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The Effect of Local Public Spending on Poverty Reduction in Indonesia

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List of Acronyms

BPS	Biro Pusat Statistik (Statistic Indonesia)
CGE	Computable General Equilibrium
DAC	Development Assistance Committee
DAK	Dana Alokasi Khusus (Special Allocation Funds)
DAU	Dana Alokasi Umum (General Allocation Funds)
DKI	Daerah Khusus Ibukota (Capital City, Special Region)
GLS	Generalized Least Square
GRDP	Gross Regional Domestic Product
OECD	Organisation for Economic Cooperation and Development
OLS	Ordinary Least Square
PAD	Pendapatan Asli Daerah (Own Source Revenue)
Susenas	Survei Sosial Ekonomi Nasional (National Socio-economic Survey)

Abstract

This paper aims to examine the relationship between local public spending and poverty reduction in Indonesia from 2001 to 2004. Using balanced panel data of 273 districts in Indonesia, linear and log specification model, and random effect Generalized Least Square (GLS) regression as the methodology, we find that local government spending can be a powerful instrument in reducing poverty headcount, poverty gap and poverty severity in the following year. In addition, using log specification model, we find that per capita GRDP is significant in reducing poverty headcount, poverty gap and poverty severity. But there is no correlation between per capita GRDP and poverty in the linear specification model. Regarding the district characteristics, we find that household size and percentage of rural population have positive relationship with poverty reduction. On the other hand, clean water access is the only variable which can contribute to reducing all three poverty measures. Own house variable is only significant in reducing poverty headcount, but not other poverty indices. Meanwhile, district split can reduce poverty headcount and poverty gap, but not poverty severity.

Relevance to Development Studies

Poverty reduction is an essential objective of development. Public spending is thought to be a powerful instrument in reducing poverty level. This research examines the causal relation between local public spending and poverty reduction in Indonesia.

Keywords

Public spending, poverty headcount, poverty gap, poverty severity, per capita GRDP, district characteristics

Chapter 1
Introduction

Poverty implies different definition to different societies, and is likely influenced by various values and economic factors. Many attempts have been made to interpret poverty. For instance, the World Bank (2000) defines poverty as "pronounced deprivation in well-being" and highlights that poverty has a lot of different aspects such as low income, limited access to education and health care, powerlessness, vulnerability and exposure to risk. Likewise, the Development Assistance Committee (DAC) of the OECD defines poverty as "the inability of people to meet economic, social and other standards of well-being" (OECD, 2001).

Poverty reduction is an essential objective of development. Even though there are quite different ideas about development, one same general idea is it includes eradicating poverty. One of the United Nations Millennium Development Goals is eradicating extreme poverty and hunger. The goal was turned into a specific target by World Bank: "Reducing by one half the proportions of people in extreme poverty by 2015". With recent global economic and food crises, keeping the promise to meet the target by 2015 has become the major challenge of these institutions. Due to its linkage to many important aspects of people's life, poverty reduction has also become the priority of the developing country's agenda.

Reducing poverty level is a challenge in most countries especially those with large geographic areas under their jurisdictions. Indonesia is a very populous country with more than 230 million residents. By population, it is the fourth largest country in the world. Based on data form Statistics Indonesia on March 2009 using the national poverty line, 14.15% people of all population in Indonesia live in poverty. Even though the poverty rate is decreasing from the previous year 2008 (15.42%) and from 2007 (16.58%), based on World Bank standard ($2 a day), poverty rate in Indonesia is still very high (around 49% in 2006). It means that almost half of the population in Indonesia lives in poverty.

Since January 1, 2001, Indonesia has been implementing fiscal decentralization. As decentralization should lead to balanced development and enhanced welfare of Indonesians, managing poverty reduction programs has become main government responsibility. One way to reduce poverty level and achieve the objective is by allocating local government expenditure in effective and productive manner. Van de Walle (1995) stated that "public spending is a potentially powerful instrument for fighting poverty". Generally, what is needed is certain spending categories and better targeting. It is interesting to see whether billion Rupiahs' districts public spending each year in Indonesia will generate a contribution to poverty reduction or not.

Previous studies related to this issue have been conducted in several countries. First, Fan et al. (2002) concluded that local government expenditures on education, telecommunications and agricultural research and extension reduced the poverty level in rural China. Second, Fan et al. (2000) found that public spending on rural roads and agricultural research and extension reduced

rural poverty in India. Third, Fan et al (2008) revealed that increased investment in rural electrification and additional government spending on agricultural research decrease the poverty level in rural Thailand. Finally, Jung and Thorbecke (2003) found that proper targeting of education expenditure on poor households can contribute to poverty reduction in Tanzania and Zambia.

However, there are no studies conducted yet examining the linkage between public spending and poverty reduction in Indonesia. A clear understanding about the relevant of public spending to poverty alleviation is essential for policymaking. The government must ensure that the poor get benefits from the economic policy. It means that they should create appropriate plan and manage their expenditure effectively in order to accomplish the objective. Studying the role of district public expenditure in reducing poverty after decentralization era in Indonesia will be an important addition to the literature.

The objective of this study is to examine the relationship between public spending and poverty reduction at district level in Indonesia. The main research questions are:

1. Does total district spending lower poverty headcount in Indonesia?
2. Does total district spending narrow poverty gap in Indonesia?
3. Does total district spending decrease poverty severity in Indonesia?

We used panel data from Indonesia's Socio-Economic Household Survey (*Susenas*) and Ministry of Finance. The panel data is constructed by combining the district spending (local government's expenditure) data of 2001and *Susenas* Data from 2002 to 2005. The data of poverty headcount, poverty gap and poverty severity are calculated based on the poverty data from Statistics Indonesia.

The paper finds that local government spending can be a powerful instrument in reducing poverty headcount, poverty gap and poverty severity in the following year. In addition to that, we find that per capita GRDP is significant in reducing poverty headcount, poverty gap and poverty severity using log specification model. But there is no correlation between per capita GRDP and poverty in the linear specification model. Regarding the district characteristics, we find that household size and percentage of rural population have positive relationship with poverty reduction. On the other hand, clean water access is the only variable which can contribute to reducing all three poverty measures. Own house variable is only significant in reducing poverty headcount, but not other poverty indices. Meanwhile, district split can reduce poverty headcount and poverty gap, but not poverty severity.

The rest of this paper is organized as follows: Chapter 2 provides the literature related to public spending, poverty reduction and the linkage between the two. Chapter 3 describes the overview of Indonesia's public spending and poverty level. Chapter 4 discusses the data and methodology, while findings are presented in Chapter 5. Finally, chapter 6 concludes.

Chapter 2
Literature Review

2.1 Poverty and Public Spending

Poverty has been defined and described in many different ways, changing from time to time in various societies. Two definitions made by international institutions are as follows:

"Poverty is pronounced deprivation in well-being" (World Bank, 2000)

"Poverty is the inability of people to meet economic, social and other standards of well-being" (OECD 2001: 37).

Ray (1998) described that basically poverty has two dimensions: absolute and relative poverty. Poverty is an absolute concept related to the certain adequate levels of food, clothing and shelter that people need to have, in order to function properly wherever they live in this world. But at the same time, the adequate or acceptable level may vary across the universe, relative to people's socioeconomic standards. These two considerations in principle lead to the need for poverty lines which share common particular elements, but are likely to be different among countries around the globe.

The notion of poverty line can be defined as a decisive threshold of income or access to goods and services where individuals are classified to be poor when their incomes are below that threshold (Ray, 1998). This line reflects a minimum level of "acceptable" economic participation in a certain time. National standards of poverty line vary across countries since different countries have different minimum standards. National poverty line is usually set based on minimum caloric requirements (for example 2100, 2300 or 2500 Kcal per person per day) which an individual needs to function normally in his/her society. The cost of this minimum consumption diet is then calculated using the consumption pattern of the people in the middle or in the poorest half of the distribution. After that, non-food components like shelter and clothing are added to obtain an estimate of the poverty line. Estimates of international poverty standards need a unique poverty line; otherwise we have no internationalized metric for cross-country comparison. The most famous of those estimates are the World Bank's $1 and $2 per day. The estimates are adjusted for inflation and Purchasing Power Parity. According to this estimate, if we choose $2 a day as the poverty line, people who earn below $2 a day will be declared as poor. But when we choose $1 as the poverty line (extreme poverty estimate), they cannot be classified as poor, except their income is below $1 a day.

Poverty can be measured in many different ways. There are some good reviews about alternative poverty measures and their properties, for instance in what have been discussed by Foster, et al. (1984) and Ravallion (1993). Three most important measures (poverty indices) are the poverty headcount ratio, poverty gap and poverty severity.

Head count is number of individuals below the poverty line. The head count ratio can be defined as the fraction of the population under the poverty line. But even though this index is the most often quoted, the headcount ratio is still a limited measure of poverty. It takes no consideration of degree of poverty and could be unaffected by a policy that makes the poor getting poorer (Deaton, 1997). Policies related to poverty can become skewed, for instance, reducing poverty can be achieved only by bringing those people who are just below the poverty line to just above it and ignoring the very poor. As an alternative, poverty gap emerges to cover the limitation of poverty headcount.

The poverty gap measure is the average income needed to bring all the poor to the poverty line. The poverty gap index is basically the mean over the population of the proportionate poverty gap, where the poverty gap is the mean distance of the poor below the poverty line, as a proportion of that line (Ravallion, 1993). The non-poor are considered as having zero poverty gaps. This measure has some advantageous over the previous one. For example, there is no discontinuity in a person's contribution to the poverty measure when that person across the poverty line. Another one is that the social welfare interpretation makes more sense than the headcount ratio due to presence of the principle of transfers (Deaton, 1997). However, the poverty gap will be larger with the presence of transfers from poor to non-poor or from poor to less poor so that they become non-poor. Nevertheless, transfers among the poor have no impact on the poverty measure. Due to this limitation, we need to have another poverty measure.

Foster, Greer and Thorbecke (1984) offer poverty severity index, which is sensitive to the living standard's distribution (degree of inequality) among the poor. It takes into consideration the variation in the distribution of welfare among the poor which measures the intensity of the poor. This is an important poverty indicator which describes inequality in the distribution of poor people's spending. Changes in total poverty can be allocated to changes in sectoral poverty measure (Deaton, 1997). He also stated that this poverty severity index is also constantly differentiable, even at the poverty line.

Poverty reduction, or poverty alleviation, has been largely a result of overall economic growth (Krugman and Wells, 2009). Ray (1998) stated that poverty can be measured in two approaches. First, poverty is measured in absolute term by using the change of people's income. Generally there is a positive relationship between an increase in average income per capita and the percentage of people lived above an absolute poverty line (McKinley, 2001). Second, poverty is measured the relative term by identifying how much people get the access to the basic needs. However, measuring poverty in a relative term regarding the dimension of poverty is quite difficult. There are variations related to society-specific interpretations that need to be considered.

Public spending or government expenditure is classified by economists into three main types (Ballo and Grilli, 1994). First, government purchases of goods and services for current use are classed as government consumption. Second, government purchases of goods and services intended to create future benefits, such as infrastructure investment or research spending, are classed as government investment. Third, government expenditures that are not purchases of goods and services, and instead just represent transfers of money, such as

social security payments, are called transfer payments. Government spending can be financed by seigniorage, taxes, or government borrowing.

The first two types of government spending, that is government consumption and government investment, together constitute one of the major components of gross domestic product. The term public spending is most commonly used to refer to the aggregate sum of all public sector expenditures. The public sector, in organizational and economic terms, is the sum of those parts of the economy formally under the control of or responsible to the state, including both central and local government.

2.2. The linkage between Public Spending and Poverty Reduction

Public spending can be an essential instrument in eradicating poverty. Generally, what is needed is certain spending categories and finer targeting in others. The objective of public spending is to promote efficiency and equity. To have a significant impact on poverty, it must be budgeted and distributed to effective programs that help the poor expanding their access to resources and their income potential (Van de Walle, 1995).

"In achieving efficiency and equity, public policies correct some market failures and improve distributional outcomes from a market-based resources allocation. This role is achieved through targeted government expenditures in the form of direct provision of certain public services such as education, health and infrastructure. The assessment of the role of public policies in affecting income distribution and poverty requires the knowledge of the functional relationship between the targets (poverty and income distribution) and the instruments (public policies). This relationship is far from being completely understood. Part of the problem is the fact that public policies are not only exclusively directed toward poverty alleviation, and affect poverty mainly indirectly through complex interactions between public policies and growth on the one hand, and public policies and income distribution, on the other" (Ali and Fan, 2007). Public spending can affect poverty reduction by increasing the growth of the economy and the chance of the poor to contribute to the growth process (Wilhelm and Fiestas, 2005). For both channels, the effect on poverty is expected to be experienced with a time lag.

The empirical studies examining the relationship between public spending and poverty reduction have been conducted in developing countries for many years. Fan, et al. (2002) used simultaneous equations model to estimate the effects of different kinds of government spending on poverty and production growth in rural China. Using provincial data from 1970-1997, they found that government expenditure on education has the largest impact on poverty reduction while government spending on agricultural research and extension has the biggest effect on production growth. Another result from this study is that if the government wants to reduce poverty with the highest effect, investments should be focused on the western region. On the other hand, if the government would like to optimize to maximize the agricultural production growth, then the investment should be targeted to the central region.

Fan, et al. (2000) examined the effects of government expenditures on poverty alleviation in rural India. Using state level data for 1970 to 1993, they separate between direct and indirect effects. The direct effects are obtained from the benefits that the poor get from government's employment programs and the indirect effects emerge when government spending in rural infrastructure, agriculture, health and education, create agricultural and non-agricultural growth, which generate more employment and earning opportunities for the poor, and also access to cheaper food. According to them, targeting government expenditures must be incorporated with stimulating economic growth. It is necessary to produce the resources needed for future government expenditures and also to increase the welfare of rural people. This is the reason why their model is made so as to determine the growth as well as the poverty impact of different types of public spending. They found that government expenditure on roads has the greatest impact on poverty reduction while spending on agricultural research and extension has the largest effect on agricultural productivity growth.

Fan, et al. (2008) studied quite similar type of research in rural Thailand. They used regional-level data for 1977–1999 to build a conceptual framework and model to estimate the impact of government expenditure on agricultural growth and rural poverty in Thailand. The study finds that government spending on agricultural research gives the biggest impact on agricultural productivity, whereas public spending on rural electricity has the largest effect on poverty reduction, mostly through better non-farm employment and agricultural productivity channels. Another point from this study is that investments in the Northeast Region, such as spending on electricity, can reduce poverty more than in any other regions, due to underinvestment in the past and the existence of concentrated poverty in this region.

Another similar study by Fan and Zhang (2008) is conducted in Uganda. Using district-level data for 1992, 1995, and 1999, they estimated the impact of various types of government spending on poverty alleviation and agricultural growth. Additional government expenditure on agricultural research and extension contribute the most to growth in agricultural production. It is still principally become the requirement to fulfil the need of the food for such large population. Besides, agricultural research and extension expenditure also has the largest effect on poverty reduction. However, this research has some data constraints, particularly the long run data. There is no coordinated and systematic data collection for the long run.

Another perspective comes from Jung and Thorbecke (2003), who emphasized the role of education spending. They examined the impact of public education expenditure on human capital, growth and poverty in Tanzania and Zambia, which are classified as two Heavily Indebted Poor Countries. Using a Computable General Equilibrium (CGE) Model, they found that education expenditure can increase economic growth. But to obtain the maximum benefits from education spending, high physical investment is required. They also stated that poverty alleviation can be achieved through better targeting of educational spending to poor households.

2.3 How Can Public Spending Reduce Poverty?

Poverty can be decomposed into growth and inequality effects.[1] The study about this poverty decomposition has attracted much attention from some scholars since the last decade. They mainly state that poverty reduction can be accomplished by economic growth and/or by the distribution of income. Change in poverty is affected by change in economic growth, holding distribution of income fixed. Change in poverty is also can be influenced by change in distribution of income (inequality), holding economic growth constant. The fact that the relationship among growth, inequality and poverty is complex and interdependent makes it obvious to put policies and programs addressing distributional concerns and poverty reduction into top priority of the government to enhance both economic growth and equity (Kakwani, Khandker and Son, 2004).

An important objective of public spending or government expenditure is to enhance household living standards, mainly for the poor (Van de Walle, 1995). Public spending should increase efficiency by correcting some market failures and promote equity by improving the distribution of welfare (Van de Walle, 1995). She also mentioned that to alleviate poverty, public spending programs can be classified into two approaches: broad targeting and narrow targeting. In broad targeting, there is no direct attempt to reach the poor as individuals. The benefits from this kind of targeting come from some spending whose outcomes are relatively significant to the poor, for example education and health spending. On the other side, narrow targeting is type of spending which is directly targeted to the poor. The benefits of public spending programs entail some particular groups of people, for instance poor people in remote area and poor mother. Each of these approaches has its own costs and benefits for the poor. Narrow targeting may be considered as a better and more effective way of reaching the poor. It also has the lower cost. But anti-targeting view argues that targeted spending usually could not fully cover the poor and in many cases, there is leakage to the non-poor. Narrow targeting can also creates dependency and bad morale. Furthermore, another perspective believe that if governments can raise economic growth and effectively expend in primary social services with broad targeting, then the need for narrow targeting approach no longer exist.

Demery (2002) analyzed the benefit incidence of public spending in his paper. He stated that the government is usually the one who takes the responsibility to help the poor out of poverty. The basic services provision might be considered as the most effective mechanism to reach the goal. But it has to be supported by the following conditions:

1. Public spending can only be effective in alleviating poverty when there is appropriate policy setting. Pro-poor spending must be endorsed by pro-poor policies.

[1] See details on Kakwani and Subbarao (1990, 1991, 1992) and Datt and Ravallion (1992).

2. It is assumed that the public spending process, including accountability, budget management and transparency, is based on the results and impacts and not just line items. The efficiency of the spending and the impact of targeted beneficiaries should be taken into consideration.
3. Public policy and public spending decisions must be based on the needs and preferences of the majority of the population. The government and the household must have a synergy so as to be able to collaborate in effectively regarding the provision of public services. Therefore, a clear flow of information is definitely needed.

Chapter 3
An Overview of Public Spending and Poverty Reduction in Indonesia

3.1 Local Public Spending

Indonesia started implementing fiscal decentralization system on January 1, 2001. This system adopted two laws, Laws 22/1999 on Regional Governance (Local Government Administration), amended by Laws 32/2004, and Laws 25/1999 on Intergovernmental Fiscal Relationships (Central and Local Fiscal Balance) amended by Laws 33/2004. Prior to decentralization era, Indonesia was a highly centralized nation lead by President Soeharto. At that period, local governments have less power to construct their own development plans. Central government controlled almost all local governments budgeting. The reformation into more decentralizing government function started in 1998 when President Habibie replaced Soeharto. With only two years of preparation, which is quite rush, Indonesia changed its system from centralized into decentralized country.

The fiscal decentralization program in Indonesia is intended to: "(1) increase national allocation and regional government efficiency; (2) meet regional aspirations, improve overall fiscal structure, and mobilize regional and therefore national revenues; (3) enhance accountability, increase transparency, and expand constituent participation in decision-making at the regional level; (4) lessen fiscal disparities among regional governments, assure the delivery of basic public services to citizens across the country and promotion of government efficiency objectives; and (5) improve social welfare of Indonesians" (Suhendra and Amir, 2006).

Fiscal decentralization led to change in local governments' budget. They have been receiving much more transfers from the central government and are allowed to expend it without the central's permission. From Table 1 we can see that the share of local to national spending is 14% during 1996-2000, while in Table 2, from the period of 2001 to 2005, the share increased to 25%.

Table 3.1 Share of Local Spending During Pre-Decentralization Era

Fiscal Year	1996	1997	1998	1999	2000	1996-2000 avg
Local Government (in Trillion Rp)	12.5	15.2	26.7	38.2	37.9	26.1
National Government Spending (Consolidated, in Trillion Rp)	94.7	97.4	199.7	270.2	258.9	184.2
Share local to national spending	0.132	0.156	0.134	0.141	0.146	0.14

Source: Swasono (2007)

Table 3.2 Share of Local Spending Since Decentralization Era

Fiscal Year	2001	2002	2003	2004	2005	2001-2005 avg
Local Government (in Trillion Rp)	84.9	117	131.53	143.32	214.75	138.3
National Government Spending (Consolidated, in Trillion Rp)	426.9	462.6	508.03	573.32	757.15	545.6
Share local to national spending	0.199	0.253	0.259	0.250	0.284	0.25

Source: Swasono (2007)

3.2 Poverty Reduction in Indonesia

From the late 1970s until the mid 90s, Indonesia had been quite successful in reducing the national poverty level. For example, the number of population living in poverty declined from 54.2 million people (40.1%) in 1976 to 34.5 million people (17.7%) in 1996. The reduction of poverty in that era was caused by growth and increased in agricultural productivity. The economic crisis that hit the Indonesian economy in the mid 1997 changed the situation. The crisis increased the number of poor people to 49.5 million people (24.2%) in 1998. With some macroeconomic policies and development programs, the number of poor people decreased gradually to 36.1 million people (16.1%) in 2004 and 35.2 million (15.8%) at the end of 2005. Poverty trends from 1976 to 2005 are in Figure 1.

Even though the level of poverty is getting better, the large number of people living below another standard ("near poor") which is $2 a day need to be noticed. In 2005, around 15% of population lives below the national poverty line, of about US $1.5 a day, but around half of population, more than 110 million people live on less than US $2 a day (Figure 2).

Figure 1. Poverty Trends In Indonesia

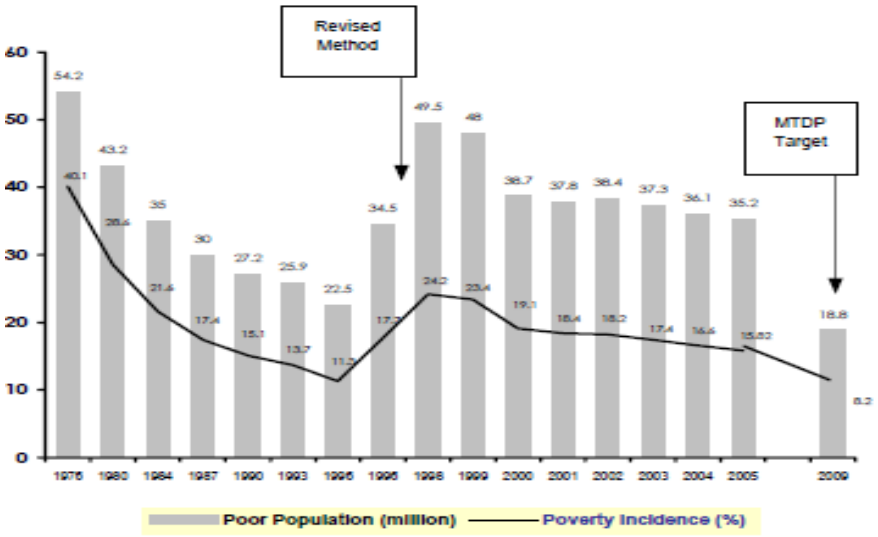
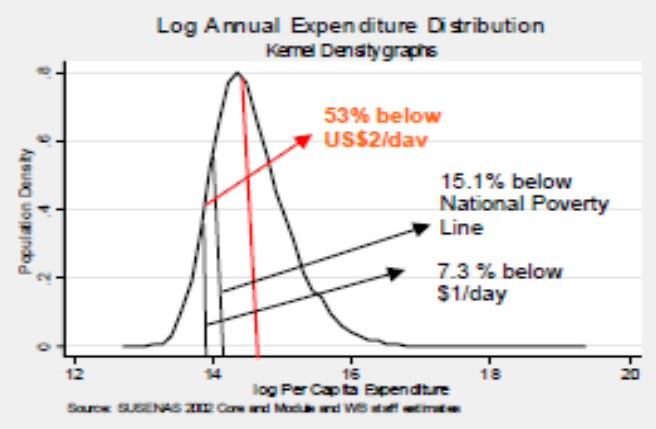


Figure 2. Poverty Rates



Source: Bappenas (2006)

Chapter 4
Data and Methodology

In chapter two, we discussed the literature review and the relationship between public spending and poverty reduction. Here, we outline the empirical data and methodology including model specification that we use to examine a causal effect of public spending and poverty reduction.

4.1 Data

The empirical analysis in this paper uses balanced panel data of 273 districts in Indonesia from 2001 to 2004. The data is collected from Indonesia's Socio-Economic Household Survey (*Susenas*), Ministry of Finance, and Statistic Indonesia (BPS). During the period of observation, some districts split and as a result, there are several new districts emerged. The data from the split districts are aggregated and assigned to the original district. The district definition frame, which is applied for the year 2000 (pre-decentralization), comprises 305 districts. Some of these districts were dropped from the sample for some reasons. First, the capital city, DKI Jakarta, consists of six districts but is treated as one observation, because the budget data is merged for the larger metropolis. Second, only districts which have complete *Susenas* data are analyzed in this study. Third, budget data is not available for all districts. Finally, two provinces, Aceh and Papua, are excluded since both have a special autonomy status in 2001 and their budgets are not comprised in the Ministry of Finance's dataset compilation.

Susenas data contains information on household socio-economic characteristics including some variables being analyzed in this study such as average age, household size, percentage female population, percentage rural population and clean water access. *Susenas* fielded every year and representative at the district level. We use 2001 to 2006 *Susenas* data for this paper.

Detailed records of local government spending from 2001 to 2004 are collected from Ministry of Finance. Both routine and development spending can be classified into some sectors, such as health, education, transport, social and agriculture. Since the Indonesian government changed the financial report format for provincial and district level spending according to Government Regulation 24/2005 about Governmental Accounting Standard, time consistent data for district expenditures are available only from 2001 to 2004.

The two data sources, *Susenas* and public spending data, are combined to construct a district level panel. Because the *Susenas* data are collected in February, while the local public spending data reflects the fiscal year from January to December, the effects of changes in public spending are observed in the *Susenas* of the following year. Therefore, the panel data contains district spending data of 2001 to 2004, linked with the *Susenas* data of 2002 to 2005.

In this study, we use three important poverty measures as we mentioned in chapter two: poverty headcount, poverty gap and poverty severity. The data of these poverty indices are calculated based on the poverty data from Statistics

Indonesia. Table 4.1 lists the variables used in this research, with their definitions and sources.

Table 4.1 Definitions and Sources of the Variables

Variable	Definition	Source
Poverty Headcount Ratio (p0)	The fraction of the population under the poverty line	BPS
Poverty Gap (p1)	The average income needed to bring all the poor to the poverty line	BPS
Poverty Severity (p2)	Inequality in the distribution of poor people's spending	BPS
pctot	Total district spending of total routine and development spending (per capita)	Ministry of Finance
Age	Average age	*Susenas*
Female	Female share	*Susenas*
Hhsize	Household size	*Susenas*
House	Owns house	*Susenas*
Water	The fraction of households in the district with access to clean water	*Susenas*
Rural	Rural share (percentage of rural population)	*Susenas*
Pops	Population of district	*Susenas*
Split	District split	*Susenas*
pcgrdp	Per Capita Gross Regional Domestic Products	BPS

4.2 Methodology

We use random effect Generalized Least Square (GLS) regression as the methodology in this research. The main assumption in our model is that unobserved effect is uncorrelated with each explanatory variable in every time period. Since the *Susenas* data is collected in February, while the spending data reflects the calendar year, from January to December, it is more natural to regress the poverty variables on the lagged spending. In addition, per capita Gross Regional Domestic Product (GRDP) is also lagged due to the similar reference period. Region and time interaction variables are included in the model to allow region specific shocks. Controlling variables consist of age, female, household size, house, water, rural, split, population and per capita GRDP. They are chosen because they are important district characteristics and important controlling variables that can affect poverty reduction. We use both linear and log specification in our models. Denoting the districts by the subscript *i* and the year of observation by the subscript *t*, the linear specification is as follows:

$$Pov = \beta_1 + \beta_2 lagpctot_{it-1} + \beta_3 laggrdp_{it-1} + \beta_4 age_{it} + \beta_5 female_{it} + \beta_6 hhsize_{it} + \beta_7 house_{it} + \beta_8 water_{it} + \beta_9 rural_{it} + \beta_{10} split_{it} + \beta_{11} water_{it} + \beta_{12} pops_{it} + dyear.region + \varepsilon_{it}$$

where *Pov* is Poverty Measure: Poverty Head Count Ratio (p0)/Poverty Gap (p1)/Poverty Severity (p2) at district level and *lagpctot* is lagged of total district spending (total routine and development spending) of each district during the period of observation. The term ε_{it} is the composite error term, which consists

of individual specific error component and the combined time series and cross-section error component. We expect the interaction between local public spending and poverty measure to have a negative sign. So, a 1 unit increase in district spending will reduce 1 unit of p0, p1 and p2. Regarding the controlling variables (the district characteristics), the coefficients are interpreted similarly like public spending, a 1 unit increase in all the controlling variables, will increase or decrease the poverty index, depending on the sign of the coefficients.

For log specification model, we take total spending, per capita GRDP and population in the log forms. Some log specifications in the model are needed to estimate elasticities. In this case, we would like to measure the percentage change in total district spending, per capita GRDP and population affecting change per unit of poverty index. The complete log specification is as follows:

$$Pov = \beta_1 + \beta_2 laglnpctot_{it-1} + \beta_3 laglngrdp_{it-1} + \beta_4 age_{it} + \beta_5 female_{it} + \beta_6 hhsize_{it} + \beta_7 house_{it} + \beta_8 water_{it} + \beta_9 rural_{it} + \beta_{10} split_{it} + \beta_{11} water_{it} + \beta_{12} lnpops_{it} + dyear.region + \varepsilon_{it}$$

In this model, different interpretation only occurs in variables with log form: spending, per capita GRDP and population. For example, if the correlation between total district spending and poverty has negative sign, it means that 1% increase in total district spending will reduce 1 unit of poverty index.

In order to be a more useful the panel data analysis, the unobserved factors which can affect the dependent variable need to be considered. This unobserved effect is usually denoted as variable a_i. This variable captures all of the unobserved time-constant factors that affect the dependent variable. Since i here denotes different district, we describe a_i as an unobserved district effect or a district fixed effect. It represents all factors affecting poverty measure that constant over time, for instance specific geographical feature of a district in a certain region and historical background.

When we use fixed effect model, the objective is to eliminate a_i since it is thought to be correlated with one or more explanatory variables. One method to remove it is by differencing the data in the adjacent time periods. After that a standard OLS can be applied on the data. If the time periods are more than two, pooled OLS can be used on the differenced data. We also must assume that homoskedasticity and the differenced errors are serially correlated.

The random effect approach assumes that the unobserved effect (a_i) is not correlated with all the explanatory variables. The unobserved effect can be included in the error term and the serial correlation over time can be handled by GLS estimation. If all the random effects assumptions hold, the random effect estimator is asymptotically more efficient than pooled OLS, first differencing, or fixed effects (Wooldridge, 2003).

So, the random effect method can only be appropriate if we can assume that the a_i are uncorrelated with all the independent variables. But if the a_i are correlated with some of them, the fixed effect or first differencing method is required. In order to determine which approach should be used in the analysis, we apply Hausman test.

Chapter 5
Findings and Analysis

In the following sections, we present the estimation results for each of the poverty indices: p0, p1 and p2 with linear model and log specification models on total spending, per capita GRDP, and population, then discuss the general findings and their policy implications.

5.1 The Effect of Total Public Spending on Poverty Headcount Ratio

Table 5.1 presents the impact of local public spending on poverty headcount index, using log specification model. Hausman test is conducted to determine whether fixed effect or random effect approach that should be used for analysis. The complete estimation results are in Appendix A.1.

Table 5.1 The Impact of Total Public Spending on Poverty Headcount Ratio, using log specification model

Variables	Fixed Effect (Robust Standard Error)	Random Effect (Robust Standard Error)
Laglnpctot	-0.0150*	-0.0213***
	(0.00859)	(0.00727)
Laglnpcgrdp	-0.00153	-0.0122**
	(0.00531)	(0.00481)
Age	-0.00352	0.000870
	(0.00359)	(0.00246)
Female	-0.334	-0.234
	(0.219)	(0.189)
Hhsize	0.0760***	0.0585***
	(0.0157)	(0.0106)
House	0.0853	0.110**
	(0.0660)	(0.0562)
Water	-0.0657*	-0.0801***
	(0.0354)	(0.0216)
Rural	0.325**	0.123***
	(0.163)	(0.0229)
Split	-0.0179**	-0.0153***
	(0.00785)	(0.00544)
Lnpops	-0.00487	-0.00151
	(0.0309)	(0.00676)
Constant	0.127	0.339
	(0.438)	(0.212)
Observations	788	788
R-squared	0.169	0.153
Number of districts	273	273
Hausman test	0.0915	

*Statistical significance: * at 10%, ** at 5%, and *** at 1% level*
Source: data calculated by author

Based on the result of Hausman test, P-value is 0.0915, which is insignificant since Prob>chi2 is larger than 0.05. Thus, it is statistically justifiable to use random effects. It means that district variation in poverty does not seem to be driven by district fixed effects (such as historical and institutional background) once we control for district spending, GRDP and some basic district

characteristics. From the Table 5.1 in random effect column, the result shows that increase in 1% of total district spending can lower poverty headcount ratio by 0.0213 next year. It can be inferred that every 1% increase in total spending will decrease the number of individuals under the poverty line by 0.0213 times the number of the population in each district. The result is statistically significant in 1% level of significance. Compared to current national poverty headcount, 14.15%, the amount of poverty reduction of each district is quite large. It implies that local government's expenditure can be a powerful instrument in reducing poverty level in the following year.

The policy implication of this finding is that since local government spending is effective in decreasing poverty, the local government should keep maintaining good control of the budget use so that the public spending can still be one of the media in reducing poverty. In order to be able to increase the effect of spending on poverty, the government might consider implementing some specific targeting programs in their spending to help the poor become independent and have a solid base to live their lives. The central government could also apply some policies to induce extra spending by district governments, for instance increasing the amount of participating fund which is obligatory in compliance with the transfers of Dana Alokasi Khusus (DAK) or Special Allocation Fund from central to district government. In addition, the central government can also encourage the district government to spend their savings in some bank accounts. Many of the local government has quite high level of savings but reluctant to spend them. They can also be encouraged to find alternative Pendapatan Asli Daerah (PAD) or Own Source Revenue to add their spending capacity. Another alternative could be in the form of allocating some fractions of General Allocation Fund (Dana Alokasi Umum) in region with very high fiscal capacity and allocate them to region with very small fiscal capacity.

The estimation result also reveals that per capita GRDP is significant in reducing poverty headcount. With 5% level of significance, it implies that every 1% increase in per capita GRDP reduces poverty headcount ratio by 0.0122 in the subsequent year. It can be inferred that 1% increase in per capita GRDP will decrease the number of individuals under the poverty line by 0.02 times the total population in every district. The result implies that regional growth is relevant in lowering the poverty level. This also means that the government should keep focus on raising regional growth. In particular, they should manage and monitor the pro-poor growth policies and programs, so that it can become more effective from time to time.

The regression result also depicts a finding that household size has positive relationship with poverty headcount. Additional one person in a household can raise poverty headcount ratio by 0.0585. It is statistically significant in 1% level of significance. Another meaning of this finding is that an additional one person in a household can increase the number of individuals under the poverty line by 0.0585 times the total population in each district. A relevant policy implication of this finding is the government should consider the intensification of family planning program to lower the average household size in district level and to reduce the number of population in Indonesia.

Another positive relationship in Table 5.1 includes house variable. Based on the estimation results, an increase of 1 person owning a house leads to an increase in poverty headcount ratio by 0.11. With 5% level of significance, it describes the fact that even though the number of people which have their own house is increasing, the poverty headcount ratio is worsening. It means that the welfare of some people increase but the distribution of income is not really equal; the welfare only covers the mid-upper group level of income of the population. Policy implication of this finding could be in the form of how the government can provide affordable housing for poor people, especially the ones who do not own a house yet.

The last positive relation in this first estimation is rural share (percentage of rural population) on poverty. Based on the table above, with 1% level of significance, a 1% increase in rural population will increase poverty headcount by 0.123. In Indonesia, the number of poor people living in rural area is larger than the ones living in urban area. The result suggests that the more population in rural area, the worse the poverty level in the district. This indicates that the government should expand the development in rural regions.

Clean water access and district splits are the variables which can contribute to reducing poverty, in this case poverty headcount index. The estimation result reveals that access to clean water is statistically significant at 1% level of significance. 1% increase in the fraction of households with access to clean water will reduce poverty headcount ratio by 0.08. The easier people get access to clean water, the better condition they will be. This is why the government should pay more attention to facilitate the community, especially with low income, with easy access to clean water.

District splits also have 1% level of significance in the causal relation with poverty. A split district will reduce poverty headcount ratio by 0.0153. If split district emerges, it will decrease the number of individuals under the poverty line by 0.0153 times the total population in that district. This result implies that split district may have a good effect on poverty reduction. So, the government can consider allowing a district to split if all the requirements to stand alone as a new district are fulfilled. A regional government in new split district will likely be able to match public goods to local preferences better than will higher-level governments, due to closer gap to local residents.

Table 5.2 reveals the estimation result of the impact of local public spending on poverty headcount ratio, using linear specification model. Hausman test is applied to decide whether fixed effect or random effect method that should be used for the analysis. The complete estimation results are in Appendix A.2. Based on the result of Hausman test, P-value is 0.977, which is insignificant because Prob>chi2 is bigger than 0.05. So, it is safe to use random effects. It means that district variation in poverty does not seem to be driven by district fixed effects. From the Table 5.2 in random effect column, the result shows that an increase in 1 Rupiah (Rp) of total district spending can reduce poverty headcount ratio by 0.0000000185 next year. It also can be concluded that every Rp1 increase in total district spending will reduce the number of individuals under the poverty line by 0.0000000185 times the number of the population in each district. The result is statistically significant in 1% level of significance. It implies that local government's expenditure can be an effective

instrument in reducing poverty level in the next year. The policy implication of this finding is similar to the ones with log specification model.

Table 5.2 The Impact of Total Public Spending on Poverty Headcount Ratio using linear specification model

Variables	Fixed Effect (Robust Standard Error)	Random Effect (Robust Standard Error)
lagpctot	-1.56e-08***	-1.85e-08***
	(5.26e-09)	(5.34e-09)
lagpcgrdp	4.31e-10	2.2e-11
	(4.01e-10)	(3.86e-10)
Age	-0.00325	0.000699
	(0.00358)	(0.00255)
female	-0.322	-0.210
	(0.218)	(0.189)
hhsize	0.0779***	0.0609***
	(0.0155)	(0.0108)
house	0.0763	0.109*
	(0.0656)	(0.0563)
water	-0.0635*	-0.0855***
	(0.0355)	(0.0219)
Rural	0.410**	0.140***
	(0.161)	(0.0227)
Split	-0.0186**	-0.0164***
	(0.00778)	(0.00540)
Pops	6.46e-09	4.02e-09
	(4.62e-08)	(7.24e-09)
Constant	-0.215	-0.140
	(0.191)	(0.143)
Observations	788	788
R-squared	0.170	0.159
Number of districts	273	273
Hausman test	0.977	

*Statistical significance: * at 10%, ** at 5%, and *** at 1% level*
Source: data calculated by author

Other similar results involve household size, own house, and rural share which have positive relationship, and clean water access and split district which have negative relationship with poverty headcount index. Household size and rural share are statistically significant in 1% level of significance, while own house is significant in 10% level of significance. It can be concluded from the regression result that an additional one person in one household can increase the number of individuals under the poverty line by 0.0609 times the total population in each district. Other positive relations are an increase of 1 person owning a house leads to an increase in poverty headcount ratio by 0.109, whereas 1% increase in rural population will increase poverty headcount by 0.14. In the negative relation, 1% increase in the fraction of households with access to clean water will reduce poverty headcount ratio by 0.0855 and one district split decrease poverty headcount by 0.0164. The policy implications of these findings are the same with findings in the previous model.

5.2 The Effect of Total Public Spending on Poverty Gap

Table 5.3 presents the impact of local public spending on poverty gap index, using log specification model. Hausman test is conducted to determine whether fixed effect or random effect approach should be used for analysis.

The complete estimation results are in Appendix B.1. Based on the result of Hausman test, P-value is 0.05565, which is insignificant since Prob>chi2 is larger than 0.05. Accordingly, it is statistically justifiable to use random effects. It means that district variation in poverty is not driven by district fixed effects such as geographical feature, once we control for district spending, per capita GRDP and some basic district characteristics. From the Table 5.1 in random effect column, the result shows that increase in 1% of total district spending can lower poverty gap measure by 0.00683 next year. It can be inferred that every 1% increase in total spending will decrease the gap to the poverty line by 0.00683 in each district for the following year. The result is statistically significant in 1% level of significance.

Table 5.3 The Impact of Total Public Spending on Poverty Gap Measure, using log specification model

Variables	Fixed Effect (Robust Standard Error)	Random Effect (Robust Standard Error)
laglnpctot	-0.00548**	-0.00683***
	(0.00239)	(0.00203)
laglnpcgrdp	0.000494	-0.00257**
	(0.00121)	(0.00118)
age	-0.00143	4.23e-05
	(0.00107)	(0.000611)
female	-0.0743	-0.0587
	(0.0585)	(0.0525)
hhsize	0.0201***	0.0141***
	(0.00504)	(0.00298)
house	0.00459	0.0137
	(0.0173)	(0.0148)
water	-0.0145	-0.0182***
	(0.00910)	(0.00516)
rural	0.117***	0.0251***
	(0.0416)	(0.00574)
split	-0.00325	-0.00236
	(0.00199)	(0.00148)
lnpops	-0.00657	-0.00135
	(0.00697)	(0.00168)
Constant	0.0978	0.120**
	(0.102)	(0.0590)
Observations	788	788
R-squared	0.125	0.1033
Number of districts	273	273
Hausman test	0.5565	

*Statistical significance: * at 10%, ** at 5%, and *** at 1% level*
Source: data calculated by author

Compared to current national poverty gap, 2.5, the amount of this poverty gap reduction is huge. It implies that local government's expenditure can be a powerful instrument in reducing poverty level. The policy implication of this finding is that since local government spending is effective in decreasing poverty, the local government should keep maintaining good supervision on the use of the local government budget so that the public spending can still be useful in reducing poverty. To increase the effect of spending on poverty, the government can consider implementing some narrow targeting programs to the poor in their spending to help them escaping from poverty completely.

The estimation result also shows that per capita GRDP is significant in decreasing poverty gap. With 5% level of significance, it implies that every 1%

increase in per capita GRDP reduces poverty gap index by 0.00257 in the subsequent year. It can be inferred that 1% increase in per capita GRDP will lower the gap to the poverty line by 0.00257 next year. The result implies that regional growth is relevant in reducing the poverty gap. This also means that the government should keep focus on increasing regional growth. In particular, they should manage and monitor the pro-poor growth policies and programs, so that it can become more effective from time to time.

The regression result also reveals a finding that household size has positive relationship with poverty gap. Adding one person in a household can increase poverty gap index by 0.00257. It is statistically significant in 1% level of significance. Another meaning of this finding is that an addition one person in one household can increase the gap from the poverty line by 0.00257 in each district. A relevant policy implication of this finding is the government should consider the intensification of family planning program to decrease the average household size in district level and to lower the population in Indonesia.

Another positive relation is in the causal relation between rural (percentages of rural population) on poverty. Based on the table above, with 1% level of significance, a 1% increase in rural population will increase poverty gap by 0.0251. The number of poor people living in rural area is larger than the ones living in urban area. The result suggests that the more population in rural area, the worse the poverty gap in the district. The result indicates that the government should develop the rural regions even further.

Water access is the only district characteristic which can contribute to reducing poverty, in this case poverty gap measure. The estimation result shows that access to clean water is statistically significant at 1 % level of significance. 1% increase in the fraction of households with access to clean water will reduce poverty gap by 0.0182. Since water is the essential natural resource, the easier people get access to clean water, the better condition they will be. This is why the government should give more attention to accommodate the society, especially with group of low income people, with easy access to clean water.

Table 5.4 describes the estimation result of the effect of local public spending on poverty gap measure, using linear specification model. Hausman test is used to decide whether fixed effect or random effect method that should be applied in the analysis. The complete estimation results are in Appendix B.2. Based on the result of Hausman test, P-value is 0.2813, which is insignificant because Prob>chi2 is bigger than 0.05. Hence, it is safe to use random effects. It means that district variation in poverty is not driven by district fixed effects. From the Table 5.4 in random effect column, the result shows that Rp1 of total district spending can narrow poverty gap from the poverty line by 0.000000004.51 next year. The result is statistically significant in 1% level of significance. It implies that local government's expenditure can be a useful medium in decreasing poverty level in the subsequent year. The policy implication of this finding is similar to the ones with log specification model.

Other similar results involve household size and rural share with positive relationship, and clean water access and split district with negative relationship on poverty gap measure. Household size and rural share are statistically significant in 1% level of significance. It can be concluded from the regression result that an addition one person in one household can increase the poverty gap

from the poverty line by 0.0146 in each district. Another positive relation is an additional 1% in rural population will increase poverty gap for 0.140. In the negative relation, 1% increase in the fraction of households with access to clean water will reduce poverty gap for 0.0196 and one district split decrease poverty gap for 0.00261. The policy implications of these findings are the same with findings in the log specification model.

Table 5.4 The Impact of Total Public Spending on Poverty Gap using linear specification model

Variables	Fixed Effect (Robust Standard Error)	Random Effect (Robust Standard Error)
lagpctot	-4.15e-09***	-4.51e-09***
	(1.47e-09)	(1.46e-09)
lagpcgrdp	1.71e-10*	4.44e-11
	(9.36e-11)	(9.44e-11)
Age	-0.00133	2.31e-05
	(0.00106)	(0.000635)
Female	-0.0706	-0.0492
	(0.0582)	(0.0523)
Hhsize	0.0205***	0.0146***
	(0.00508)	(0.00309)
House	0.00142	0.0139
	(0.0173)	(0.0149)
Water	-0.0137	-0.0196***
	(0.00919)	(0.00531)
Rural	0.142***	0.0289***
	(0.0432)	(0.00571)
Split	-0.00342*	-0.00261*
	(0.00199)	(0.00146)
Pops	-6.88e-09	8.75e-10
	(1.11e-08)	(1.65e-09)
Constant	-0.0649	-0.0294
	(0.0528)	(0.0371)
Observations	788	788
R-squared	0.122	0.104
Number of districts	273	273
Hausman test	0.2813	

*Statistical significance: * at 10%, ** at 5%, and *** at 1% level*
Source: data calculated by author

5.3 The Effect of Total Public Spending on Poverty Severity

Table 5.5 presents the impact of local public spending on poverty severity using log specification model. Hausman test is used to determine whether we should apply fixed effect or random effect method in the analysis. The complete estimation results are in Appendix C.1. Based on the result of Hausman test, P-value is 0.9976, which is insignificant since Prob>chi2 is larger than 0.05. Consequently, it is statistically justifiable to use random effects. It means that district variation in poverty is not affected by district fixed effects once district spending, per capita GRDP and some basic district characteristics are controlled.

From the Table 5.5 in random effect column, the result shows that an increase in 1% of total district spending can decrease poverty severity by 0.00253 next year. It can be inferred that every 1% increase in total spending will decrease inequality in the distribution of poor people's spending by 0.00253 in

each district for the following year. The result is statistically significant in 1% level of significance. Compared to current national poverty severity, 0.68, the amount of poverty severity reduction is enormous. It implies that local government's expenditure can be an influential instrument in reducing poverty level. The policy implication of this finding is that the local government should keep monitoring the use of the budget so that the public spending can still be benefit to the poor. So as to be able to increase the effect of spending on poverty, the government can consider implementing some narrow targeting programs to the poor in their spending to help them out of poverty.

Table 5.5 The Impact of Total Public Spending on Poverty Severity using log specification model

Variables	Fixed Effect (Robust Standard Error)	Random Effect (Robust Standard Error)
laglnpctot	-0.00216**	-0.00253***
	(0.00105)	(0.000855)
laglnpcgrdp	0.000143	-0.00110**
	(0.000467)	(0.000450)
age	-0.000655	4.61e-06
	(0.000510)	(0.000227)
female	-0.0267	-0.0243
	(0.0246)	(0.0226)
hhsize	0.00770***	0.00476***
	(0.00226)	(0.00121)
house	-0.00330	0.00186
	(0.00748)	(0.00593)
water	-0.00443	-0.00576***
	(0.00366)	(0.00191)
rural	0.0497***	0.00756***
	(0.0169)	(0.00223)
split	-0.000869	-0.000459
	(0.000753)	(0.000634)
lnpops	-0.00267	-0.000712
	(0.00271)	(0.000665)
Constant	0.0406	0.0542**
	(0.0396)	(0.0253)
Observations	788	788
R-squared	0.097	0.074
Number of districts	273	273
Hausman test	0.9976	

*Statistical significance: * at 10%, ** at 5%, and *** at 1% level*

Source: data calculated by author

The estimation result reveals that per capita GRDP is significant in reducing poverty severity. With 5% level of significance, it implies that every 1% increase in per capita GRDP reduces poverty severity by 0.0011 in the subsequent year. It can be concluded that 1% increase in per capita GRDP will decrease inequality in the distribution of poor people's spending by 0.0011 in each district for the following year. The result implies that regional growth is relevant in lowering the poverty level. This also means that the government should keep focus on raising regional growth. In particular, they should manage and monitor the pro-poor growth policies and programs, so that it can become more effective in reducing poverty.

The regression result also describes a finding that household size has positive relationship with poverty severity. Additional one person in a household can raise poverty severity by 0.00476. It is statistically significant in 1%

level of significance. A relevant policy implication of this finding is the government should consider the intensification of family planning program to lower the average household size in district level and to reduce the number of population in Indonesia.

Rural share has positive relationship on poverty as well. Based on the table above, with 1% level of significance, a 1% increase in rural population will increase poverty severity by 0.00756. In Indonesia, the number of poor people living in rural area is larger than the ones living in urban area. The result suggests that the more population in rural area, the worse the poverty level in the district. This indicates that the government should expand the development in rural regions.

Clean water access is the only variable of district characteristics which can contribute in decreasing poverty severity. The estimation result describes that access to clean water is statistically significant at 1 % level of significance. 1% increase in the fraction of households with access to clean water will reduce poverty severity by 0.00576. The easier people get access to clean water, the better condition they will be. This is why the government should pay more attention to facilitate the community, especially with low income, with easy access to clean water.

Table 5.6 The Impact of Total Public Spending on Poverty Severity using linear specification model

Variables	Fixed Effect (Robust Standard Error)	Random Effect (Robust Standard Error)
Lagpctot	-1.55e-09**	-1.53e-09**
	(6.76e-10)	(6.13e-10)
Lagpcgrdp	6.21e-11*	8.37e-12
	(6.97e-11)	(6.24e-11)
Age	-0.000619	4.73e-06
	(0.000508)	(0.000237)
Female	-0.0253	-0.0198
	(0.0245)	(0.0223)
Hhsize	0.00782***	0.00497***
	(0.00229)	(0.00126)
House	-0.00445	0.00230
	(0.00759)	(0.00604)
Water	-0.00412	-0.00634***
	(0.00371)	(0.00200)
Rural	0.0593***	0.00884***
	(0.0183)	(0.00223)
Split	-0.000935	-0.000557
	(0.000753)	(0.000630)
Pops	-2.68e-09	2.39e-10
	(4.55e-09)	(5.68e-10)
Constant	-0.0251	-0.00805
	(0.0216)	(0.0142)
Observations	788	788
R-squared	0.094	0.0745
Number of districts	273	273
Hausman test	0.0838	

*Statistical significance: * at 10%, ** at 5%, and *** at 1% level*
Source: data calculated by author

Table 5.6 shows the estimation result of the impact of local public spending on poverty severity, using linear specification model. Hausman test is ap-

plied to decide whether fixed effect or random effect method that should be used for the analysis. The complete estimation results are in Appendix C.2. Based on the result of Hausman test, P-value is 0.0838, which is insignificant because Prob>chi2 is bigger than 0.05. Hence, it is safe to use random effects. It means that district variation in poverty is not driven by district fixed effects. From the Table 5.6 in random effect column, the result shows that an increase in Rp1 of total district spending can reduce poverty severity by 0.00000000153 next year. It also can be concluded that every Rp1 increase in total district spending will decrease inequality in the distribution of poor people's spending by 0.00000000153 in each district for the following year. The result is statistically significant in 1% level of significance. It implies that local government's expenditure can be a potential instrument for lowering poverty severity in the subsequent year. The policy implication of this finding is similar to the ones with log specification model.

Other similar results involve household size and rural share which have positive relationship, and clean water access which has negative relationship with poverty severity. Household size and rural share are statistically significant in 1% level of significance. It can be concluded from the regression result that an additional one person in a household can increase poverty severity by 0.00497, while 1% increase in rural population will increase poverty severity by 0.00884. In the negative relation, 1% increase in the fraction of households with access to clean water will reduce poverty severity by 0.00634. The policy implications of these findings are the same with findings in the earlier model.

Chapter 6
Conclusion

This paper gives empirical evidence using log and linear specification models on the relationship between local public spending and poverty reduction. Using balanced panel data of 273 districts in Indonesia from 2001 to 2004 and random effect Generalized Least Square (GLS) regression as the methodology, we find that local government spending can be a powerful instrument in reducing poverty headcount, poverty gap and poverty severity in the following year. The policy implication of this finding is that since local government spending is effective in decreasing poverty, the local government should keep maintaining good control of the budget use so that the public spending can still be one of the media in reducing poverty. In order to be able to increase the effect of spending on poverty, the government might consider implementing some specific targeting programs in their spending to help the poor become independent and have a solid base to live their lives. The central government could also apply some policies to induce extra spending by district governments, for instance increasing the amount of participating fund which is obligatory in compliance with the transfers of Special Allocation Fund from central to district government. In addition, the central government can also encourage the district government to spend their savings. Many of the local government has quite high level of savings but reluctant to spend them. They can also be encouraged to find alternative Own Source Revenue to add their spending capacity. Another alternative could be in the form of allocating some fractions of General Allocation Fund in region with very high fiscal capacity and allocate them to region with very small fiscal capacity.

Using log specification model, we find that per capita GRDP is significant in reducing poverty headcount, poverty gap and poverty severity. The result implies that regional growth is relevant in decreasing the poverty level. It means that the government should keep focus on raising regional growth. In particular, they should manage and monitor the pro-poor growth policies and programs, so that it can become more effective in reducing poverty. We find no correlation between per capita GRDP and poverty in the linear specification model.

Regarding the district characteristics, we find that household size and percentage of rural population have positive relationship with poverty reduction. On the other hand, clean water access is the only variable which can contribute to reducing all three poverty measures. Own house variable is only significant in reducing poverty headcount, but not other poverty indices. Meanwhile, district split can reduce poverty headcount and poverty gap, but not poverty severity.

The shortcoming of this study is that it does not cover all the districts in Indonesia during the period of observation due to several limitations. It also only captures the total district spending but not sectoral district spending. The period of research can also be enlarged to more than four years. Based on

these limitations, the further area of study can involve all districts spending, several types of spending and capture longer period of observation.

Appendices

Appendix A.1

Fixed-effects (within) regression — Number of obs = 788
Group variable: id_299 — Number of groups = 273

R-sq: within = 0.1688 — Obs per group: min = 1
between = 0.3620 — avg = 2.9
overall = 0.3469 — max = 3

F(20,495) = 5.03
corr(u_i, Xb) = -0.4841 — Prob > F = 0.0000

p0	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
laglnpctot	-.0150265	.0083368	-1.80	0.072	-.0314064	.0013534
laglnpcgrdp	-.0015302	.0057407	-0.27	0.790	-.0128094	.0097489
age	-.0035217	.0037814	-0.93	0.352	-.0109513	.0039079
female	-.3335282	.2085275	-1.60	0.110	-.7432365	.07618
hhsize	.076033	.0137634	5.52	0.000	.048991	.1030749
house	.0853164	.0766738	1.11	0.266	-.0653298	.2359627
water	-.0656944	.0387069	-1.70	0.090	-.1417445	.0103558
rural	.325343	.1724525	1.89	0.060	-.0134861	.6641722
split	-.0178891	.0059191	-3.02	0.003	-.0295187	-.0062596
lnpops	-.0048687	.037347	-0.13	0.896	-.078247	.0685096
_Iregion_2	(dropped)					
_Iregion_3	(dropped)					
_Iregion_4	(dropped)					
_Iregion_5	(dropped)					
_Iyear_2002	(dropped)					
_Iyear_2003	-.0088149	.0087575	-1.01	0.315	-.0260213	.0083915
_Iyear_2004	-.0180338	.0081384	-2.22	0.027	-.0340239	-.0020437
_Iyear_2005	(dropped)					
_Iyear_2006	(dropped)					
_Ireg~2_2002	-.016093	.0087779	-1.83	0.067	-.0333395	.0011535
_Ireg~2_2003	(dropped)					
_Ireg~2_2004	.0039533	.0082974	0.48	0.634	-.0123491	.0202557
_Ireg~2_2005	(dropped)					
_Ireg~2_2006	(dropped)					
_Ireg~3_2002	(dropped)					
_Ireg~3_2003	-.0085149	.0101313	-0.84	0.401	-.0284206	.0113908
_Ireg~3_2004	.0194962	.0101969	1.91	0.056	-.0005384	.0395307
_Ireg~3_2005	(dropped)					
_Ireg~3_2006	(dropped)					
_Ireg~4_2002	.003	.0110973	0.27	0.787	-.0188036	.0248036
_Ireg~4_2003	(dropped)					
_Ireg~4_2004	.0029797	.0111436	0.27	0.789	-.018915	.0248743
_Ireg~4_2005	(dropped)					
_Ireg~4_2006	(dropped)					
_Ireg~5_2002	(dropped)					
_Ireg~5_2003	.0099901	.0134563	0.74	0.458	-.0164483	.0364286
_Ireg~5_2004	.0387966	.0132871	2.92	0.004	.0126905	.0649027
_Ireg~5_2005	(dropped)					
_Ireg~5_2006	(dropped)					
_cons	.1273016	.5309964	0.24	0.811	-.9159831	1.170586
sigma_u	.11561184					
sigma_e	.0366864					
rho	.90851735	(fraction of variance due to u_i)				

F test that all u_i=0: F(272, 495) = 13.21 — Prob > F = 0.0000

Random-effects GLS regression — Number of obs = 788
Group variable: id_299 — Number of groups = 273

R-sq: within = 0.1530 — Obs per group: min = 1
between = 0.5869 — avg = 2.9
overall = 0.5686 — max = 3

Random effects u_i ~ Gaussian — Wald chi2(24) = 477.01
corr(u_i, X) = 0 (assumed) — Prob > chi2 = 0.0000

p0	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
laglnpctot	-.0212727	.0074783	-2.84	0.004	-.03593	-.0066155
laglnpcgrdp	-.0122415	.0051131	-2.39	0.017	-.022263	-.00222
age	.0008701	.0024346	0.36	0.721	-.0039016	.0056418
female	-.2344465	.189864	-1.23	0.217	-.6065732	.1376801
hhsize	.05851	.0105518	5.55	0.000	.0378289	.0791912
house	.1102708	.0602542	1.83	0.067	-.0078253	.2283668
water	-.0800609	.0245926	-3.26	0.001	-.1282615	-.0318603
rural	.1232132	.0245556	5.02	0.000	.0750852	.1713412
split	-.0153072	.0058718	-2.61	0.009	-.0268157	-.0037988
lnpops	-.0015091	.0078399	-0.19	0.847	-.016875	.0138567
_Iregion_2	-.0519183	.0190001	-2.73	0.006	-.0891579	-.0146787
_Iregion_3	-.0476571	.020519	-2.32	0.020	-.0878736	-.0074406
_Iregion_4	-.0360325	.0228132	-1.58	0.114	-.0807455	.0086804
_Iregion_5	.1348252	.0257601	5.23	0.000	.0843364	.185314
_Iyear_2002	.0050999	.0073423	0.69	0.487	-.0092908	.0194906
_Iyear_2003	.0100625	.005321	1.89	0.059	-.0003665	.0204915
_Ireg~2_2002	-.0213042	.0084582	-2.52	0.012	-.0378819	-.0047264
_Ireg~2_2003	-.0054298	.0083299	-0.65	0.514	-.021756	.0108964
_Ireg~3_2002	.0106658	.0099618	1.07	0.284	-.0088589	.0301905
_Ireg~3_2004	.0293821	.0101666	2.89	0.004	.0094559	.0493083
_Ireg~4_2002	-.0004134	.0111738	-0.04	0.970	-.0223138	.0214869
_Ireg~4_2003	-.0049048	.011203	-0.44	0.662	-.0268622	.0170527
_Ireg~5_2003	.0101404	.0133584	0.76	0.448	-.0160416	.0363223
_Ireg~5_2004	.0370694	.0132306	2.80	0.005	.0111379	.063001
_cons	.339385	.2353471	1.44	0.149	-.1218868	.8006567
sigma_u	.0772899					
sigma_e	.0366864					
rho	.81612547	(fraction of variance due to u_i)				

	Coefficients (b) fixed	(B) random	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
laglnpctot	-.0150265	-.0212727	.0062462	.0036847
laglnpcgrdp	-.0015302	-.0122415	.0107113	.0026099
age	-.0035217	.0008701	-.0043918	.0028934
female	-.3335282	-.2344465	-.0990817	.0862286
hhsize	.076033	.05851	.0175229	.008837
house	.0853164	.1102708	-.0249543	.0474163
water	-.0656944	-.0800609	.0143665	.0298903
rural	.325343	.1232132	.2021298	.1706953
split	-.0178891	-.0153072	-.0025819	.0007468
lnpops	-.0048687	-.0015091	-.0033596	.0365149
_Iyear_2003	-.0088149	.0100625	-.0188774	.0069556
_Ireg~2_2002	-.016093	-.0213042	.0052112	.0023475
_Ireg~3_2004	.0194962	.0293821	-.009886	.0007851
_Ireg~4_2002	.003	-.0004134	.0034135	.
_Ireg~5_2003	.0099901	.0101404	-.0001503	.0016202
_Ireg~5_2004	.0387966	.0370694	.0017272	.0012239

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(16) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 23.91
Prob>chi2 = 0.0915
(V_b-V_B is not positive definite)

Appendix A.2

Fixed-effects (within) regression — Number of obs = 788
Group variable: id_299 — Number of groups = 273

R-sq: within = 0.1696 — Obs per group: min = 1
between = 0.3544 — avg = 2.9
overall = 0.3388 — max = 3

F(20,495) = 5.05
corr(u_i, Xb) = -0.6175 — Prob > F = 0.0000

p0	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lagpctot	-1.56e-08	7.88e-09	-1.98	0.048	-3.11e-08	-1.51e-10
lagpcgrdp	4.31e-10	5.48e-10	0.79	0.432	-6.46e-10	1.51e-09
age	-.0032502	.0037804	-0.86	0.390	-.0106778	.0041775
female	-.3223133	.2080214	-1.55	0.122	-.7310269	.0864004
hhsize	.0778897	.0138539	5.62	0.000	.0506701	.1051093
house	.0762615	.0767834	0.99	0.321	-.0746001	.227123
water	-.0635059	.038589	-1.65	0.100	-.1393244	.0123126
rural	.4104563	.1717428	2.39	0.017	.0730216	.7478911
split	-.0186326	.0059199	-3.15	0.002	-.0302637	-.0070014
pops	6.46e-09	5.40e-08	0.12	0.905	-9.96e-08	1.13e-07
_Iregion_2	(dropped)					
_Iregion_3	(dropped)					
_Iregion_4	(dropped)					
_Iregion_5	(dropped)					
_Iyear_2002	(dropped)					
_Iyear_2003	-.0145948	.0068308	-2.14	0.033	-.0280157	-.001174
_Iyear_2004	-.0246933	.0062152	-3.97	0.000	-.0369048	-.0124818
_Iyear_2005	(dropped)					
_Iyear_2006	(dropped)					
_Ireg~2_2002	-.0154781	.008786	-1.76	0.079	-.0327405	.0017843
_Ireg~2_2003	(dropped)					
_Ireg~2_2004	.0042099	.0082933	0.51	0.612	-.0120844	.0205043
_Ireg~2_2005	(dropped)					
_Ireg~2_2006	(dropped)					
_Ireg~3_2002	(dropped)					
_Ireg~3_2003	-.0070862	.0102903	-0.69	0.491	-.0273043	.013132
_Ireg~3_2004	.0212919	.0104211	2.04	0.042	.0008169	.0417669
_Ireg~3_2005	(dropped)					
_Ireg~3_2006	(dropped)					
_Ireg~4_2002	-.0040874	.0115192	-0.35	0.723	-.02672	.0185452
_Ireg~4_2003	-.0047002	.0111104	-0.42	0.672	-.0265295	.0171291
_Ireg~4_2004	(dropped)					
_Ireg~4_2005	(dropped)					
_Ireg~4_2006	(dropped)					
_Ireg~5_2002	(dropped)					
_Ireg~5_2003	.0082341	.0131979	0.62	0.533	-.0176967	.0341648
_Ireg~5_2004	.037749	.0131934	2.86	0.004	.0118269	.0636711
_Ireg~5_2005	(dropped)					
_Ireg~5_2006	(dropped)					
_cons	-.2145218	.1982951	-1.08	0.280	-.6041257	.1750821
sigma_u	.12939162					
sigma_e	.03666925					
rho	.9256567	(fraction of variance due to u_i)				

F test that all u_i=0: F(272, 495) = 14.22 — Prob > F = 0.0000

Random-effects GLS regression — Number of obs = 788
Group variable: id_299 — Number of groups = 273

R-sq: within = 0.1585 — Obs per group: min = 1
between = 0.5673 — avg = 2.9
overall = 0.5505 — max = 3

Random effects u_i ~ Gaussian — Wald chi2(24) = 443.35
corr(u_i, X) = 0 (assumed) — Prob > chi2 = 0.0000

p0	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
lagpctot	-1.85e-08	7.05e-09	-2.62	0.009	-3.23e-08	-4.64e-09
lagpcgrdp	2.20e-11	5.16e-10	0.04	0.966	-9.89e-10	1.03e-09
age	.0006991	.0025001	0.28	0.780	-.0042009	.0055992
female	-.2095908	.1892518	-1.11	0.268	-.5805175	.1613358
hhsize	.0609139	.0106992	5.69	0.000	.0399438	.081884
house	.1089705	.0608283	1.79	0.073	-.0102508	.2281919
water	-.0855434	.0247812	-3.45	0.001	-.1341136	-.0369732
rural	.1401787	.0247888	5.65	0.000	.0915936	.1887638
split	-.0164173	.0058309	-2.82	0.005	-.0278457	-.004989
pops	4.02e-09	9.53e-09	0.42	0.673	-1.47e-08	2.27e-08
_Iregion_2	-.0780604	.0191441	-4.08	0.000	-.1155822	-.0405386
_Iregion_3	-.0412349	.0207315	-1.99	0.047	-.0818679	-.0006019
_Iregion_4	-.0435741	.0232665	-1.87	0.061	-.0891755	.0020274
_Iregion_5	.143003	.0261622	5.47	0.000	.091726	.19428
_Iyear_2003	-.0089175	.0055655	-1.60	0.109	-.0198257	.0019907
_Iyear_2004	-.0211155	.0055704	-3.79	0.000	-.0320334	-.0101976
_Ireg~2_2003	.0122015	.0082946	1.47	0.141	-.0040556	.0284586
_Ireg~2_2004	.0178363	.0082727	2.16	0.031	.0016221	.0340505
_Ireg~3_2003	-.0115643	.0099103	-1.17	0.243	-.030988	.0078595
_Ireg~3_2004	.0186038	.010157	1.83	0.067	-.0013036	.0385113
_Ireg~4_2002	-.006189	.0112617	-0.55	0.583	-.0282615	.0158836
_Ireg~4_2003	-.0081362	.0110802	-0.73	0.463	-.0298529	.0135805
_Ireg~5_2002	-.0048875	.0129149	-0.38	0.705	-.0302003	.0204253
_Ireg~5_2004	.0282516	.012786	2.21	0.027	.0031915	.0533116
_cons	-.1398018	.1370993	-1.02	0.308	-.4085115	.128908
sigma_u	.08097422					
sigma_e	.03666925					
rho	.82982456	(fraction of variance due to u_i)				

	Coefficients (b) fixed	(B) random	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
lagpctot	-1.56e-08	-1.85e-08	2.82e-09	3.52e-09
lagpcgrdp	4.31e-10	2.20e-11	4.09e-10	1.86e-10
age	-.0032502	.0006991	-.0039493	.0028357
female	-.3223133	-.2095908	-.1127224	.0863519
hhsize	.0778897	.0609139	.0169758	.0088009
house	.0762615	.1089705	-.0327091	.0468573
water	-.0635059	-.0855434	.0220375	.0295805
rural	.4104563	.1401787	.2702776	.1699444
split	-.0186326	-.0164173	-.0022152	.0010225
pops	6.46e-09	4.02e-09	2.44e-09	5.32e-08
_Iyear_2003	-.0145948	-.0089175	-.0056773	.0039604
_Iyear_2004	-.0246933	-.0211155	-.0035778	.0027567
_Ireg~2_2004	.0042099	.0178363	-.0136264	.0005834
_Ireg~3_2003	-.0070862	-.0115643	.0044781	.0027708
_Ireg~3_2004	.0212919	.0186038	.0026881	.0023309
_Ireg~4_2002	-.0040874	-.006189	.0021016	.0024221
_Ireg~4_2003	-.0047002	-.0081362	.003436	.0008188
_Ireg~5_2004	.037749	.0282516	.0094974	.0032535

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(15) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 6.15
Prob>chi2 = 0.9771
(V_b-V_B is not positive definite)

Appendix B.1

```
Fixed-effects (within) regression               Number of obs      =       788
Group variable: id_299                          Number of groups   =       273

R-sq:  within  = 0.1247                         Obs per group: min =         1
       between = 0.2641                                        avg =       2.9
       overall = 0.2457                                        max =         3

                                                F(20,495)          =      3.53
corr(u_i, Xb)  = -0.7304                        Prob > F           =    0.0000
```

p1	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
laglnpctot	-.0054835	.0023805	-2.30	0.022	-.0101607	-.0008063
laglnpcgrdp	.0004943	.0016392	0.30	0.763	-.0027264	.003715
age	-.0014326	.0010798	-1.33	0.185	-.003554	.0006889
female	-.0742637	.0595441	-1.25	0.213	-.191254	.0427267
hhsize	.0201306	.0039301	5.12	0.000	.0124089	.0278523
house	.0045853	.0218939	0.21	0.834	-.0384311	.0476017
water	-.0145109	.0110526	-1.31	0.190	-.0362267	.0072048
rural	.1170786	.049243	2.38	0.018	.0203274	.2138297
split	-.003248	.0016902	-1.92	0.055	-.0065688	.0000728
lnpops	-.006566	.0106643	-0.62	0.538	-.0275189	.0143868
_Iregion_2	(dropped)					
_Iregion_3	(dropped)					
_Iregion_4	(dropped)					
_Iregion_5	(dropped)					
_Iyear_2002	(dropped)					
_Iyear_2003	-.002108	.0025007	-0.84	0.400	-.0070212	.0028052
_Iyear_2004	-.0027396	.0023239	-1.18	0.239	-.0073055	.0018263
_Iyear_2005	(dropped)					
_Iyear_2006	(dropped)					
_Ireg~2_2002	-.0036693	.0025065	-1.46	0.144	-.0085939	.0012554
_Ireg~2_2003	(dropped)					
_Ireg~2_2004	.0015202	.0023693	0.64	0.521	-.0031349	.0061753
_Ireg~2_2005	(dropped)					
_Ireg~2_2006	(dropped)					
_Ireg~3_2002	(dropped)					
_Ireg~3_2003	-.0003966	.002893	-0.14	0.891	-.0060806	.0052874
_Ireg~3_2004	.0055886	.0029117	1.92	0.056	-.0001321	.0113094
_Ireg~3_2005	(dropped)					
_Ireg~3_2006	(dropped)					
_Ireg~4_2002	.0006681	.0031688	0.21	0.833	-.0055578	.006894
_Ireg~4_2003	(dropped)					
_Ireg~4_2004	.002357	.003182	0.74	0.459	-.003895	.0086089
_Ireg~4_2005	(dropped)					
_Ireg~4_2006	(dropped)					
_Ireg~5_2002	(dropped)					
_Ireg~5_2003	-.003183	.0038424	-0.83	0.408	-.0107323	.0043664
_Ireg~5_2004	.0074653	.0037941	1.97	0.050	.0000108	.0149198
_Ireg~5_2005	(dropped)					
_Ireg~5_2006	(dropped)					
_cons	.0967582	.1516236	0.64	0.524	-.2011471	.3946635
sigma_u	.03739595					
sigma_e	.01047564					
rho	.92723828	(fraction of variance due to u_i)				

```
F test that all u_i=0:     F(272, 495) =    10.19                 Prob > F = 0.0000
```

Random effects u_i ~ **Gaussian** Wald chi2(**24**) = **369.47**
corr(u_i, X) = **0** (assumed) Prob > chi2 = **0.0000**

p1	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
laglnpctot	-.0068324	.0020789	-3.29	0.001	-.010907	-.0027579
laglnpcgrdp	-.0025723	.001412	-1.82	0.068	-.0053398	.0001952
age	.0000423	.0006425	0.07	0.948	-.001217	.0013016
female	-.0586501	.0527718	-1.11	0.266	-.1620809	.0447807
hhsize	.0140715	.0028346	4.96	0.000	.0085159	.0196271
house	.0137073	.0162915	0.84	0.400	-.0182233	.045638
water	-.0181966	.0064775	-2.81	0.005	-.0308923	-.0055009
rural	.0250654	.0063413	3.95	0.000	.0126367	.0374942
split	-.0023575	.0016647	-1.42	0.157	-.0056202	.0009052
lnpops	-.0013527	.0020102	-0.67	0.501	-.0052926	.0025873
_Iregion_2	-.0111108	.004926	-2.26	0.024	-.0207655	-.0014561
_Iregion_3	-.0105185	.0052586	-2.00	0.045	-.0208252	-.0002119
_Iregion_4	-.0044536	.0058666	-0.76	0.448	-.015952	.0070447
_Iregion_5	.0401265	.0066107	6.07	0.000	.0271698	.0530831
_Iyear_2002	-.0009455	.002054	-0.46	0.645	-.0049714	.0030803
_Iyear_2003	.0013059	.001512	0.86	0.388	-.0016575	.0042693
_Ireg~2_2002	-.0051208	.0024062	-2.13	0.033	-.0098369	-.0004047
_Ireg~2_2003	-.0019933	.0023718	-0.84	0.401	-.006642	.0026553
_Ireg~3_2002	.0015561	.0028365	0.55	0.583	-.0040032	.0071155
_Ireg~3_2004	.0065891	.0028951	2.28	0.023	.0009149	.0122634
_Ireg~4_2002	-.0016913	.0031817	-0.53	0.595	-.0079273	.0045448
_Ireg~4_2003	-.0032296	.00319	-1.01	0.311	-.0094819	.0030227
_Ireg~5_2003	-.0037842	.0037983	-1.00	0.319	-.0112286	.0036603
_Ireg~5_2004	.0063724	.0037621	1.69	0.090	-.0010012	.0137459
_cons	.1204514	.0637007	1.89	0.059	-.0043997	.2453025
sigma_u	.0191564					
sigma_e	.01047564					
rho	.76979766	(fraction of variance due to u_i)				

	——— Coefficients ———			
	(b) fixed	(B) random	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
laglnpctot	-.0054835	-.0068324	.0013489	.0011598
laglnpcgrdp	.0004943	-.0025723	.0030666	.0008326
age	-.0014326	.0000423	-.0014748	.0008678
female	-.0742637	-.0586501	-.0156136	.0275797
hhsize	.0201306	.0140715	.0060591	.0027223
house	.0045853	.0137073	-.009122	.0146263
water	-.0145109	-.0181966	.0036857	.0089555
rural	.1170786	.0250654	.0920131	.048833
split	-.003248	-.0023575	-.0008905	.0002924
lnpops	-.006566	-.0013527	-.0052133	.0104731
_Iyear_2003	-.002108	.0013059	-.0034139	.0019918
_Ireg~2_2002	-.0036693	-.0051208	.0014515	.0007018
_Ireg~3_2004	.0055886	.0065891	-.0010005	.0003104
_Ireg~4_2002	.0006681	-.0016913	.0023593	.
_Ireg~5_2003	-.003183	-.0037842	.0006012	.0005806
_Ireg~5_2004	.0074653	.0063724	.0010929	.0004917

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(**16**) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= **14.57**
Prob>chi2 = **0.5565**
(V_b-V_B is not positive definite)

Appendix B.2

Fixed-effects (within) regression — Number of obs = 788
Group variable: id_299 — Number of groups = 273

R-sq: within = 0.1217 — Obs per group: min = 1
between = 0.2685 — avg = 2.9
overall = 0.2490 — max = 3

F(20,495) = 3.43
corr(u_i, Xb) = -0.8098 — Prob > F = 0.0000

p1	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lagpctot	-4.15e-09	2.26e-09	-1.84	0.066	-8.58e-09	2.79e-10
lagpcgrdp	1.71e-10	1.57e-10	1.09	0.276	-1.37e-10	4.79e-10
age	-.0013347	.0010818	-1.23	0.218	-.0034603	.0007909
female	-.0706045	.0595293	-1.19	0.236	-.1875659	.0463568
hhsize	.0204894	.0039646	5.17	0.000	.0127	.0282789
house	.0014167	.0219731	0.06	0.949	-.0417553	.0445886
water	-.0137298	.011043	-1.24	0.214	-.0354267	.0079671
rural	.1422262	.0491475	2.89	0.004	.0456627	.2387897
split	-.0034206	.0016941	-2.02	0.044	-.0067491	-.0000921
pops	-6.88e-09	1.55e-08	-0.45	0.656	-3.72e-08	2.35e-08
_Iregion_2	(dropped)					
_Iregion_3	(dropped)					
_Iregion_4	(dropped)					
_Iregion_5	(dropped)					
_Iyear_2002	(dropped)					
_Iyear_2003	-.0029719	.0019548	-1.52	0.129	-.0068125	.0008687
_Iyear_2004	-.0040266	.0017786	-2.26	0.024	-.0075212	-.000532
_Iyear_2005	(dropped)					
_Iyear_2006	(dropped)					
_Ireg~2_2002	-.0030651	.0025143	-1.22	0.223	-.0080051	.0018748
_Ireg~2_2003	(dropped)					
_Ireg~2_2004	.0015693	.0023733	0.66	0.509	-.0030936	.0062323
_Ireg~2_2005	(dropped)					
_Ireg~2_2006	(dropped)					
_Ireg~3_2002	(dropped)					
_Ireg~3_2003	-.0001955	.0029448	-0.07	0.947	-.0059813	.0055903
_Ireg~3_2004	.0058836	.0029822	1.97	0.049	.0000243	.0117429
_Ireg~3_2005	(dropped)					
_Ireg~3_2006	(dropped)					
_Ireg~4_2002	-.0022472	.0032965	-0.68	0.496	-.008724	.0042296
_Ireg~4_2003	-.0028642	.0031794	-0.90	0.368	-.009111	.0033827
_Ireg~4_2004	(dropped)					
_Ireg~4_2005	(dropped)					
_Ireg~4_2006	(dropped)					
_Ireg~5_2002	.0044446	.0037768	1.18	0.240	-.002976	.0118652
_Ireg~5_2003	(dropped)					
_Ireg~5_2004	.0108867	.0036597	2.97	0.003	.0036962	.0180771
_Ireg~5_2005	(dropped)					
_Ireg~5_2006	(dropped)					
_cons	-.0652815	.0566957	-1.15	0.250	-.1766755	.0461124
sigma_u	.04341053					
sigma_e	.01049362					
rho	.94479265	(fraction of variance due to u_i)				

F test that all u_i=0: F(272, 495) = 10.79 — Prob > F = 0.0000

Random-effects GLS regression — Number of obs = 788
Group variable: id_299 — Number of groups = 273

R-sq: within = 0.1040 — Obs per group: min = 1
between = 0.5179 — avg = 2.9
overall = 0.4913 — max = 3

Random effects u_i ~ Gaussian — Wald chi2(24) = 317.37
corr(u_i, X) = 0 (assumed) — Prob > chi2 = 0.0000

p1	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
lagpctot	-4.51e-09	1.96e-09	-2.30	0.022	-8.36e-09	-6.64e-10
lagpcgrdp	4.44e-11	1.45e-10	0.31	0.760	-2.40e-10	3.29e-10
age	.0000231	.0006614	0.03	0.972	-.0012733	.0013195
female	-.0491513	.0528164	-0.93	0.352	-.1526695	.0543669
hhsize	.0146377	.0028817	5.08	0.000	.0089896	.0202858
house	.0138961	.0165005	0.84	0.400	-.0184443	.0462364
water	-.0196036	.0065286	-3.00	0.003	-.0323995	-.0068078
rural	.0288585	.0063952	4.51	0.000	.0163241	.0413929
split	-.0026111	.0016608	-1.57	0.116	-.0058663	.0006441
pops	8.75e-10	2.40e-09	0.36	0.715	-3.83e-09	5.58e-09
_Iregion_2	-.0169159	.0049545	-3.41	0.001	-.0266266	-.0072052
_Iregion_3	-.0096701	.0053033	-1.82	0.068	-.0200643	.0007241
_Iregion_4	-.0063623	.0059742	-1.06	0.287	-.0180714	.0053469
_Iregion_5	.0360016	.0066897	5.38	0.000	.0228901	.0491131
_Iyear_2003	-.0009775	.0015858	-0.62	0.538	-.0040856	.0021307
_Iyear_2004	-.0030812	.0015844	-1.94	0.052	-.0061866	.0000243
_Ireg~2_2003	.0018636	.0023715	0.79	0.432	-.0027844	.0065116
_Ireg~2_2004	.0039235	.0023657	1.66	0.097	-.0007131	.0085601
_Ireg~3_2003	-.0018717	.0028342	-0.66	0.509	-.0074266	.0036833
_Ireg~3_2004	.0049592	.002904	1.71	0.088	-.0007325	.0106508
_Ireg~4_2002	-.0028992	.0032182	-0.90	0.368	-.0092068	.0034085
_Ireg~4_2003	-.0041862	.0031702	-1.32	0.187	-.0103996	.0020272
_Ireg~5_2002	.0057595	.0036936	1.56	0.119	-.0014798	.0129987
_Ireg~5_2004	.0106002	.003658	2.90	0.004	.0034306	.0177698
_cons	-.029391	.0370737	-0.79	0.428	-.1020541	.0432721
sigma_u	.01993113					
sigma_e	.01049362					
rho	.78296526	(fraction of variance due to u_i)				

	Coefficients (b) fixed	(B) random	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
lagpctot	-4.15e-09	-4.51e-09	3.57e-10	1.11e-09
lagpcgrdp	1.71e-10	4.44e-11	1.27e-10	5.97e-11
age	-.0013347	.0000231	-.0013578	.0008561
female	-.0706045	-.0491513	-.0214532	.0274623
hhsize	.0204894	.0146377	.0058517	.0027227
house	.0014167	.0138961	-.0124794	.0145103
water	-.0137298	-.0196036	.0058738	.0089065
rural	.1422262	.0288585	.1133677	.0487297
split	-.0034206	-.0026111	-.0008095	.0003339
pops	-6.88e-09	8.75e-10	-7.76e-09	1.53e-08
_Iyear_2003	-.0029719	-.0009775	-.0019944	.0011429
_Iyear_2004	-.0040266	-.0030812	-.0009454	.0008081
_Ireg~2_2004	.0015693	.0039235	-.0023542	.00019
_Ireg~3_2003	-.0001955	-.0018717	.0016762	.0007994
_Ireg~3_2004	.0058836	.0049592	.0009244	.0006786
_Ireg~4_2002	-.0022472	-.0028992	.000652	.0007138
_Ireg~4_2003	-.0028642	-.0041862	.001322	.0002426
_Ireg~5_2002	.0044446	.0057595	-.0013148	.0007887
_Ireg~5_2004	.0108867	.0106002	.0002864	.0001108

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(16) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 18.76
Prob>chi2 = 0.2813
(V_b-V_B is not positive definite)

Appendix C.1

```
Fixed-effects (within) regression               Number of obs      =       788
Group variable: id_299                          Number of groups   =       273

R-sq:  within  = 0.0967                         Obs per group: min =         1
       between = 0.2102                                        avg =       2.9
       overall = 0.1871                                        max =         3

                                                F(20,495)          =      2.65
corr(u_i, Xb)  = -0.8048                        Prob > F           =    0.0001
```

p2	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
laglnpctot	-.0021585	.0010584	-2.04	0.042	-.004238	-.000079
laglnpcgrdp	.0001428	.0007288	0.20	0.845	-.0012891	.0015748
age	-.0006552	.0004801	-1.36	0.173	-.0015984	.000288
female	-.0267466	.0264734	-1.01	0.313	-.0787607	.0252675
hhsize	.0077035	.0017473	4.41	0.000	.0042704	.0111366
house	-.0032967	.009734	-0.34	0.735	-.0224218	.0158285
water	-.0044284	.004914	-0.90	0.368	-.0140832	.0052265
rural	.049686	.0218935	2.27	0.024	.0066703	.0927017
split	-.0008695	.0007514	-1.16	0.248	-.0023459	.0006069
lnpops	-.0026748	.0047414	-0.56	0.573	-.0119905	.0066409
_Iregion_2	(dropped)					
_Iregion_3	(dropped)					
_Iregion_4	(dropped)					
_Iregion_5	(dropped)					
_Iyear_2002	(dropped)					
_Iyear_2003	-.0005405	.0011118	-0.49	0.627	-.0027249	.001644
_Iyear_2004	-.0003492	.0010332	-0.34	0.736	-.0023792	.0016808
_Iyear_2005	(dropped)					
_Iyear_2006	(dropped)					
_Ireg~2_2002	-.0012313	.0011144	-1.10	0.270	-.0034208	.0009582
_Ireg~2_2003	(dropped)					
_Ireg~2_2004	.0005882	.0010534	0.56	0.577	-.0014815	.0026578
_Ireg~2_2005	(dropped)					
_Ireg~2_2006	(dropped)					
_Ireg~3_2002	(dropped)					
_Ireg~3_2003	.000401	.0012862	0.31	0.755	-.0021261	.0029281
_Ireg~3_2004	.0022342	.0012945	1.73	0.085	-.0003093	.0047777
_Ireg~3_2005	(dropped)					
_Ireg~3_2006	(dropped)					
_Ireg~4_2002	.0001667	.0014088	0.12	0.906	-.0026014	.0029347
_Ireg~4_2003	(dropped)					
_Ireg~4_2004	.0010972	.0014147	0.78	0.438	-.0016824	.0038768
_Ireg~4_2005	(dropped)					
_Ireg~4_2006	(dropped)					
_Ireg~5_2002	(dropped)					
_Ireg~5_2003	-.0024562	.0017083	-1.44	0.151	-.0058126	.0009003
_Ireg~5_2004	.0021859	.0016869	1.30	0.196	-.0011284	.0055002
_Ireg~5_2005	(dropped)					
_Ireg~5_2006	(dropped)					
_cons	.0402984	.0674121	0.60	0.550	-.0921507	.1727475
sigma_u	.01563825					
sigma_e	.00465748					
rho	.91852621	(fraction of variance due to u_i)				

```
F test that all u_i=0:     F(272, 495) =     7.19              Prob > F = 0.0000
```

Random-effects GLS regression — Number of obs = 788
Group variable: id_299 — Number of groups = 273

R-sq: within = 0.0744 — Obs per group: min = 1
between = 0.4861 — avg = 2.9
overall = 0.4413 — max = 3

Random effects u_i ~ Gaussian — Wald chi2(24) = 290.38
corr(u_i, X) = 0 (assumed) — Prob > chi2 = 0.0000

p2	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
laglnpctot	-.0025337	.0008825	-2.87	0.004	-.0042634	-.000804
laglnpcgrdp	-.0011043	.000593	-1.86	0.063	-.0022665	.0000578
age	4.61e-06	.0002536	0.02	0.986	-.0004924	.0005017
female	-.0243293	.0223968	-1.09	0.277	-.0682262	.0195676
hhsize	.004756	.001143	4.16	0.000	.0025158	.0069962
house	.0018647	.0066329	0.28	0.779	-.0111355	.0148649
water	-.0057576	.0025497	-2.26	0.024	-.010755	-.0007603
rural	.0075588	.0024449	3.09	0.002	.002767	.0123507
split	-.0004588	.0007305	-0.63	0.530	-.0018905	.000973
lnpops	-.0007124	.0007719	-0.92	0.356	-.0022253	.0008006
_Iregion_2	-.0034573	.0019172	-1.80	0.071	-.0072149	.0003004
_Iregion_3	-.0032331	.00202	-1.60	0.109	-.0071921	.0007259
_Iregion_4	-.0004545	.0022634	-0.20	0.841	-.0048907	.0039817
_Iregion_5	.0154703	.002545	6.08	0.000	.0104822	.0204584
_Iyear_2002	-.0011311	.0008833	-1.28	0.200	-.0028624	.0006002
_Iyear_2003	.0001251	.0006667	0.19	0.851	-.0011816	.0014319
_Ireg~2_2002	-.0016886	.0010628	-1.59	0.112	-.0037716	.0003944
_Ireg~2_2003	-.000797	.001049	-0.76	0.447	-.002853	.0012589
_Ireg~3_2002	.0002012	.0012546	0.16	0.873	-.0022577	.0026602
_Ireg~3_2004	.0021124	.0012805	1.65	0.099	-.0003974	.0046222
_Ireg~4_2002	-.0009263	.0014072	-0.66	0.510	-.0036844	.0018318
_Ireg~4_2003	-.0015477	.0014109	-1.10	0.273	-.0043129	.0012176
_Ireg~5_2003	-.002858	.0016762	-1.71	0.088	-.0061434	.0004274
_Ireg~5_2004	.0015795	.0016606	0.95	0.342	-.0016752	.0048342
_cons	.0542256	.0261768	2.07	0.038	.00292	.1055312
sigma_u	.00697734					
sigma_e	.00465748					
rho	.69176515	(fraction of variance due to u_i)				

	Coefficients (b) fixed	(B) random	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
laglnpctot	-.0021585	-.0025337	.0003752	.0005842
laglnpcgrdp	.0001428	-.0011043	.0012472	.0004237
age	-.0006552	4.61e-06	-.0006598	.0004076
female	-.0267466	-.0243293	-.0024173	.0141147
hhsize	.0077035	.004756	.0029475	.0013216
house	-.0032967	.0018647	-.0051614	.0071244
water	-.0044284	-.0057576	.0013293	.0042007
rural	.049686	.0075588	.0421272	.0217566
split	-.0008695	-.0004588	-.0004107	.0001762
lnpops	-.0026748	-.0007124	-.0019624	.0046781
_Iyear_2003	-.0005405	.0001251	-.0006656	.0008897
_Ireg~2_2002	-.0012313	-.0016886	.0004573	.0003353
_Ireg~3_2004	.0022342	.0021124	.0001218	.0001898
_Ireg~4_2002	.0001667	-.0009263	.0010929	.0000672
_Ireg~5_2003	-.0024562	-.002858	.0004019	.0003295
_Ireg~5_2004	.0021859	.0015795	.0006064	.0002965

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(16) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 4.54
Prob>chi2 = 0.9976
(V_b-V_B is not positive definite)

.

Appendix C.2

```
Fixed-effects (within) regression               Number of obs      =       788
Group variable: id_299                          Number of groups   =       273

R-sq:  within  = 0.0935                         Obs per group: min =         1
       between = 0.2044                                        avg =       2.9
       overall = 0.1808                                        max =         3

                                                F(20,495)          =      2.55
corr(u_i, Xb)  = -0.8583                        Prob > F           =    0.0003
```

p2	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lagpctot	-1.55e-09	1.00e-09	-1.54	0.124	-3.52e-09	4.24e-10
lagpcgrdp	6.21e-11	6.97e-11	0.89	0.373	-7.49e-11	1.99e-10
age	-.0006189	.000481	-1.29	0.199	-.001564	.0003262
female	-.02528	.0264684	-0.96	0.340	-.0772842	.0267243
hhsize	.0078214	.0017627	4.44	0.000	.004358	.0112848
house	-.0044524	.0097698	-0.46	0.649	-.0236479	.014743
water	-.0041202	.00491	-0.84	0.402	-.0137672	.0055269
rural	.0592929	.0218523	2.71	0.007	.0163581	.1022277
split	-.0009347	.0007532	-1.24	0.215	-.0024146	.0005452
pops	-2.68e-09	6.87e-09	-0.39	0.697	-1.62e-08	1.08e-08
_Iregion_2	(dropped)					
_Iregion_3	(dropped)					
_Iregion_4	(dropped)					
_Iregion_5	(dropped)					
_Iyear_2002	(dropped)					
_Iyear_2003	-.0009134	.0008691	-1.05	0.294	-.0026211	.0007942
_Iyear_2004	-.0008955	.0007908	-1.13	0.258	-.0024493	.0006583
_Iyear_2005	(dropped)					
_Iyear_2006	(dropped)					
_Ireg~2_2002	-.0009779	.0011179	-0.87	0.382	-.0031743	.0012185
_Ireg~2_2003	(dropped)					
_Ireg~2_2004	.0006017	.0010552	0.57	0.569	-.0014716	.0026749
_Ireg~2_2005	(dropped)					
_Ireg~2_2006	(dropped)					
_Ireg~3_2002	(dropped)					
_Ireg~3_2003	.0004633	.0013093	0.35	0.724	-.0021092	.0030358
_Ireg~3_2004	.0023322	.001326	1.76	0.079	-.000273	.0049374
_Ireg~3_2005	(dropped)					
_Ireg~3_2006	(dropped)					
_Ireg~4_2002	-.001133	.0014657	-0.77	0.440	-.0040127	.0017468
_Ireg~4_2003	-.0012967	.0014137	-0.92	0.359	-.0040743	.0014808
_Ireg~4_2004	(dropped)					
_Ireg~4_2005	(dropped)					
_Ireg~4_2006	(dropped)					
_Ireg~5_2002	(dropped)					
_Ireg~5_2003	-.0029815	.0016793	-1.78	0.076	-.0062809	.0003179
_Ireg~5_2004	.0017543	.0016787	1.04	0.297	-.001544	.0050525
_Ireg~5_2005	(dropped)					
_Ireg~5_2006	(dropped)					
_cons	-.0250538	.0252308	-0.99	0.321	-.0746265	.024519
sigma_u	.01816462					
sigma_e	.00466575					
rho	.93810679	(fraction of variance due to u_i)				

```
F test that all u_i=0:     F(272, 495) =     7.51            Prob > F = 0.0000
```

Random-effects GLS regression — Number of obs = 788
Group variable: id_299 — Number of groups = 273

R-sq: within = 0.0745 — Obs per group: min = 1
between = 0.4665 — avg = 2.9
overall = 0.4238 — max = 3

Random effects u_i ~ Gaussian — Wald chi2(24) = 252.81
corr(u_i, X) = 0 (assumed) — Prob > chi2 = 0.0000

p2	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
lagpctot	-1.53e-09	8.30e-10	-1.84	0.065	-3.16e-09	9.75e-11
lagpcgrdp	8.37e-12	6.24e-11	0.13	0.893	-1.14e-10	1.31e-10
age	4.73e-06	.0002613	0.02	0.986	-.0005074	.0005169
female	-.0198178	.0224559	-0.88	0.377	-.0638307	.024195
hhsize	.0049735	.0011625	4.28	0.000	.0026951	.0072519
house	.0022999	.0067259	0.34	0.732	-.0108826	.0154823
water	-.0063412	.0025646	-2.47	0.013	-.0113677	-.0013148
rural	.0088448	.0024601	3.60	0.000	.0040231	.0136665
split	-.0005567	.0007305	-0.76	0.446	-.0019886	.0008751
pops	2.39e-10	8.97e-10	0.27	0.790	-1.52e-09	2.00e-09
_Iregion_2	-.0052704	.001923	-2.74	0.006	-.0090394	-.0015014
_Iregion_3	-.0031056	.0020319	-1.53	0.126	-.0070882	.0008769
_Iregion_4	-.001092	.0023002	-0.47	0.635	-.0056002	.0034163
_Iregion_5	.012679	.0025637	4.95	0.000	.0076543	.0177037
_Iyear_2003	-.0000686	.0006989	-0.10	0.922	-.0014384	.0013013
_Iyear_2004	-.0004979	.0006967	-0.71	0.475	-.0018634	.0008676
_Ireg~2_2003	.0003982	.0010504	0.38	0.705	-.0016606	.0024569
_Ireg~2_2004	.001208	.0010482	1.15	0.249	-.0008463	.0032623
_Ireg~3_2003	-.0003388	.0012559	-0.27	0.787	-.0028003	.0021227
_Ireg~3_2004	.0018567	.0012862	1.44	0.149	-.0006641	.0043775
_Ireg~4_2002	-.001353	.0014243	-0.95	0.342	-.0041445	.0014386
_Ireg~4_2003	-.0019002	.0014055	-1.35	0.176	-.0046549	.0008545
_Ireg~5_2002	.0036228	.0016367	2.21	0.027	.0004148	.0068307
_Ireg~5_2004	.0045984	.0016219	2.84	0.005	.0014196	.0077773
_cons	-.0080501	.0151001	-0.53	0.594	-.0376457	.0215455
sigma_u	.00721097					
sigma_e	.00466575					
rho	.70489301	(fraction of variance due to u_i)				

	Coefficients (b) fixed	(B) random	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
lagpctot	-1.55e-09	-1.53e-09	-1.67e-11	5.63e-10
lagpcgrdp	6.21e-11	8.37e-12	5.38e-11	3.11e-11
age	-.0006189	4.73e-06	-.0006236	.0004039
female	-.02528	-.0198178	-.0054621	.0140109
hhsize	.0078214	.0049735	.0028479	.0013251
house	-.0044524	.0022999	-.0067523	.0070861
water	-.0041202	-.0063412	.0022211	.004187
rural	.0592929	.0088448	.0504481	.0217134
split	-.0009347	-.0005567	-.000378	.0001835
pops	-2.68e-09	2.39e-10	-2.92e-09	6.81e-09
_Iyear_2003	-.0009134	-.0000686	-.0008449	.0005166
_Iyear_2004	-.0008955	-.0004979	-.0003976	.0003742
_Ireg~2_2004	.0006017	.001208	-.0006063	.0001219
_Ireg~3_2003	.0004633	-.0003388	.0008021	.0003702
_Ireg~3_2004	.0023322	.0018567	.0004756	.0003225
_Ireg~4_2002	-.001133	-.001353	.00022	.0003459
_Ireg~4_2003	-.0012967	-.0019002	.0006035	.0001518
_Ireg~5_2004	.0017543	.0045984	-.0028442	.000433

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(15) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 23.01
Prob>chi2 = 0.0838
(V_b-V_B is not positive definite)

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