CIRJE-F-315

Fiscal Decentralization, Commitment and Regional Inequality:
Evience from State-level Cross-sectional Data for the United States

Nobuo Akai
University of Hyogo

Masayo Sakata
Osaka International University

January 2005

Fiscal Decentralization, Commitment and Regional Inequality:

Evidence from State-level Cross-sectional Data for the United States [*]

Nobuo Akai[†] Masayo Sakata[1]

Abstract

While conventional approaches to fiscal decentralization suggest that decentralization lowers the power of redistribution among regions, recent theories argue that fiscal decentralization works as a commitment device. In this manner, where the budget in a given region is highly dependent on transfers from the central government, there is an incentive for effort following fiscal decentralization. The former effect is argued to increase regional inequality, while the latter suggests a decrease in regional inequality. However no known empirical work has directly examined the relationship between fiscal decentralization and regional inequality. In this paper, cross-sectional data for the United States, excluding the convergence of regional income, are used to derive the net relationship. It is also the case that the direction of this effect on regional inequality depends on how fiscal decentralization is promoted. While the former distribution effect directly depends on the central government's share of power, the latter incentive effect depends on autonomy. Two measures that represent the power of the central government and autonomy are used to identify these effects. The results indicate that local expenditure or revenue share in fiscal decentralization has no significant effect on regional inequality, while the achievement of autonomy by fiscal decentralization has a negative effect on regional inequality. This supports the theory that fiscal decentralization works as a commitment device. The results also show that how fiscal decentralization is promoted is important for how it impacts on regional inequality.

Key Words: Fiscal Decentralization, Regional inequality, Commitment

JEL classification: H71, H72, H73, H77

---

[*] Earlier versions of this paper were presented at the 60th Congress of the International Institute of Public Finance and the Japanese Economic Association Meeting. The authors gratefully acknowledge helpful comments by Professor Lars Feld (Philipps University, Marburg, Germany) and Professor Toru Nakazato (Sophia University, Tokyo, Japan). We take responsibility for any remaining errors or shortcomings in the paper.

[†]Correspondence to: Nobuo Akai, School of Business Administration, University of Hyogo, 8-2-1 Gakuen-Nishimachi, Nishiku, Kobe, 651-2197, Japan,
TEL:+81-(0)78-794-5984, FAX:+81-(0)78-794-6166, E-mail: akai@biz.u-hyogo.ac.jp

[1] Faculty of Politics, Economics and Law, Osaka International University

1. Introduction

Fiscal decentralization, or the devolution of fiscal responsibilities to lower levels of government, has recently focused on its role for good governance (see, for example, Oates (1993)). While this viewpoint of fiscal decentralization concerns its efficiency benefits, another view of fiscal decentralization argues that fiscal decentralization may increase regional inequality (disparity) because the centralized fiscal system is needed to establish public infrastructures for all regions and reduces regional inequality, especially at the development stage (Prud'homme (1995)). After combining the efficiency and equity effects, the total social welfare effect of fiscal decentralization is more ambiguous. Conversely, and as discussed in McKinnon (1995) and Qian and Weingast (1997), more recent theoretical work that focuses on fiscal decentralization as a commitment device suggests that regional inequality may be related to the efficiency of public services, and that ex ante fiscal decentralization may not only contribute to enhanced efficiency, but also reduce ex post regional inequality.

In a centralized fiscal system, it is possible to redistribute resources from rich to poor regions. This reduces regional inequality in the ex post sense. However, this does not necessarily mean that regional inequality becomes smaller when compared with ex ante regional inequality when the dynamic incentive effect of regions is considered. For example, bailout policies for the ex post poor region through the redistribution of resources from the central government may soften its budget and distort the ex ante incentive of regions that become poor ex post without any effort, but can escape with effort. In this situation, fiscal decentralization, which involves the devolution of government fiscal responsibilities to lower levels of government, may work as a commitment device not to bail out the ex post poor region and provides an incentive for regions that have power to escape being poor. This suggests that hard budgets from fiscal decentralization reduce regional inequality by enhancing the incentive for efficient public policy for those regions that can escape from being poor by their own effort. If this holds, regional inequality may become smaller after fiscal decentralization.

However, it should be noted that the reduction in regional inequality should be distinguished from the convergence of inequality as a nation develops. The difference is that in the former the driving force reducing inequality is not national development, rather it is the commitment of government policy. Even if a nation fully develops, inequality is not reduced as long as the commitment device is not incorporated (this can be proven, in part, from the fact that regional inequality remains in developed countries).

If this theory concerning credibility is correct, a new hypothesis that fiscal decentralization as a commitment device reduces regional inequality can be put forward. In order to test this hypothesis, it is important to use a desirable data set, which can exclude the convergence effect in the development stage. The current paper is a first step in empirically examining this hypothesis and uses a desirable data set for a single country at the same stage of development. The data used are state-level cross-sectional data for the United States, which enables us to estimate how fiscal decentralization at the same developed stage affects regional inequality in an objective manner.

The issue of regional inequality has been analyzed in a number of economic fields, including urban–regional economics and macroeconomics. First, regional economics has focused on regional disparity of income as the result of differing patterns of urbanization and economic development. For instance, Williamson (1965) first examined the pattern of variation in the spatial distribution of regional incomes using Kuznets' inverted-U hypothesis, showing that regional income inequality increases in the earliest phases of economic development, and then decreases as economic development progresses. Several papers have extended this type of analysis by considering additional factors related to urbanization.[2] However, this body of work has mainly focused on the relationship between regional disparity and urban development, rather than the system of fiscal

2 For recent empirical studies, see the special issue of *Annals of Regional Science* 35(1). For example, Fujita and Hu (2001) estimate trends in regional disparity during the period 1985–1994, from the aspects of both income distribution and production agglomeration by using GDP and industry output data.

institutions.

Second, regional inequality has also been examined in research concerning income convergence among regions, as developed in Barro and Sala-i-Martin (1992). The purpose of this work is to examine the relationship between income growth and the initial income level (the level of economic development). Such research associated with convergence is then regarded as the factor analysis of economic growth by using economic factors in each region, rather than the factor analysis of inequality by using common economic factors for all regions. Only a few studies have examined the effect of fiscal institutions on regional inequality (in what the authors regard as a somewhat partial manner), and no empirical work has comprehensively examined the relationship between fiscal decentralization and regional inequality. The only other known works that examine fiscal decentralization, at least in part, are Shankar and Shar (2003), Kim, Hong and Ha (2003) and Kanbur and Zhang (2002). Whereas Shankar and Shar (2003) found a positive correlation between regional inequality and decentralization, they examined only unconditional correlation. Since many other factors are highly correlated with both variables, problems associated with omitted variable bias are likely to be high. A second paper by Kim, Hong and Ha (2003) concluded that systems with decentralization have higher rates of regional inequality using Korean time series data from 1971–1997. However, the measure of decentralization used in that study is the spatial distribution of public services, which may not accurately reflect the true decentralization of power and resources in a given country. In addition, it is difficult to differentiate these changes from trends in regional income convergence. The third paper, by Kanbur and Zhang (2002), examines the effect of fiscal decentralization on inequality among Chinese provinces during the period 1952–1999. However, this study included the effect of regional income convergence.

In this paper, we provide a more systematic examination of the real relationship between fiscal decentralization and regional inequality by (1) using an appropriate data set to obtain the net commitment effect of decentralization, and (2) focusing on the quality of fiscal decentralization. First, since we focus on the effect of fiscal decentralization on regional inequality rather than convergence of income among regions, it is generally better to use data at the same stage of economic development, especially in a developed economy. This implies that cross-sectional, rather than time-series, data is more desirable. However, with cross-country data in which cultural, historical and institutional differences between developing and developed countries are substantial, it may be difficult to determine the true effect of fiscal decentralization unless adjustments are made to account for these differences. On this basis, data from the fifty US states are appropriate since there are no substantial historical or cultural differences across observations.

Second, it also appears that the direction of fiscal decentralization's effect on regional inequality depends on how it is promoted. While the distribution effect directly depends on the power share of the central government as described by the orthodox approach to fiscal decentralization, the incentive effect depends on autonomy as a new hypothesis. It may be possible to discriminate these two effects by defining the measure of fiscal decentralization in several ways. In this paper, by using two types of measures that represent the power of the central government (**Authority power**) and autonomy (**Autonomy power**), we examine the two opposing effects in the same regression. Finally, we estimate the relationship in a number of ways, including (1) various measures of regional inequality, (2) several measures of fiscal decentralization,[3] and (3) taking account of the problem of endogeneity.

The results indicate that fiscal decentralization measured by the power share of the central government may not reduce regional inequality, while fiscal decentralization as a commitment device may lower measured regional inequality. The results in some of the regressions are statistically significant and robust within a wide range of specification. Our results also suggest that the equity effect of decentralization through the efficiency effect created by commitment persists when decentralization occurs, and this may be the opposite of that conventionally put forward. Our

3 In previous work, only one measure of fiscal decentralization is used. For example, Kanbur and Zhang (2002) specify the revenue share of the sub-national government. However this single measure may not necessarily represent a true measure of fiscal decentralization. The current paper adopts several measures reflecting various views of fiscal decentralization. See Appendix A for more detail.

work supports the idea that the continuing trend of fiscal decentralization toward greater autonomy may be justified not only on efficiency grounds, but also on considerations of equity.

The remainder of the paper is organized as follows. Section 2 illustrates four indicators of fiscal decentralization and describes the combination of hypotheses and indicators. Section 3 describes the variables used in the analyses. In Section 4 we provide the regression results concerning the relationship between regional inequality and fiscal decentralization. Section 5 concludes the paper.

2. Conventional and New Measures of Fiscal Decentralization and Related Hypotheses

In order to capture the incentive effect of fiscal decentralization, we need to construct an effective measure of fiscal decentralization. In other words, we separate measures into those measuring the power of authority, which corresponds to the conventional discussion, and those concerning autonomy, which affects the incentives of local government. Definitions of the measures of authority and autonomy are as follows.

2.1 Indicators that Measure Authority Power

Generally, fiscal decentralization is interpreted as devolution of the authority associated with decision-making to a lower level of government. The authority associated with decision-making is usually allocated on the basis of legal relationships between these higher and lower levels of government. However, it is difficult to quantitatively measure the allocation of authority. Earlier work has suggested indicators based on the relative size of revenue or expenditure to represent the allocation of authority. When the grantor directs in detail the purposes for which the funds are to be used, the grants should be attributed to the level of government that collects the revenues.

We provide three indicators measuring the authority power of local government, RI (revenue share), PI (expenditure share) and PRI (average between revenue and expenditure shares), which represent the relative fiscal size between state and local governments (detailed explanation of these indicators is presented in Appendix A). As these measures of authority power fall, the power of local government associated with decision making on the allocation of resources decreases. In other words, political and financial powers concentrate more in the authority of the single central government. Because one of the main policies of central government is to reduce inequality, it is easy for central governments to carry out a redistribution policy in the centralized environment. Consequently, fiscal decentralization lowers the power of redistribution and increases regional inequality. Therefore, these indicators may capture the effect most conventionally proposed, that fiscal decentralization lowers the power of redistribution and increases regional inequality.

2.2 Indicators that Measure Autonomy Power

We next consider the incentive effect achieved by the autonomy of local government. Even if the expenditure or revenue shares described above are small, autonomy may be fiscally decentralized in that sufficient resources for public spending are originally allocated to the lower level of government. Thus, local government's autonomy is high if all fiscal needs are financed in the local government region, in which authority may be fiscally decentralized. Conventional indicators of fiscal decentralization are not able to reflect this condition. Therefore, we specify other indicators representing autonomy: that is, how public spending at the lower level of government is maintained by its own revenue (the degree of fiscal independence).

It is assumed that autonomy corresponds to the degree of accountability or commitment (or the degree of a hard budget constraint). We should be able to catch such an effect as a commitment device by AI (**Autonomy power**), defined as the local government's own revenue share of total revenue (a more detailed explanation of this indicator is presented in Appendix A).

This indicator corresponds to the grants share (the share of grant revenue in total revenue) subtracted from unity. When this falls, the local government obtains proportionately more grants from the central government (a soft budget), and this may distort the incentive for increasing regional income by reducing efforts in the conduct of efficient public policy. Therefore, this indicator is used to estimate the effect of fiscal decentralization as a commitment device on regional inequality, and especially to test the new hypothesis that fiscal decentralization decreases regional inequality.

3. Empirical Analysis

The primary aim of this paper is to estimate the relationship between regional inequality and fiscal decentralization. The analysis begins by presenting the Ordinary Least Square (OLS) estimates using cross-sectional, time-series data. The analysis then uses Two Stage Least Square (TSLS) estimates in order to consider the problem of endogeneity. Finally, an alternative inequality index is employed as a check of the robustness of the results.

3.1 Empirical Model

This section presents simple cross-sectional regressions of the form:

$$Inequality_i = \alpha_0 + \alpha_1 FiscalDecentralization_i + X_i \beta + \varepsilon_i, \quad i \ (= 1,\ldots,50) \qquad (1)$$

where i refers to state *I*, $Inequality_i$ represents degree of regional inequality, $FiscalDecentralization_i$ represents indicators of fiscal decentralization described in Section 2, and X_i is a vector of control variables comprising state characteristics. The parameters α_0 and α_1 are scalars, β represents a parameter vector, and ε_i is the error term, which is assumed to be normally distributed, homoscedastic, and independent across observations.

We divide fiscal decentralization into two factors; *Autonomy power, as* measured by AI , and

Authority power, as described in Section 2 and measured by RI , PI and PRI .

Therefore, we rewrite equation (1) as:

$$Inequality_i = a_0 + a_1 Authority \quad power_i + a_2 Autonomy \quad power_i + X_i b + \upsilon_i \tag{2}$$

By including two different qualities of decentralization indicators, we consider the various effects of fiscal decentralization. If the coefficient of AI is negative, it may indicate that dependency on subsidies increases regional inequality. This then shows that achieved autonomy gives strong incentives to the poor region to improve income, and regional inequality falls. If the estimated coefficient for RI , PI or PRI is positive, it suggests that the conventional discussion is supported and fiscal decentralization increases regional inequality.

3.2 Data and Variables

As discussed earlier, we use state-level cross-sectional data for the United States during the period 1993–2000 to derive the effect of fiscal decentralization. State-level cross-sectional data is often used for the analysis of inequality. We use similar variables specified in this earlier body of work (e.g., Al-Samarrie and Miller (1967), Morrill (2000)). Table 1 provides descriptive statistics and definitions for these variables.

[Table 1 around here.]

First, the measure of inequality used in this paper is the regional income inequality among counties in each state. This measure differs from both regional inequality among states and personal income inequality as based on micro census data (Partridge, Rickman and Levernier (1996), Morrill （2000）, Lynch (2003)) . As a measure of regional inequality in each state, we use the GINI coefficient calculated from pre-tax income in each county. This measure has been widely used in previous studies in this area (e.g., McGillivray and Matthew (1991) and others). The index ranges from 0 indicating perfect equality to 1 representing perfect inequality. We calculate the index using pre-tax personal income per capita for counties within each state from *USA Counties*, published by the US Census Bureau over the period 1993–2000.

Second, we introduce several explanatory variables to explain the regional inequality within each state. By including a large number of each state's socio-economic characteristics in the empirical model, it is possible to capture most effects on regional inequality by controlling for differences across states. Most of the explanatory variables used are similar to those in previous work in this area. However, in addition to the variables normally used, we include a number of additional factors. The regional inequality function incorporates fiscal, geographical, political and economic factors for the period 1992–1999. A list of these variables follows. All variables specified incorporate one-period lagged values in order to remove any potential endogeneity.

- Fiscal Decentralization (RI , PI , PRI , AI_{I}); See Appendix A for details;[4]
- Real Gross State Products per capita (**GSP per capita, Square of GSP per capita**);
- Population mobility factor, measured by highway mileage (mile)[5] per area (square mile) (**Highway per area**);
- Human agglomeration, measured by the ratio of metropolitan population to total population (**Metropolitan Rate**);
- Human capital level and labor quality, measured by the level of Education (**Education**);
- Industrial structure, measured by the share of GSP in both construction and manufacturing industries to nominal GSP (**Manufacture**);
- Political effects, measured by Liberal vs. Conservative tendencies (the share of the seats in the

4 Since the estimates of the models where fiscal autonomy (AI_{I}) includes or excludes federal grants are similar, only the results for the latter specification are reported.

5 Immigrant includes persons who may have entered the United States as non-immigrants or refugees.

state legislature held by Democrats) (**LIB vs. CON**);

- Globalization, measured by the share of foreign direct investment[6] to nominal GSP (**Foreign Direct Investment**);
- Economic stability effect, measured by percent unemployed of the civilian labor force (**Unemployment Rate**);
- Regional size effect, measured by the level of state's population (**Population**).

All variables are specified in natural logarithms and all data is obtained from *USA Counties* and the *Statistical Abstract of the United States* (various years).

Predictions for the effects of these socio-economic variables can be made on the basis of earlier work:

1. Kuznets' inverted U-hypothesis suggests that regional income differentials increase in early development stages, then stabilize in mature periods on growth (Kuznets inverted the U-curve). Williamson (1965) provides a number of reasons why regional inequality may decrease in the latter stages of development. For example, government policies aimed at equalizing regional growth rates and income inequality levels, discovery of new resources in less developed regions, etc. On the other hand, Amos (1988) highlights two patterns of the inequality–regional development nexus, each based on the simple neoclassical factor market equilibrating mechanism. The first pattern is based on the conventional stabilization effects. In proposing his second pattern, Amos questions whether regional inequality will in fact stabilize during the latter stage of development, as it would be naïve to expect regional growth rates to equalize and relative per capita incomes to remain unchanged, given the often dynamic nature of regional growth. In such an environment, Amos proposes the so-called "augmented inverted U," where a simple increase–decrease inverted U is replaced with a pattern of increase–decrease–increase. The second pattern would be plausible if the economy, even after development, had not stabilized. On this basis, the

6 Foreign direct investment is the gross book value of foreign company US affiliates by State.

coefficients of **GSP per capita** and **Square of GSP per capita** could be positive or negative.

2. The change of accessibility to the interior could contribute to a decrease in the cost of transportation. As a result, agglomeration of industry occurs and the productivity in a region changes because firms desire good access to the products of other firms. Dunford (1996) argued that regional disparity depended on spatial productivity and employment rate. The development of infrastructure would affect the structure of residents' wages through changes in regional productivity. Therefore, the estimated coefficient on **Highway per area** could be positive or negative.
3. Since urbanization is often regarded as a measure of economic development, greater metropolitan share should reduce income inequality (Kuznets (1955)). However, if the prevalence of service-producing industries with a bimodal wage distribution is centered in metropolitan areas, a positive metropolitan inequality relationship is expected (Partridge, Rickman and Levernier (1996)). A positive or negative coefficient is hypothesized for the **Metropolitan Rate**.
4. As discussed in Partridge, Rickman and Levernier (1996), human capital promoted by education has two effects. While the prevalence of low-level education in all regions decreases regional inequality keeping high-level education constant, the prevalence of high-level education in all regions increases it. The expected sign of **Education** is unclear.
5. Kuznets suggested that farm-based economies had greater income inequality, and that a greater share of the labor-force employed in manufacturing is negatively associated with income inequality. A negative relationship between manufacturing's share of the labor force and income inequality is plausible because manufacturing may provide less-skilled workers the opportunity to earn greater wages (Borjas and Ramey (1994)). The expected sign of **Manufacture** is negative.
6. As suggested by Fujita, Krugman and Venables (1999), when an economy opens up to

world markets, regional inequality will be affected. Globalization of the economy can change internal comparative advantage and hence location patterns. However the effect of globalization varies. The expected sign of **Foreign Direct Investment** is unclear.

Although it is difficult to predict the effects of the remaining variables—Economic stability effect (**Unemployment Rate**), Political effect (**LIB vs. CON**), and Regional size effect (**Population**)—on regional inequality, they are included in the model to capture other political or regional influences.

4. Regression Results

4.1 Basic Results

We first provide basic results from the OLS regression using data on the 50 US states. We estimate four models: (1) a basic model; (2) one including a time dummy; (3) another including a regional dummy; and (4) another including both time and regional dummies. We adopt a regional dummy[7] to consider specific characteristics among regions in the United States.[8] The results are shown in Table 2. The coefficients of both dummies are not shown due to space limitations.

---

7 Regional dummies were constructed by dividing the 50 US states into eight regions: Region 1 = Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont; Region 2 = Delaware, Maryland, New Jersey, New York, Pennsylvania; Region 3 = Illinois, Indiana, Michigan, Ohio; Region 4 = Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota, Wisconsin; Region 5 = Alabama, Arkansas, Florida, Georgia, Mississippi, Kentucky, Louisiana, North Carolina, Oklahoma, South Carolina, Tennessee, Virginia, West Virginia; Region 6 = Arizona, New Mexico, Texas; Region 7 = Colorado, Idaho, Montana, Utah, Wyoming; Region 8 = Alaska, California, Hawaii, Nevada, Oregon, Washington.

8 Formally, we may estimate the effect of fiscal decentralization considering state fixed effects. However it should be noted that the state fixed effect is highly correlated with the fiscal decentralization measure in each state because there is little variation in the fiscal decentralization measure across time. This multicollinearity distorts estimates of the real effect of fiscal decentralization from its cross-state variation. In order to avoid this problem, we use regional dummies instead of state dummies.

[Table 2 around here.]

Regarding ***Authority power***, we cannot find any significant effect of fiscal decentralization on regional inequality. This result shows that the change of redistribution that may be created by the decrease of the power of central government is not so large and does not affect regional inequality.

As for ***Autonomy power***, we have negative and significant coefficients of fiscal decentralization on regional inequality in all models. When fiscal decentralization increases by 1%, regional inequality decreases from –0.51% to –0.25%. This shows the positive relationship between fiscal decentralization as a commitment device and regional inequality, which is consistent with our hypothesis that fiscal decentralization as a commitment device reduces regional inequality.

Concerning the estimated coefficient of other state characteristics, some conclusions emerge. We discuss these based on the results obtained using the pooled data. Most of the variables significantly affect regional inequality. Detailed discussion follows.[9]

First, the significant and positive coefficient on **GSP per capita** shows that regions in highly developed states experience higher levels of inequality. The estimated coefficient of **Square of GSP per capita** is also positive and significant. As discussed in Section 3, this result is different from the conventional theory of Kuznets' inverted U with a high level of development, but is consistent with the theory developed by Amos (1988) and McGillivray and Matthew's (1991) analysis of Australian regional inequality. This is also consistent with the findings of Partridge et al. (1996) concerning US state income inequality, which suggest that there is some evidence that at a very advanced stage of economic development, income inequality and average income are positively related.

Second, the estimated coefficient of **Highway per area** is negative and significant. This result is interpreted as suggesting that development of transportation yields industrial agglomeration and

---

9 Although we also included the ratio of population aged over 65 years to total population, the share of local and state government education expenditure to total expenditure, and a dummy variable for Proposition 13 as explanatory variables to capture local characteristics, none of the estimated coefficients were statistically significant.

improvement of productivity within the region. As a consequence, regional inequality is reduced. Third, the estimated coefficient of **Metropolitan Rate** is negative and significant, which shows that agglomeration reduces regional inequality, similar to Morrill's (2000) conclusions on US state income inequality. Fourth, the estimated coefficient of **Education** is negative and significant, except for models including regional dummies. This result is similar to the findings of Partridge et al. (1996) and Al-Samarrie and Miller (1992), both of which conclude that inequality falls when accompanied by higher amounts of education.

Fifth, the estimated coefficient of **Manufacture** is negative and significant, as expected. This correlation is consistent with the findings of Morrill (2000) using US data in the 1970s. Sixth, the estimated coefficient of **Foreign Direct Investment** is negative and significant. This is inconsistent with the findings of Fujita and Hu (2001) in China. Finally the results show that the Economic stability effect (**Unemployment Rate**), Political effect (**LIB vs. CON**) and Regional size effect (**Population**) also significantly impact upon regional inequality. Importantly, the results provide convincing evidence that fiscal decentralization as a commitment device may contribute to a decrease in regional inequality.

4.2 Consideration of Endogeneity of Decentralization Measures

In this section, we consider some potential problems in previous OLS estimations and provide corrected estimation results.

When we use cross-sectional data, especially in a single country, the estimations suffer from endogeneity bias between regional inequality and the Autonomy indicator (AI). In order to provide correct estimates, we estimate the effect of fiscal decentralization by considering endogeneity and correct for these potential problems using TSLS.[10] Table 3 presents the results as estimated by

[10] We add two instrumental variables to the exogenous variables already included in the basic regression model. These are the White rate (ratio of the white population to the total population) and Government size (the ratio of state and local governments' expenditure to nominal GSP). Two tests are used to examine the validity of this particular set of instruments (Horiuchi (2002)). First, an ***F test*** of the null

TSLS.

[Table 3 around here.]

The new results by TSLS method are almost the same as the results discussed in section 4.1. Namely, that the fact that fiscal decentralization does not necessarily increase regional inequality and may in fact reduce it holds after considering the problem of endogeneity.

4.3 Robust Check: Another Measure of Regional Inequality

In the previous section, we adopt the GINI coefficient as a measure of the regional inequality. In order to test the robustness of these results we add the Coefficient of Variation (CV), which is one of the most widely used measures of regional inequality (e.g., Shankar and Shah (2003)) and is similar to the GINI coefficient. The CV is defined as:

$$CV = \frac{\sqrt{\frac{1}{n}\sum_{i=1}^{n}\left(x_i - \frac{1}{n}\sum_{i}^{n} x_i\right)^2}}{\frac{1}{n}\sum_{i}^{n} x_i}$$

where x_i is the personal income per capita of the i th county, and n is the number of counties within a state. The larger CV is, the larger the disparity among regions. The correlation coefficient is 0.93 between Coefficient of Variation and GINI Coefficient in this paper. Table 4 provides the results obtained with the pooled data.

---

hypothesis that the coefficients on the instrumental variables in the first-stage regression are jointly zero. High values of the F statistics suggest that the set of instrumental variables is valid. Table 3 shows the result of the F test. The values in all the regression models are highly significant. The second more appropriate test is an ***nR²* *test***. The test statistic is the number of observations multiplied by R^2 from a regression of the residuals from the second-stage regression on both the included and excluded exogenous variables. The null hypothesis is that the instrument set contains no variables that should be included. The low value infers a valid model. Table 3 shows the results of the nR^2 test where the P-values are high. Therefore, we recognize the validity of the instrumental variables used.

[Table 4 around here.]

As shown, the coefficient of ***Autonomy power*** is negative and significant in all models. This means that the results in this paper are robust for the inequality measure.

5. Conclusion

The effect of fiscal decentralization on regional inequality has been a major focus of debate in the context of recent public reforms. The convention is that fiscal decentralization may increase regional inequality because the power of redistribution as a nation becomes lower after fiscal decentralization. On the other hand, the theory based on the role as a commitment device of fiscal decentralization suggests the opposite relationship between fiscal decentralization and regional inequality.

This paper has estimated the real effect of fiscal decentralization using an appropriate data set and several indicators of fiscal decentralization. As a result, we have presented new empirical evidence that fiscal decentralization as a commitment device may reduce regional inequality. As discussed, our data set is one in which differences relating to history, culture, and the stage of economic development are minimized, and hence is admirably suited to determining the true effect of fiscal decentralization as a commitment device on regional inequality. This distortion-free data set has revealed the truly negative effect of fiscal decentralization on regional inequality.

Appendix A: Specification of Fiscal Decentralization

Definition of measures

Revenue Indicator

The **Revenue Indicator (RI)** is defined for each state as the ratio of local government revenue to combined state and local government revenue.[11] This indicator corresponds to the most approximate measure of the allocation of authority when the government that collects revenue has authority associated with its own revenue (the tax to be collected and the type of expenditure to be made), but all intergovernmental grants are conditional or matching grants. In calculating revenue share, we use government revenue excluding grants from other governments.

Production Indicator

The **Production Indicator (PI)** is defined as the ratio of local government expenditure to combined state and local government expenditure. This indicator corresponds to the most approximate measure of the allocation of authority when a local government has authority associated with its expenditure (the tax to be collected and the type of expenditure to be made) implicitly considering that all intergovernmental grants are non-matching or lump-sum grants. In calculating expenditure share, we use government expenditure including grants from other governments.

Production–Revenue Indicator

The indicators defined above are regarded as extreme cases regarding the allocation of authority. For the middle case, an indicator that combines these is considered. The **Production–Revenue**

11 In order to grasp the concept of authority allocation most accurately, we exclude revenues financed by public debt from both state and local revenue data.

Indicator (PRI **)** represents a decentralization measure that incorporates both revenue and expenditure shares. The normalized indicator is defined as the mean of RI and PI ; that is, *PRI* = $(PI + RI)/2$.

Autonomy Indicator

The **Autonomy Indicator (** AI **)** is defined as the local government's own revenue share of its total revenue. In calculating the autonomy of local government in a state, the federal grant provided from outside the state is considered. Hence, we consider two indicators for AI to account for the potential impact of federal grants. AI_{I} represents the local government's real fiscal independence and is based on the local government's own revenue and total revenue, *excluding* federal grants. AI_{II} represents actual independence from the state government, and is based on the local government's own revenue and the total revenue, *including* federal grants.

Correlation between fiscal decentralization indicators and degree of fiscal decentralization by state (average data during 1992–1999) are summarized in Tables A.1 and A.2, respectively.

Table A.1: Correlation Coefficient between Fiscal Decentralization Indicators (1992–1999)

Correlation matrix

1992-1999	RI	PI	PRI	AI_{I}	AI_{II}
RI	1.000				
PI	0.847	1.000			
PRI	0.966	0.956	1.000		
AI_{I}	0.497	0.151	0.348	1.000	
AI_{II}	0.562	0.218	0.417	0.990	1.000

This table shows the correlations between the five decentralization indicators. It is apparent that RI, PI and PRI are highly correlated with each other. However, AI_{I} and AI_{II} are less correlated with the remaining indicators.

Table A.2: Degree of Fiscal Decentralization by State (average data during 1992–1999)

Average value during 1992-1999	RI	PI	PRI	AI1	AI2
Alabama	0.400	0.450	0.425	0.691	0.668
Alaska	0.197	0.316	0.256	0.662	0.630
Arizona	0.451	0.521	0.486	0.668	0.645
Arkansas	0.301	0.376	0.339	0.600	0.585
California	0.435	0.520	0.477	0.615	0.596
Colorado	0.482	0.541	0.511	0.755	0.734
Connecticut	0.353	0.392	0.372	0.731	0.709
Delaware	0.210	0.313	0.261	0.575	0.557
Florida	0.497	0.550	0.524	0.745	0.723
Georgia	0.485	0.513	0.499	0.737	0.719
Hawaii	0.205	0.225	0.215	0.885	0.817
Idaho	0.313	0.421	0.367	0.603	0.587
Illinois	0.471	0.507	0.489	0.737	0.707
Indiana	0.421	0.475	0.448	0.671	0.658
Iowa	0.398	0.459	0.429	0.671	0.651
Kansas	0.450	0.499	0.475	0.704	0.693
Kentucky	0.300	0.376	0.338	0.631	0.610
Louisiana	0.389	0.411	0.400	0.687	0.664
Maine	0.346	0.380	0.363	0.705	0.681
Maryland	0.401	0.445	0.423	0.744	0.713
Massachusetts	0.368	0.414	0.391	0.684	0.652
Michigan	0.366	0.465	0.416	0.605	0.588
Minnesota	0.380	0.493	0.436	0.633	0.616
Mississippi	0.367	0.427	0.397	0.613	0.593
Missouri	0.407	0.468	0.438	0.720	0.698
Montana	0.298	0.363	0.331	0.632	0.597
Nebraska	0.560	0.562	0.561	0.822	0.803
Nevada	0.369	0.508	0.439	0.635	0.613
New Hampshire	0.463	0.428	0.446	0.873	0.853
New Jersey	0.380	0.441	0.410	0.688	0.677

Continued Table A.2

New Mexico	0.243	0.373	0.308	0.502	0.479
New York	0.501	0.526	0.513	0.707	0.687
North Carolina	0.393	0.480	0.436	0.652	0.635
North Dakota	0.312	0.368	0.340	0.651	0.612
Ohio	0.351	0.443	0.397	0.679	0.656
Oklahoma	0.349	0.424	0.386	0.654	0.636
Oregon	0.361	0.461	0.411	0.672	0.629
Pennsylvania	0.372	0.446	0.409	0.675	0.644
Rhode Island	0.312	0.327	0.320	0.736	0.703
South Carolina	0.373	0.405	0.389	0.704	0.684
South Dakota	0.404	0.431	0.417	0.773	0.737
Tennessee	0.544	0.535	0.539	0.791	0.774
Texas	0.482	0.522	0.502	0.737	0.718
Utah	0.399	0.458	0.429	0.708	0.684
Vermont	0.356	0.360	0.358	0.725	0.700
Virginia	0.394	0.474	0.434	0.715	0.694
Washington	0.375	0.472	0.424	0.675	0.655
West Virginia	0.268	0.331	0.299	0.566	0.552
Wisconsin	0.331	0.482	0.406	0.596	0.583
Wyoming	0.387	0.443	0.415	0.634	0.621

References

Akai, N. and Sakata, M., 2002. Fiscal Decentralization Contributes to Economic Growth: Evidence from State-level Cross-section Data for the United States, Journal of Urban Economics 52 (1), 93-108.

Al-Samarrie, A., Miller, H., 1967. State differentials in income concentration, American Economic Review 57 (1), 59-72.

Amos, O. M., 1988. Unbalanced regional growth and regional income inequality in the latter stages of development, Regional Science and Urban Economics 18 (4), 549-566.

Barro, R. J., Sala-i-Martin X. X., 1992. Convergence, Journal of Political Economy 100 (2), 223-251.

Borjas, G. J. and Ramey, V. A., 1994. Time-Series Evidence on the Sources of Trends in Wage Inequality, American Economic Review 84 (2), 10-16.

Dunford, M., 1996. Disparities in Employment, Productivity, and Output in the E.U.: The Roles of Labour Market Governance and Welfare Regimes, Regional Studies 30 (4), 339-357.

Fujita, M., Krugman, P., and Venables, A. J., 1999. The Spatial Economy. The MIT Press: Cambridge, Massachusetts.

Fujita, M., and Hu, D., 2001. Regional disparity in China 1985–1994: The effects of globalization and economic liberalization, The Annals of Regional Science 35 (1), 3-37.

Horiuchi, Y., 2002. Turnout Decline in Japan during the 1990s: Did Voters Lose Interest and Faith in Politics ?, mimeo

Kanbur, R. and Zhang, X., 2002. Fifty Years of Regional Inequality in China: A Journey through Revolution, Reform and Openness, No 2887 in CEPR Discussion Papers from CEPR Discussion Papers.

Kim, E., Hong, S. W., and Ha, S. J., 2003. Impacts of National Development and Decentralization

Policies on Regional Income Disparity in Korea, Annals of Regional Science 37 (1) (March 2003), 79-91.

Kuznets, S., 1955. Economic Growth and Income Inequality, American Economic Review 45 (1), 1-28.

Lynch, G. R., 2003. Estimates of Income and Income Inequality in the United States and in Each of the Fifty States: 1988–1999, Journal of Regional Science 43(3), 571-588.

McGillivray M. and Matthew, P., 1991. Regional income inequality in a developed nation: A cross-sectional study of Australian sub-state regions, The Review of Regional Studies 21 (2), 137-152.

McKinnon R., 1995. Market-preserving fiscal federalism in the American monetary union Spectrum; Summer 1995; 68, 3; ABI/INFORM Global, 36.

Morrill, R., 2000. Geographic variation in change in income inequality among US states, 1970-1990, The Annals of Regional Science 34 (1), 109-130.

Oates, W., 1993. Decentralization and economic development, National Tax Journal 46, 237–243.

Partridge, D. M., Rickman, S. D., and Levernier, W., 1996. Trends in U.S. income inequality: Evidence from a panel of states, The Quarterly Review of Economics and Finance 36 (1), Spring 1996, 17-37.

Prud'homme, R., 1995. The Dangers of Decentralization, World Bank Research Observer 10, 201-220.

Qian, Y. and Weingast, B., 1997. Federalism as a Commitment to Preserving Market Incentives, Journal of Economic Perspectives 11 (Fall), 83-92.

Rothenberg, D, and Stano, M., 1977. The determinants of interstate variations in income distribution, Review of Social Economy 35 (1), 55-66.

Shankar, R., and Shar, A., 2003. Bridging the Economic Divide Within Countries—A Scorecard on the Performance of Regional Policies in Reducing Regional Income Disparities, World Development 31 (8), 1421-1441.

Williamson, J. G., 1965. Regional inequality and the process of national development: A description of the patterns, Economic Development and Cultural Change 13 (4), 158-200.

Table 1: Variable Definitions, Means and Standard Deviations

Variable	Mean	Standard deviation	Definition
GINI Coefficient	0.099	0.024	Calculated by regional income inequality among counties in each state
Coefficient of Variation	0.196	0.053	Calculated by regional income inequality among counties in each state
GSP per capita	150596	178265	Real Gross State Product (GSP) per 1000 persons
Highway per area	1.637	0.986	Ratio of highway mileage to state's total area ($mile^2$)
Metropolitan Rate	66.917	21.182	Percentage of metropolitan population (%)
Unemployment Rate	5.334	1.515	Ratio of unemployed to the civilian labor force (%)
Education	0.096	0.014	Ratio of high school graduates in total population aged 18–24 years old
Opennes	5.924	3.725	Ratio of state's exports to other countries and other states to nominal GSP
Manufacture	0.213	0.066	The share of consolidated gross state product in both constrution and manufacturing industries to nominal GSP
LIB vs.CON	0.536	0.157	The share of seats in the state legislature held by Democrats
Foreign Direct Investment	0.127	0.146	The share of foreign direct investment to nominal GSP. Foreign direct investmen is gross book value of US affiliates of foreign companies by state
Population	5345336	5819321	State population
Indicator of fiscal decentralization			
RI	0.379	0.082	Ratio of local government revenue to state and local government revenue
PI	0.440	0.072	Ratio of local government expenditure to state and local government expenditure
PRI	0.410	0.074	(PI+RI)/2, which reflects both revenue and expenditure aspects of fiscal decentralization
AI_I	0.685	0.076	Ratio of local government's own revenue to total revenue, with revenues excluding federal grants

Table 2: Estimation Result (Inequality = GINI Coefficient) Method = OLS

Ordinary Least Square Results

		RI				PI				PRI			
	Indep. Var.	Cross-section and time series data				Cross-section and time series data				Cross-section and time series data			
	Constant	16.036	16.265	8.608	7.975	16.208	16.443	9.407	8.827	16.182	16.419	9.007	8.364
		[5.41]***	[5.48]***	[3.06]***	[2.84]***	[5.61]***	[5.67]***	[3.44]***	[3.24]***	[5.54]***	[5.60]***	[3.26]***	[3.03]***
Decentralization Indicator	Authority Power	-0.025	-0.020	-0.107	-0.125	0.014	0.033	-0.100	-0.133	-0.009	0.001	-0.117	-0.143
		[0.43]	[0.34]	[1.81]*	[2.11]**	[0.19]	[0.40]	[1.42]	[1.76]*	[0.13]	[0.01]	[1.74]*	[2.06]**
	Autonomy Power(AI)	-0.485	-0.486	-0.253	-0.259	-0.509	-0.505	-0.328	-0.349	-0.503	-0.503	-0.289	-0.301
		[4.71]***	[4.65]***	[2.63]***	[2.71]***	[5.42]***	[5.31]***	[3.77]***	[3.99]***	[5.22]***	[4.15]***	[3.20]***	[3.35]***
	GSP per capita	6.153	6.308	2.617	2.229	6.267	6.462	2.891	2.468	6.224	6.394	2.733	2.310
		[3.60]***	[3.68]***	[1.63]	[1.38]	[3.72]***	[3.79]***	[1.84]*	[1.55]	[3.66]***	[3.74]***	[1.73]*	[1.44]
	Square of GSP per capita	0.823	0.846	0.304	0.245	0.838	0.867	0.341	0.276	0.832	0.857	0.319	0.254
		[3.44]***	[3.53]***	[1.36]	[1.08]	[3.54]***	[3.63]***	[1.55]	[1.23]	[3.50]***	[3.58]***	[1.44]	[1.13]
	Highway per area	-0.080	-0.081	-0.155	-0.157	-0.079	-0.078	-0.160	-0.318	-0.080	-0.080	-0.159	-0.161
		[5.10]***	[5.06]***	[8.51]***	[8.62]***	[4.95]***	[4.82]***	[8.62]***	[9.17]***	[5.12]***	[5.04]***	[8.69]***	[8.81]***
	Metropolitan Rate	-0.193	-0.190	-0.093	-0.101	-0.188	-0.185	-0.084	-0.090	-0.190	-0.187	-0.088	-0.096
		[3.84]***	[3.60]***	[1.92]*	[2.04]**	[3.88]***	[3.61]***	[1.73]*	[1.83]*	[3.86]***	[3.59]***	[1.83]*	[1.95]*
	Education	-0.248	-0.248	0.060	0.094	-0.239	-0.238	0.074	0.108	-0.243	-0.243	0.065	0.099
		[2.86]***	[2.86]***	[0.58]	[0.90]	[2.80]***	[2.75]***	[0.74]	[1.04]	[2.82]***	[2.80]***	[0.64]	[0.95]
	Manufacture	-0.328	-0.330	-0.325	-0.322	-0.328	-0.330	-0.322	-0.318	-0.328	-0.330	-0.323	-0.320
		[10.4]***	[10.5]***	[9.65]***	[9.44]***	[10.5]***	[10.6]***	[9.44]***	[9.17]***	[10.4]***	[10.5]***	[9.53]***	[9.29]***
	LIB vs. CON	-0.148	-0.144	-0.125	-0.123	-0.143	-0.137	-0.122	-0.123	-0.146	-0.141	-0.125	-0.125
		[4.84]***	[4.65]***	[3.32]***	[3.20]***	[4.62]***	[4.30]***	[3.20]***	[3.15]***	[4.73]***	[4.48]***	[3.30]***	[3.22]***
	Foreign Direct Investment	-0.046	-0.048	-0.139	-0.139	-0.041	-0.042	-0.140	-0.143	-0.044	-0.046	-0.142	-0.143
		[2.07]**	[2.15]**	[5.76]***	[5.73]***	[1.79]*	[1.79]*	[5.48]***	[5.51]***	[1.95]*	[2.00]**	[5.71]***	[5.72]***
	Population	0.213	0.211	0.175	0.181	0.207	0.204	0.171	0.178	0.211	0.208	0.175	0.181
		[10.4]***	[9.59]***	[9.19]***	[8.98]***	[104]***	[9.35]***	[9.36]***	[9.18]***	[10.3]***	[9.41]***	[9.29]***	[9.09]***
	Unemployment Rate	-0.190	-0.181	-0.087	-0.122	-0.186	-0.173	-0.087	-0.127	-0.189	-0.179	-0.087	-0.126
		[4.16]***	[3.26]***	[1.90]*	[2.19]**	[4.07]***	[3.10]***	[1.90]*	[2.29]**	[4.12]***	[3.20]***	[1.90]*	[2.26]**
	Adjusted R-squared	0.532	0.528	0.616	0.616	0.532	0.528	0.615	0.614	0.532	0.528	0.616	0.615
	Variables Included in Equation:												
	Regional dummy	no	no	yes	yes	no	no	yes	yes	no	no	yes	yes
	Time dummy	no	yes	no	yes	no	yes	no	yes	no	yes	no	yes

Note: Figures in parentheses are the absolute values of t-statistics. Asterisks indicate variables whose coefficients are significant at the 10%(*), 5%(**) and 1%(***) levels, respectively. The sample size is 400. Due to limits on space, we do not report the results for the estimated coefficient of the dummy variables in the table. Standard Errors are heteroskedastic consistent.

Table 3: Estimation Results (Inequality = GINI Coefficient) Method = TSLS

Two Stage Least Squares Method

		RI				PI				PRI			
		Cross-section and time series data				Cross-section and time series data				Cross-section and time series data			
	Indep. Var.												
	Constant	16.218	16.464	9.287	8.640	15.999	16.264	8.997	8.329	16.115	16.375	9.063	8.429
		[4.99]***	[4.99]***	[2.96]***	[2.71]***	[4.91]***	[4.94]***	[2.88]***	[2.63]***	[5.01]***	[5.02]***	[2.92]***	[2.67]***
Decentralization Indicator	Authority Power	0.027	0.031	0.015	-0.011	0.027	0.040	-0.061	-0.108	0.030	0.036	-0.013	-0.046
		[0.26]	[0.31]	[0.18]	[0.13]	[0.29]	[0.43]	[0.72]	[1.19]	[0.29]	[0.34]	[0.15]	[0.52]
	Autonomy Power(AI)	-0.641	-0.643	-0.650	-0.637	-0.641	-0.621	-0.765	-0.791	-0.638	-0.627	-0.686	-0.685
		[2.57]***	[2.62]***	[3.40]***	[3.40]***	[1.71]*	[1.69]*	[3.93]***	[4.13]***	[2.49]**	[2.50]**	[3.89]***	[3.96]***
	GSP per capita	5.922	6.083	2.179	1.820	5.784	6.038	1.578	1.071	5.875	6.083	1.907	1.513
		[3.19]***	[3.23]***	[1.24]	[1.02]	[2.57]***	[2.67]***	[0.87]	[0.58]	[3.06]***	[3.13]***	[1.08]	[0.84]
	Square of GSP per capita	0.790	0.813	0.249	0.192	0.771	0.808	0.166	0.087	0.783	0.814	0.212	0.149
		[3.04]***	[3.08]***	[1.02]	[0.77]	[2.46]**	[2.55]**	[0.66]	[0.34]	[2.92]***	[3.00]***	[0.86]	[0.59]
	Highway per area	-0.076	-0.076	-0.148	-0.150	-0.073	-0.074	-0.153	-0.157	-0.074	-0.075	-0.149	-0.152
		[4.19]***	[4.22]***	[7.05]***	[7.12]***	[3.13]***	[3.25]***	[6.85]***	[6.98]***	[3.71]***	[3.78]***	[6.88]***	[6.98]***
	Metropolitan Rate	-0.184	-0.182	-0.072	-0.083	-0.186	-0.184	-0.069	-0.078	-0.185	-0.183	-0.072	-0.082
		[3.81]***	[3.74]***	[1.53]	[1.74]*	[4.07]***	[3.99]***	[1.46]	[1.65]*	[3.95]***	[3.87]***	[1.55]	[1.75]*
	Education	-0.254	-0.255	0.031	0.069	-0.261	-0.256	-0.009	0.037	-0.256	-0.254	0.014	0.055
		[2.77]***	[2.75]***	[0.31]	[0.67]	[2.42]**	[2.39]**	[0.08]	[0.35]	[2.73]***	[2.70]***	[0.13]	[0.54]
	Manufacture	-0.342	-0.344	-0.368	-0.363	-0.346	-0.345	-0.387	-0.382	-0.344	-0.344	-0.376	-0.370
		[8.43]***	[8.50]***	[8.95]***	[8.88]***	[5.71]***	[5.96]***	[8.49]***	[8.51]***	[7.66]***	[7.78]***	[8.90]***	[8.84]***
	LIB vs. CON	-0.142	-0.137	-0.127	-0.126	-0.143	-0.137	-0.142	-0.145	-0.142	-0.137	-0.133	-0.133
		[3.75]***	[3.58]***	[3.16]***	[3.09]***	[3.88]***	[3.62]***	[3.42]***	[3.42]***	[3.79]***	[3.59]***	[3.28]***	[3.23]***
	Foreign Direct Investment	-0.041	-0.042	-0.119	-0.120	-0.040	-0.041	-0.127	-0.130	-0.040	-0.042	-0.122	-0.123
		[1.67]*	[1.72]*	[4.57]***	[4.57]***	[1.67]*	[1.67]*	[4.66]***	[4.71]***	[1.62]	[1.66]*	[4.52]***	[4.56]***
	Population	0.205	0.204	0.164	0.171	0.205	0.203	0.177	0.187	0.204	0.203	0.169	0.177
		[9.89]***	[9.87]***	[8.62]***	[8.86]***	[10.7]***	[10.5]***	[9.43]***	[9.43]***	[9.90]***	[9.82]***	[9.00]***	[9.16]***
	Unemployment Rate	-0.195	-0.190	-0.120	-0.162	-0.197	-0.187	-0.138	-0.196	-0.195	-0.187	-0.127	-0.174
		[4.33]***	[3.62]***	[2.42]**	[2.82]***	[3.69]**	[2.77]***	[2.63]***	[3.16]***	[4.23]***	[3.45]***	[2.52]***	[2.99]***
	Adjusted R-squared	0.530	0.526	0.604	0.604	0.530	0.527	0.596	0.595	0.530	0.526	0.601	0.601
	Over-identifying restrictions test, P-value	0.953	1.253	0.548	0.403	0.943	1.269	0.747	0.435	0.94	1.26	0.62	0.42
		[.329]	[0.26]	[0.46]	[0.53]	[0.33]	[0.26]	[0.39]	[0.51]	[0.33]	[0.26]	[0.43]	[0.52]
	F-test statistic for joint significance of	95.44	100.10	190.03	201.77	26.04	27.61	126.74	134.69	70.80	74.89	192.34	203.46
	instruments in first stage regression (p-	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
	nR-squared (p-value)	0.959	1.285	0.608	0.454	0.916	1.257	0.840	0.500	0.934	1.272	0.690	0.479
		[0.33]	[0.26]	[0.44]	[0.50]	[0.34]	[0.26]	[0.36]	[0.48]	[0.33]	[0.26]	[0.41]	[0.49]
	Variables Included in Equation:												
	Regional dummy	no	no	yes	yes	no	no	yes	yes	no	no	yes	yes
	Time dummy	no	yes	no	yes	no	yes	no	yes	no	yes	no	yes

Note: Figures in parentheses are the absolute values of t-statistics. Asterisks indicate variables whose coefficients are significant at the 10%(*), 5%(**) and 1%(***) levels, respectively. The sample size is 400. Due to limits on space, we do not report the results for the estimated coefficient of the dummy variables in the table.

Table 4: Estimation Results (Inequality = CV Coefficient) Method = TSL

Two Stage Least Squares Method

	RI				PI				PRI			
Indep. Var.	Cross-section and time series data				Cross-section and time series data				Cross-section and time series data			
Constant	13.419	13.537	6.129	5.245	14.371	14.608	6.006	5.235	13.847	13.991	6.006	5.195
	[3.84]***	[3.82]***	[1.89]*	[1.60]	[4.00]***	[4.01]***	[1.88]*	[1.62]	[3.99]***	[3.97]***	[1.88]*	[1.61]
Decentralization Indicator: Authority Power	-0.065	-0.066	-0.002	-0.039	0.010	0.034	-0.060	-0.110	-0.050	-0.049	-0.025	-0.068
	[0.60]	[0.62]	[0.02]	[0.47]	[0.10]	[0.32]	[0.68]	[1.19]	[0.44]	[0.43]	[0.28]	[0.75]
Decentralization Indicator: Autonomy Power(AI)	-0.402	-0.409	-0.570	-0.551	-0.144	-0.123	-0.667	-0.687	-0.356	-0.355	-0.602	-0.601
	[1.50]	[1.55]	[2.89]***	[2.86]***	[0.35]	[0.30]	[3.68]***	[3.52]***	[1.29]	[1.31]	[3.32]***	[3.39]***
GSP per capita	6.537	6.601	2.246	1.755	8.011	8.267	1.818	1.269	6.966	7.069	2.050	1.545
	[3.27]***	[3.26]***	[1.24]	[0.96]	[3.23]***	[3.30]***	[0.97]	[0.67]	[3.36]***	[3.37]***	[1.13]	[0.84]
Square of GSP per capita	0.849	0.858	0.216	0.138	1.053	1.090	0.158	0.070	0.908	0.923	0.190	0.149
	[3.04]***	[3.02]***	[0.86]	[0.54]	[3.04]**	[3.11]***	[0.61]	[0.26]	[3.13]***	[3.14]***	[0.75]	[0.59]
Highway per area	-0.061	-0.062	-0.115	-0.117	-0.071	-0.071	-0.119	-0.123	-0.066	-0.067	-0.116	-0.119
	[4.17]***	[3.20]***	[5.32]***	[5.41]***	[2.77]***	[2.83]***	[5.23]***	[5.40]***	[3.05]***	[3.10]***	[5.22]***	[5.36]***
Metropolitan Rate	-0.165	-0.166	-0.067	-0.082	-0.157	-0.153	-0.063	-0.076	-0.160	-0.161	-0.066	-0.080
	[3.18]***	[3.19]***	[1.38]	[1.69]*	[3.11]***	[3.00]***	[1.31]	[1.58]	[3.18]***	[3.16]***	[1.38]	[1.67]*
Education	-0.274	-0.272	-0.035	0.023	-0.200	-0.193	-0.063	0.003	-0.254	-0.251	-0.047	0.014
	[2.78]***	[2.74]***	[0.34]	[0.22]	[1.68]*	[1.63]	[0.59]	[0.03]	[2.50]***	[2.47]***	[0.46]	[0.14]
Manufacture	-0.357	-0.358	-0.354	-0.347	-0.313	-0.313	-0.063	-0.360	-0.345	-0.345	-0.360	-0.352
	[8.19]***	[8.23]***	[8.35]***	[8.26]***	[4.67]***	[4.88]***	[1.31]	[7.87]***	[7.12]***	[7.22]***	[8.28]***	[8.20]***
LIB vs. CON	-0.208	-0.202	-0.102	-0.101	-0.193	-0.185	-0.113	-0.115	-0.204	-0.198	-0.107	-0.107
	[5.10]***	[4.90]***	[2.46]**	[2.41]**	[4.73]***	[4.43]***	[2.66]***	[2.65]***	[5.03]***	[4.80]***	[2.56]**	[2.52]**
Foreign Direct Investment	-0.059	-0.060	-0.137	-0.138	-0.049	-0.049	-0.144	-0.146	-0.057	-0.058	-0.140	-0.141
	[2.28]**	[2.24]**	[5.11]***	[5.12]***	[1.82]*	[1.80]*	[5.15]***	[5.20]***	[2.15]**	[2.13]**	[5.04]***	[5.09]***
Population	0.193	0.194	0.131	0.141	0.185	0.181	0.140	0.152	0.191	0.192	0.135	0.145
	[9.89]***	[8.76]***	[6.65]***	[7.11]***	[8.77]***	[8.45]***	[7.28]***	[7.50]***	[8.59]***	[8.57]***	[6.95]***	[7.33]***
Unemployment Rate	-0.127	-0.133	-0.040	-0.099	-0.091	-0.073	-0.053	-0.126	-0.119	-0.120	-0.045	-0.110
	[2.62]***	[2.36]**	[0.77]	[1.68]*	[1.55]	[0.97]	[0.99]	[1.98]**	[2.38]**	[2.04]**	[0.67]	[1.83]*
Adjusted R-squared	0.534	0.530	0.637	0.641	0.509	0.501	0.634	0.637	0.530	0.525	0.636	0.640
Over-identifying restrictions	0.647	0.823	0.006	0.066	0.533	0.840	0.001	0.057	0.64	0.82	0.00	0.06
test, P-value	[0.42]	[0.37]	[0.94]	[0.80]	[0.47]	[0.36]	[0.98]	[0.81]	[0.43]	[0.37]	[0.97]	[0.81]
F-test statistic for joint	95.44	100.10	190.03	201.77	26.04	27.61	126.74	134.69	70.80	74.89	192.34	203.46
significance of instruments in	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
nR-squared (p-value)	0.628	0.812	0.006	0.071	0.529	0.853	0.001	0.062	0.612	0.806	0.002	0.066
	[0.43]	[0.37]	[0.94]	[0.79]	[0.47]	[0.36]	[0.98]	[0.80]	[0.43]	[0.37]	[0.97]	[0.80]
Variables Included in Equation:												
Regional dummy	no	no	yes	yes	no	no	yes	yes	no	no	yes	yes
Time dummy	no	yes	no	yes	no	yes	no	yes	no	yes	no	yes

Note: Figures in parentheses are the absolute values of t-statistics. Asterisks indicate variables whose coefficients are significant at the 10%(*), 5%(**) and 1%(***) levels, respectively. The sample size is 400. Due to limits on space, we do not report the results for the estimated coefficient of the dummy variables in the table.