto regime profited as a vehicle for business interests to set up mutually advantageous relations with oligarchic power. Thus the lost grip of Golkar domination in the parliament does not automatically imply that this integral relationship is eased as business interests and elites have successfully adapted to the new political environment without changing their predatory mentality (See Robinson and Hadiz 2004; Chua 2009; Tomsa 2008; Malley 2003).

Another feature of new government in Indonesia is political Islam measured as the ratio of seats held by political Islam to total seats in the local parliament. Islam-based political parties remark the rebirth of *politik aliran* in Indonesia. Interestingly, the empirical results show evidence that the ratio of seats held by Islamic parties to the total seats in the local parliament (ISL1) is statistically significant with a negative impact on public sector efficiency even when seats held by PKB and PAN are included (ISL2). Again this result supports the view that there is no real new government in the decentralized and democratized Indonesia.

As previously described, the feature of political Islam may also represent a patron-client political relationship. In young democratic countries such as Indonesia, patron-client politics is prevalent. Democratization cannot eliminate patron-client politics as it is considered as rational for redistributive coalitions and effective as a strategy to achieve the goal of powerful constituencies within these coalitions. However patron-client politics undermines accountability (Khan 2005). On the other hand patron-client politics may also help improve accountability in the short run. In the absence of credibility, politicians' reliance on patrons may improve outcomes in the short run relative to the situation where politicians can do nothing to make them credible. Patron can function as an intermediary between citizens and parties/politicians to improve accountability when populations are polarized around non-service issue such as religion, ethnic, caste or tribal background (Keefer and Vlaicu Keefer 2005). The estimation results show that ISL2 is statistically significant with negative impact on public sector efficiency. This indicates that patron-client politics fail to function as intermediaries between parties/politicians and their constituents.

Subsequent political variables to be empirically examined are democratic participation (DP) and political fragmentation (PF). Democratic participation and its effect on economic performance has been an interest among scholars in politics as well as economics. Higher democratic participation is generally associated with better economic performance though there is no robust explanation on how democratic participation affects economic performance (Rodrik 2000). Therefore, the effect of democratic participation on economic performance is usually left for an empirical investigation (See Blair 2000; Borge 2008).

High democratic participation in the decentralized system indicates high legitimacy and accountability in the provision of public services resulting in increased public sector efficiency. However the results show an inverse association between democratic participation and public sector efficiency that contradicts the traditional claim. In the context of electoral democracy in Indonesia this result may not be surprising because of money politics and a class

bias politic. Electoral contests in almost all levels of government are characterised by money politics where voters do not vote on the basis of accountability considerations but pragmatically as an exchange for money (See Ufen 2006). Therefore money politics distort the significance of electoral participation.

A class bias politic as acknowledged by Lijphart (1997) may also cause democratic participation to have nothing to do with better public service performance. In a young democracy such as Indonesia large participation of less educated and poor people can worsen the quality of the inputs into the political process and policies coming out of it (See Mueller 2003). Concurrently, elites are able to capture government and bend policies to advance their interests at the expense of larger uneducated poor voters.

Patron-client politics also appears as a problem concurrent with money politics and a class bias politic that diminishes the significance of democratic participation. In the setting of a new government characterised by political Islam, the model produces a negative sign for the effect of democratic participation on public sector efficiency. This indicates that while *politik aliran* may have increased political participation, especially in relation with Islam as the major religion in Indonesia (Mujani 2003), it is evident that the participation has nothing to do with better public sector efficiency and even diminishes public sector efficiency.

Dealing with political fragmentation (PF) the model shows inconsistent results with ambiguous signs. It fails to provide strong evidence of the impact of political fragmentation on public sector efficiency. However a significant impact of political fragmentation on public sector efficiency is shown in the model 1 and 5 with a positive sign. As a higher index (measured using Herfindahl-Hirschman) denotes lower fragmentation hence a higher political fragmentation is associated with lower efficiency. This is parallel with the result found in Borge, Falch and Tovmo (2008) claiming that in the absence of accountability and political credibility, the more size-fragmented the government, the lower is the public sector efficiency.

The coefficient estimate of the corruption perception index and infrastructure perception index is expected to suggest how the quality of governance affects public sector efficiency. The results show that public sector efficiency is not associated with the corruption perception index. In the early decentralized Indonesia corruption is widespread along with fiscal and power delegation to local governments. Thus improved efficiency might not correlate with the perception about corruption as corruption occurs in almost all levels of government and institutions. Unlike the corruption perception index, the infrastructure perception index shows a significant and positive impact on public sector efficiency. This appears to agree with Fisman and Gatti (2000) claiming that if decentralization shows a gain in efficiency this is not due to an improved quality of governance but rather other factors such as a variation in initial infrastructure levels across jurisdictions.

6.4. Discussion

This chapter has illustrated the use of data envelopment analysis (DEA) to construct a descriptive measure of the efficiency score in the public sector. It has been previously mentioned that non parametric-DEA is employed in respect to a situation where price data is not relevant or even unavailable as in the case of the public sector. DEA is also suitable where inputs and outputs are in the form of indicator measures.

As is the nature of a non-parametric analysis there is no foundation for a formal statistical inference to the DEA efficiency score. With no statistical inference, the consistency of DEA for the efficiency estimate is critical. In regard to this matter, Banker (1993) provides a formal statistical foundation for DEA by identifying conditions under which DEA estimators are statistically consistent and maximize likelihood. In addition, whether statistical inference is critical in the DEA analysis also depends on the intention and the condition of which the efficiency scores are generated. This study employs DEA to generate descriptive measures of the efficiency of local jurisdictions in the first stage. Subsequently, the efficiency scores are taken into the second stage to be regressed against

institutional and political variables as well as other control variables. Therefore, as a descriptive measure, the DEA efficiency score can be treated in the same way as other variables and when the econometric properties apply in the second stage the efficiency score will be taken into account (See McDonald 2009).

This chapter has also discussed the estimation of the empirical model using fixed effect vector decomposition (FEVD). Unlike most studies that use Tobit to serve as the regression analysis in the second stage, this study uses ordinary least square (OLS). The estimation technique of the FEVD is basically a fixed effect that decomposes the individual effect into explained and unexplained parts. The model then regresses public sector efficiency against the unexplained part together with time variant and time-invariant variables using pooled OLS. The adoption of FEVD is vital to deal with the time-invariant explanatory variables with correlation between individual effect and explanatory variables. In this case a standard FE is impotent.

The underlying data generating process of the DEA efficiency score can be best described as a particular kind of fractional or proportional data. Though the efficiency score is limited between 0 and 1 there is no censoring process. Thus, the adoption of Tobit for the second stage is questionable. On the contrary, OLS results in a consistent estimator (See McDonald 2009). Banker and Natarajan (2008) provide statistical foundations for the analysis of the impact of environmental variables on efficiency. They prove that standard DEA in the first stage followed by OLS or MLE in the second stage yields consistent estimators.

Given that input and output indicators in the DEA calculation are observed variables the DEA efficiency scores can also be interpreted as an “observed” value of efficiency relative to an “observed” frontier regardless of how sophisticated the mathematical technique used in the calculation. Thus the DEA efficiency score can be interpreted as a descriptive measure of relative efficiency for production units in the sample, which can be treated in the same way as other variables in the regression analysis. As an “observed” measure of efficiency, when properties in the regression analysis are evaluated, the scores should also be taken

into account. For those reasons, this study did not perform a complex bootstrap method proposed by Simar and Wilson (2007, 2008).

Chapter 7

Concluding Remarks and Policy Implications

7.1. Introduction

Decentralization policy in Indonesia delegates power to local jurisdictions mainly in relation to expenditure. The delegation of expenditure power gives local jurisdictions the ability to achieve the maximum flow of services from local spending. Improved public service provision is expected to occur as a result of a process where public goods and services are provided by empowered local jurisdictions with more compact political processes. Decentralization may also promote competition among jurisdictions to provide combinations of taxation, expenditures, public service provision and regulatory policies that better match local preferences. Concurrently, political decentralization along with fiscal decentralization may promote political legitimacy and accountability for public service provision.

A public sector efficiency (PSE) score is constructed in a comprehensive way using several indicators in education, health, poverty mitigation, infrastructure, as well as macroeconomic performance as outcome indicators. Local expenditure per capita is taken as an input indicator. Then an input oriented DEA is employed to assess the efficiency score from 2005 to 2008. Changes in the political structure as a result of the 2004 electoral contest are taken as environmental variables explaining the PSE of decentralized local governments.

A regression analysis is employed where PSE is explained against a fiscal decentralization measure, political and institutional variables, as well as total factor productivity growth. The data generating process (DGP) for the DEA efficiency score which is limited to the interval from 0 to 100 is considered as a particular kind of fractional or proportional data. Fixed effect vector

decomposition (FEVD) is selected as a panel model to deal with time-invariant explanatory variables.

7.2. Major findings

Stage one of the method measures public sector efficiency using input oriented DEA with constant returns to scale assumption. Findings from the efficiency calculation are as follows: First the distribution of the efficiency score shows large variation across local jurisdictions. Second local jurisdictions on Java Island consistently achieve the maximum efficiency score over the observation period. This implies that local jurisdictions on Java Island benchmark public sector efficiency in Indonesia. Third Papua and Papua Barat emerge with the lowest efficiency score over the observation period with a large divergence from the maximum score. Fourth the distance between the median efficiency score and the maximum score is large. This indicates a significant disparity across local jurisdictions in efficiency. In general the results correspond with the regional disparity pattern in Indonesia's economic development. That is, poorly developed regions have relatively inefficient local governments.

In the second stage, the estimation of all models shows a consistent result in which decentralization correlates positively with PSE. It suggests that the higher the degree of decentralization the more efficient is public service provision by local jurisdictions. It implies that the greater the ability of a local jurisdiction to finance its expenditure with local own revenue the greater is the efficiency.

However evidence that decentralization has a positive impact on efficiency should be interpreted with caution because the growth rate of total factor productivity as a control variable has a significant and positive impact on the PSE. The growth rate of total factor productivity is measured using a Solow residual which is generally interpreted as the entire productivity growth of total resources in a particular economy (Barro 2004). Accordingly, the positive impact of the degree of decentralization on the PSE may due to the existing total productivity performance. A local jurisdiction with higher productivity is more able to generate

local own revenue and hence have higher efficiency in the public sector as well. Therefore, it is not surprising if local jurisdictions on Java Island generally achieve higher efficiency score compared to the jurisdictions in the outer Java.

A new government in the democratized and decentralized Indonesia is represented by two major political structures: First Golkar does not hold a dominant majority in the parliament though its power is still significant. Second many political parties rooted in a particular socio-religious group flourish in the Indonesian democracy, known as *politik aliran*. Interestingly, the estimation of the empirical model finds evidence that the new government structure has had nothing to do with the improved public sector efficiency. While Golkar fails to be attributed to the improved efficiency, *politik aliran* emerges with an adverse impact on efficiency. The adverse relationship between *politik aliran* and efficiency outcome also indicates that patron-client politic undermines the outcome of decentralization and democratization.

Another interesting finding from this study is an adverse impact of democratic participation on public sector efficiency. This contradicts the general claim that associates democratic participation with better economic performance. However, in the case of Indonesia this finding is not surprising as electoral democracy is characterised by endemic money politics, a class bias politic and a patron-client politic. These political features distort the significance of democratic participation, reduce accountability, and subsequently undermine public sector efficiency.

Dealing with political fragmentation, the estimation of all models finds inconsistent results. This indicates that a higher political fragmentation as a consequence of a multi-party system does not have a consistent effect on efficiency. However, the estimation shows that model 1 and 5 produce a significant estimate with a positive sign. This implies that the more dispersed political parties in the parliament the lower is the efficiency.⁴⁹ The more dispersed

⁴⁹ Political fragmentation is measured using Herfindahl-Hirschman index. The lower the index the higher is the fragmentation.

political power is generally associated with higher cost in achieving policy decisions.

The political liberalization in the decentralized democratized Indonesia has increased the number of political parties to participate in the election, shaping the structure of government with highly dispersed political power both in the executive and legislature. The highly dispersed political power to some extent should have been constructive for the development of a system of checks and balances. Therefore it should have helped improve political accountability. However, the structure of government with highly dispersed political power as the result of the 2004 and 2009 elections in Indonesia exhibits sophisticated political patterns across local jurisdictions. The coalition patterns tend to be pragmatic, dealing with local leader election and therefore are highly diverse across local jurisdictions. Even at the national level, there is no clear division between coalition and opposition. In this situation the system of checks and balances as an important mechanism in the democracy does not work well. Therefore improved accountability within highly dispersed political power is uncertain. Thus the high political fragmentation in the decentralized Indonesia is indistinct in respect to improved efficiency in the public sector and even tends to reduce the efficiency.

A corruption perception index and an infrastructure perception index are taken as a general representation of the quality of institutional governance. The estimate shows that public sector efficiency is positively associated with the infrastructure perception index, but fails to find evidence of an effect for the corruption perception index. This indicates that the outcome of the decentralization is not contingent with the perception about corruption which is prevalent in the decentralized Indonesia. Corruption occurs almost in all levels of government and institutions. Thus in the case of Indonesia, the outcome of decentralization is independent to the perception about corruption but dependent on the perception about the level of infrastructure. This finding may support conflicting conclusions about corruption and decentralization that hold in different settings (See Fisman and Gatti 2002, Fan, Lin and Treisman 2009).

In general, findings in this study have confirmed political studies in the post-Suharto Indonesia. Many political studies have portrayed post-Suharto Indonesia as a protracted phase of decentralization and democratization. There is no real new political structure as an outcome from the electoral democracy, but a continuation of the old structure with new rules in a limited democracy. A new political structure may exist as an outcome of the electoral democracy, but it has nothing to do with improved public sector efficiency. This shows that the local political dynamic has failed to deliver improved public sector efficiency in the decentralized Indonesia.

7.3. Policy Implications

Decentralization will be efficiency-enhancing if it leads to a condition where there is some sort of accountability for policy choices, expenditure decisions, and service delivery. Therefore, any strategies to improve public service efficiency should be targeted not only at fiscal and organizational capacity improvement, but also at the incentive and disincentives governing local government behaviour. The key institutional feature that needs to be addressed is a strengthening of participation at the local level to allow citizens to voice their preferences, effectively monitor and benchmark the performance of local governments and react appropriately to that performance. This will mean that politicians and local officials have an incentive to be responsive.

It has been shown that there is a large disparity in the public sector efficiency across local jurisdictions in Indonesia. The variation is associated with the variation in the degree of fiscal decentralization and total factor productivity growth. This implies that despite limited tax power delegation, the ability of local jurisdictions to generate local tax revenue is crucial for the improved efficiency. This result has to be seen as a motivation for local governments to enhance fiscal and organizational capacity in conjunction with economic productivity. The ability of local jurisdictions to generate their own revenue is crucial for the improved efficiency. This is because local jurisdictions that raise a substantial

portion of their own revenue tend to be more accountable to citizens, more efficiency enhancing, and to be less corrupt.

7.4. Limitations and Further Focus for Future Research

There are limitations that have to be taken as a consideration in interpreting the results and inferring the conclusions as well as policy implications. Future studies are expected to overcome these limitations.

The first limitation deals with gaps in the data used in assessing public sector efficiency in the first stage of the method. The outcome indicators are available at the level of provincial government that apply for all Kabupaten/Kota district governments in a province. The input data is available at the level of Kabupaten/Kota district government. Accordingly, the input data is aggregated up to the provincial level. Thus, the efficiency score obtained is supposed to be interpreted as an average efficiency score of local jurisdictions within the same province. The score varies across provincial governments. Future studies are expected to overcome this gap, so that public sector efficiency can be assessed at the level of Kabupaten/Kota district government.

Second the political variables are generated from the outcome of one election period. The 2004 political contest was the first election following the implementation of the decentralization. It was the first direct election in Indonesia where voters directly chose leaders at every level of governments. Thus the result can only be interpreted as a result of a single period of election cycle. When the data is available for the time period after the 2009 election, future studies are expected to expand the observation period that cover the outcome of the 2009 electoral contest. An investigation into the outcome of more than one election periods has advantages in that it will gain extensive information due to changes in political dynamic across election periods.

Third, the political agency relationship framework is taken from the perspective of the relationship between voters as principals and politicians as agents. Voters delegate their preferences to politicians through a ballot. Politicians

as agents play a policy formation game and set policies on behalf of citizens. The flow of the political agency relationship in relation to public service provision is complex in that it involves many agency relationships other than a voter-politician relationship. Politicians do not directly provide public services. They mandate policy to bureaucrats, and subsequently, bureaucrats organize frontline provider (doctors, nurses, teachers, etc.) to provide public services.

Any future studies are expected to be able to capture the complexity of the political agency relationships by taking into account other relevant variables. An example is political cohesion between the executive and the legislature. Political cohesion is generally taken as a political variable to capture the association between politicians in the parliament and executives. In political science, it is common to look at the strength of political association and its implication on various aspects. Stronger political cohesion may result in better public policy. In the context of local politics in Indonesia, the political affiliation from where the elected mayor comes can be taken as a proxy for political cohesion. The stronger the parliamentary back-up to the executives (proxied by the number of seats held by a party and its coalition that sponsor an elected mayor), the stronger is the political cohesion.

Future studies are also expected to measure the interaction effects of fiscal decentralization and the infrastructure index of public sector efficiency. The investigation is expected to help Indonesia's government to find a minimum target for the infrastructure index so that the country's efficiency in fiscal decentralization and resource allocation could be improved.

7.5. Contributions of the Study

Despite its limitation, this study makes major contributions from an empirical standpoint. First this is the first study in Indonesia that measures public sector efficiency in a comprehensive way, involving numerous indicators in Indonesia's most prominent public sector categories. The efficiency score obtained from the calculations is beneficial in benchmarking public sector performance across

decentralized local governments. Second whilst most of Indonesia's political studies claim a phase of protracted decentralization and democratization, it has been further revealed in this study that the protracted phase of decentralization and democratization have nothing to do with improved public sector efficiency.

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Appendix 1: Hausman Taylor test

The test rejects null hypothesis indicating the rejection of RE specification.

Model Estimate	χ^2	Probability
1	19.055767	0.0001
2	11.793776	0.0027
3	27.846997	0.0000
4	15.971725	0.0003
5	26.010088	0.0000
6	13.156302	0.0014

Source: Author's calculation from section 5.3.1 using Eviews-6.

Note:

Estimate 1 and 2 stands for the PSE in the setting of new government formation characterised by the lost grip of Golkar domination in the assembly. Estimate 3, 4, 5, & 6 stands for the PSE in the setting of new government formation characterised by political Islam.

**Appendix 2: Per capita public spending (Kabupaten/Kota +
Province), in million Rupiah.**

No.	Province	2005	2006	2007	2008	Average
1	Nanggroe Aceh Darussalam	2.099	2.0781	2.655	3.620	2.613
2	Sumatera Utara	0.885	0.8713	1.168	1.260	1.046
3	Sumatera Barat	1.355	1.3355	1.711	2.063	1.616
4	R i a u	2.478	2.3820	3.323	3.178	2.840
5	Jambi	1.628	1.5995	1.990	2.360	1.894
6	Sumatera Selatan	1.278	1.2560	1.601	1.727	1.465
7	Bengkulu	1.398	1.3811	2.261	2.848	1.972
8	Lampung	0.874	0.8627	1.045	1.049	0.958
9	Kep Bangka Belitung	1.808	1.7549	2.418	3.034	2.254
10	Kepulauan Riau	2.643	2.5178	3.691	3.324	3.044
11	DKI Jakarta	1.713	1.6931	1.907	1.745	1.764
12	Jawa Barat	0.583	0.5730	0.696	0.741	0.648
13	Jawa Tengah	0.660	0.6563	0.812	0.913	0.760
14	Dista Yogyakarta	1.036	1.0224	1.178	1.496	1.183
15	Jawa Timur	0.678	0.6723	0.807	0.950	0.777
16	Banten	0.686	0.6711	0.745	0.782	0.721
17	B a l i	1.498	1.4767	1.718	1.877	1.642
18	Nusa Tenggara Barat	0.944	0.9278	1.137	1.264	1.068
19	Nusa Tenggara Timur	1.235	1.2078	1.479	1.773	1.423
20	Kalimantan Barat	1.402	1.3796	1.646	1.946	1.593
21	Kalimantan Tengah	2.701	2.6691	3.140	3.907	3.104
22	Kalimantan Selatan	1.480	1.4517	1.894	2.277	1.776
23	Kalimantan Timur	5.325	5.1670	6.408	7.107	6.002
24	Sulawesi Utara	1.529	1.5063	2.033	2.357	1.856
25	Sulawesi Tengah	1.669	1.6307	2.055	2.321	1.919
26	Sulawesi Selatan	1.201	1.1795	1.465	1.732	1.394
27	Sulawesi Tenggara	1.482	1.4527	2.203	2.563	1.925
28	Gorontalo	1.695	1.6610	2.135	2.577	2.017
29	Sulawesi Barat	1.426	1.4160	2.249	2.292	1.846
30	Maluku	2.193	2.1593	2.371	3.363	2.522
31	Maluku Utara	2.787	2.6812	3.379	4.070	3.229
32	Papua Barat	5.754	5.4943	7.230	10.069	7.137
33	Papua	6.052	5.7072	8.041	8.935	7.184
Average		1.884	1.833	2.381	2.773	

Source: Author's calculation based on SIKD data, Ministry of Finance Republic Indonesia.

Appendix 3: Fiscal decentralization measured as a ratio of local government revenue to total spending (Kabupaten/Kota+Provinces).

No.	Local Government	2005	2006	2007	2008	Average
1	Nanggroe Aceh Darussalam	0.0697	0.0882	0.0835	0.0732	0.0786
2	Sumatera Utara	0.2520	0.1979	0.1638	0.1868	0.2001
3	Sumatera Barat	0.1746	0.1419	0.1266	0.1326	0.1439
4	R i a u	0.1443	0.1364	0.1281	0.1718	0.1452
5	Jambi	0.1995	0.1314	0.1228	0.1392	0.1482
6	Sumatera Selatan	0.1690	0.1256	0.1101	0.1296	0.1336
7	Bengkulu	0.1480	0.1004	0.1139	0.0858	0.1120
8	Lampung	0.1919	0.1285	0.1185	0.1448	0.1459
9	Kep Bangka Belitung	0.2643	0.1848	0.1429	0.1491	0.1853
10	Kepulauan Riau	0.1219	0.1740	0.1708	0.2142	0.1702
11	DKI Jakarta	0.6104	0.5151	0.5053	0.6553	0.5715
12	Jawa Barat	0.3195	0.2510	0.2330	0.2619	0.2663
13	Jawa Tengah	0.2498	0.2093	0.1913	0.2034	0.2134
14	Dista Yogyakarta	0.2482	0.2114	0.2098	0.2049	0.2186
15	Jawa Timur	0.2779	0.2126	0.2236	0.2302	0.2361
16	Banten	0.3458	0.2825	0.2923	0.3373	0.3145
17	B a l i	0.3599	0.2700	0.2917	0.3488	0.3176
18	Nusa Tenggara Barat	0.1200	0.1121	0.1079	0.1141	0.1135
19	Nusa Tenggara Timur	0.0871	0.0790	0.0709	0.0689	0.0765
20	Kalimantan Barat	0.1211	0.0998	0.0984	0.1033	0.1056
21	Kalimantan Tengah	0.0992	0.0761	0.0775	0.0781	0.0827
22	Kalimantan Selatan	0.2323	0.1791	0.1684	0.1857	0.1914
23	Kalimantan Timur	0.1380	0.1253	0.1184	0.1386	0.1301
24	Sulawesi Utara	0.1483	0.0998	0.0928	0.0952	0.1090
25	Sulawesi Tengah	0.1384	0.0739	0.0655	0.0775	0.0888
26	Sulawesi Selatan	0.1711	0.1438	0.1420	0.1426	0.1499
27	Sulawesi Tenggara	0.1104	0.0734	0.0598	0.0883	0.0830
28	Gorontalo	0.0996	0.0752	0.0738	0.0778	0.0816
29	Sulawesi Barat	0.0741	0.0493	0.0339	0.0506	0.0520
30	Maluku	0.0633	0.0515	0.0642	0.0582	0.0593
31	Maluku Utara	0.0564	0.0485	0.0476	0.0638	0.0541
32	Papua Barat	0.0280	0.0200	0.0313	0.0338	0.0283
33	Papua	0.0496	0.0365	0.0392	0.0433	0.0421
	Average	0.1783	0.1426	0.1370	0.1542	

Source: Author's calculation based on SIKD data, Ministry of Finance Republic Indonesia.

Appendix 4.1: Socio-economic indicators in selected public sector categories (2005)

No.	Province	Education		Health		Infrastructure	Poverty
		NPE	NSE	IMR	ATI	Water	
1	Nanggroe Aceh Darussalam	95.48	78.39	39	3,156	11.54	28.69
2	Sumatera Utara	92.58	70.73	26	13,401	23.48	14.68
3	Sumatera Barat	91.84	66.09	32	3,443	21.15	10.89
4	R i a u	93.86	71.00	22	3,175	3.79	12.51
5	Jambi	92.33	62.72	32	1,980	16.40	11.88
6	Sumatera Selatan	92.65	59.97	30	4,821	17.29	21.01
7	Bengkulu	90.62	60.74	36	1,271	14.23	22.18
8	Lampung	91.60	62.54	28	3,985	5.69	21.42
9	Kep Bangka Belitung	89.98	60.82	24	851	3.74	9.74
10	Kepulauan Riau	90.49	62.90	19	691	39.36	10.97
11	DKI Jakarta	91.09	73.83	18	7,308	46.90	3.61
12	Jawa Barat	89.49	58.27	37	28,541	12.91	13.06
13	Jawa Tengah	93.39	66.32	24	17,523	14.86	20.49
14	Dista Yogyakarta	94.40	81.20	19	1,241	8.82	18.95
15	Jawa Timur	93.17	64.78	32	21,592	16.82	19.95
16	Banten	90.91	60.39	35	6,240	13.78	8.86
17	B a l i	91.57	69.01	25	1,282	40.19	6.72
18	Nusa Tenggara Barat	90.91	65.41	66	3,563	14.68	25.92
19	Nusa Tenggara Timur	88.07	38.67	46	2,320	19.53	28.19
20	Kalimantan Barat	89.52	51.48	30	3,837	8.94	14.24
21	Kalimantan Tengah	93.62	66.66	21	1,716	17.63	10.73
22	Kalimantan Selatan	93.29	55.77	41	2,991	33.62	7.23
23	Kalimantan Timur	91.16	67.09	26	1,648	43.11	10.57
24	Sulawesi Utara	89.09	62.61	19	3,705	23.59	9.34
25	Sulawesi Tengah	89.60	58.11	42	2,195	22.40	21.80
26	Sulawesi Selatan	88.13	56.02	36	9,089	24.19	14.98
27	Sulawesi Tenggara	90.57	62.12	38	2,301	27.79	21.45
28	Gorontalo	82.62	45.01	50	1,342	15.94	29.05
29	Sulawesi Barat	88.13	56.02	36	1,056	12.80	14.98
30	Maluku	89.39	68.14	34	1,082	25.77	32.28
31	Maluku Utara	91.75	60.04	40	567	22.02	13.23
32	Papua Barat	72.56	44.21	29	555	16.77	40.83
33	Papua	72.56	44.21	29	1,919	13.84	40.83
	AVERAGE	89.89	61.55	32.15		19.81	17.92

Source: BPS Statistics Indonesia

Appendix 4.2: Socio-economic indicators in selected public sector categories (2006)

No.	Province	Education		Health		Infrastructure	Poverty
		NPE	NSE	IMR	ATI	Water	
1	Nanggroe Aceh Darussalam	95.48	78.39	39.00	3251	10.93	28.28
2	Sumatera Utara	93.96	73.08	27.00	16678	25.89	15.01
3	Sumatera Barat	94.17	67.77	32.00	3650	23.05	12.51
4	R i a u	94.72	72.93	28.00	2597	2.66	11.85
5	Jambi	94.36	65.32	32.00	2610	16.76	11.37
6	Sumatera Selatan	93.01	68.01	32.00	5101	19.02	20.99
7	Bengkulu	93.89	66.73	33.00	1343	13	23
8	Lampung	93.94	66.65	29.00	4614	4.93	22.77
9	Kep Bangka Belitung	91.51	55.30	33.00	785	4.12	10.91
10	Kepulauan Riau	93.66	72.01	28.00	2597	37.93	12.16
11	DKI Jakarta	90.78	71.41	14.00	7301	39.73	4.57
12	Jawa Barat	94.21	62.13	33.00	30515	12.79	14.49
13	Jawa Tengah	94.05	67.67	25.00	17330	16.77	22.19
14	Dista Yogyakarta	94.38	72.30	14.00	1232	14.17	19.15
15	Jawa Timur	94.20	70.28	29.00	23068	17.78	21.09
16	Banten	94.83	66.56	39.00	7745	12.92	9.79
17	B a l i	93.33	70.15	21.00	1374	38.27	7.08
18	Nusa Tenggara Barat	94.50	69.62	51.00	3756	16.61	27.17
19	Nusa Tenggara Timur	91.58	47.23	35.00	3772	20.33	29.34
20	Kalimantan Barat	93.82	60.92	35.00	4513	9.27	15.24
21	Kalimantan Tengah	95.97	67.69	29.00	1623	17.01	11
22	Kalimantan Selatan	93.28	62.12	41.00	3577	34.72	8.32
23	Kalimantan Timur	92.86	64.00	23.00	2056	48.29	11.41
24	Sulawesi Utara	90.40	66.03	16.00	4149	28.72	11.54
25	Sulawesi Tengah	92.87	62.97	41.00	2430	18.12	23.63
26	Sulawesi Selatan	91.08	60.27	34.00	8446	25.5	14.57
27	Sulawesi Tenggara	92.26	72.42	32.00	3187	28.09	23.37
28	Gorontalo	90.48	52.31	34.00	1509	16.02	29.13
29	Sulawesi Barat	91.67	55.19	34.00	1135	12.8	20.74
30	Maluku	92.24	76.86	38.00	1546	23.79	33.03
31	Maluku Utara	93.10	65.31	43.00	529	22.5	12.73
32	Papua Barat	88.16	53.94	35.00	690	23.09	41.34
33	Papua	78.11	47.36	35.00	2385	13.84	41.52
AVERAGE		92.63	65.18	31.64		20.29	18.83

Source: BPS Statistics Indonesia

Appendix 4.3: Socio-economic indicators in selected public sector categories (2007)

No.	Province	Education		Health		Infrastructure	Poverty
		NPE	NSE	IMR	ATI	HPWS	
1	Nanggroe Aceh Darussalam	95.73	76.36	32.6	2,551	12.18	26.65
2	Sumatera Utara	93.91	73.61	23.3	13,369	21.42	13.90
3	Sumatera Barat	94.45	67.23	27.1	3,660	22.71	11.90
4	R i a u	94.80	69.96	22.3	2,403	2.58	11.20
5	Jambi	93.88	65.77	27.5	1,957	16.71	10.27
6	Sumatera Selatan	92.69	64.97	25.6	4,941	17.82	19.15
7	Bengkulu	94.21	68.73	29.4	1,333	11.15	22.13
8	Lampung	94.04	68.30	25.8	4,541	4.08	22.19
9	Kep Bangka Belitung	91.59	52.24	26.4	821	2.10	9.54
10	Kepulauan Riau	93.50	71.34	20.6	774	25.47	10.30
11	DKI Jakarta	93.27	71.26	8.4	8,312	34.26	4.61
12	Jawa Barat	94.16	66.90	27.9	29,243	11.38	13.55
13	Jawa Tengah	94.78	68.84	21.4	16,481	14.71	20.43
14	Dista Yogyakarta	93.53	74.48	8.7	1,139	10.25	18.99
15	Jawa Timur	94.45	69.02	25.4	22,945	16.36	19.98
16	Banten	92.97	58.41	32	7,853	9.22	9.07
17	B a l i	94.43	66.63	12.9	1,362	34.86	6.63
18	Nusa Tenggara Barat	94.09	70.65	44.6	3,000	14.72	24.99
19	Nusa Tenggara Timur	91.59	49.48	32.3	3,276	14.14	27.51
20	Kalimantan Barat	93.48	54.62	28	3,936	7.43	12.91
21	Kalimantan Tengah	95.42	60.07	22.8	1,171	15.70	9.38
22	Kalimantan Selatan	94.00	59.27	34.9	3,200	35.30	7.01
23	Kalimantan Timur	93.23	71.14	20.2	1,889	47.70	11.04
24	Sulawesi Utara	90.75	65.95	12.1	3,753	19.64	11.42
25	Sulawesi Tengah	92.04	59.04	35.9	1,954	14.80	22.42
26	Sulawesi Selatan	92.06	60.36	28.2	6,336	23.26	14.11
27	Sulawesi Tenggara	93.64	65.77	30	2,231	20.41	21.33
28	Gorontalo	90.18	52.16	32	1,157	17.98	27.35
29	Sulawesi Barat	92.17	52.21	28.2	822	10.26	19.03
30	Maluku	93.45	70.08	32.6	1,104	17.66	31.14
31	Maluku Utara	91.95	64.67	35.5	601	16.91	11.97
32	Papua Barat	90.67	48.76	32.7	664	27.02	39.31
33	Papua	80.92	48.60	31.7	1,839	14.43	40.78
	Average	92.91	63.84	26.64		17.72	17.64

Source: BPS Statistics Indonesia

Appendix 4.4: Socio-economic indicators in selected public sector categories (2008)

No.	Province	Education		Health		Infrastructure	Poverty
		NPE	NSE	IMR	ATI	HPWS	
1	Nanggroe Aceh Darussalam	96.16	76.67	32.1	2795	12.18	23.53
2	Sumatera Utara	94.25	73.95	22.7	14158	21.42	12.55
3	Sumatera Barat	94.70	66.95	26.3	3697	22.71	10.67
4	R i a u	95.24	69.70	21.8	2103	2.58	10.63
5	Jambi	94.17	65.60	26.9	2227	16.71	9.32
6	Sumatera Selatan	93.05	64.92	25	5217	17.82	17.73
7	Bengkulu	94.63	68.64	28.6	1217	11.15	20.64
8	Lampung	94.23	68.78	24.8	4643	4.08	20.98
9	Kep Bangka Belitung	91.53	52.04	26	959	2.1	8.58
10	Kepulauan Riau	94.95	72.00	20.3	600	25.47	9.18
11	DKI Jakarta	93.71	71.35	8.2	7999	34.26	4.29
12	Jawa Barat	94.09	67.21	27.1	30067	11.38	13.01
13	Jawa Tengah	95.12	69.14	20.7	15503	14.71	19.23
14	Dista Yogyakarta	94.28	74.42	8.5	1139	10.25	18.32
15	Jawa Timur	94.53	68.90	24.5	22686	16.36	18.51
16	Banten	93.34	58.28	31.3	7570	9.22	8.15
17	B a l i	94.82	67.03	12.7	1431	34.86	6.17
18	Nusa Tenggara Barat	94.36	70.51	43.2	3123	14.72	23.81
19	Nusa Tenggara Timur	91.67	49.56	31.2	3031	14.14	25.65
20	Kalimantan Barat	93.94	54.77	27.4	3646	7.43	11.07
21	Kalimantan Tengah	95.61	60.12	22.4	1118	15.7	8.71
22	Kalimantan Selatan	94.15	59.53	33.9	3157	35.3	6.48
23	Kalimantan Timur	93.59	71.19	19	1980	47.7	9.51
24	Sulawesi Utara	91.24	66.39	11.5	4008	19.64	10.10
25	Sulawesi Tengah	92.83	59.08	34.9	2101	14.8	20.75
26	Sulawesi Selatan	92.15	60.62	27.4	6170	23.26	13.34
27	Sulawesi Tenggara	94.24	65.95	29.1	2312	20.41	19.53
28	Gorontalo	90.44	52.35	30.8	1176	17.98	24.88
29	Sulawesi Barat	92.90	51.72	27.4	1060	10.26	16.73
30	Maluku	93.77	70.01	31.8	923	17.66	29.66
31	Maluku Utara	92.44	65.01	34.3	436	16.91	11.28
32	Papua Barat	91.20	54.47	31.6	456	27.02	35.12
33	Papua	82.90	48.56	30.7	2033	14.43	37.08
Average		93.34	64.10	25.88		17.72	16.22

Source: Susenas, BPS, Republic Indonesia

Appendix 5: Macroeconomic performance

No.	Province	2005		2006		2007		2008	
		GR	UR	GR	UR	GR	UR	GR	UR
1	Nanggroe Aceh Darussalam	(10.12)	13.25	1.56	11.255	(2.36)	10.06	(5.27)	9.38
2	Sumatera Utara	5.48	11.44	6.20	13.165	6.90	10.37	6.39	9.33
3	Sumatera Barat	5.73	12.42	6.14	12.4	6.34	10.67	6.37	8.89
4	R i a u	5.41	13.04	5.15	10.85	3.41	10.09	5.65	8.78
5	Jambi	5.57	9.67	5.89	7.195	6.82	6.48	7.16	5.53
6	Sumatera Selatan	4.84	10.69	5.20	10.715	5.84	9.87	5.10	8.27
7	Bengkulu	5.82	7.53	5.95	6.475	6.03	4.90	4.93	4.44
8	Lampung	4.02	7.66	4.98	9.445	5.94	7.94	5.26	6.73
9	Kep Bangka Belitung	3.47	7.65	3.98	7.47	4.54	6.93	4.44	5.89
10	Kepulauan Riau	6.57	10.20	6.78	11.465	7.01	8.94	6.65	8.25
11	DKI Jakarta	6.01	15.25	5.95	12.855	6.44	12.92	6.18	11.61
12	Jawa Barat	5.60	15.13	6.02	14.545	6.48	13.80	5.83	12.18
13	Jawa Tengah	5.35	9.03	5.33	8.11	5.59	7.90	5.46	7.24
14	Dista Yogyakarta	4.73	6.32	3.70	6.28	4.31	6.09	5.02	5.71
15	Jawa Timur	5.87	8.48	5.77	7.955	6.11	7.12	5.90	6.33
16	Banten	5.88	15.41	5.57	17.625	6.04	15.93	5.82	14.67
17	B a l i	5.56	4.68	5.28	5.68	5.92	4.33	5.97	3.94
18	Nusa Tenggara Barat	1.71	9.61	2.77	8.93	4.91	7.02	2.63	5.67
19	Nusa Tenggara Timur	3.46	5.14	5.08	4.315	5.15	3.85	4.81	3.72
20	Kalimantan Barat	4.69	8.37	5.23	7.795	6.02	6.78	5.42	5.95
21	Kalimantan Tengah	5.90	4.88	5.84	5.905	6.06	5.07	6.16	4.69
22	Kalimantan Selatan	5.06	6.76	4.98	8.825	6.01	7.47	6.23	6.55
23	Kalimantan Timur	3.17	10.11	2.85	12.77	1.88	12.45	4.82	11.26
24	Sulawesi Utara	4.90	14.23	5.72	14.145	6.47	12.70	7.56	11.50
25	Sulawesi Tengah	7.57	7.67	7.82	9.605	7.99	7.70	7.76	6.35
26	Sulawesi Selatan	6.05	14.76	6.72	12.54	6.34	11.63	7.78	9.77
27	Sulawesi Tenggara	7.31	9.93	7.68	8.545	7.96	6.67	7.27	5.89
28	Gorontalo	7.19	11.92	7.30	8.695	7.51	7.21	7.76	6.35
29	Sulawesi Barat	6.78	5.16	6.42	5.545	7.43	4.77	8.54	5.13
30	Maluku	5.07	13.66	5.55	14.74	5.62	13.29	4.23	10.86
31	Maluku Utara	5.10	10.99	5.48	7.72	6.01	7.20	5.98	6.76
32	Papua Barat	6.80	10.25	4.55	10.67	6.95	9.82	7.33	8.48
33	Papua	(1.09)	7.22	(1.09)	5.165	4.34	5.27	(1.49)	4.62
AVERAGE		4.71	9.95	5.22	9.68	5.70	8.58	5.44	7.60

Source: Susenas, BPS Statistics Indonesia. GR: Growth Rate, UR: Unemployment Rate

Appendix 6: Democratic participation measured as a ratio of actual votes to the eligible votes.

No.	Local Government	Eligible Voters	Actual Votes	Counted Votes	Democratic Participation
1	Nanggroe Aceh Darussalam	3,009,965	2,266,713	1,838,915	0.75
2	Sumatera Utara`	9,180,973	5,999,956	5,281,066	0.65
3	Sumatera Barat	3,155,148	2,223,239	2,022,541	0.70
4	R i a u	3,366,383	2,292,893	2,034,649	0.68
5	Jambi	2,086,780	1,556,080	1,292,650	0.75
6	Sumatera Selatan	5,192,693	3,982,645	3,458,250	0.77
7	Bengkulu	1,214,171	907,816	1,752,775	0.75
8	Lampung	5,351,733	3,978,504	3,491,266	0.74
9	Kep Bangka Belitung	782,255	545,812	459,227	0.70
10	Kepulauan Riau	1,131,676	673,412	593,568	0.60
11	DKI Jakarta	8,502,619	4,327,596	4,091,951	0.51
12	Jawa Barat	29,002,479	21,204,505	18,651,604	0.73
13	Jawa Tengah	26,190,629	18,663,295	15,072,888	0.71
14	Dista Yogyakarta	2,751,761	2,007,359	1,752,775	0.73
15	Jawa Timur	29,514,290	20,201,770	16,289,604	0.68
16	Banten	6,581,587	4,716,108	3,990,958	0.72
17	B a l i	2,667,065	2,045,675	1,699,468	0.77
18	Nusa Tenggara Barat	3,135,420	2,354,271	1,962,300	0.75
19	Nusa Tenggara Timur	2,760,518	2,247,057	2,051,582	0.81
20	Kalimantan Barat	3,154,887	2,314,404	2,036,704	0.73
21	Kalimantan Tengah	1,506,244	1,044,569	872,362	0.69
22	Kalimantan Selatan	2,478,976	1,769,528	1,463,490	0.71
23	Kalimantan Timur	2,349,862	1,578,755	1,355,072	0.67
24	Sulawesi Utara	1,679,814	1,323,131	1,239,392	0.79
25	Sulawesi Tengah	1,658,693	1,296,819	1,199,830	0.78
26	Sulawesi Selatan	5,630,977	4,132,962	3,688,770	0.73
27	Sulawesi Tenggara	1,487,818	1,120,277	993,592	0.75
28	Gorontalo	688,272	572,519	532,055	0.83
29	Sulawesi Barat	753,203	587,334	531,544	0.78
30	Maluku	1,020,421	827,591	772,579	0.81
31	Maluku Utara	691,863	550,236	519,735	0.80
32	Papua Barat	521,735	423,752	381,121	0.81
33	Papua	2,064,532	1,851,783	1,719,581	0.90
Average					0.74

Source: KPU, Republic Indonesia

Appendix 7: Political fragmentation measured using Herfindahl-Hirschman Index

No	Local Government	Political Fragmentation
1	Nanggroe Aceh Darussalam	13.95
2	Sumatera Utara	13.11
3	Sumatera Barat	18.04
4	R i a u	14.66
5	Jambi	15.62
6	Sumatera Selatan	14.15
7	Bengkulu	12.80
8	Lampung	14.05
9	Kep Bangka Belitung	19.18
10	Kepulauan Riau	12.83
11	DKI Jakarta	15.48
12	Jawa Barat	19.19
13	Jawa Tengah	20.23
14	Dista Yogyakarta	17.67
15	Jawa Timur	21.31
16	Banten	15.39
17	B a l i	32.78
18	Nusa Tenggara Barat	13.52
19	Nusa Tenggara Timur	19.18
20	Kalimantan Barat	15.13
21	Kalimantan Tengah	18.63
22	Kalimantan Selatan	14.67
23	Kalimantan Timur	17.68
24	Sulawesi Utara	23.94
25	Sulawesi Tengah	18.61
26	Sulawesi Selatan	23.25
27	Sulawesi Tenggara	16.42
28	Gorontalo	29.79
29	Sulawesi Barat	17.94
30	Maluku	12.76
31	Maluku Utara	14.39
32	Papua Barat	18.12
33	Papua	15.31
Average		

Source: Author's calculation based on database pemilu 2004: peta daerah pemilihan, perolehan suara dan kursi untuk DPR RI, DPRD propinsi, dan DPRD kabupaten/kota se-Indonesia.

Appendix 8: Formation of new government measured as ratio of Seats held by Golkar and Political Islam parties to the total Seats in the local assembly.

		GOL2	ISL1	ISL2
1	Nanggroe Aceh Darussalam	0.19	0.38	0.56
2	Sumatera Utara	0.22	0.21	0.29
3	Sumatera Barat	0.28	0.36	0.52
4	R i a u	0.25	0.29	0.42
5	Jambi	0.24	0.24	0.49
6	Sumatera Selatan	0.24	0.26	0.41
7	Bengkulu	0.23	0.24	0.40
8	Lampung	0.22	0.20	0.38
9	Kep Bangka Belitung	0.20	0.40	0.45
10	Kepulauan Riau	0.19	0.21	0.38
11	DKI Jakarta	0.09	0.36	0.49
12	Jawa Barat	0.29	0.29	0.42
13	Jawa Tengah	0.18	0.17	0.42
14	Dista Yogyakarta	0.15	0.18	0.48
15	Jawa Timur	0.16	0.13	0.48
16	Banten	0.26	0.36	0.49
17	B a l i	0.20	0.02	0.04
18	Nusa Tenggara Barat	0.24	0.36	0.50
19	Nusa Tenggara Timur	0.32	0.03	0.09
20	Kalimantan Barat	0.24	0.15	0.23
21	Kalimantan Tengah	0.29	0.16	0.31
22	Kalimantan Selatan	0.22	0.36	0.56
23	Kalimantan Timur	0.29	0.24	2.75
24	Sulawesi Utara	0.36	0.04	0.07
25	Sulawesi Tengah	0.33	0.21	0.32
26	Sulawesi Selatan	0.41	0.27	0.39
27	Sulawesi Tenggara	0.24	0.35	0.52
28	Gorontalo	0.48	0.30	0.39
29	Sulawesi Barat	0.33	0.23	0.30
30	Maluku	0.21	0.25	0.30
31	Maluku Utara	0.23	0.31	0.40
32	Papua Barat	0.27	0.13	0.17
33	Papua	0.27	0.07	0.17

Source: Author's calculation based on database pemilu 2004: peta daerah pemilihan, perolehan suara dan kursi untuk DPR RI, DPRD propinsi, dan DPRD kabupaten/kota se-Indonesia.

Appendix 9: Corruption perception Index and physical infrastructure index

No.	Local Government	Corruption Perception Index	Physical Infrastructure Index
1	Nanggroe Aceh Darussalam	5.87	55.79
2	Sumatera Utara	3.84	45.23
3	Sumatera Barat	4.64	54.45
4	R i a u	3.55	51.07
5	Jambi	5.57	43.36
6	Sumatera Selatan	3.87	54.58
7	Bengkulu	4.46	43.58
8	Lampung	4.58	54.17
9	Kep Bangka Belitung	5.03	47.12
10	Kepulauan Riau	4.35	37.5
11	DKI Jakarta	4.06	74.06
12	Jawa Barat	3.67	51.45
13	Jawa Tengah	4.58	65.29
14	Dista Yogyakarta	6.43	61.06
15	Jawa Timur	4.26	62.93
16	Banten	4.57	61.22
17	B a l i	4.25	67.03
18	Nusa Tenggara Barat	5.41	43.53
19	Nusa Tenggara Timur	2.97	48.11
20	Kalimantan Barat	3.81	44.15
21	Kalimantan Tengah	6.1	36.64
22	Kalimantan Selatan	5.11	60.59
23	Kalimantan Timur	5.03	48.18
24	Sulawesi Utara	3.98	62.62
25	Sulawesi Tengah	4.5	46.3
26	Sulawesi Selatan	4.7	61.45
27	Sulawesi Tenggara	3.43	45.72
28	Gorontalo	4.83	47.88
29	Sulawesi Barat	4.08	20.14
30	Maluku	4.32	39.65
31	Maluku Utara	5.01	28.11
32	Papua Barat	3.39	26.21
33	Papua	5.01	28.17

Source: Transparency International, Indonesia – USAID and KPPOD

Appendix 10: Total factor productivity growth measured using Solow residual

No.	Local Government	2005	2006	2007	2008	AVG
1	Nanggroe Aceh Darussalam	2.047411	1.406185	1.459884	1.680133	1.648403
2	Sumatera Utara	1.715134	1.371372	1.098047	1.420118	1.401168
3	Sumatera Barat	1.617946	1.329084	1.224367	1.575549	1.436737
4	R i a u	1.033612	0.256475	0.014113	1.109794	0.603498
5	Jambi	1.959624	1.659151	1.310895	1.552018	1.620422
6	Sumatera Selatan	1.451038	0.911273	0.689205	1.288613	1.085032
7	Bengkulu	2.621841	2.81012	2.657518	2.448044	2.634381
8	Lampung	1.703244	1.619848	1.58163	1.609921	1.628661
9	Kep Bangka Belitung	1.17812	0.719893	0.48581	1.089805	0.868407
10	Kepulauan Riau	1.003515	-0.04839	-0.63631	0.241174	0.139998
11	DKI Jakarta	0.499935	-0.66762	-1.05384	0.504978	-0.17914
12	Jawa Barat	1.729103	1.465581	1.302436	1.563704	1.515206
13	Jawa Tengah	1.828213	1.524761	1.393875	1.570853	1.579426
14	Dista Yogyakarta	1.184401	0.599628	0.371769	0.867662	0.755865
15	Jawa Timur	1.619339	1.222639	1.159937	1.604753	1.401667
16	Banten	1.425334	1.037021	0.87502	1.194162	1.132885
17	B a l i	2.09195	1.917829	1.209161	1.345261	1.64105
18	Nusa Tenggara Barat	1.553362	1.344908	1.125251	1.268508	1.323007
19	Nusa Tenggara Timur	2.380776	2.23621	2.289769	2.079763	2.24663
20	Kalimantan Barat	1.243004	0.748763	0.590445	1.024189	0.9016
21	Kalimantan Tengah	0.787604	-0.03997	-0.27268	0.488987	0.240984
22	Kalimantan Selatan	2.306784	2.001051	1.668282	1.720786	1.924226
23	Kalimantan Timur	1.813677	0.901023	0.587319	1.789973	1.272998
24	Sulawesi Utara	1.724465	1.270946	0.871534	1.122508	1.247363
25	Sulawesi Tengah	1.632162	1.450798	1.23908	1.501367	1.455852
26	Sulawesi Selatan	1.699971	1.630299	1.465549	1.470299	1.56653
27	Sulawesi Tenggara	1.375069	1.111513	1.014302	1.243806	1.186172
28	Gorontalo	4.025075	1.416961	1.287764	1.215764	1.986391
29	Sulawesi Barat	2.437485	2.579188	2.093525	7.358044	3.617061
30	Maluku	3.370976	3.987286	3.758024	2.993313	3.5274
31	Maluku Utara	3.294489	3.565921	3.557104	2.642034	3.264887
32	Papua Barat	0.731917	0.178291	0.074754	0.843222	0.457046
33	Papua	1.515104	0.564977	0.147346	0.813855	0.76032

Source: Author's calculation.