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Liu, Yongzheng; Martinez-Vazquez, Jorge; and Wu, Alfred M., "Fiscal Decentralization, Equalization, and Intra-Provincial Inequality in China" (2014). *ICEPP Working Papers*. 210.
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INTERNATIONAL CENTER FOR PUBLIC POLICY

International Center for Public Policy
Working Paper 14-32
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Fiscal Decentralization, Equalization, and Intra-Provincial Inequality in China

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Abstract

Using a nationwide county-level panel dataset for the years 1995-2009, this paper conducts the first analysis in the literature to examine the impacts of fiscal decentralization and fiscal equalization, both measured at the sub-provincial level, on intra-provincial inequality in China. While fiscal decentralization offers significant advantages regarding public expenditure efficiency, a potentially large disadvantage is that it may lead to increased regional inequality. In this paper, in line with our theoretical hypotheses, we find that while fiscal decentralization at the sub-provincial level in China leads to larger intra-provincial inequality, fiscal equalization efforts performed by provincial governments tend to mitigate the detrimental effect of fiscal decentralization on intra-provincial inequality. Our results also indicate that the quantitative effects of fiscal decentralization on regional inequality tend to be larger when they are measured from the expenditure side, which is consistent with the fact that expenditure decentralization is a much more meaningful measure of decentralization in China. Overall, we provide evidence on the potential inequality costs of using fiscal decentralization as a development strategy. At the same time, we emphasize the importance of implementing a fiscal equalization program to ensure the overall success of decentralization policy.

Keywords: Fiscal decentralization; equalization, intra-provincial inequality; China
JEL Classifications: H11, H77, R11, R12

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1 Introduction

China's economic growth over the past decades has been remarkable. However, this growth has been uneven across the country, resulting in significant and still growing regional inequality in economic development, with the inland regions lagging far behind the coastal regions. An ever-increasing body of research has attempted to describe and explain the patterns of regional inequality in China (see Wang et al., 2014, for a recent survey), even though the various dimensions of this issue have not received the same degree of attention in the literature (Tsui, 1993). The general research agenda has mainly focused on the dimensions of inland-coastal inequality, rural-urban inequality, and inter-provincial inequality at the aggregated country level. Just a few studies have examined *intra-provincial inequality* at the sub-provincial level, in large part due to the lack of detailed data at the sub-provincial level in the early years of this research. Further investigation targeting this type of inequality, nevertheless, is vital because *intra-provincial inequality* accounts for the majority of the overall regional inequality in the country (e.g., Tsui, 1993; Cheong and Wu, 2012). As estimated by Cheong and Wu (2012), intra-provincial inequality based on county-level data contributed roughly 60% of China's overall inequality in 2007, and an increase in intra-provincial inequality contributed to 63% of the increase in overall inequality in China during the 1997-2007 period. Thus, a better understanding of the patterns of intra-provincial inequality and especially of its determinants should play an important role in the design of national policies addressing the overall level of regional inequality in China.

Given that the nature of intra-provincial inequality is naturally within provinces and that there is substantial variation of this type of inequality across provinces, the general determinants of this type of inequality need to be sought in some good measure at the sub-national level. Among those potential determinants we are particularly interested in the role played by fiscal decentralization policies at the sub-provincial level, which are largely formulated at the discretion of provincial governments, especially on the expenditure side of the budget.

Two key questions guide our analysis. First, does fiscal decentralization at the sub-provincial level contribute to higher intra-provincial inequality? While decentralization through empowering local governments and satisfying the heterogeneous preferences of the constituents has been viewed as enhancing efficiency and economic growth, its implications for the evolution of regional inequality remain an open question. Second, what roles do fiscal equalization policies pursued by provincial governments play in offsetting the impact of provincial fiscal decentralization on intra-provincial inequality? As an important supplemental policy of decentralization reform in China, fiscal equalization was introduced and scaled up over the past decade to ameliorate regional fiscal disparities. However, a substantial variation of equalization efforts exists across provinces, and in addition, the actual performance of those equalization programs suffers from institutional deficiencies and the possible predatory behaviors of some provincial governments (Martinez-Vazquez et al., 2008).

Using county-level data for the years 1995-2009, this paper contributes to the literature in three significant ways. First, utilizing both cross-section and time-series information we conduct for the first time in the literature an examination of the impact of fiscal decentralization policies at the sub-provincial level on intra-provincial inequality. The extant literature, mainly focused on inter-provincial disparities (by using provincial-level data), has been unable to capture the dynamics of the patterns and variations of inequality below the provincial level. In addition, our analysis based on both cross-section and time-series information provides more accurate and unbiased estimates for the impact of fiscal decentralization policies on regional inequality than other past studies on China, which have relied only on time-series information at the aggregated country level (e.g., Kanbur and Zhang, 2005; Song, 2013). Second, we investigate the impacts of fiscal decentralization at the sub-provincial level in China. Although fiscal decentralization in China has attracted worldwide attention, research at the sub-provincial level has been much rarer.[1] Nevertheless, an analysis at the sub-provincial level appears to be more justified because sub-provincial governments in China provide the

[1]Recent studies by Uchimura and Jütting (2009), Brehm (2013), Wu and Wang (2013) are notable exceptions in this regard.

majority of essential public services such as education and health care (World Bank, 2002; Gong and Wu, 2011); therefore, without examining the impact of decentralization at this level, it may be difficult to gauge the actual impact of decentralization on regional inequality. In addition, provincial governments in China have been granted substantial discretion in determining their own fiscal decentralization policy within their borders, which actually has given rise to a high level of variation in sub-provincial treatments. This variation is so substantial that it even outweighs the variation of fiscal decentralization policies across European countries (Dollar and Hofman, 2008). As the geographic areas of many Chinese provinces are equivalent to those of many European countries, a panel study of sub-provincial decentralization in China presents the additional advantage of avoiding the potential unobserved heterogeneity that may exist in the relevant cross-country studies of fiscal decentralization (see Ezcurra and Pascual, 2008; Lessmann, 2009; Sorens, 2014).[2] Third, we explicitly explore the role played by the provinces' fiscal equalization efforts in offsetting the impacts of fiscal decentralization on regional inequality. At present, all central government transfers have to go through provincial governments before reaching the various layers of sub-provincial governments, even in the case of those transfers that have been specifically designed for sub-provincial governments (Martinez-Vazquez et al., 2008). Clearly, the availability of fiscal resources and the choices of intermediate-level governments, and here we mean mostly provincial governments, can play an important role in determining the observed outcomes within provinces.

In what follows, we discuss in section 2 the theoretical debate on the relationship between fiscal decentralization and regional inequality and the potential role played by fiscal equalization. We then set up the empirical methodology and discuss the data in section 3. In section 4 we present the main empirical results, and in section 5 we provide some further robustness checks for the empirical results. In section 6 we conclude.

[2]These studies, based on data for OECD countries or European Union countries, tend to find a negative relationship between fiscal decentralization and regional inequality. In advanced democracies, the detrimental effect of fiscal decentralization on regional equity may be reduced by various institutional factors, including, of course, equalization transfer programs.

2 Theoretical Framework and Hypotheses

The debate on the relationship between fiscal decentralization and regional inequality dates back to Tiebout (1956) and Oates (1972), who justify decentralization policy as a way to achieve economic efficiency in the allocation of resources in the public sector. Under the assumption that public officials respond to the desires of their constituents, sub-national governments in a decentralized economy are better able to match differing preferences across jurisdictions. When taxpayers are mobile, gains in efficiency are enhanced because individuals can migrate sorting themselves out among the jurisdictions that best match their preferred tax-expenditure package. However, enhanced efficiency under a decentralized framework is only one of the widely accepted objectives that guide government policy; achieving greater equality is another desired objective and one that may not go side by side with the gains in efficiency associated with decentralization. A survey of the literature reveals that there are at least several compelling mechanisms for fiscal decentralization to lead to greater regional inequality; this is especially the case for countries like China at early stages of economic development and where decentralization policy has been implemented within weak institutional frameworks.[3]

First, in the presence of inter-jurisdictional competition, unfettered fiscal decentralization is likely to lead to a concentration of economic resources in rich jurisdictions and thus increase disparities across sub-national governments (Martinez-Vazquez and McNab, 2003). Several things may be at play here. First, due to the initial regional heterogeneity in institutional, economic and social endowments, by empowering local governments, decentralization tends to reinforce the competitive advantages of rich regions, which results in these regions competing and attracting more mobile and valuable resources, while the poor regions tend

[3]There may be circumstances under which fiscal decentralization has the opposite effect on regional inequality. For instance, as pointed out by Rodríguez-Pose and Ezcurra (2010), decentralization is likely to enhance fiscal transparency and place central and local governments under pressure to equalize public goods and services around the country, which eventually may contribute to lower levels of regional inequality. Nevertheless, this argument appears to be weak in the Chinese context where the main focus of the central government has been to foster strong fiscal and political incentives for local governments to promote local economic development as opposed to any emphasis on equalizing public goods and services delivery.

to have less ability to attract investment and recruit talent (Prud'homme, 1995; Cai and Treisman, 2005). Second, not unrelated, richer regions have greater capacity for matching local preferences with abundant resources, leading mobile factors to flow more easily to these areas as opposed to the poorer regions. Third, richer regions can offer substantial tax abatements and land write-downs to incoming businesses, while the poorer ones, shorter on government revenues can hardly do the same. Given the vast heterogeneity in terms of social, economic, and fiscal conditions across China's provinces, those predictions fit neatly in the Chinese context. Over the past several decades China has experienced a high concentration of economic resources in the rich provinces (i.e., costal/eastern provinces), at the same time the country has undergone an intense asymmetric inter-jurisdictional competition process. It appears that fiscal decentralization in recent decades has not eased the problem of the regional overconcentration of resources in some areas of the country but rather has tended to reinforce the existing patterns (e.g., Zhao and Zhang, 1999; Zhang, 2006).

Second, by forcing regional governments to rely mostly on revenues raised from their own jurisdictions, fiscal decentralization has weakened the central government's role in redistributing income from rich to poor regions, resulting in higher regional inequality. In the fiscal decentralization literature there is some consensus that the objective of income redistribution should be a central government responsibility for two main reasons: one is that the benefits of redistribution spill over beyond provincial and local boundaries; second, redistribution policies of sub-national governments will be compromised by the in-migration of poor families who are attracted by the higher benefits and the out-migration of rich families trying to escape the redistributive taxes. Of course, this problem is anticipated to be weakened when the implementation of fiscal decentralization is accompanied by fiscal equalization policies.

Third, from a political perspective, rich regions are likely to exert a greater influence on central decision-making, thereby increasing their chance of being offered more resources (Rodríguez-Pose and Ezcurra, 2010). In many countries, though decentralization makes sub-

national governments more financially independent through the assignment of tax powers to the local authorities, generally the central government still tends to have a final say over discretionary funds, interregional coordination, and even the pace and scope of decentralization. Richer regions with better financial resources and possibly greater political influence can make the central government develop policies or allocate discretionary funds in favor of rich areas. In China, richer regions are indeed likely to receive more sources due to their political advantageous position. For one thing, in the context of China's political structure, the party secretary and the governor of a given province may exert a substantially different influence on the central decision-making apparatus. Some rich, influential provinces, such as Guangdong province, can have a greater say in Beijing as the party secretary of Guangdong province is usually a member of the Central Politburo of the Chinese Communist Party,[4] meaning that the top leader in Guangdong province can have a direct involvement in the central government's decision making process. This reciprocal accountability, as observed by Shirk (1990), reveals that some local party leadership may have a greater say in affecting the central government's policy making as the central leadership needs support from local governments. The leverage exerted by other local party leaders is substantially different. Some poorer, lagging regions have far less influence in the central policy making process. As an example, this asymmetry in political influence was made evident by the introduction of the "tax rebates" as a major component of the fiscal transfer system introduced in the 1994 Tax-Sharing reform, which in effect rewarded the richer regions of China with substantial additional funds.

From these various arguments above, we derive the following hypothesis:

Hypothesis 1 *Fiscal decentralization is positively associated with regional inequality in China.*

The above discussion provides valuable insights into the regional inequality effect of fiscal decentralization; however, the discussion relies heavily on the assumption of the absence of

[4]The 25-member Politburo is one of the most powerful decision-making bodies in China.

an important supplementary policy under decentralized systems—fiscal equalization. Nevertheless, it is generally agreed that fiscal equalization exerts an important role in shaping the final net impacts of fiscal decentralization and thus a more thorough investigation of fiscal decentralization needs to be taken into consideration. Given the very nature of equalization policy, we expect that the possible detrimental effects of fiscal decentralization on equality will be mitigated with the presence of fiscal equalization [Hypothesis 2]. This outcome can be anticipated for two reasons. First, fiscal equalization by redirecting resources from the richer regions to the poorer regions should improve horizontal fiscal balances, leading to a more level playing field for all jurisdictions (Oates, 1999). More specifically, by funding a nationwide standard of provision for public goods and services through an equalization program, central governments make sure that richer regions do not have this type of advantage over poorer regions in the inter-jurisdictional competition for business and other mobile factors. At the same time, poorer regions are provided with ways to catch up with the richer ones based on joint programs of the local authorities with the central government. Equalization policy not only means that poorer regions will have more public resources for public goods provision but also that poorer regions now may have a stronger capacity to work on suitable solutions for local development.[5] On the other hand, since equalization systems distribute fiscal transfers to regions in a way that correlates inversely with their fiscal capacities, a number of scholars have observed that fiscal equalization induces significant incentive effects on the taxing and expenditure policy of regional governments in a way that reduces the extent of inter-jurisdictional competition among rich and poor regions, and so mitigates the detrimental effect of fiscal decentralization on regional inequality (e.g., Boadway and Flatters, 1982; Smart, 1998; Liu, 2014). This is because when a region attempts to attract mobile factors from other regions by cutting tax rates or increasing public expenditure, it

[5]Drawing on a political economy model, Kotsogiannis and Schwager (2008) also point out that equalization programs may improve local accountability through enabling voters to compare public good supplies between regions thus keeping politicians more accountable. As fiscal equalization efforts usually aim to ensure the same standards for public services across regions, politicians will have to be more self-restrained and be less rent-seeking; otherwise, poor public goods provision may make rational voters punish the incumbents.

increases its own tax base relative to the national average, which simultaneously reduces the region's entitlement for higher grants.

Hypothesis 2 *The positive effect of fiscal decentralization on enlarging regional inequality is likely to be mitigated by fiscal equalization policies.*

Finally, as we highlighted in the first section of the paper, all central government transfers in China have to go through the provincial governments before reaching the various layers of sub-provincial governments (prefectures, counties and townships); thus, provincial governments enjoy a substantial degree of discretion in designing their own equalization policies to meet their diversified policy objectives. It is also this feature that is likely to generate large variations in equalization efforts across provinces. This high degree of variation provides us a good scenario to test Hypothesis 2 in the Chinese context.

3 Econometric Methodology, Measurement of Key Variables, and Data

3.1 Econometric Specification

In this section we discuss the empirical strategy with the objective of testing the predictions that are explicitly summarized in Hypotheses 1 and 2. Specifically, to assess the causal impacts of fiscal decentralization on intra-provincial inequality, we estimate a standard two-way fixed effects model of the form,

$$I_{it} = \alpha + \beta FD_{it} + \gamma EQ_{it} + \theta FD_{it} * EQ_{it} + \mathbf{X}_{it}\delta + \eta_i + \vartheta_t + \epsilon_{it} \tag{1}$$

where i represents province and t denotes year. The dependent variable I_{it} is our measure of intra-provincial inequality in the level of economic development based on county level data; FD_{it} is the fiscal decentralization indicator of a province; EQ_{it} is a proxy of the equalization

effort conducted by the provincial government;[6] and $FD_{it} * EQ_{it}$ is the interaction term between the two variables. On the grounds of Hypotheses 1 and 2, we expect to find a positive sign for coefficient β and a negative sign for coefficient θ. Furthermore, the model includes province dummies (η_i) to control for unobserved heterogeneity across provinces that are constant over time and also year dummies (ϑ_t) to control for year effects that affect all provinces; ϵ_{it} is an idiosyncratic error term.

As control variable $\mathbf{X}_{it}$ we seek to capture the general factors of significance in determining regional inequality based on the extant empirical literature. Several factors have been identified as particularly important in explaining regional inequality in China. These include real GDP per capita, the share of secondary sector in total GDP, the share of state-owned enterprises (SOEs) outputs in total industrial output, trade openness, and the urbanization rate.

Real GDP per capita serves as a proxy for the level of economic development of the provinces; it is commonly agreed in the literature that economic development exerts a significant impact on spatial inequality, though the net effect of this variable is theoretically unclear. For example, from the viewpoint of the new economic geography school, economic growth has a tendency to be associated with agglomeration (economies), which eventually leads to an uneven spatial development (Krugman, 1998; Fujita and Thisse, 2002); on the other hand, it is suggested that advances in economic development may endow the regions with a larger scope for redistributive politics through transmission channels besides inter-regional grants and transfers (Lessmann, 2009). The share of the secondary sector in total GDP and the share of SOEs outputs in total industrial output are employed to capture the impacts of economic structure on the patterns of regional development within provinces. Over the years, a key source of regional inequality in China has been the location-biased national industrialization strategy (particularly in the case of the heavy-industry development strategy), and restrictive inter-regional migration policies (e.g., the *Huhou* system),

[6] See the next subsection for detailed definitions on the intra-provincial inequality, fiscal decentralization indicator, and equalization effort index.

which lead to an uneven spatial distribution of industrialization outcomes (see Tsui, 1991; Kanbur and Zhang, 2005). Trade openness has been consistently found to be one of the major contributors of China's regional inequality, reflecting the dramatic changes in regional comparative advantage and industry clustering patterns as a result of trade liberalization (e.g., Kanbur and Zhang, 2005; Fan et al., 2011). In view of this, we include trade openness, measured as the ratio of total trade (exports and imports) to GDP at the provincial level, to control for this effect. Lastly, the rural-urban gap has persistently accounted for a large share of regional inequality in China (e.g., Tsui, 1993; Kanbur and Zhang, 1999, 2005; Sicular et al., 2007), which, to a large extent has been rooted in the institutional legacies of socialism which gave rise to a series of urban-biased social and economic policies. Thus, the urbanization level, measured as the share of urban population in the total province population, is expected to reduce the rural-urban gap and contribute to a lower level of regional inequality within the provinces.

3.2 Measures of Key Variables

Below, we explain in further detail the measurements of our key variables of interest: intra-provincial inequality, fiscal decentralization, and equalization effort of provincial governments.

3.2.1 Intra-provincial inequality

As we have stressed in the introduction, our primary focus is on the economic aspect of disparities within provinces; thus, we follow the conventional empirical literature on regional inequality (e.g., Williamson, 1965; Petrakos et al., 2005; Rodríguez-Pose and Ezcurra, 2010) to define our dependent variable, intra-provincial inequality, as the population-weighted coefficient of variation of per capita GDP of the counties within the province, which takes the following form,

$$I_{it} = \frac{\sqrt{\sum_{j=1}^{n_i} p_{jt}(y_{jt} - \mu_{it})^2}}{\mu_{it}} \tag{2}$$

where y_{jt} and p_{jt} are the per capita GDP and population share of county j in province i for year t, respectively;[7] n_i is the total number of counties in province i; μ_{it} is the population-weighed average of per capita GDP in province i for year t, i.e., $\mu_{it} = \sum_{j=1}^{n_i} p_{jt} y_{jt}$. This measure of dispersion presents several appealing features. First, it is independent of the number of regions considered; second, it satisfies the Pigou-Dalton transfer principle in the sense that an arithmetical transfer from the rich to the poor regions reduces inequality (Cowell, 2011); and third, by taking into account the different weights in population across counties, this measure of dispersion is independent of scale and population size.

3.2.2 Fiscal decentralization indicators

Measuring the extent of fiscal decentralization has been long debated in both theoretical work and empirical studies. This has been the case largely because fiscal decentralization unfolds along several dimensions and at different paces; thus no single indicator is able to adequately capture the full picture of the process and ideally that process should be measured separately for each of the dimensions (Martinez-Vazquez and McNab, 2003; Stegarescu, 2005). Nevertheless, this issue can be at least partially overcome by considering alternative indicators that reflect different aspects of the decentralization process (Liu et al., 2013). For this reason, we measure the degree of fiscal decentralization in the provinces by simultaneously considering expenditure decentralization and revenue decentralization. Of these two indicators, expenditure decentralization, defined as the local share of total government expenditure, has been the most widely used indicator in the literature (e.g., Oates, 1985;

[7] Similar to other relevant studies that have used Chinese county data (e.g., Zhang, 2006; Uchimura and Jütting, 2009), our basic unit for calculating intra-provincial inequality is county j, which does not include the city district ("*qu*"), as the latter differs significantly from the former in many aspects including administrative, economic, and fiscal aspects. In this regard it has been highlighted in the literature that when calculating regional inequality, it is necessary to use a territorial classification that creates relatively homogenous regions (Lessmann, 2009).

Davoodi and Zou, 1998; de Mello, 2000) as it captures the degree of local governments' expenditure responsibilities in the public sector, quantifying who does what. Beyond these arguments, there is even a stronger reason to measure decentralization from the expenditure side rather than the revenue side in the Chinese context. This is due to the fact that fiscal revenues in China are reallocated between the central and local governments in a complex web of flows (e.g., revenue sharing, rebates and transfers, etc.) and local governments have virtually no authority in either determining their tax rates or tax bases (Qiao et al., 2008; Wu and Wang, 2013).[8] Given this, we expect to find a stronger effect of decentralization from the expenditure side measurement.

While most of the existing empirical studies on fiscal decentralization in China have relied on data at the center-province level (e.g., Zhang and Zou, 1998; Jin and Zou, 2005; Qiao et al., 2008), we utilize county data to measure fiscal decentralization at the province-local level. This is a more accurate measure of the degree of decentralization at the province level because provincial governments in China enjoy almost full discretion in designing their decentralization policy for local governments within their borders.[9] In addition, our measurement of fiscal decentralization at the sub-provincial level fits much better in our context, as our interest is to explain the county variations in the level of economic development within provinces. More specifically, following and extending Wu and Wang (2013), we define (1) expenditure decentralization as the share of sub-provincial expenditure (i.e., the aggregation of prefectural, county and township public expenditures) in total expenditure of the province and (2) revenue decentralization as the share of sub-provincial revenue (i.e., the aggregation of prefectural, county and township revenue) in total revenue of the province.

[8] In contrast, local governments in China have significant levels of autonomy and discretion on the expenditure side of the budget.

[9] Uchimura and Jütting (2009) and Wu and Wang (2013) are notable exceptions in that they also measure fiscal decentralization at the sub-provincial level in China.

3.2.3 Equalization effort

Equalization effort is a relative concept that reflects the extent of changes in the distribution of fiscal resource within provinces with and without the presence of equalization transfers from provincial governments. Following this concept and drawing on the relevant work by Martinez-Vazquez and Timofeev (2008), we measure equalization effort of provincial governments as the percentage change of intra-provincial disparities in fiscal revenues before and after taking into account the equalization transfers received by county governments. More specifically, the measure takes the following form,

$$EQ_{it} = \frac{f_{it}^{b} - f_{it}^{a}}{f_{it}^{b}} \tag{3}$$

where f_{it}^{b} is the population-weighted coefficient of variation of own source revenue in province i for year t, and it is calculated according to a formula similar to equation (2) on the basis of county-level data; f_{it}^{a} is the corresponding population-weighted coefficient of variation of total revenue taking into account the equalization transfers received by county governments in province i for year t. Being part of the decentralization design in the provinces, fiscal transfers at the sub-provincial level are at the discretion of provincial governments. Therefore, a larger value of EQ_{it} indicates higher equalization efforts being pursued by provincial governments, which in turn affects the final performance of the decentralization policy in the provinces.

It is worth noting here that intergovernmental fiscal transfers in China are mainly categorized into three groups: tax rebates, equalization transfers, and ad hoc transfers. The one we take into account in the calculation of the "after" fiscal disparities (i.e., f_{it}^{a}) is the exact group of equalization transfers, which has been widely believed to precisely reflect the actual equalization intention of upper-level governments (e.g., Zhang and Martinez-Vazquez, 2003; Huang and Chen, 2012; Liu et al., Forthcoming).[10] Nevertheless, as robustness checks we

[10]The tax rebate was a compromised outcome to smooth the implementation of the Tax-Sharing reform in 1994. Specifically, the tax rebate was introduced to guarantee the vested interests of richer provincial governments prior to the 1994 reform. Its essence was to return to the provinces the amounts of VAT, consumption taxes and income taxes that otherwise would have gone to these provinces under the old system.

present in section 5, we also consider the case where the total amounts of fiscal transfers are taken into account.

3.3 Data

The panel dataset we use for the quantitative analysis covers 26 provinces in China for the years 1995-2009. Similar to the relevant work by Uchimura and Jütting (2009) in using county data, we exclude the four province-level municipalities, Beijing, Tianjin, Shanghai, and Chongqing for the following two reasons: first, the legal status of counties (and also districts) in these municipalities is non-comparable to the counties in other provinces since they may differ dramatically in terms of administrative and fiscal status; second, these municipalities only have a very limited number of counties, which weakens their representativeness in calculating the intra-provincial inequality.[11] Since the formal intergovernmental fiscal transfers system was only in place in 1995,[12] we use year 1995 as the starting period in our analysis; the end year of the panel dataset, 2009, is the last year that fiscal data at the county level were released. Finally, Tibet is also excluded from the sample due to data unavailability.

County-level data used for the calculations of the key variables discussed in the previous subsection are taken from the *Prefecture, City, and County Public Finance Statistics (Quanguo Dishixian Caizheng Tongji Ziliao, 1996-2010)*, which provides the most detailed and disaggregated data on subnational public finances and some basic economic and socio-economic variables (such as GDP and population). It is also noted that population data at the county level for year 2001 and onward are complemented from the *China Statistical Yearbook for Regional Economy (Zhongguo Quyu Jingji Tongji Nianjian, 2002-2010)* as they

By design the tax rebates did not perform any equalization role. The ad hoc transfers typically involve the central government response to high-priority emergencies or are generally associated with particular programmatic objectives; this type of transfer is usually endowed with strong bargaining features. See Zhang and Martinez-Vazquez (2003) for a detailed discussion on the fiscal transfers system in China, and Huang and Chen (2012) and Liu et al. (Forthcoming) for analyses of its equalization effects.

[11] For example, Shanghai has only one county and Beijing has only two.

[12] The Tax-Sharing system reform was implemented in year 1994.

are no longer reported in the previous documents. All other data at the provincial-level are collected from various issues of the *China Statistical Yearbook* and the *China Compendium of Statistics 1949-2008*. Table A1 in the Appendix provides a detailed description and sources of all the variables, while their summary statistics are reported in Table 1.

4 Empirical Findings

4.1 Baseline Results

Table 2 presents the estimation results for our baseline model (1). All specifications are estimated using a two-way fixed effects model, along with controlling for the major explanatory variables and correcting for robust standard errors. Overall, the baseline model has a R-squared value around 0.63, indicating that 63% of the variation of intra-provincial inequality is explained in our model.

To begin with, we examine the effect of fiscal decentralization on intra-provincial inequality assuming no interaction effect from the equalization effort of provincial governments. Columns (1) and (2) report the corresponding results with alternatively considering expenditure decentralization and revenue decentralization as the key variable of interest. As shown, the coefficient of expenditure decentralization (i.e., column (1)) is positive and statistically significant at 5% level, supporting Hypothesis 1 that an increase of fiscal decentralization leads to larger intra-provincial inequality. Quantitatively, a one-percentage point increase in the measure of expenditure decentralization increases intra-provincial inequality by 0.008 points; in other words, a province with the sample average value of expenditure decentralization (i.e., 73.7%) will have a 0.59 points increase in its intra-provincial disparity—a value that is equivalent to 89.8% of the sample average value of intra-provincial inequality across provinces and years. Turning to the coefficient of revenue decentralization (column (2)), it confirms the previous finding that fiscal decentralization is positively associated with intra-provincial inequality, though the coefficient is only statistically significant at the margin.

In addition, the magnitudes of the coefficients also reveal that the quantitative impacts of fiscal decentralization tend to be smaller when it is measured from the revenue side, which in turn is consistent with the conventional wisdom that expenditure decentralization appears to be a more accurate and practically more meaningful measure of decentralization in China. Overall, we find supportive evidence for Hypothesis 1 in suggesting a positive relationship between fiscal decentralization and intra-provincial inequality in economic development.

However, in the above analysis, the effect of fiscal decentralization may not be sufficiently captured. The reason is that, as highlighted in Hypothesis 2, although an increase in fiscal decentralization may give rise to an increase in intra-provincial inequality, its final effect may also depend on how equalized the distribution of fiscal resource is within the provinces. For instance, even if two provinces may have the same share of sub-provincial government expenditure in total expenditure of the province, the possible detrimental effects of one province's decentralization policy on regional inequality within the province may be less severe than in the other province. This is true because out of the same share of sub-provincial expenditure the former may have a more equalized distribution of expenditure among counties (due to the higher equalization effort of provincial government), which in turn contributes to a more balanced regional development within the province. Given this, to address the effect of fiscal decentralization on intra-provincial inequality more precisely and also to test Hypothesis 2, we take into account the interaction effect between fiscal decentralization and equalization effort of provincial governments. This interaction term allows us to evaluate how equalization efforts by provincial governments influence the effects of fiscal decentralization. The results are shown in columns (3) and (4) of Table 2. The estimated coefficients of both fiscal decentralization indicators remain positive and statistically significant, while the coefficients of the interaction term are significantly negative. This confirms Hypothesis 2 in the sense that the partial effect of fiscal decentralization on intra-provincial inequality is decreasing with the level of equalization effort exercised by the provincial government.

Regarding the other variables included in the model, the equalization effort variable (in

levels) in the specifications without adding an interaction term (i.e., columns (1) and (2)) has a negative coefficient but is only statistically significant at the margin. It becomes positive and significant once the interaction is added; however, considering together with the negative and significant coefficient of the interaction term (i.e., columns (3) and (4)), the net partial effect of equalization effort depends on the level of fiscal equalization. Nevertheless, evaluating at the sample mean value of any of the two fiscal decentralization indicators, the net partial effect of equalization effort is always negative and significant,[13] suggesting that, on average, a higher level of equalization effort by provincial governments is associated with a lower level of intra-provincial economic disparities. All other control variables in general have statistically significant coefficients and the results are mostly consistent with what we predicted. Real GDP per capita along with the two measures of economic structure, the share of secondary industry in total GDP and the share of SOEs outputs in total industrial output, have positive and significant coefficients, indicating that the provincial economic development and industrialization process tend to enlarge regional inequality within provinces. Consistent with previous studies, urbanization is found to be an effective element in reducing intra-provincial inequality in China, while trade openness contributes to larger regional inequality within provinces, though this effect tends to be statistically significant only at the margins in some specifications.

4.2 Instrumental Variable

A potential concern is that the endogeneity of fiscal decentralization may bias our estimates in Table 2. Endogeneity may be present because the deterioration of intra-provincial inequality may lead to a strong demand for centralization and so lower the level of fiscal decentralization and increase equalization efforts within provinces. A more subtle argument for the existence of the endogeneity of fiscal decentralization is implied by the findings of Sacchi and Salotti (2014). These authors find evidence that high regional economic dispari-

[13]For example, looking at column (3) in Table 2, the net partial effect of equalization effort is, 2.212-0.033*(mean of expenditure decentralization indicator)=2.212-0.033*73.7=-0.220.

ties are associated with lower levels of fiscal decentralization in OECD countries for the years 1981-2005.

Previous studies on the impacts of fiscal decentralization have also acknowledged the potential endogeneity bias in their estimates, though they do not explicitly control for it[14]—to a large extent due to small sample sizes and the lack of good instruments (e.g., Zhang and Zou, 1998; Xie et al., 1999; Lin and Liu, 2000; Jin et al., 2005; Qiao et al., 2008). In this subsection, we account for the potential endogeneity bias by using an instrumental approach. Facing the same difficulty in previous studies of finding good external instruments, we follow the traditional practice of using the first and second lagged values of fiscal decentralization and equalization effort as instruments. The validity of these instruments is justified by the fact that while the decentralization policy in a province is likely to be consistent over a short period of time, intra-provincial inequality in the later year should not affect provinces' choice of decentralization policy in the preceding years in a significant way.

Table 3 documents the results we obtain utilizing the instrumental method. The F-test statistics from the first stage regression and the over-identifying restriction tests are noted at the bottom of the table. As shown, the Cragg-Donald F-statistics are reasonably large and statistically significant, indicating the instruments are good predictors of the fiscal decentralization and equalization effort variables; the p-values of the Hansen J statistics suggest that we cannot reject the hypothesis of no correlation between the instruments and the error term in the regressions. Comparing the results in Tables 3 and 2 confirms our earlier findings: fiscal decentralization leads to larger regional inequality within provinces while equalization efforts by provincial governments help reduce the detrimental effects of fiscal decentralization on regional equality, with the parameter estimates in Table 3 being larger than those in Table 2, confirming our expectations that taking endogeneity into account would lead to higher estimated inequality impacts.

[14] Fisman and Gatti (2002) and Iimi (2005) are the two exceptions in the literature.

5 Robustness Checks

In order to test for the robustness of the main results, we conduct sensitivity analyses along three dimensions: adding more control variables, using alternative measures of intra-provincial inequality, and using alternative measures of equalization effort by provincial governments. In all robustness checks, we find results from the completed specifications equivalent to those in columns (3) and (4) of Tables 2 and 3 that include the interaction variable.

5.1 Additional Control Variables

Beyond the most common discussed factors that we already included as control variables, there are possibly some other variables including human capital and inflation that may also explain the pattern of regional inequality (e.g., Fleisher et al., 2010; Kyriacou et al., 2013). In addition, by changing the income taxes (i.e., personal and corporate income taxes) from local source taxes to shared taxes, the 2002 income tax reform in China significantly affected the revenue assignments among different levels of governments, which eventually may have affected the pattern of regional development. We control for these three additional variables to check the robustness of our results. Following the literature, human capital is defined as the average years of schooling in the provinces;[15] inflation is measured as the annual percentage change in the consumer price index; and the 2002 income tax reform is captured by a dummy variable equaling 1 for the years after 2002 (0 otherwise).

Table 4 reports the new estimated results. As shown, the inclusion of these additional explanatory variables does not alter the parameter estimates or conclusions regarding the effects of fiscal decentralization on intra-provincial inequality. In all cases with and without controlling for endogeneity, expenditure and revenue decentralization remain positive and significant, while the interaction term between fiscal decentralization and equalization effort

[15]Data on human capital is derived from Chen et al. (2004) for the year before 2001 and it is augmented by the authors for the years after 2001.

remain negative and significant. Both human capital and inflation appear to enlarge regional inequality within provinces, although they are in general statistically insignificant. The 2002 income tax reform tends to significantly reduce intra-provincial inequality—in a broad sense, confirming our expectation that the centralization of revenues should help reduce regional inequality.

5.2 Alternative Measure of Regional inequality

Our second round of checking the robustness of our results consists of using alternative known measures of regional inequality. This may be important because different measures of inequality rely on varied approaches to the aggregation of information contained in the distribution, which in turn may lead to different orderings of the distribution analyzed (Ezcurra and Pascual, 2008; Rodríguez-Pose and Ezcurra, 2010). For this reason, we re-calculate the measures of intra-provincial inequality and equalization effort using two other measures of inequality that have been widely used in the literature on personal income distribution and in the study of regional inequality (e.g., Terrasi, 1999; Ezcurra and Pascual, 2008; Rodríguez-Pose and Ezcurra, 2010): They are the Gini coefficient and the Theil index. These two indices can be calculated as follows, respectively,

$$G_{it} = \frac{1}{2\mu_{it}} \sum_{j=1}^{n_i} \sum_{k=1}^{n_i} p_{jt} p_{kt} |y_{jt} - y_{kt}| \tag{4}$$

and

$$T_{it} = \sum_{j=1}^{n_i} p_{jt} \frac{y_{jt}}{\mu_{it}} log(\frac{y_{jt}}{\mu_{it}}) \tag{5}$$

where both j and k denote counties; and the rest of the notation is the same in equation (2). Note that these two indices also satisfy the requirements that they are independent of the number of regions considered, the scale and population size of the regions, and the Pigou-Dalton transfer principle.

Tables 5 and 6 summarize the results corresponding to the alternative measures of intra-provincial inequality and equalization effort of provincial governments using the Gini coefficient and the Theil index. The results again suggest that greater levels of expenditure and revenue decentralization lead to larger regional inequality within provinces, whereas greater equalization efforts by provincial governments help offset the detrimental effects of fiscal decentralization on regional inequality.[16] Quantitatively, it would appear that the effect of fiscal decentralization on intra-provincial inequality becomes smaller when these alternative measures of inequality are adopted; however, this is, in large part, due to an overall smaller value of intra-provincial inequality measured by these indices (see Table 1).

5.3 Alternative Measure of Equalization Effort

Lastly, it is noted earlier that in the calculation of equalization effort of provincial governments, we have only considered the equalization transfers component, which, from a normative perspective, appears to be the best way to capture the equalization intention of provincial governments. Nevertheless, it also seems to be warranted, as further robustness checks, to consider the case where the total amount of fiscal transfers is used in the calculation of the equalization effort; due to the bargaining features of the transfers system, some other components of transfers (for example, the ad hoc transfers) may also result in a certain degree of equalization effects (e.g., Huang and Chen, 2012; Liu et al., Forthcoming).

To investigate this, we re-calculate the equalization effort indicator based on the distribution of total fiscal transfers within provinces and re-calculate equation (2). The results are presented in Table 7. The results are quite comparable to those in Tables 2 and 3 where we do and do not control for endogeneity, confirming our conclusions on the roles of fiscal decentralization and fiscal equalization. The magnitudes of the estimated coefficients for fiscal equalization are a bit smaller. This may be an indication that the other components of

[16] Although the coefficient of revenue decentralization in column (4) of Table 5 appears to be not statistically significant, its joint test with the interaction term is statistically significant at the 10% significance level.

the transfer system may not be as equalizing as our primary measure of equalization effort based on equalization transfers only.

6 Conclusions

The link between fiscal decentralization and regional inequality has long been debated in the literature. The empirical evidence has been mixed even when the studies have only focused on the same group of countries (e.g., OECD countries). After carefully assessing this issue in the Chinese institutional context, we hypothesize that fiscal decentralization is likely to result in larger regional inequality, while the equalization effort exercised by provincial governments is likely to work as an effective tool in correcting some of the detrimental effects of fiscal decentralization. These two hypotheses are tested by employing county-level panel data, where fiscal decentralization, equalization and regional inequality are all measured at the sub-provincial level. Our results provide strong support to the two hypotheses. These results are also shown to be robust across different regression methods, alternative measures of intra-provincial inequality, and alternative measures of fiscal decentralization and equalization efforts by provincial governments.

In light of the fact that a large part of regional inequality in China arises from intra-provincial inequality, it is surprising to see that these two factors (fiscal decentralization and equalization efforts) contributing to this type of inequality have been so rarely investigated in the literature. Thus, our study contributes to a better understanding of the general determinants of intra-provincial inequality and so the overall regional inequality in China, with a particular emphasis on the role played by the fiscal decentralization policies pursued by provincial governments.

From a policy perspective, the main results of this study provide valuable insights for how to reduce regional inequality within provinces, if that is the policy objective of the central government or provincial governments.

First, in China the subnational government share in public expenditures is significantly larger than is the case even in the most decentralized countries. This is largely due to the fact that many social expenditure responsibilities in public welfare, including unemployment compensation and pensions, have been long assigned to subnational governments, especially at the lowest level (Martinez-Vazquez and Qiao, 2011). Therefore there is plenty of scope for China's central government to reassign and centralize those expenditure responsibilities that currently are clearly wrongly assigned since expenditures on social welfare and unemployment compensation should be the domain of the central government. As we have seen in this paper, this type of policy would contribute significantly towards regional convergence in China.

The second set of findings in this paper reinforces the traditional wisdom highlighting the importance of maintaining an effective equalization program for the successful implementation of a decentralized system. The question remains open on whether provincial governments are currently sufficiently involved in implementing equalization programs pursuing more balanced regional development and more equal access to public services for their residents. Greater equalization efforts at the provincial level will require further increasing the overall pool of funds dedicated to equalization and making this increased funding more stable and predictable by adopting an explicit funding rule for the available pool of funds. Because provincial governments still have considerable discretion in setting these and other forms of fiscal interactions with their subordinate governments, the central authorities need to weigh the need for introducing minimum performance standards in matters of equalization at the provincial level.

There is more that central authorities can do to increase regional convergence. As Shankar and Shah (2003) have pointed out, past interventionist policies by central governments aiming to promote regional development often have resulted in regional divergence. In the Chinese case, during the 1980s and early 1990s removing barriers to factor mobility and the opening of economic development zones were essential to economic prosperity and greater inequality across the regions. Further liberalization of factor mobility, including the removal

of the internal migration (e.g., *Hukou*) restrictions, should further contribute to regional convergence. But in fact when it comes to the minimum standards of basic services people are demanding in their regions, the Chinese institutional context in recent years has proved that a proactive approach, to some extent using interventionist policies, has been quite instrumental in reducing regional inequality: through an improved centrally orchestrated equalization effort less developed regions are being equipped with improved fiscal capacity, although this effort may still be falling short (Liu et al., Forthcoming), calling for substantially increased central equalization transfers.

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Table 1: Summary Statistics

Variable	Mean	Std. Dev.	Min	Max	Obs
wcv_gdppc	0.66	0.25	0.2	1.79	390
wgini_gdppc	0.31	0.08	0.11	0.55	390
wtheil_gdppc	0.18	0.11	0.02	0.7	390
Expenditure decentralization	73.68	8.81	46.25	89.23	390
Revenue decentralization	80.4	8.58	55.2	99.08	390
Equalization effort 1	0.32	0.21	-0.02	0.73	390
Equalization effort 2	0.32	0.2	-0.08	0.73	390
Equalization effort 3	0.43	0.24	-0.1	0.9	390
Equalization effort 4	0.34	0.21	-0.31	0.78	390
GDP per capita, log	1.88	0.62	0.4	3.38	390
Share of SOEs outputs	0.54	0.21	0.11	0.95	390
Share of secondary sector	0.44	0.07	0.2	0.58	390
Urbanization	0.37	0.12	0.16	0.79	380
Openness	0.22	0.29	0.03	1.58	390
Schooling	7.52	0.82	4.69	9.24	390
Inflation	3.11	4.8	-3.2	21.4	390
Tax reform 2002	0.53	0.5	0	1	390

Table 2: Main Results: Fixed Effects Estimation

	(1)	(2)	(3)	(4)
Expenditure decentralization	0.008**		0.021***	
	(2.251)		(3.993)	
Revenue decentralization		0.003		0.010***
		(1.305)		(3.624)
Equalization effort 1	-0.173	-0.159	2.212***	1.819***
	(-1.352)	(-1.281)	(3.664)	(4.336)
Expenditure decentralization			-0.033***	
× Equalization effort 1			(-4.081)	
Revenue decentralization				-0.026***
× Equalization effort 1				(-4.720)
GDP per capita, log	0.447**	0.528***	0.565***	0.597***
	(2.285)	(2.839)	(3.251)	(3.495)
Share of SOEs outputs	0.396**	0.362**	0.262	0.216
	(2.397)	(2.276)	(1.608)	(1.361)
Share of secondary sector	1.063**	1.001**	0.495	1.126**
	(2.127)	(2.074)	(1.169)	(2.355)
Urbanization	-0.172**	-0.155**	-0.106	-0.137**
	(-2.321)	(-2.197)	(-1.486)	(-1.977)
Openness	0.096	0.107	0.112	0.186**
	(1.123)	(1.291)	(1.295)	(2.128)
Constant	-1.533***	-1.222***	-2.543***	-2.108***
	(-3.378)	(-3.231)	(-4.742)	(-4.782)
Province fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	380	380	380	380
R-squared	0.624	0.621	0.649	0.640

Note: Robust t-statistics in parentheses; $***p < 0.01, **p < 0.05, *p < 0.1$.

Table 3: Main Results: Fixed Effects with IVs Estimation

	(1)	(2)	(3)	(4)
Expenditure decentralization	0.016**		0.036***	
	(2.239)		(3.255)	
Revenue decentralization		0.002		0.011**
		(0.629)		(2.565)
Equalization effort 1	-0.405*	-0.355	2.107**	1.828***
	(-1.701)	(-1.535)	(2.399)	(3.271)
Expenditure decentralization			-0.035***	
× Equalization effort 1			(-3.202)	
Revenue decentralization				-0.028***
× Equalization effort 1				(-3.728)
GDP per capita, log	0.639***	0.768***	0.683***	0.822***
	(4.268)	(6.025)	(4.863)	(6.743)
Share of SOEs outputs	0.705***	0.611***	0.593***	0.422***
	(4.464)	(3.869)	(4.080)	(2.937)
Share of secondary sector	0.947*	0.912*	0.455	1.012**
	(1.855)	(1.889)	(1.029)	(2.109)
Urbanization	-0.169*	-0.109	-0.129	-0.104
	(-1.913)	(-1.443)	(-1.488)	(-1.396)
Openness	0.046	0.064	0.073	0.141
	(0.506)	(0.697)	(0.792)	(1.458)
Constant	-2.408***	-1.819***	-3.633***	-2.477***
	(-4.099)	(-3.480)	(-4.579)	(-4.249)
Province fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	332	332	332	332
R-squared	0.641	0.644	0.655	0.657
Cragg-Donald F Statistic	24.88	64.74	16.55	41.47
Hansen J statistic (p-value)	0.341	0.445	0.358	0.818

Note: Robust t-statistics in parentheses; $***p < 0.01, **p < 0.05, *p < 0.1$.

Table 4: Robustness Checks: Additional Control Variables

	Fixed Effects		Fixed Effects+IVs	
	(1)	(2)	(3)	(4)
Expenditure decentralization	0.021***		0.035***	
	(4.001)		(3.417)	
Revenue decentralization		0.010***		0.010**
		(3.587)		(2.516)
Equalization effort 1	2.168***	1.823***	2.028**	1.831***
	(3.673)	(4.337)	(2.480)	(3.285)
Expenditure decentralization	-0.032***		-0.034***	
× Equalization effort 1	(-4.079)		(-3.275)	
Revenue decentralization		-0.026***		-0.028***
× Equalization effort 1		(-4.684)		(-3.693)
GDP per capita, log	0.570***	0.584***	0.681***	0.808***
	(3.147)	(3.341)	(4.570)	(6.239)
Share of SOEs outputs	0.253	0.170	0.583***	0.376**
	(1.525)	(1.031)	(4.028)	(2.502)
Share of secondary sector	0.481	1.069**	0.451	0.962**
	(1.135)	(2.302)	(1.009)	(2.066)
Urbanization	-0.118	-0.146**	-0.130	-0.103
	(-1.622)	(-2.023)	(-1.505)	(-1.384)
Openness	0.121	0.201**	0.074	0.149
	(1.387)	(2.290)	(0.799)	(1.544)
Tax reform 2002	-0.675***	-0.805***	-0.588***	-0.676***
	(-3.130)	(-3.726)	(-4.675)	(-5.266)
Schooling	0.019	0.057	0.015	0.047
	(0.571)	(1.620)	(0.407)	(1.270)
Inflation	0.006	0.005	0.003	0.006
	(0.676)	(0.575)	(0.284)	(0.514)
Constant	-2.761***	-2.522***	-3.111***	-2.116***
	(-4.435)	(-4.585)	(-3.892)	(-3.369)
Province fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	380	380	332	332
R-squared	0.650	0.642	0.656	0.660
Cragg-Donald F Statistic	.	.	16.17	39.23
Hansen J statistic (p-value)	.	.	0.336	0.848

Note: Robust t-statistics in parentheses; $***p < 0.01, **p < 0.05, *p < 0.1$.

Table 5: Robustness Checks: Gini Measure of Regional Inequality

	Fixed Effects		Fixed Effects+IVs	
	(1)	(2)	(3)	(4)
Expenditure decentralization	0.005***		0.008***	
	(3.846)		(4.027)	
Revenue decentralization		0.003***		0.001
		(2.872)		(0.711)
Equalization effort 2	0.605***	0.479***	0.530***	0.282*
	(4.001)	(3.533)	(3.095)	(1.885)
Expenditure decentralization	-0.009***		-0.008***	
× Equalization effort 2	(-4.299)		(-3.616)	
Revenue decentralization		-0.006***		-0.004**
× Equalization effort 2		(-3.799)		(-2.027)
GDP per capita, log	0.165***	0.168***	0.210***	0.231***
	(3.203)	(3.339)	(6.683)	(7.949)
Share of SOEs outputs	0.040	0.026	0.076	0.037
	(0.772)	(0.492)	(1.631)	(0.738)
Share of secondary sector	0.185	0.354***	0.128	0.251**
	(1.524)	(2.645)	(1.188)	(2.096)
Urbanization	-0.032	-0.045**	-0.034	-0.023
	(-1.373)	(-2.040)	(-1.520)	(-1.151)
Openness	0.041	0.062**	0.064***	0.085***
	(1.467)	(2.253)	(2.663)	(3.182)
Constant	-0.545***	-0.450***	-0.793***	-0.371***
	(-3.915)	(-3.612)	(-4.896)	(-2.720)
Province fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	380	380	332	332
R-squared	0.746	0.735	0.785	0.780
Cragg-Donald F Statistic	.	.	16.24	52.29
Hansen J statistic (p-value)	.	.	0.321	0.768

Note: Robust t-statistics in parentheses; $***p < 0.01, **p < 0.05, *p < 0.1$.

Table 6: Robustness Checks: Theil Index Measure of Regional Inequality

	Fixed Effects		Fixed Effects+IVs	
	(1)	(2)	(3)	(4)
Expenditure decentralization	0.008***		0.014**	
	(3.061)		(2.568)	
Revenue decentralization		0.004***		0.003*
		(3.007)		(1.781)
Equalization effort 3	0.562***	0.615***	0.610	0.619**
	(2.619)	(3.760)	(1.611)	(2.556)
Expenditure decentralization	-0.008***		-0.010**	
× Equalization effort 3	(-2.955)		(-2.271)	
Revenue decentralization		-0.008***		-0.009***
× Equalization effort 3		(-4.220)		(-3.000)
GDP per capita, log	0.212**	0.238***	0.286***	0.344***
	(2.574)	(3.010)	(4.279)	(6.689)
Share of SOEs outputs	0.120	0.072	0.222***	0.116*
	(1.577)	(0.987)	(3.212)	(1.804)
Share of secondary sector	0.494**	0.640***	0.427**	0.555**
	(2.381)	(2.891)	(2.058)	(2.550)
Urbanization	-0.052	-0.044	-0.051	-0.019
	(-1.637)	(-1.459)	(-1.353)	(-0.574)
Openness	0.062	0.093**	0.072**	0.112***
	(1.613)	(2.345)	(2.009)	(2.663)
Constant	-1.163***	-1.005***	-1.614***	-1.038***
	(-4.734)	(-5.384)	(-4.147)	(-4.742)
Province fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	380	380	332	332
R-squared	0.625	0.624	0.635	0.649
Cragg-Donald F Statistic	.	.	14.97	32.01
Hansen J statistic (p-value)	.	.	0.142	0.637

Note: Robust t-statistics in parentheses; $***p < 0.01, **p < 0.05, *p < 0.1$.

Table 7: Robustness Checks: Alternative Measure of Equalization Effort

	Fixed Effects		Fixed Effects+IVs	
	(1)	(2)	(3)	(4)
Expenditure decentralization	0.018***		0.034***	
	(3.498)		(2.620)	
Revenue decentralization		0.009***		0.009**
		(3.149)		(2.065)
Equalization effort 1	1.966***	1.570***	2.620**	1.317***
	(3.178)	(4.005)	(2.033)	(2.619)
Expenditure decentralization	-0.028***		-0.043**	
× Equalization effort 1	(-3.247)		(-2.168)	
Revenue decentralization		-0.021***		-0.021***
× Equalization effort 1		(-3.991)		(-2.762)
GDP per capita, log	0.567***	0.551***	0.758***	0.764***
	(3.238)	(3.264)	(5.078)	(6.311)
Share of SOEs outputs	0.293*	0.285*	0.499***	0.479***
	(1.838)	(1.856)	(3.374)	(3.370)
Share of secondary sector	0.669	1.106**	0.375	0.974**
	(1.541)	(2.345)	(0.750)	(2.040)
Urbanization	-0.128*	-0.147**	-0.092	-0.102
	(-1.749)	(-2.060)	(-1.099)	(-1.343)
Openness	0.125	0.213**	0.031	0.135
	(1.475)	(2.458)	(0.309)	(1.381)
Constant	-2.317***	-1.917***	-3.591***	-2.235***
	(-4.287)	(-4.500)	(-3.904)	(-3.969)
Province fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	380	380	332	332
R-squared	0.636	0.633	0.641	0.654
Cragg-Donald F Statistic	.	.	16.12	24.76
Hansen J statistic (p-value)	.	.	0.442	0.344

Note: Robust t-statistics in parentheses; $***p < 0.01, **p < 0.05, *p < 0.1$.

Appendix

Table A1: Description of Variables and Sources

Variable	**Definition**	**Source**
wcv_gdppc	Population-weighted coefficient of variation of per capita county GDP	Prefecture, City, and County Public Finance Statistics (PCCPFS); and Authors' calculations
wgini_gdppc	Population-weighted Gini coefficient of per capita county GDP	PCCPFS and Authors' calculations
wtheil_gdppc	Population-weighted Theil index of per capita county GDP	PCCPFS and Authors' calculations
Expenditure decentralization	Sub-provincial expenditure as a share of total expenditure of the province	PCCPFS and Authors' calculations
Revenue decentralization	Sub-provincial revenue as a share of total revenue of the province	PCCPFS and Authors' calculations
Equalization effort 1	Percentage change of intra-provincial inequality in fiscal revenue before and after taking into account the equalization transfers received; based on C.V. measure	PCCPFS and Authors' calculations
Equalization effort 2	Percentage change of intra-provincial inequality in fiscal revenue before and after taking into account the equalization transfers received; based on Gini coefficient measure	PCCPFS and Authors' calculations
Equalization effort 3	Percentage change of intra-provincial inequality in fiscal revenue before and after taking into account the equalization transfers received; based on Theil index measure	PCCPFS and Authors' calculations
Equalization effort 4	Percentage change of intra-provincial inequality in fiscal revenue before and after taking into account the total transfers received; based on C.V. measure	PCCPFS and Authors' calculations
GDP per capita, log	Real GDP per capita, log	China Statistical Yearbook
Share of SOEs outputs	The share of SOEs outputs in total industrial outputs	China Statistical Yearbook
Share of secondary sector	The share of secondary sector in total GDP	China Compendium of Statistics 1949-2008
Urbanization	The share of urban population in total population	China Compendium of Statistics 1949-2008
Openness	The ratio of total trade (exports and imports) to GDP	China Statistical Yearbook
Schooling	Average years of schooling of population	Chen et al. (2004) and Authors' calculations
Inflation	Annual percentage change in consumer price index	China Statistical Yearbook
Tax reform 2002	=1 if year 2002 and after; 0 otherwise	Authors' calculations