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The Effect of Fiscal Decentralization on Economic Growth

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List of Acronyms

BPS	: Badan Pusat Statistik (Statistics Indonesia)
DAK	: Dana Alokasi Khusus (Specific Allocation Fund)
DAU	: Dana Alokasi Umum (General Allocation Fund)
SDO	: Subsidi Daerah Otonomi (Subsidy for Autonomous Region)
RGDP	: Regional Gross Domestic Product
GDP	: Gross Domestic Product
KPPOD	: Komite Pemantauan Pelaksanaan Otonomi Daerah (The Committee for Regional Autonomy Implementation Monitoring)

Abstract

This research paper is to examine the impact of fiscal decentralization on economic growth in 19 provinces covering 180 districts in Indonesia with focusing fiscal decentralization after being formulated Law No.25/1999, which was implemented in 2001. Using panel model to investigate this relationship, we find that the relationship between fiscal decentralization either from local government expenditure or general allocation fund is positive effect after three years implementation Law 22/1999 and Law 25/1999 however, the impact is very small.

Relevance to Development Studies

After three years of implementation decentralization in Indonesia, the success result of the process has not provided the significant impact on the development in Indonesia. Instead, most of people worry about the process of decentralization because local governments still rely on their budget from transfer and increase locally owned revenue to get excessive taxes and levies that can threat investment in Indonesia because they burden investors, which in turn would result in the destruction of economic. Most of local government is not really concerned on how budget can boost economic development but how to get their budget to fund their expenditure. With regard to this reason, we want to test the effect of fiscal decentralization on economic growth because economic growth can be view as one of indicators welfare of people in country. This is very relevance with development studies that purpose to improve welfare of people, especially in developing countries.

Keywords

Economic growth, Fiscal decentralization, Local government expenditure, General allocation fund

Chapter 1
INTRODUCTION

1.1 Background

The financial and economic crisis that happened in Indonesia since the middle of 1997 had lowered economic growth until 13.7 percent in 1998 which it was 7.1 percent in 1994 - 1997 on average. At the peak of the occurrence, inflation reached 77 percent and the rupiah went down until Rp. 17,000/USD which had been in Rp. 2,400/USD in 1997[1]. Because of depreciation of rupiah, a lot of industries that depended on imported material collapsed resulting in unemployment every where on the part of all regions in Indonesia. Although IMF had intervened to make an economic reform program to stabilize Indonesia's economic condition, the recovery had no significant effect.

This situation had brought dissatisfaction from the societies towards government. They considered that the slowdown of the recovery was caused by some issues such as inconvenience of IMF's policies, corruption, and the weakness of law enforcement. This caused stronger pressure of many provinces to ask for greater decentralization to manage their affairs, to have a larger share of their natural resources especially outside Java islands that have abundant natural resources and felt exploited and treated unfairly during the Suharto's regime. If in the part of the world, the demand for decentralization is triggered by the need for improving service delivery, however the pressure for decentralization in Indonesia is related more with control over resources, political, and legal autonomy (Ahmad, E and Mansoor, A, 2000).

Although the central government was worried toward the ready of province and local government in implementing fiscal decentralization, finally at the time of President Habibie, Law No.22/1999 on regional government and Law No.25/1999 on the fiscal balance between the central government and the regions were formulated to meet the pressure of societies. These laws, however, have been effectively implemented from January 2001.

Fiscal decentralization has actually been introduced in Indonesia since 1974 with the implementation of Law No.5/1974. According to Law No.5/1974, decentralization is devolution of administration service from central to region government or from higher to lower government. However, the implementation of decentralization was not maximal where decentralization in this President Suharto's New Order, still developed centralized government system.

Until now, it has been difficult to asses the success of decentralization process in Indonesia in all types of impact of decentralization. International community, however, judged that Indonesia has been able to manage and reduce negative effect on decentralization (Bambang Brojonegoro, 2002). The most successful of decentralization process is democratization where people can choose directly president, governor without any chaos. However, most people also feel

[1] The data is obtained from economic indicator published by BPS, Statistics Indonesia

sceptical about the success of decentralization because of the delegation of authority placed under municipalities/regencies, district level. A lot of municipalities/regencies have still big dependence on central government in financing their development except for some districts that have concentrated industries or some districts outside Java Island that have rich of natural resources (Suwondo, Kutut, 2002) .

While several people still feel sceptical with the result of decentralization, however they hope that decentralization process can enhance the rate of economic growth which, in turn, will increase welfare of people in the country. With regard to this reason, this research paper will observe the impact of fiscal decentralization on the rate of economic growth on municipalities/regencies in Indonesia after three years of decentralization process during 2001-2003. The economic impact is the most crucial one because Indonesia has still not been able to cope with the 1997 financial and economic crises.

1.2. Research Objective

To test the effect of decentralization under Law No. 22/1999 and Law No.25/1999 on economic growth on municipalities/regencies in Indonesia after three years of implementation these laws during 2001-2003.

1.3. Research Question

- What is the effect of fiscal decentralization before and after implementation Law No.22/1999 and Law No.25/1999.
- Can decentralization delegated under district increase economic growth in Indonesia after three years of fiscal decentralization during 2001-2003?
- Can decentralization in the first year of implementation have the effect on economic growth during 2001-2003?
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1.4 Scope and Limitation

Indonesia is a big country consisting of 33 provinces, 360 regencies, and 90 municipalities (based on 2006)[2]. In the first year fiscal decentralization was passed in 2001, Indonesia consisted of 30 provinces, covering 269 regencies, and 75 municipalities. However, due of the paucity of data, we only observe 19 provinces, covering 180 regencies/municipalities. Actually, a lot of factors that can influence economic growth however, because the limitation of data available we only use three variables in this research paper. Variables that are used in this study are 2 indicators of fiscal decentralization from local government expenditure and general allocation fund, share of adult population age between 15-60 years that works at least one hour per week, and share of population completed higher education.

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[2] Our calculation based on a number of regencies/municipalities in RGDP regencies/municipalities, published by BPS, Statistics Indonesia, 2002-2006.

Chapter 2
LITERATURE REVIEW

2.1. Historical Background Decentralization in Indonesia

Decentralization in Indonesia basically has been implemented since 1974 under Law No.5/1974. According to this Law, decentralization is stated as a transfer of services administration from the central to regional government or from an upper to lower government. In this period, although the Indonesian government designated autonomous region, however, still maintained central control and tend to be authoritarian under the Soeharto's regime. The system instead raised the dependency of regions[3] on the central government for revenue, and further weakened regional capacity to carry out development.

Following the reform after the 1997 economic crises, the central government decreed a new decentralization scheme through Law No.22/1999. The new law focuses on the regional government through improving administration and political decentralization particularly at the regency and municipal (district) level, and Law No.25/1999 focuses on fiscal balance between the central government and the regional government.

Through these laws more authority is delivered to regional governments in finance and management decision, making their own expenditure and increasing their own revenue. The head of regency and municipality will no longer report to the head of province (governor), instead they are responsible to the locally elected assembly (*Dewan Perwakilan Rakyat, DPR*). The provinces still will keep being responsible to the central government (Ryaas Rasyid, 2002).

According to Law No. 25/1999 with regard to fiscal balance between the central government and the regional government, two leading transfers on Law No.5/1974 transferred from central to region have been eliminated; the *subsidi Daerah Otonomi* (SDO) for paying local public servants and routine expenditures and the inpres grant pointed to development projects. These revenue shares are replaced by a General Allocation fund (DAU). This fund is intended to equalize the fiscal capacity among provinces to meet their need in financing their expenditures. The distribution of this fund is based on five main factors: number of population, size of territory, geographical location, level of income, and potential of natural resources (World Bank, 2006). The allocation of this fund is expected to fill the gap between regional fiscal capacity and their need. In addition to DAU, there is another fund that is given to support specific projects in some selected region called a Special Allocation Fund (DAK).

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[3] Regional government in this paper is government administrative under central government covering province and district (municipality/regency) level. Province is subdivided in district (municipality/regency) level.

2.2. Fiscal Decentralization

Fiscal decentralization is financial aspects of devolving to regional and local government consisting of two issues interrelated; First, the division of spending responsibilities and revenue sources between national, provincial, and district level of government, Second, the amount of discretion given to regional and local governments to determine their expenditures and revenues (Kenneth Davey, 2003).

In that regard, fiscal decentralization in providing autonomy in financial aspect constitutes intensifying the role of local government to participate in the development. The most important thing in fiscal decentralization is to what extent local governments are given authorities to determine allocation for their own expenditure and their ability to increase their locally generated revenue (*PAD*). That is not only to increase it own revenue but also the authority in managing the potentiality of local region for welfare of people. The potential benefit of devolving fiscal responsibilities to lower level of government is to increase efficiency of public service delivery, reduce information and transaction cost (World Bank, 1997). However, if fiscal decentralization is not accompanied by improving the skill of local apparatus, good political accountability, it will have bad effect in the local government creating corruption and bad public services.

Fiscal decentralization is the main component in decentralization (World Bank, 2006). In implementing the function, local governments are provided the authority in determining their own decision on devolving public service, supported by the availability of financial sources from their locally generated revenue (PAD) including local taxes and retributions receipt (levies), output of regional government corporate and other local government. Besides that, regional government (provincial and local) receive other revenues consisting of the balanced budget consisting of general allocation fund and specific allocation fund (DAU and DAK), tax revenue sharing, and non tax revenue sharing (natural resource exploitation), Khusaeni Mohammad, 2006).

The most of local taxes resources at the municipality/regency level are obtained from street lighting tax, entertainment business tax, the use of ground and surface water tax, hotel and restaurant tax, and exploitation and processing of classification mining activities tax. The other taxes that have high source for their own local revenue still become the authority of the central government so the local revenue (PAD) are not enough to finance their local needs. Meanwhile, allocation fund that is received by local governments at the municipality/regency level from central government are only enough to finance their routine expenditure, so they try to increase their own local revenue by imposing more taxes and levies as sources to finance many kind of infrastructure and finance public expenditures. However, increasing in levies and taxes often results in distortion in the economy of local region because of resulting in the bad impact on investment climate, appearing deadweight loss of taxes, reducing producer and consumer surplus which leads to deteriorating in economy (Saad, Ilyas, 2001).

Fiscal decentralization system in Indonesia primarily relies on the balanced budget to meet imbalance budget, mostly derived from general allocation fund (DAU). This relates to the Law No. 25/1999 that do not give local taxing power significantly to local government since the fiscal decentralization in Indonesia was designed as the expenditure decentralization financed by transfer (Bojonegora, Bambang, 2002). DAU comes from at least 25% of national domestic revenue that

by central government, 90% of this amount is transferred down to the local government, and 10% is transferred to the province (Article no.7 Law 25/1999). The size of the general allocation fund (DAU) transfer for each municipality/regency is set on two criteria; the local needs and the local potential. The local need is represented by the size of population, the number of people living below the poverty line, and the total area. The larger the population, the larger the number of people living below the poverty line, and the larger the total area, the larger the transfer will be allocated to the region. Meanwhile, the local potential is set by the number and the scale of industrial activities. The larger the number and the scale of industrial activities mean the greater the region's potential to create revenue, so the smaller transfer allocated to the region (Saad Ilyas, 2001).

2.1.1. Advantages of Fiscal Decentralization

Law No.25/1999 that was implemented in 2001 introduced the fiscal decentralization policy intended to boost the efficiency of the provision of public services, by providing a better appropriateness between expenditures with local preferences, priorities, and preferences, and revenue capabilities because local governments are better positioned than the central government. The efficiency of the provision the public services is expected to be able to increase economic growth that become the most crucial issue because of slow down of recovery process of the 1997 financial and economic crises. On the other hand, the process itself is expected to make contribution to the economic reformation with reducing disparity between java and outside java.

Indonesia is an island nation that has large population and large land area with large variation among regions so if it is regulated uniformity by the central government, the provision of government services may be not quite efficient. Large area land also would produce high information and transaction cost because time required to approve local decision if local government have to report all activities and obtain agreement from the central government, hence it would lead to the problem of communication (Alm, James and Bahl, Roy, 1999). With implementing fiscal decentralization, the potential benefit of devolving fiscal responsibilities to lower level government will increase efficiency of public service delivery, reduce information and transaction cost (World Bank, 1997).

An Indonesian economy is dominated by Java Island so regions outside Java especially that had abundant natural resources felt exploited and treated unfairly during the centralization era. Some of regions in outside java wanted to make secessionism with Indonesia as such Aceh, Maluku, and Papua. This is the biggest trigger of decentralization in Indonesia. Finally, the central government formulated Law No.22/1999 and law 25/1999 to reduce conflict and tension between these regions with the central government with proving greater decentralization on the basis of autonomy under district area. The implementation of fiscal decentralization can be assumed to give appeasement through some degree of regional autonomy.

However, after three years the process of decentralization, it has been difficult to asses the success of decentralization process in Indonesia in all types of impact of decentralization. International community, however, judged that Indonesia has been able to manage and reduce negative effect on decentralization. The central government felt that they had managed it quite well but still worried with the process in the future because the decentralization was implemented in hurried manner.

However, Indonesia could have adjusted well with the new condition with the peace condition and without any chaos (Brojonegore, B. 2002). This can be proven on the result of democratization process where people can choose directly president and government as well as reduction of tension and conflict between the regions and the central government. This is as opinion Dawn Brancati:

> "….at least under the right circumstances, decentralization can bring frustrated ethnic populations closer to the government and provide them with an outlet in which to address their grievances has led many politicians, especially those representing minority groups, to herald decentralized governance as the ticket to reducing, if not necessarily preventing, ethnic conflict and secessionism.

The reduction of conflict and tension can be convinced as factor encouraging new investment in Indonesia, in turn will become conducive factor for foreign investment. This is in accordance with survey conducted by (Komite Pemantauan Otonomi Daerah) KPPOD saying that major concern for investors to place their activities was factors such as the certainty, law enforcement, licencing process, and local regulation.

2.1.2. Disadvantages of Fiscal Decentralization

Besides the advantages of fiscal decentralization mentioned above, it also brings disadvantages especially in the case of Indonesia because decentralization implemented mostly based on political reason. One important indicator of fiscal decentralization should be the ability of the local governments to obtain their own revenue sources and eliminate their dependency of transfer (Brojonegoro, Bambang, 2002). However, in Indonesia case, most local governments do not enough pay attention on optimizing their local own revenue, otherwise they still rely on the dependency on the existence of generally fund allocation (DAU). On the other hand, the central government has really not given decentralization fully to local governments because it is reluctant to give local taxing power to them. Since the amount of transfers do not meet their local needs, they seek other sources with increasing their local own revenue (PAD) by increasing taxes and levies. Under fiscal decentralization, imposing new taxes and levies has become interesting tools to produce additional revenue to strengthen their financial management.

Taxes and levies that are obtained disruptively will have distortion in economy. The local business people will add these charges on their commodities that they produce, and eventually lead to higher prices at the consumer level, hence reduce consumer surplus. The burden of high levies and taxes also will force down prices at producer level. Traders will have to shift some of the burden to the purchase price at the producer gate so the producer has to lower their commodities prices, eventually lead to reducing producer surplus which reduce welfare of society.

High taxes and levies that result from fiscal decentralization also are considered as reducing foreign investment climate in Indonesia. Although the main reason of investor to relocate their activities to other countries is because the uncertainty, low law enforcement, and long licensing process however high taxes and levies also discourage incentive for incoming investment (Saad Ilyas, 2007).

2.3. Economic Growth

Economic growth is an increase in real gross domestic product (GDP), measured by the percentage change in real GDP from one year to the next year. There are two ways in defining GDP (Blanchard, 2000);

GDP is the value of final goods and services (destined for final consumption) that are produced in the economy during in the given period of time.

GDP is the sum of value added in the economy during in the given period of time. However, study by Zang and Zou (1998) uses income at constant price as measurement of economic growth.

Economic growth is considered as the most important aspect in implementation decentralization because economic growth constitutes one of quantitative measurements in evaluating the success of development program. An increase in GDP is viewed as an increase in welfare of population.

Zhang and Zou (1998) mention that economic growth is influenced by labor force, investment rate, degree of openness of economy, inflation rate, national taxation, provincial taxation, provincial income, and national GDP, and degree of decentralization. They divided the degree of decentralisation into 3 measurements, that is; the ratio of consolidated provincial spending to consolidated central spending, the ratio of provincial budgetary spending to central budgetary spending, and the ratio of provincial extra budgetary spending to central budgetary spending that the 3 measurements are expressed in per capita term. However, Robert M. McNab (2001) uses the ratio of total provincial revenue to total government revenue and the ratio of total provincial expenditure to total government expenditure as measurement of fiscal decentralization.

2.4. Fiscal Decentralization and Economic Growth

There has been an on-going debate between the theoretical literature and the empirical point of view that decentralization is effective strategy to promote economic growth and development especially in developing countries. In theory, decentralization can be looked at as away to stimulate an increase in economic growth, providing considerable opportunities for better governance. The potential benefits of devolving fiscal responsibilities from the central government to the lower government are to increase efficient provision of public service, which in turn, will promote economic growth. Related to the theory, decentralization is expected to have a positive relationship[4] with economic growth. On the other hand, decentralization can also have a negative relationship[5] with economic growth if it is not accompanied with improving the capability of local government apparatus and better political accountability. Several of literatures say that the impact of decentralization on economic growth through the allocation efficient benefits will

[4] Positive relation means that an increase of degree of fiscal decentralization will lead to an increase economic growth.

[5] Negative relation means that an increase of fiscal decentralization will lead to lower economic growth.

lead to an increase on economic growth. However, several of investigation on empirical result in several countries found that the effect fiscal decentralization on economic growth produced different output.

Investigation of Zhang and Zou (1997) on *Fiscal Decentralization, Public Spending, and Economic Growth in China* with using cross-country data from 1986 to 1992 state that there is a significant negative impact between fiscal decentralization and growth in developing countries. The higher degree of decentralization is the lower economic growth in China during the last fifteen years. It can be concluded that there has been an inconsistency between economic theory and empirical evidence based on Investigation of Zhang and Zou. Potential gains that are obtained in most of literatures concentrate on the data of empirical result in developed countries, none in developing countries (Davoodi and Zou, 19997). Serdar Yilmaz, 1999 also found that there is high positive correlation between GDP per capita and local government spending. On the other hand, the correlation coefficient in developing countries is very low, even negative. The analysis of coefficient correlation represents what the extent local governments can allocate resources. Atsushi Iimi (2004) on *Decentralization and Economic Growth Revisited: An Empirical Note*, also found that there is a significant positive relationship between fiscal decentralization and economic growth in 51 countries; 7 low income countries, 10 lower middle income countries, 12 upper middle countries, and 22 high income countries. It is no surprising because half of samples of countries are developed countries as

Oates 1993, and Martinesz and Macnab, 2001 argue that expenditure for infrastructure and social sector will be effective to increase economic growth on region because local government is better positioned to know their own characteristic and know what they need. In the other word, local government can allocate fund on every economic sector effectively than central government do to deliver public services. These public-finance considerations are more effective on boost economic growth in local governments than central government because they do not consider these geographical differences on each region (Davoodi and Zou, 1997). However, the direct impact fiscal decentralization on economic growth will not happen if fiscal decentralization is not effectively done (Martinez and Macnab, 2001). Fiscal decentralization can encourage instability of macroeconomic, which in turn will lead to deteriorating economic growth, because fiscal decentralization can reduce central government spending and taxes that can be used to conduct over development.

Zang and Zou (1997) argued that decentralizing on revenue and spending constitutes a way to improve the efficiency on public sector, reduce budget deficit, and boost economic growth. This argument is based on that local governments are better positioned in delivering public service appropriate on local preferences and local needs than central government.

According to World Bank (1997), fiscal decentralization can have impact on economic growth indirectly. There are three mechanisms the effect of fiscal decentralization on economic growth. First, fiscal decentralization will increase economic growth through government expenditure sector, therefore there are positive relation between fiscal decentralization and economic growth. Second, fiscal decentralization will result in instability macroeconomic performance, meaning that fiscal decentralization and economic growth has negative relation. Third, the impact

fiscal decentralization on economic growth is different between developed and developing countries. If in developed countries the relation is positive but in developing countries, the relation is negative. The reason behind this, local governments in developing countries maybe not have skill in human resources in managing their financing to conduct economic development, which in turn will lead to macroeconomic instability, hence hinder economic growth.

2.5. Evidence of Empirical Studies

As mentioned earlier, the study of Zhang and Zou (1997) on *Fiscal Decentralization, Public Spending, and Economic Growth in China* find that a higher degree of fiscal decentralization of government spending is related on lower provincial economic growth over 1986 to 1992 for 28 provinces. They use three indicators of fiscal decentralization in their empirical estimation.

The first estimation is conducted by using the ratio of provincial budgetary spending to central budgetary central budgetary spending as indicator of fiscal decentralization. From the results of LSDV regression, they find that the degree of fiscal decentralization has significantly a negative effect with economic growth, the sign and magnitude of the coefficient for fiscal decentralization is – 0.054. This is contradiction with expectation on theory that fiscal decentralization is usually related to positive economic growth. The other independent variables; labour growth has a positive but insignificant effect on economic growth. Both the central tax and provincial revenue have a negative and insignificant effect on economic growth. The coefficient of labour force has positive sign but not significant at the 5 percent of significant level. Tax rate has similar result with labour force.

The second estimation is by using the ratio of consolidated provincial spending to consolidated central spending. In the second estimation, they find negative effect between fiscal decentralization and economic growth, the sign and magnitude of fiscal decentralization is -0.387 at the level of significance 10 percent.

The third estimation is the ratio of provincial extra budgetary spending to central budgetary spending as indicator of fiscal decentralization. Again, fiscal decentralization has negative effect on economic growth.

With using a panel data set of 46 countries during 1970-1989, Davoodi and Zou find a negative relationship between fiscal decentralization and economic growth in developing countries, but none in developed countries.

The investigation uses a cross country panel data using the ordinary least square estimating regression by using three country groups-the full sample (world), developing, and developed countries. The dependent variable is average growth rate of real per capita output over two periods; five and ten-year periods. The independent variables are fiscal decentralization measured by the subnational share of total government spending; tax rate; country fixed effect and time fixed effect; and control variables consisting of the average growth of population, initial human capital, initial per capita income, initial per capita GDP, and the average real investment share of GDP.

Another study related to the fiscal decentralization issue is the study of Atsushi Iimi (2004) on *Decentralization and Economic Growth Revisited: An Empirical Note*. The analysis uses data on 51 countries, including 7 low income countries, 10 lower-middle income countries, 12 upper-middle countries, and 22 high income countries

for the period from 1997 to 2001. In the study, Atsushi estimates variables that relate with economic growth with using the Ordinary Least Square (OLS). The dependent variable is the average growth rate of real GDP per capita, while the independent variables are average tax rate which is measured by total tax revenues divided by GDP in particular year during the period, the degree of fiscal decentralization which is measured by the local share of the expenditure to total government expenditure, the degree of political decentralization which is defined by the average score of the evaluation of political right, the productivity of local government spending, population growth rate, and the initial of human capital measured by the percentage of secondary school enrolment and a set of dummy variables of income groups. With the estimation result based on the Ordinary Result (OLS) and Instrumental Variable, Atsushi find that fiscal decentralization has significantly positive relation with economic growth; the degree of political right has insignificantly negative relation with economic growth; the population growth rate and dummy variables of income groups have insignificantly negative relation with economic growth; while initial human capital has significantly positive relation with economic growth.

Chapter 3
DATA AND ANALYSIS METHOD

3.1. Sample

Sample data that are used in this research methodology consist of 180 municipalities/regencies in 19 provinces, Indonesia. Municipalities/regencies that are covered in this research paper are those that were not split out from 1999 – 2003. We reduce several of provinces because of paucity of data available.

This sample data use secondary data that is obtained from the book published by BPS, Statistics Indonesia, "Gross Regional Domestic Product Regencies/Municipalities in Indonesia and data of local government revenue and expenditure at district level are obtained from the ministry of Finance.[6].

3.2. Variable in the Model

As mentioned by Kenneth Davey, fiscal decentralization is financial aspects of devolving to regional government consisting of the division of spending responsibilities and revenue sources. With regard to Kenneth'statement, this research paper will observe the effects of fiscal decentralization on economic growth through two aspects of fiscal decentralization, from revenue and expenditure side. From revenue side, we will use the ratio of general allocation fund (DAU) to RGDP and from expenditure side, we will use the ration of local expenditure side to RGDP as proxy of degree of fiscal decentralization. We take general allocation fund (DAU) as proxy to measure fiscal decentralization from revenue side because most of local governments in Indonesia still rely on revenue to meet their expenditures from DAU where PAD that they obtained is not enough to cover their expenditures. We need to observe fiscal decentralization from expenditure side because based on Law No.25/1999, fiscal decentralization in Indonesia is designed as expenditure decentralization that is financed by transfer, not as revenue side. In this case, central government still have local taxing power so local government have less revenue sources from taxes so still rely heavily on transfer. The measurement of fiscal decentralization is supported by paper conducted by Murshed and Tadjoeddin, 2008 mentioning that the principal of decentralization is to deliver services closer to local people, however the extent of devolution is difficult to measure and quantify so they employ fiscal dimension to measure fiscal decentralization as the proxy for state capacity, that is; a measure of the economic size of district government relative to local income (the ratio of local government expenditure to RGDP).

The other variables that are assumed to have effect on economic growth in this observation are labour force measured by the ratio of share of adult population age between 15-60 years that works at least one hour per week, human capital that is measured by share of population completed higher education and initial per capita regional gross domestic product as control variable.

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[6] The data is derived from website online at www.djpk.depkeu.go.id

Labour force is covered as independent variable based on the theory of production function that capital and labour are function of output (Barro, R, 1990). This variable also is used by Zhang and Zou, 1997 on their empirical estimation model. Other independent variable; human capita is included in the model for analysis because human capital can improve life level through enlarging employment opportunities, and increasing productivity, hence increasing economic growth (Elias, Silvina and Fernandoz (2000). According to them, many channel for human investment are formal schooling, primary research, on-the job training, learning by doing and product innovation. For this reason, we take human capital investment to include in the model. The other variable is initial per capita income that is quoted from Davoodi and Zou when investigating the relationship between fiscal decentralization and economic growth. We include this variable in the model to correlation between initial income per capita and the relative size of local government expenditure to RGDP and correlation between initial per capita income. If the correlation is negative, we would expect that the poorer regions (with lower per capita income) have bigger the share of local government expenditure to RGDP rather than the richer regions, whereas the positive correlation is indication that the poorer regions have smaller share of local government expenditure to RGDP rather than the richer regions (Tadjoeddin and Murshed, 2008).

3.3. Model

This study uses; first, the multiple regression method with balanced panel model, combining annual time-series data during the period 1999-2003 before and after implementing fiscal decentralization based on Law 25/1999 for model 1, second, we also want to know the effect of fiscal decentralization on economic growth from the data after implementing the law from 2001-2003 for model 2, and the third, cross section model with 180 observations to see whether fiscal decentralization in the first implementation. In each type of model, we use two approaches to know the effect of fiscal decentralization on economic growth; from expenditure side and revenue side; except for the first model. In the model 1, we only examine fiscal decentralization from expenditure side because the presence of general allocation fund is in the years after implementing Law No.25/1999.

Model 1

In this model, we use the balanced panel model to know the effect decentralization from 1999-2003 with one dummy variable. There are two models in the equation; first, model with independent variable, fiscal decentralization, which is measured from expenditure side, and second; fiscal decentralization from expenditure side.

Model 1; $Yij = \beta_0 + \beta_1 DCEij + \beta_2 Lij + \beta_3 SCij + \beta_4 D_j + \mu_{ij}$

Where;

Y_{ij} = The economic growth, representing the growth rate of RGDP in real term.

DCEij = The second fiscal decentralization, representing the ratio of local government expenditure to RGDP in real term.[7]

Lij = Labour that is measured by the ratio of adult population age between 15-60 years that works at least one hour per week.

SCij = Human capital that is measured by the ratio of population completed higher education.

Dj = Dummy variable

= 1 , for 2001, 2002, 2003 (years after implementing Law No.25/1999)

= 0, for 1999, 2000 (years before implementing Law No.25/1999)

i,j = Regency/municipality, year

Model 2

In this model, we examine the balanced panel model to test the effect fiscal decentralization after implementing Law 25/1999, from 2001-2003.

Model 2.A. $Yij = \beta_0 + \beta_1 DCEij + \beta_2 Lij + \beta_3 SCij + \beta_4 Ii_j + \mu_{ij}$

Model 2.B; $Yij = \beta_0 + \beta_1 DCRij + \beta_2 Lij + \beta_3 SCij + \beta_4 Ii_j + \mu_{ij}$

Where;

Y_{ij} = The economic growth, representing the growth rate of RGDP in real term.

DCEij= The second fiscal decentralization, representing the ratio of local government expenditure to RGDP in real term.[8]

DCRij = The first fiscal decentralization, representing the ratio of general allocation fund (DAU) to RGDP in real term.

Lij = Labour that is measured by the ratio of adult population age between 15-60 years that works at least one hour per week.

SCij = Human capital that is measured by the ratio of population completed higher education.

Iij = Initial per capita income in 2001

[7] Before implementing fiscal decentralization based on Law No.25/1999, fiscal year started from april to march. With regard to this, fiscal year on 1999/2000 only is for 9 month because the next year in 2001 it starts from January to December. For this reason, we use estimation to get the data of local government spending in 1999.

[8] Before implementing fiscal decentralization based on Law No.25/1999, fiscal year started from april to march. With regard to this, fiscal year on 1999/2000 only is for 9 month because the next year in 2001 it starts from January to December. For this reason, we use estimation to get the data of local government spending in 1999.

Model 3

In this model, we want to know whether fiscal decentralization in the first implementation of Law No.25/1999 has impact on economic growth during 2001-2003.

Model 3.A. $Yi = \beta_0 + \beta_1 DCEi + \beta_2 Li + \beta_3 SCi + \mu_i$

Model 3.B. $Yi = \beta_0 + \beta_1 DCRi + \beta_2 Li + \beta_3 SCi + \mu_i$

Y_i = The economic growth, representing the growth rate of RGDP in real term.

DCEi = The second fiscal decentralization, representing the ratio of local government expenditure to RGDP in real term.[9]

DCRi = The first fiscal decentralization, representing the ratio of general allocation fund (DAU) to RGDP in real term.

Li = Labour that is measured by the ratio of adult population age between 15-60 years that works at least one hour per week.

SCi = Human capital that is measured by the ratio of population completed higher education.

3.4. The Hypothesis of the Model

The hypothesis to test whether fiscal decentralization has impact on economic growth is as follow;

Ho: $\beta_1 = 0$ (There is no correlation between decentralization and economic growth).

H1: $\beta_1 \neq 0$ (There is correlation between decentralization and economic growth).

We will reject the null hypothesis if the probability value of the coefficient of fiscal decentralization variable is less than the significant level that we choose and accept the null hypothesis if probability value of the coefficient of fiscal decentralization variable is bigger than the significant level.

3.5. Test and Correction for Problems in Multiple Regression

In the multiple regression model, we often find problems such as multicollenearity, autocorrelation, and heteroscedasticity. With regard to this reason, before making conclusion we will check model from multicollenearity and heteroscedasticity. In this paper, we do not need to check autocorrelation because we only use cross section data for analysis whereas autocorrelation is to check data for time series. For balanced panel model, with combination time series and cross section observations, the model can reduce the problems that often appear in multiple regression model,

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[9] Before implementing fiscal decentralization based on Law No.25/1999, fiscal year started from april to march. With regard to this, fiscal year on 1999/2000 only is for 9 month because the next year in 2001 it starts from January to December. For this reason, we use estimation to get the data of local government spending in 1999.

so we only process with robust standard error after choosing the best model between the fixed effect model and random effect model.

3.5.1 Multicollenearity

Mullticollenearity is test to know correlation among independent variables in multiple regression model or the existence of linear relationship among independent variables. The consequences that will happen in the multicollenearity are (Gujarati, 1995);

1. The precise of estimation is difficult to find.
2. The confident intervals are larger that lead to the acceptance for Ho.
3. The t values of the coefficient of variable tend to insignificant.
4. R^2, the measure of goodness of fit will be very high.

According to (Gujarati, 1995), if correlation value between variables is larger than 0.80, meaning there is high multicollenearity in that model. The consequence of the presence of multicollenearity, we must conduct remedial for that model. There are several methods to deal with multicollenearity; droping a variable(s), transforming variables, and adding new data.

3.5.2. Test for Heteroscedasticy

Heterscedasticity will appear if the variance of each disturbance error or dependent variables is not constant. The effect of the presence is the OLS estimators become inefficient (high variance). This is problem that is common in cross section data. There are several ways to detect from this problem but in this paper, we only detect with Breusch-Pagan / Cook-Weisberg and Graphical Model with plotting residual and the estimated yi). In Breusch-Pagan test, the null hypothesis in this test is homoscedasticy (constant variance), so if probability value of this test is less that 5 %, we will reject Ho, meaning there is heteroscedasticity in that model. In the graphical model, we suspect the presence of heteroscedasticity if the graphic has systematic pattern (Gujarati, D, 1995). Although there are several ways to correct for heteroscedasticity, to get simple procedure, we will correct this problem with using White's (hubers) procedure. This test provides standard error to remedy for heteroscedasticity but the coefficients of regressors are still the same with model before correcting it. This test is also called robust standard error.

Chapter 4
ESTIMATION RESULT

4.1. Estimation Result of the Effect of Fiscal Decentralization on Economic Growth Before and After Implementing Law No. 25/1999 from 1999-2003

4.1.1. Panel Model with Random Effect Estimation

The estimation result for this model can be seen as the table 4.1.1. From the table we can get the equation for this model as the following model;

Model 1.A

$$Yij = 0.03511 + 0.01555\ DEij - 0.0077\ Lij - 0.00419\ SCij + 0.00917\ Di1 + eij$$
$$(0.000) \quad (0.115) \quad (0.279) \quad (0.876) \quad (0.00)$$[10]

From the random effect model in the equation above, we find that the coefficient of fiscal decentralization that is measured as the ratio of local government expenditure to Regional Gross Domestic Product (RGDP) has positive sign but not significantly different from zero at the 5% level of significance. We fail to find the significant effect between fiscal decentralization and economic growth in this model. The other independent variables; labour represented as share of population age between 15-60 that works at least 1 hour per week also has coefficient that is negative but not significantly different from zero. Again, we fail to explain the significant effect between share of population age between 15-60 years that works at least one hour per week and economic growth. The coefficient of human capital represented as the share of population completed higher education is positive but not significantly different from zero at the 5% level of significance. This variable loses it significance as well. The coefficient of dummy is positive and significantly different from zero at the 1% level of significance. However, we can not explain the effect on the other variables because they are not significant. From this model we can not explain about the effect of fiscal decentralization on economic growth.

[10] Figures in the bracket are the probability value of corresponding variable.

Table 4.1.1
Random Effect Panel Model 1999-2003; Expenditure Side as Proxy of Fiscal Decentralization

Dependent variable: economic growth	Random Effect	
Variable	coeff.	std error
(1)	(2)	(3)
Constant	0.0351148*	0.0043807
The ratio of local government expenditure to RGDP	0.0155556	0.0109470
The ratio of employee to population	-0.0077140	0.0071295
The ratio of share of population completed higher education school	-0.0041934	0.0269003
Dummy	0.0091688*	0.0018142
R-squared		
Within		0.0627
Between		0.0213
Overall		0.0472
Observation		900

Note:* significant 1%, ** significant 5%, ***significant 10%
Source: based on our calculation from stata result

4.1.2. Panel Model with Fixed Effect Estimation

From table 4.1.2, we can find the equation as the following model;

Model 1.B

$$Yij = 0.0265 + 0.0223\ DEij + 0.0075\ Lij - 0.0131\ SCij + 0.0862\ Di1 + eij$$
$$(0.000) \quad (0.116) \quad (0.386) \quad (0.677) \quad (0.00)$$[11]

From the fixed effect model, coefficient of fiscal decentralization is positive but not significantly different from zero at the 5 % level of significance. We fail to find the significant effect of fiscal decentralization and economic growth. The coefficient of labour that is represented as share of adult population age between 15-60 years that works at least 1 hour per week also fails to explain the significant effect on economic growth. The coefficient of school is positive but not significantly different from zero at the level of 5 % significance. Again, the variable can not explain the significant effect on economic growth. Dummy variable has positive effect on economic growth at the level of significance 1 percent. However, because the other variables are not significant, we can not explain the effect toward the other variables.

[11] Figures in the bracket are the probability value of corresponding variable.

Table 4.1.2
Fixed effect panel model 1999-2003; Expenditure Side as Proxy of Fiscal Decentralization

Dependent variable: Economic growth	Random	
Variable	coeff.	std error
(1)	(2)	(3)
Constant	0.0264885*	0.0052545
The ratio of local government expenditure to RGDP	0.0222495	0.0141520
The ratio of employee to population	0.0075106	0.0086608
The ratio of share of population completed higher education school	-0.0130656	0.0313795
Dummy	0.0086181*	0.0019907
R-squared		
Within		0.0672
Between		0.0067
Overall		0.0357
Observation		900

Note:* significant 1%, ** significant 5%, ***significant 10%

Source: based on our calculation from stata result

4.1.3. The Best Model after Examining Hausman Test

To find the best model between random effect and fixed effect, we examine them with hausman test (see appendix 1 for the overall result). We find that hausman fixed effect has probability value less than 5 percent (5% is general for the level of significance in doing analyses) and chi2 (4) = 10.60 that is outside the confident interval. Therefore, we reject the null hypothesis and draw conclusion that fixed effect model is better than the random effect model so to make conclusion of our result of study, we use the fixed effect model to do the best analysis (see chapter 3 to get more explanation). After choosing the best model, we see the robustness of fixed effect model and the result is in table 4.1.3. The coefficient variables are still the same with the model 4.1.2 but different standard error and probability value (see appendix 1). From the table, the coefficient of fiscal decentralization has positive sign and still not significantly different from zero at the 5% level of significance. However, fiscal decentralization has significantly positive effect on economic growth at the 10% level of significance. This means that if fiscal decentralization from expenditure side that is represented by the ratio of local government expenditure increases, economic growth will increase. Holding the other variables constant, a 10% increase of fiscal decentralization will increase economic growth by 0.002 percent. From the model, the coefficient dummy is positive and significantly different from zero but because the other variables are not significant, the coefficient can not explain the effect towards the other variables on economic growth. However, if we use the significant level of 10 percent in our observation, fiscal decentralization will have bigger effect on economic growth after implementation Law No.25/1999. The difference of an increase of economic growth before and after implementation Law No.25/1999 can be seen on the intercept value. Before implementation the law, intercept in the model only 0.0264885 and after implementation that law the intercept increase by (0.02648 + 0.0086).

Table 4.1.3
Fixed Effect Robust Panel Model; Expenditure Side as Proxy of Fiscal Decentralization

Dependent variable; Economic growth	Fixed Effect	
Variable	coeff.	std error
(1)	(2)	(3)
Constant	0.0264885*	0.0050993
The ratio of local government expenditure to RGDP	0.0222495**	0.0114969
The ratio of employee to population	0.0075106	0.0083812
The ratio of share of population completed higher education school	-0.0130656	0.0277786
Dummy	0.0086181*	0.0018547
R-squared		
Within		0.0672
Between		0.0067
Overall		0.0357
Observation		900

Note:* significant 1%, ** significant 5%, ***significant 10%
Source: based on our calculation from stata result

4.2. Estimation Result of the Effect of Fiscal Decentralization (From Expenditure Side) on Economic Growth after Implementing Law No.25/1999 from 2001-2003

4.2.1. Panel Model with the Random Effect Estimation

The estimation result for this model can be seen as on the table 4.2.1. From the table, we can find equation for the random effect regression as the following result;

Model 2.A.1

$$Yij = 0.0468 + 0.0188\ DEij - 0.0136\ Lij - 0.0080\ SCij + 1.23e\text{-}10\ Ii1 + eij$$
$$(0.000) \quad (0.034) \quad (0.045) \quad (0.727) \quad (0.198)$$[12]

Table 4.2.1 shows that coefficient of fiscal decentralization is positive and significantly different from zero at the 5% level of significance. Similar result is obtained from the coefficient of the ratio of share of population age between 15-60 years that works at least one hour per week but with the opposite sign. If fiscal decentralization increases 10 percent, economic growth will increase by 0.0018 % at the 5% level of significance, holding the other variables constant. And if the share of population age between 15-60 years that works at least one hour per week increases by 10 percent, economic growth will reduce by 0.0014 percent. Meanwhile, we can not find the significant effect on the coefficient of the share of population completed higher education and the coefficient of initial per capita income as control variable. From the random effect regression model, we can conclude that based on the analysis from 2001-2003 (after implementing Law no.25/1999) fiscal decentralization from expenditure side have positive effect on economic growth.

[12] Figures in the bracket are the probability value of corresponding variable

Table 4.2.1
Random Effect Model from 2001-2003; Expenditure Side as Proxy of Fiscal Decentralization

Dependent variable: economic growth	Random effect	
Variable	coeff	Std error
(1)	(2)	(3)
Constant	0.0467722*	0.0044138
The ratio of local government expenditure to RGDP	0.018779**	0.0088547
The ratio of employee to population	-0.013643**	0.0068141
The ratio of share adult population to higher school	-0.0079965	0.0229160
Initial RGDP per capita	1.23e-10	9.56e-11
R-squared		
Within		0.0043
Between		0.0502
Overall		0.0263
Observation		540

Note:* significant 1%, ** significant 5%, ***significant 10%
Source: based on our calculation from stata result

Table 4.2.1 shows that coefficient of fiscal decentralization is positive and significantly different from zero at the 5% level of significance. Similar result is obtained from the coefficient of the ratio of share of population age between 15-60 years that works at least one hour per week but with the opposite sign. If fiscal decentralization increases 10 percent, economic growth will increase by 0.0018 % at the 5% level of significance, holding the other variables constant. And if the share of population age between 15-60 years that works at least one hour per week increases by 10 percent, economic growth will reduce by 0.0014 percent. Meanwhile, we can not find the significant effect on the coefficient of the share of population completed higher education and the coefficient of initial per capita income as control variable. From the random effect regression model, we can conclude that based on the analysis from 2001-2003 (after implementing Law no.25/1999) fiscal decentralization from expenditure side have positive effect on economic growth.

4.2.2 Panel Model with the Fixed Effect Estimation

From table 4.2.2, we can make a model for the fixed effect regression as follow;

Model 2.A.2

$$Yij = 0.0382813 + 0.0265518\ DEij - 0.0001327\ Lij + 0.0027332\ SCij + eij$$
$$(0.000) \qquad (0.051) \qquad (0.987) \qquad (0.920)$$

In the fixed effect equation, the coefficient of local government expenditure to RGDP is positive but not significantly different from zero at the 5 % level of significance. But it will have significantly different from zero at the 10% level of significance. At the conventional 5% significant level, fiscal decentralization fails to explain the effect on economic growth but at the 10% level of significance, an increase of 10 percent fiscal decentralization will increase economic growth 0.0027 percent, holding the other variables constant. Coefficient of share of adult population age between 15-60 years that works at least one hour per week is negative

but not significantly different from zero either at the 5 % level or 10 % level of significance. The coefficient of share population completing higher education is positive but not significantly different from zero either at the 5% level or 10 % level significance. This can be concluded that from the fixed effect regression model based on investigating from 2001-2003 (after implementing Law no.25/1999), fiscal decentralization from expenditure side fails to explain the significant effect on economic growth at the 5% level of significance. However, it has positive effect at the 10% level of significance.

Table 4.2.2
Fixed Effect Model from 2001-2003; Expenditure Side as Proxy of Fiscal Decentralization

Variable	Fixed effect	
	coeff	Std error
(1)	(2)	(3)
Constant	0.0382813*	0.0053655
The ratio of local government expenditure to RGDP	0.0265518***	0.0135637
The ratio of employee to population	-0.0001327	0.0084225
The ratio of share adult population to higher school	-0.0027332	0.027194
R-squared		
Within		0.0106
Between		0.0025
Overall		0.0044
Observation		540

Note:* significant 1%, ** significant 5%, ***significant 10%
Source: based on our calculation from stata result

4.2.3 The Best Model after Examining Hausman Test

After making the two regression models, random effect regression model and fixed effect regression model, we construct Hausman fixed test to examine the best model between them (see the appendix 2.A for the overall result of random effect and fixed effect estimation and the hausman test). From the appendix 2.A, we see that probability value of hausman fixed test is less than 5 %, therefore the fixed effect estimation has better result than that of the random effect estimation. To see the robustness of our result, we make the best model with the fixed effect robust standard error. The result is displayed in table 4.2.3. The coefficients of variable are still same with model 4.2.2 but with different standard error and probability value (see appendix 2.A). From the stata result in appendix 2 we can see only the coefficient of fiscal decentralization that has significantly positive effect on economic growth at the level 5% of significant. If fiscal decentralization increases by 10 %, economic growth will increase by 0.026 percent, holding the other variable constant. The other variables fail to explain the significant effect on economic growth.

4.3. Estimation Result of the Effect of Fiscal Decentralization (From Revenue Side) on Economic Growth on Economic after Implementing Law No.25/1999 from 2001-2003

4.3.1. Panel Model with the Random Effect Estimation

From table 4.3.1, we can construct model for random effect estimation as the following model;

Model 2.B.1

$$Yij = 0.04816 + 0.0104\ DRij - 0.0133\ Lij - 0.0086\ SCij + 1.08e\text{-}10\ Ii1 + eij$$
$$(0.000) \quad (0.435) \quad (0.053) \quad (0.710) \quad (0.269)$$

From that model, we find that the coefficient of fiscal decentralization that is represented by the ratio of general allocation fund to RGDP (Regional Gross Domestic product) is positive but not significantly different from zero. Therefore, we fail to explain the significant effect between fiscal decentralization on economic growth. The coefficient of labour that is represented by share of adult population age between 15-60 years that works at least one hour per week is negative and significantly different from zero at the significant level of 10 % but not significantly different from zero at the significant level of 5 %. The coefficient of share adult population completing higher education is positive but not significantly different from zero either at the significant level of 5 % or 10 %. Again the coefficient of Initial RGDP per capita can not explain the significant effect on economic growth.

Table 4.3.1
Random Effect Model from 2001-2003; Revenue Side as Proxy of Fiscal Decentralization

Variable	random effect	
	coeff.	std error
(1)	(2)	(3)
Constant	0.0481567*	0.0044428
The ratio of general allocation fund to RGDP	0.0104116	0.0133400
The ratio of employee to population	0.0132847***	0.0068659
The ratio of share adult population to higher school	-0.0085742	0.0230162
Initial RGDP per capita	1.08e-10	9.77e-11
R-squared		
Within		0.0002
Between		0.0479
Overall		0.0197
Observation		540

Note:* significant 1%, ** significant 5%, ***significant 10%
Source: based on our calculation from stata result

4.3.2. Panel Model with the fixed Effect Estimation

From table 4.3.1, we can construct the panel model based on analysis from 2001-2003, the model is as follow;

Model 2.B.2

$$Yij = 0.032536 + 0.0879665\ DRij - 0.0004089\ Lij + 0.0019146\ SCij + eij$$
$$(0.000) \qquad (0.054) \qquad (0.961) \qquad (0.944)$$

In the model, we can find that the coefficient of fiscal decentralization that is represented by the ratio of general allocation fund to RGDP is positive but not significantly different from zero at the 5% level of significance. However, that coefficient is significantly different from zero at the 10% level of significant. Therefore, we can conclude that the coefficient of decentralization has effect on economic growth at the level significant of 10 %, meaning that if fiscal decentralization increases 10 percent, economic growth will increase by 0.0088 percent, holding the other variables constant at the 10% level of significant but not at the 5% level of significance. The coefficient of share of adult population age between 15-60 years that works at least one week per hour and share of population completed higher education is not significant therefore can not explain the effect on economic growth.

Table 4.3.2
Fixed Effect Model from 2001 – 2003; Revenue Side as Proxy of Fiscal Decentralization

Dependent variable: economic growth	Fixed effect	
Variable	coeff.	std error
(1)	(2)	(3)
Constant	0.032536*	0.0069818
The ratio of general allocation fund to RGDP	0.0879665***	0.0455969
The ratio of employee to population	-0.0004089	0.0084283
The ratio of share adult population to higher school	0.0019146	0.0271879
R-squared		
Within		0.0103
Between		0.0004
Overall		0.000
Observation		540

Note:* significant 1%, ** significant 5%, ***significant 10%
Source: based on our calculation from stata result

4.3.3 Fixed Effect Robust Standard Error

To further investigate these two models between the random effect and fixed effect estimation and choose the best model of them, we would examine them using the hausman fixed test (for the overall result for the estimation, see appendix 2.B). From the appendix 2.B, we find that probability hausman fixed test (0.0144) is less than 5 percent and the chi2 (3) = 10.56 that is outside the confident interval. Therefore, we reject the null hypothesis saying that fixed effect and random effect estimators do not differ substantially. We conclude that fixed effect estimation is better than the random effect estimation. To get the robustness of our result, we process estimation with the fixed effect robust standard error and the result can be seen at table 4.3 3.

Estimation model that is derived from that table is as follow;

$$Yij = 0.032536 + 0.0879665\ DRij - 0.0004089\ Lij + 0.0019146\ SCij + eij$$
$$(0.000) \qquad (0.003) \qquad (0.960) \qquad (0.929)$$

The difference of model between (4.3.1) random effect without robust and (4.3.3) random effect with robust is in the probability value of the test (figures in the bracket below the coefficient variables), however they have the same coefficient. From the model, we find that the coefficient of fiscal decentralization from revenue side represented by share of general allocation fund (DAU) to RGDP is positive and significantly different from zero at the level significant of 5 percent. It means that fiscal decentralization has effect on economic growth. If fiscal decentralization increases 10 percent, economic growth will increase by 0.088 percent, holding the other variables constant. The other variables, share of adult population age between 15-60 years that works at least one hour per week and share of population completed higher education still can not explain the significant effect on economic growth.

Table 4.3.3
Fixed Effect Robust Standard Error, 2001-2003; Revenue Side as Proxy of Fiscal Decentralization

Dependent variable : economic growth	Fixed	
Variable	coeff.	std error
(1)	(2)	(3)
Constant	0.032536*	0.0062502
The ratio of general allocation fund to RGDP	0.0879665**	0.0280762
The ratio of employee to population	-0.0004089	0.0080762
The ratio of share adult population to higher school	0.0019146	0.0215856
R-squared		
Within		0.0103
Between		0.0004
Overall		0.0000
Observation		540

Note:* significant 1%, ** significant 5%, ***significant 10%
Source: based on our calculation from stata result

4.4. Estimation Result of Cross Section Model in 2001

The purpose of this model is to know whether fiscal decentralization from expenditure side and revenue side in the first year implementing Law No.25/1999 has effect on the economic growth during 2001-2003. Before conducting analysis, we have to detect problems that often appear in multiple regression model.

$Yi = \beta_0 + \beta_1 DCEi + \beta_2 Li + \beta_3 SCi + \mu_i$ …….model 3.A.
$Yi = \beta_0 + \beta_1 DCRi + \beta_2 Li + \beta_3 SCi + \mu_i$ …… model 3.B.

4.4.1. Multicollenearity

Correlation value between variables:

For model 44.A

```
             |      yij      lij     scij    dceij
-------------+------------------------------------
         yij |   1.0000
         lij |  -0.2445   1.0000
```

```
        scij |   0.0598   0.0127   1.0000
       dceij |  -0.0187   0.1680   0.0574   1.0000
```

For model 4.4.B

```
             |     yij      lij     scij    dcrij
-------------+------------------------------------
         yij |   1.0000
         lij |  -0.2445   1.0000
        scij |   0.0598   0.0127   1.0000
       dcrij |  -0.0786   0.2446   0.1329   1.0000
```

From table either for model 4.4.A or 4.4.B above all of the correlation value among independent variables are less than 0.8 meaning this model is free from problem of multicollenearity, so we can conduct the next step to do the other test. We do not need to check autocorrelation because we only use cross section data not time series.

4.4.2. Heteroscedasticity

Further test is Breusch-Pagan / Cook-Weisberg test for heteroskedasticity. The result of test using stata is as follow;

1. Breusch-Pagan / Cook-Weisberg test for model 4.4.A

Ho: Constant variance

Variables: fitted values of yij

chi2(1) = 1.19

Prob > chi2 = 0.2750

2. Breusch-Pagan / Cook-Weisberg test for model 4.4.B

Ho: Constant variance

Variables: fitted values of yij

chi2(1) = 1.11

Prob > chi2 = 0.2919

From the Breush-Pagan test for model 4.4.A and 4.4.B, we find that probability value is larger than 5 percent so we do not have reason to reject the null hypothesis. It means that model 4.4.A and 44.A have constant variances so they are free from heteroscedasticity problems and we can continue to make analysis for that model. Test for heteroscedasticity can also be done with plot for the estimated residual square toward the estimated yi (see appendix 3.A for model 3.A and appendix 3.B for model 3.B). According to Gujarati (1995), if there is no systematic pattern, it may be indication of no heteroscedasticity in the data. However, to make sure the right result, in addition to use the graphical method, we check with the Breusch-Pagan /Cook-Weisberg test.

4.4.3. Estimation Model

After correcting for problems in multiple regression, we find final result for these two models as follow (see the stata result for detail in appendix 3.A for model 3.A and appendix 3.B for model 3.B);

Model 3.A

$$Yi = 0.054958 + 0.004236\ DCEi - 0.0326724\ Li + 0.0290499\ SCi + \mu_i$$
$$(0.000) \quad (0.792) \quad (0.001) \quad (0.398)$$

F (3,176) = 0.0085

Prob > F = 0.0085

Model 3.B

$$Yi = 0.0552179 - 0.0065399\ DCRi - 0.0313092\ Li + .0313387\ SCi + \mu_i$$
$$(0.000) \quad (0.701) \quad (0.002) \quad (0.366)$$

F (3, 176) = 4.05

Prob > = 0.0082

In the model 3.A, the coefficient of fiscal decentralization is positive but not significantly different from zero at the significant level of 5% therefore, fiscal decentralization in that model can not explain the significant effect on economic growth. The coefficient of fiscal decentralization on model 3.B is not significantly different from zero at the significant level of 5 percent, but with the opposite sign. The coefficient of labour that is represented the ratio of adult population age between 15-60 years in the model 3.A is negative and significantly different from zero at the significant level of 5 percent. It means that if share of adult population age between 15-60 years that works at least one hour per week increases 10 percent, economic growth during 2001-2003 will reduce by 0.003 percent. The similar result is found for model 3.B, if share of adult population age between 15-60 years that works at least one hour per week increases by 10 percent in 2001, economic growth during 2001-2003 will reduce by 0.003 percent. Human capital that is represented as the share of population completed higher education in these two models has positive sign but not significantly different from zero. They lose the significant effect on economic growth. From these two models, we find that fiscal decentralization from revenue side and expenditure side after implementing Law No.1999 have no effect on economic growth during 2001-2003.

Chapter 5
CONCLUSION

Decentralization in Indonesia with full autonomy in district area implemented in 20001 is formulated not because of the need for improving service delivery, however because of the strong pressure of many provinces to ask for greater decentralization especially outside java islands that have abundant natural resources and felt exploited and treated unfairly during the Suharto's regime.

Most of people felt sceptical with the success of decentralization process because the Law of decentralization; Law 22/1999 on regional government and Law 25/1999 on the fiscal balance between the central government and region government were made in hurried manner to meet dissatisfaction of the societies outside Java.

Although these Laws were formulated with half-hearted, on the investigation of this research paper that is conducted in 19 provinces covering 180 municipalities/regencies, we find that the impact of fiscal decentralization on economic growth is positive in the three years after implementation these laws. This finding is in accordance with theory that states that fiscal decentralization usually makes a positive impact on economic growth however, this finding is surprising in the light of the conventional finding that the relationship between fiscal decentralization and economic growth in most developing countries generally is negative.

An increase of economic growth due to an increase of degree of fiscal decentralization is not only found from the degree of fiscal decentralization that is measured from expenditure side but also from revenue side. In the three years after implementing Law No.25/1999, fiscal decentralization that is measured through local government expenditure has positive effect on economic growth, if fiscal decentralization increases 1 percent, economic growth will increase by 0.00026 percent. Whereas from fiscal decentralization that is measured through general allocation fund, if fiscal decentralization increases 1 percent, economic growth will increase by 0.00088 percent. Although the rise is very small, it can give satisfaction especially the societies outside Java to do the better development in the coming year. However, based on empirical finding that is conducted from 1999-2003, fiscal decentralization has no effect on economic growth. The same result is found when investigating to see the effect of fiscal decentralization in the first year implementation Law No.25/1999 towards economic growth during 2001-2003.

The positive relationship between fiscal decentralization and economic growth may appear because the indirect effect of reducing tension and conflict especially in regions outside java such as in Papua, Maluku, and Riau. Reducing tension and conflict make peace and certainty to do investment especially foreign investors, eventually lead to enlarging employment chance, increasing productivity and hence increasing economic growth. This is in accordance with empirical finding by Tadjoedin and Murshed (2007) that says that the impact of fiscal decentralization can reduce routine social violence in Java. Similar result is found by Dawn Brancati that good managing ethnic and secessionism through decentralization can increase national economies.

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Table 1
Sample List of Province

Provinces
(1)
1. Sumatera Utara
2. Sumatera Barat
3. Riau
4. Jambi
5. Bengkulu
6. Lampung
7. Jawa Barat
8. Jawa Tengah
9. DI Yogyakarta
10. Jawa Timur
11. Bali
12. Nusa Tenggara Barat
13. Nusa Tenggara Timur
14. Kalimantan Barat
15. Kalimantan Timur
16. Kalimantan Tengah
17. Kalimantan Selatan
18. Sulawesi Utara
19. Sulawesi Selatan

Source: Badan Pusat Statistik, Statistics Indonesia

Table 2
Percentages of Consolidated Indonesia Local Revenue

Revenue Category	Percentages		
	2001	2002	2003
(1)	(2)	(3)	(4)
Total Local Revenue	6.54	7.46	8.44
- Local Tax	2.83	2.81	3.36
- Local User Charges	2.19	2.32	2.68
- Local State Enterp	0.14	0.20	0.4
- Other Revenues	1.38	2.11	2.05
Balancing Fund;	86.68	78.78	77.11
-Tax Sharing	7.20	7.43	14.05
-Natural Resource	10.34	9.24	4.92
-General Purpose Grant	68.08	61.52	62.52
- Other	1.06	0.59	6.91
Others	6.78	13.77	8.48

Source: calculated from www.djpk.go.id

Appendix 1
Eviews Estimation Output (sample observation 1993-2003)

Result for Model 1.A

```
. xtset  district year
       panel variable:  district (strongly balanced)
        time variable:  year, 1999 to 2003
                delta:  1 unit

. xtreg  yij deij lij scij di1,fe

Fixed-effects (within) regression               Number of obs      =       900
Group variable: district                        Number of groups   =       180

R-sq:  within  = 0.0672                         Obs per group: min =         5
       between = 0.0067                                        avg =       5.0
       overall = 0.0357                                        max =         5

                                                F(4,716)           =     12.89
corr(u_i, Xb)  = -0.0556                        Prob > F           =    0.0000

------------------------------------------------------------------------------
         yij |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        deij |   .0222495    .014152     1.57   0.116    -.0055349     .050034
         lij |   .0075106   .0086608     0.87   0.386     -.009493    .0245141
        scij |  -.0130656   .0313795    -0.42   0.677    -.0746724    .0485411
         di1 |   .0086181   .0019907     4.33   0.000     .0047098    .0125264
       _cons |   .0264885   .0052545     5.04   0.000     .0161725    .0368046
-------------+----------------------------------------------------------------
     sigma_u |  .01473867
     sigma_e |   .0222224
         rho |  .30549786   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(179, 716) =     2.11            Prob > F = 0.0000

. estimates store fixed
```

Result for model 1.B

```
. xtreg  yij deij lij scij di1,re

Random-effects GLS regression                   Number of obs      =       900
Group variable: district                        Number of groups   =       180

R-sq:  within  = 0.0627                         Obs per group: min =         5
       between = 0.0213                                        avg =       5.0
       overall = 0.0472                                        max =         5

Random effects u_i ~ Gaussian                   Wald chi2(4)       =     50.67
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000

------------------------------------------------------------------------------
         yij |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        deij |   .0155556    .010947     1.42   0.155    -.0059002    .0370114
         lij |   -.007714   .0071295    -1.08   0.279    -.0216876    .0062596
        scij |  -.0041934   .0269003    -0.16   0.876     -.056917    .0485302
         di1 |   .0091688   .0018142     5.05   0.000      .005613    .0127245
       _cons |   .0351148   .0043807     8.02   0.000     .0265288    .0437009
-------------+----------------------------------------------------------------
     sigma_u |  .01020156
     sigma_e |   .0222224
         rho |  .17406016   (fraction of variance due to u_i)
------------------------------------------------------------------------------
. hausman fixed

                 ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |     fixed          .          Difference          S.E.
-------------+----------------------------------------------------------------
        deij |    .0222495     .0155556         .006694         .008969
         lij |    .0075106     -.007714        .0152246        .0049173
        scij |   -.0130656    -.0041934       -.0088722        .0161569
         di1 |    .0086181     .0091688       -.0005506        .0008195
------------------------------------------------------------------------------
                           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(4) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =       10.60
                Prob>chi2 =      0.0314
                (V_b-V_B is not positive definite)
```

```
. xtreg  yij deij lij scij di1,fe robust

Fixed-effects (within) regression               Number of obs      =       900
Group variable: district                        Number of groups   =       180

R-sq:  within  = 0.0672                         Obs per group: min =         5
       between = 0.0067                                        avg =       5.0
       overall = 0.0357                                        max =         5

                                                F(4,179)           =     11.79
corr(u_i, Xb)  = -0.0556                        Prob > F           =    0.0000

                            (Std. Err. adjusted for 180 clusters in district)
------------------------------------------------------------------------------
             |               Robust
         yij |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        deij |   .0222495   .0114969     1.94   0.055    -.0004374    .0449364
         lij |   .0075106   .0083812     0.90   0.371     -.009028    .0240492
        scij |  -.0130656   .0277786    -0.47   0.639    -.0678813      .04175
         di1 |   .0086181   .0018547     4.65   0.000     .0049583     .012278
       _cons |   .0264885   .0050993     5.19   0.000      .016426     .036551
-------------+----------------------------------------------------------------
     sigma_u |  .01473867
     sigma_e |   .0222224
         rho |  .30549786   (fraction of variance due to u_i)
------------------------------------------------------------------------------


. clear
```

Appendix 2.A

Eviews Estimation Output (sample observation 2001-2003), Expenditure Side as Proxy of Fiscal Decentralization

Result for Model 2.A.1

```
. xtset  district year
       panel variable:  district (strongly balanced)
        time variable:  year, 2001 to 2003
                delta:  1 unit

. xtreg  yij deij lij scij ii1,fe

Fixed-effects (within) regression               Number of obs      =       540
Group variable: district                        Number of groups   =       180

R-sq:  within  = 0.0106                         Obs per group: min =         3
       between = 0.0025                                        avg =       3.0
       overall = 0.0044                                        max =         3

                                                F(3,357)           =      1.28
corr(u_i, Xb)  = -0.1055                        Prob > F           =    0.2817

------------------------------------------------------------------------------
         yij |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        deij |   .0265518   .0135637     1.96   0.051     -.000123    .0532265
         lij |  -.0001327   .0084225    -0.02   0.987    -.0166967    .0164312
        scij |   .0027332    .027194     0.10   0.920    -.0507474    .0562137
         ii1 |  (dropped)
       _cons |   .0382813   .0053655     7.13   0.000     .0277292    .0488333
-------------+----------------------------------------------------------------
     sigma_u |  .01376287
     sigma_e |  .01564767
         rho |  .43617626   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(179, 357) =     2.19            Prob > F = 0.0000

. estimates store fixed
```

Result for Model 2.A.2

```
. xtreg  yij deij lij scij ii1,re

Random-effects GLS regression                   Number of obs      =       540
Group variable: district                        Number of groups   =       180

R-sq:  within  = 0.0043                         Obs per group: min =         3
       between = 0.0502                                        avg =       3.0
       overall = 0.0263                                        max =         3

Random effects u_i ~ Gaussian                   Wald chi2(4)       =      9.54
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0490

------------------------------------------------------------------------------
         yij |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        deij |    .018779   .0088547     2.12   0.034      .001424    .0361339
         lij |   -.013643   .0068141    -2.00   0.045    -.0269983   -.0002876
        scij |  -.0079965    .022916    -0.35   0.727    -.0529111     .036918
         ii1 |   1.23e-10   9.56e-11     1.29   0.198    -6.44e-11    3.10e-10
       _cons |   .0467722   .0044138    10.60   0.000     .0381214     .055423
-------------+----------------------------------------------------------------
     sigma_u |  .00977515
     sigma_e |  .01566963
         rho |  .28014096   (fraction of variance due to u_i)
------------------------------------------------------------------------------
. hausman fixed

                ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |     fixed          .          Difference          S.E.
-------------+----------------------------------------------------------------
        deij |    .0265518      .018779        .0077728        .0102746
         lij |   -.0001327     -.013643        .0135103        .0049504
        scij |    .0027332    -.0079965        .0107297        .0146413
------------------------------------------------------------------------------
                           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(3) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =        8.17
                Prob>chi2 =      0.0426


. xtreg  yij deij lij scij ii1,fe fixed
option fixed not allowed
r(198);
```

```
. xtreg  yij deij lij scij ii1,fe robust

Fixed-effects (within) regression               Number of obs      =       540
Group variable: district                        Number of groups   =       180

R-sq:  within  = 0.0106                         Obs per group: min =         3
       between = 0.0025                                        avg =       3.0
       overall = 0.0044                                        max =         3

                                                F(3,179)           =      1.53
corr(u_i, Xb)  = -0.1055                        Prob > F           =    0.2077

                            (Std. Err. adjusted for 180 clusters in district)
------------------------------------------------------------------------------
             |               Robust
         yij |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        deij |   .0265518    .012401     2.14   0.034     .0020808    .0510227
         lij |  -.0001327    .008124    -0.02   0.987    -.0161639    .0158985
        scij |   .0027332   .0217515     0.13   0.900    -.0401892    .0456555
         ii1 |  (dropped)
       _cons |   .0382813   .0050646     7.56   0.000     .0282873    .0482752
-------------+----------------------------------------------------------------
     sigma_u |  .01376287
     sigma_e |  .01564767
         rho |  .43617626   (fraction of variance due to u_i)
------------------------------------------------------------------------------

Correlation

             |     deij      lij     scij      ii1
-------------+------------------------------------
        deij |   1.0000
         lij |   0.0985   1.0000
        scij |   0.0340  -0.0185   1.0000
         ii1 |  -0.1937  -0.1361  -0.1007   1.0000
```

Appendix 2.B

Eviews Estimation Output (sample observation 2001-2003), Expenditure Side as Proxy of Fiscal Decentralization

Appendix 2.B

Result for Model 2.B.1

```
.xtreg  yij dcrij lij scij ii1,fe

Fixed-effects (within) regression               Number of obs      =       540
Group variable: district                        Number of groups   =       180

R-sq:  within  = 0.0103                         Obs per group: min =         3
       between = 0.0004                                        avg =       3.0
       overall = 0.0000                                        max =         3

                                                F(3,357)           =      1.24
corr(u_i, Xb)  = -0.4420                        Prob > F           =    0.2945

------------------------------------------------------------------------------
         yij |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       dcrij |   .0879665   .0455969     1.93   0.054    -.0017058    .1776387
         lij |  -.0004089   .0084283    -0.05   0.961    -.0169844    .0161665
        scij |   .0019146   .0271879     0.07   0.944    -.0515541    .0553833
         ii1 |  (dropped)
       _cons |    .032536   .0069818     4.66   0.000     .0188053    .0462666
-------------+----------------------------------------------------------------
     sigma_u |  .01531828
     sigma_e |  .01565006
         rho |  .48928772   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(179, 357) =     2.22            Prob > F = 0.0000

. estimates store fixed
```

Result for Model 2.B.2

```
. xtreg  yij dcrij lij scij ii1,re

Random-effects GLS regression                   Number of obs      =       540
Group variable: district                        Number of groups   =       180

R-sq:  within  = 0.0002                         Obs per group: min =         3
       between = 0.0479                                        avg =       3.0
       overall = 0.0197                                        max =         3

Random effects u_i ~ Gaussian                   Wald chi2(4)       =      5.57
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.2339

------------------------------------------------------------------------------
         yij |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       dcrij |   .0104116     .01334     0.78   0.435    -.0157342    .0365575
         lij |  -.0132847   .0068659    -1.93   0.053    -.0267417    .0001723
        scij |  -.0085742   .0230162    -0.37   0.710    -.0536851    .0365367
         ii1 |   1.08e-10   9.77e-11     1.11   0.269    -8.34e-11    3.00e-10
       _cons |   .0481567   .0044428    10.84   0.000     .0394491    .0568644
-------------+----------------------------------------------------------------
     sigma_u |  .00984832
     sigma_e |  .01567203
         rho |  .28309668   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

```
. hausman fixed

                 ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |     fixed          .          Difference          S.E.
-------------+------------------------------------------------------------
       dcrij |    .0879665     .0104116        .0775548        .0436019
         lij |   -.0004089    -.0132847        .0128757        .0048883
        scij |    .0019146    -.0085742        .0104887         .014472
------------------------------------------------------------------------------
                           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(3) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                         =       10.56
               Prob>chi2 =      0.0144

. xtreg  yij dcrij lij scij ii1,fe robust

Fixed-effects (within) regression               Number of obs      =       540
Group variable: district                        Number of groups   =       180

R-sq:  within  = 0.0103                         Obs per group: min =         3
       between = 0.0004                                        avg =       3.0
       overall = 0.0000                                        max =         3

                                                F(3,179)           =      3.57
corr(u_i, Xb)  = -0.4420                        Prob > F           =    0.0152

                            (Std. Err. adjusted for 180 clusters in district)
------------------------------------------------------------------------------
             |               Robust
         yij |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       dcrij |   .0879665   .0289516     3.04   0.003     .0308361    .1450968
         lij |  -.0004089   .0080762    -0.05   0.960    -.0163458    .0155279
        scij |   .0019146   .0215856     0.09   0.929    -.0406803    .0445095
         ii1 |  (dropped)
       _cons |    .032536   .0062502     5.21   0.000     .0202024    .0448696
-------------+----------------------------------------------------------------
     sigma_u |  .01531828
     sigma_e |  .01565006
         rho |  .48928772   (fraction of variance due to u_i)
------------------------------------------------------------------------------

Correlation
             |    dcrij      lij     scij      ii1
-------------+------------------------------------
       dcrij |   1.0000
         lij |   0.1558   1.0000
        scij |   0.0765  -0.0185   1.0000
         ii1 |  -0.2566  -0.1361  -0.1007   1.0000.
```

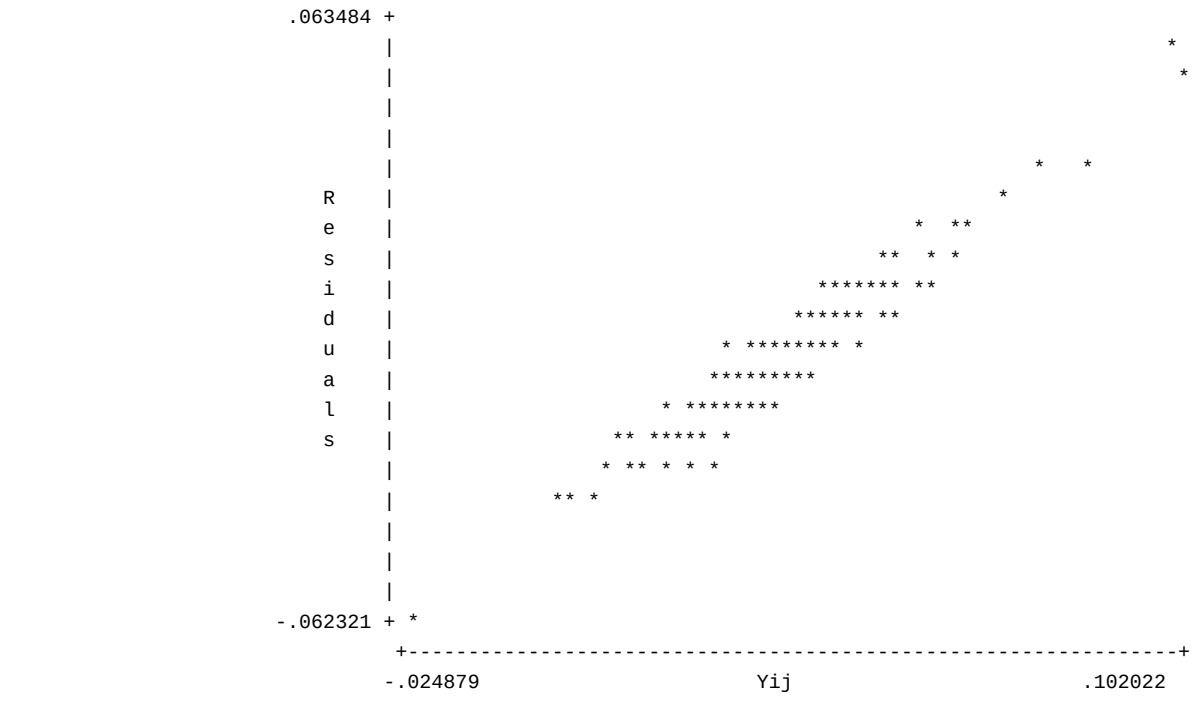
Appendix 3.A
Eviews Estimation Output (Cross Section, 2001)

Result model 3.A

```
. regress  yij lij scij dceij

      Source |       SS       df       MS              Number of obs =     180
-------------+------------------------------           F(  3,   176) =    4.02
       Model |  .002939927     3  .000979976           Prob > F      =  0.0085
    Residual |  .042923473   176  .000243883           R-squared     =  0.0641
-------------+------------------------------           Adj R-squared =  0.0481
       Total |  .045863399   179   .00025622           Root MSE      =  .01562

------------------------------------------------------------------------------
         yij |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         lij |  -.0326724   .0097239    -3.36   0.001    -.0518629   -.0134818
        scij |   .0290499   .0343045     0.85   0.398    -.0386512     .096751
       dceij |    .004236   .0160528     0.26   0.792    -.0274447    .0359167
       _cons |    .054958   .0057851     9.50   0.000     .0435408    .0663752
------------------------------------------------------------------------------

. corr  yij lij scij dceij, means
(obs=180)

    Variable |         Mean    Std. Dev.          Min          Max
-------------+--------------------------------------------------
         yij |     .0383983     .0160069     -.024879     .1020215
         lij |     .5628187     .1217704      .282665      .818745
        scij |     .0460654     .0340826      .003705       .15675
       dceij |     .1158333      .073878          .01           .5


             |      yij      lij     scij    dceij
-------------+------------------------------------
         yij |   1.0000
         lij |  -0.2445   1.0000
        scij |   0.0598   0.0127   1.0000
       dceij |  -0.0187   0.1680   0.0574   1.0000
```

```
. regress  yij lij scij dceij, beta

      Source |       SS       df       MS              Number of obs =     180
-------------+------------------------------           F(  3,   176) =    4.02
       Model |  .002939927     3  .000979976           Prob > F      =  0.0085
    Residual |  .042923473   176  .000243883           R-squared     =  0.0641
-------------+------------------------------           Adj R-squared =  0.0481
       Total |  .045863399   179   .00025622           Root MSE      =  .01562

------------------------------------------------------------------------------
         yij |      Coef.   Std. Err.      t    P>|t|                     Beta
-------------+----------------------------------------------------------------
         lij |  -.0326724   .0097239    -3.36   0.001                -.2485509
        scij |   .0290499   .0343045     0.85   0.398                 .0618543
       dceij |    .004236   .0160528     0.26   0.792                 .0195506
       _cons |    .054958   .0057851     9.50   0.000                        .
------------------------------------------------------------------------------
. vif

    Variable |       VIF       1/VIF
-------------+----------------------
       dceij |      1.03    0.968720
         lij |      1.03    0.971767
        scij |      1.00    0.996695
-------------+----------------------
    Mean VIF |      1.02

. vce, corr
Correlation matrix of coefficients of regress model

        e(V) |      lij      scij     dceij     _cons
-------------+------------------------------------------
         lij |   1.0000
        scij |  -0.0031    1.0000
       dceij |  -0.1676   -0.0561    1.0000
       _cons |  -0.8913   -0.2522   -0.1476    1.0000

. hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of yij

         chi2(1)      =     1.19
         Prob > chi2  =   0.2750
```

```
. predict res, r
. plot res  yij
```



Appendix 3.B for model 3.B

```
. regress  yij lij scij dcrij

      Source |       SS       df       MS              Number of obs =     180
-------------+------------------------------           F(  3,   176) =    4.05
       Model |  .002959102     3  .000986367           Prob > F      =  0.0082
    Residual |  .042904297   176  .000243774           R-squared     =  0.0645
-------------+------------------------------           Adj R-squared =  0.0486
       Total |  .045863399   179   .00025622           Root MSE      =  .01561

------------------------------------------------------------------------------
         yij |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         lij |  -.0313092   .0098859    -3.17   0.002    -.0508193    -.011799
        scij |   .0313387   .0345538     0.91   0.366    -.0368544    .0995318
       dcrij |  -.0065399   .0169813    -0.39   0.701    -.0400532    .0269733
       _cons |   .0552179   .0057212     9.65   0.000     .0439268    .0665089
------------------------------------------------------------------------------

. corr  yij lij scij dcrij, means
(obs=180)

    Variable |         Mean    Std. Dev.          Min          Max
-------------+--------------------------------------------------------
         yij |     .0383983     .0160069     -.024879     .1020215
         lij |     .5628187     .1217704      .282665      .818745
        scij |     .0460654     .0340826      .003705       .15675
       dcrij |     .0981423     .0715186     .0061999     .4986937
```

```
             |      yij      lij     scij    dcrij
-------------+------------------------------------
         yij |   1.0000
         lij |  -0.2445   1.0000
        scij |   0.0598   0.0127   1.0000
       dcrij |  -0.0786   0.2446   0.1329   1.0000


. regress  yij lij scij dcrij, beta

      Source |       SS       df       MS              Number of obs =     180
-------------+------------------------------           F(  3,   176) =    4.05
       Model |  .002959102     3  .000986367           Prob > F      =  0.0082
    Residual |  .042904297   176  .000243774           R-squared     =  0.0645
-------------+------------------------------           Adj R-squared =  0.0486
       Total |  .045863399   179   .00025622           Root MSE      =  .01561

------------------------------------------------------------------------------
         yij |      Coef.   Std. Err.      t    P>|t|                     Beta
-------------+----------------------------------------------------------------
         lij |  -.0313092   .0098859    -3.17   0.002                -.2381806
        scij |   .0313387   .0345538     0.91   0.366                 .0667278
       dcrij |  -.0065399   .0169813    -0.39   0.701                -.0292204
       _cons |   .0552179   .0057212     9.65   0.000                        .
------------------------------------------------------------------------------
. vif

    Variable |       VIF       1/VIF
-------------+----------------------
       dcrij |      1.08    0.923323
         lij |      1.06    0.939766
        scij |      1.02    0.981927
-------------+----------------------
    Mean VIF |      1.06

. vce, corr
Correlation matrix of coefficients of regress model

        e(V) |      lij      scij     dcrij     _cons
-------------+------------------------------------------
         lij |   1.0000
        scij |   0.0206    1.0000
       dcrij |  -0.2451   -0.1338    1.0000
       _cons |  -0.9068   -0.2593   -0.0157    1.0000

. hettest
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of yij

         chi2(1)      =     1.11
         Prob > chi2  =   0.2919

. predict res, r
```

```
. plot res  yij

 .063409 +
         |                                                                  *
         |
         |                                                                   *
         |
         |                                                      *   *
    R    |                                           *      *
    e    |                                              **
    s    |                                     *   **  * *
    i    |                                    ******* **
    d    |                                  ****** **
    u    |                           * ******** *
    a    |                          *********
    l    |                      * ********
    s    |                   ** ***** *
         |                 * ** * * *
         |             ** *
         |
         |
         |
-.061943 + *
          +-----------------------------------------------------------------+
         -.024879                        Yij                          .102022
```