Do Inter-governmental Transfers Enhance Local Education Spending in China?

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Abstract

Inter-governmental transfers have been an important source of local public goods and services financing in many developing countries, but the evidence of its effects is still inconclusive in the literature. This paper investigates the relationship between inter-governmental transfers, mostly from the central government, and county education spending during the period of 1994 – 2000 in China. I show that while pooled OLS models suggest a positive correlation, these results are likely biased. Using a regression discontinuity design, I find little evidence that supports a positive effect of transfers on county education spending in China. The lack of a local average treatment effect in the regression discontinuity design is substantively important, because it indicates that these transfers fail to enhance education spending even for those counties that are purposely targeted by the central government. Hence, the implications of this paper raise questions about the effectiveness of the Chinese government's efforts to increase inter-governmental transfers for greater local education spending in recent years.

1. Introduction

Is centralization or decentralization better suited for financing local public goods and services? This question has generated great interest among researchers (e.g., Oates 1972; Besley and Coate 2003; Treisman 2007), and the answer to this question in part hinges on the nature of the public goods and services under consideration. Many agree that decentralization leads to under-provision of certain public goods and services that confer externalities, such as infrastructure and education (e.g., Oates 1999; Inman and Rubinfield 1997; Rodden and Rose-Ackerman 1997). In these cases, the theoretical prediction is that a centralization scheme, such as inter-governmental transfers from the central government to local governments, engenders more effective public goods provision. Following this logic, the recent effort by the Chinese central government to increase inter-governmental transfers for local education spending appears to be a good strategy to address the rising disparity in sub-national education resources. In particular, many scholars have long called for greater inter-governmental transfers from the central and/or provincial governments to local governments to enhance education spending (Ge 2003; Ge and Lin 2004; Tsang 2002; World Bank 2002; Ma eds. 2005; Yuan eds. 2005). Their reasoning is that the introduction of the 1994 fiscal reform, the Tax Sharing Scheme (TSS hereafter), has undermined local governments' fiscal resources while increasing their responsibilities for public goods and services provision, thus limiting local public goods and services provision across China.

However, inter-governmental transfers have problems in their own right. For example, Rodden (2006) argues that when local governments are heavily dependent on inter-governmental grants from the central government, local governments implicitly have a "soft budget constraint." Further, the central government loses the credibility of its "no bailouts" commitment in the event of sub-national governments' fiscal deficit crises, and has to provide fiscal assistance as a result.

Meanwhile, a number of studies have identified "local elite capture" of inter-governmental transfers when local democratic institutions are weak, and these captures reduce the effectiveness of inter-governmental transfers (Crook and Manor 1998; Prud'homme 1995; Tanzi 1996; Manor 1999). Given these concerns, can the Chinese government avoided the perils of inter-governmental transfers in its recent campaign to enhance local public goods and services provision, particularly in education provision?

This paper contends that inter-governmental transfers are unlikely to be effective to enhance local education spending in China. I systematically investigate the relationship between inter-governmental transfers and county education spending for all counties in China between 1994 and 2001, and find no robust evidence for a positive association. Although a positive correlation is found in pooled OLS models, this specification likely generates biased estimates. I then employ an alternative identification strategy to evaluate the causal effect of inter-government transfers on county education spending in China. Specifically, the Chinese government has used the 1992 county personal income to generate a threshold below which a county was designated as a National Poverty County in 1994. The designation implies greater general and specific transfers from upper-tier governments. By using a fuzzy regression discontinuity design, I do not find any long-term or short-term differences in the education spending between counties just below and counties just above this threshold. This finding refutes the perception among many researchers and policymakers that the under-provision of local public goods and services is largely due to the limited fiscal resources of local governments in China. More importantly, the failure to identify a local average treatment effect (LATE) by the fuzzy regression discontinuity design is substantively important and has significant policy implications. Specifically, the null-effect found in this paper casts doubt on the effectiveness of inter-governmental transfers as the

main vehicle to enhance local public goods and services provision in China, particularly in those poor counties being targeted.

This paper contributes to the existing literature by providing a more systematic evaluation of the effect of inter-governmental transfers on local public goods and services provision in China, with a focus on local education spending. First, this paper expands the scope of existing empirical investigations by using panel data that covers all the counties in China between 1994 and 2001; in contrast, most existing studies use either provincial level data or village level data from a selective sample. Second, I develop an identification strategy to evaluate the causal effect of inter-governmental transfers. Hence, this paper provides some direct implications for future social spending policymaking in China. Lastly, I analyze the effects of transfers on both total education spending and budgetary education spending, while most existing studies are only able to evaluate budgetary education spending. Using both measures of education spending allows researchers to pinpoint any crowding-out effect of inter-governmental transfers.

Proceeding from here, section 2 first relates this paper to the literature on inter-governmental transfers and education spending in developing countries, particularly in non-democratic regimes. I then suggest some factors contributing to the failure of inter-governmental transfers on public goods and services provision in China. Section 3 details the background of Chinese inter-governmental fiscal arrangement. Section 4 describes the data and presents preliminary evidence of the effects of inter-government transfers on county education spending in China through OLS estimations. Section 5 employs a fuzzy regression discontinuity design to evaluate the causal effect of inter-governmental transfers, and shows evidence of a null effect. Section 6 provides robustness checks for the main results in section 5, and section 7 concludes.

2. Inter-governmental Transfers and Education Spending

In the context of inter-governmental transfers in developing countries, Bardhan and Mookherjee (2006) offer an analytical framework to evaluate various ways through which local public goods and services are financed. They suggest that a centralized financing scheme tends to over-provide public goods and services to local elites. In other words, inefficient inter-governmental transfers are likely to occur in developing countries that have weak local electoral accountability and lack bureaucratic efficiency[1]. However, the evidence of this theoretical prediction is mixed. A number of studies have found that inter-governmental transfers enhance local education inputs and outcomes in non-democratic regimes or regimes with weak local electoral accountability.

Specific to education, the existing literature has identified some successful cases where inter-governmental transfers enhance local education spending and/or outcomes under non-democratic regimes. For example, Indonesia was not democratized until the resignation of President Suharto in 1998. Yet, Duflo (2001) shows that a national school construction program in Indonesia, which was funded by the Indonesian national government from oil revenues in the early 1970s, has a positive effect on both education outcomes and labor market returns of those Indonesians who benefited from the program. Meanwhile, Litschig (2008), using a regression discontinuity design, identifies a positive effect of inter-governmental transfers on elementary education spending during 1982 – 1985 and on student achievement in 1991 in Brazil, but the civilian government did not reclaim the full control of Brazil until mid-1980s.

However, there is evidence that inter-governmental transfers are ineffective to enhance local education provision. For example, one should expect the positive effect identified in Litschig

[1] For details, see Bardhan (2002) for a survey on the decentralization of government and development.

(2008) to persist after Brazil become more democratic. Yet, Ferraz, Finan and Moreira (2010) find evidence that corruption undermines Brazilian inter-government transfers for local education spending when analyzing more recent data in 2005 and 2006. In addition, Reinikka and Svensson (2001) observe that only 13 percent of the total grant transferred from the central government for nonwage expenditures in schools actually reached the targeted schools in Uganda between 1991 and 1995.

The mixed results identified in the literature could be due to two reasons. First, the inter-governmental transfers programs were effective in some contexts but not in others, thus leading to mixed successes. Second, some studies use better identification strategies to evaluate the *causal* effects than other studies do. In this chapter, I offer an identification to estimate the causal effects of inter-governmental transfers on local education spending in China. Hence, the null-effect identified in this paper suggests that inter-governmental transfers fail to effectively enhance local education spending in China.

This failure of inter-governmental transfers to promote education spending in China is due to several factors. First, social spending, such as education spending, was not prioritized by most local governments during the 1990s. While inter-governmental transfers improve local governments' fiscal resources, local governments still prefer to spend in areas that contribute to their main objectives: economic development and political stability, as explicitly or implicitly revealed in many of my interviews with local government officials. Some politicians even claim that they need to prioritize spending on economic development in order to boost overall government revenues, which then allow them to have more funding for social spending[2]. Education does not have significant returns to local economic development in the short run, and it is not a main factor that affects local political stability. Thus, it's not surprising that education

[2] One deputy county head told me that she will spend money in areas only if she sees potential returns.

is often not a spending priority for many local governments. Second, even if the transfers are targeted for education spending, increasing inter-governmental transfers could discourage local governments from spending on education, in part because local governments would form the expectation that they could shift the burden of social spending to upper-tier governments[3]. For example, even if the upper-tier governments provide matching grants in order to generate incentives for social spending by county governments, my interviews reveal that county governments often find ingenious ways to circumvent the matching rules and obtain the transfers without real fiscal contributions from their own budgets. Lastly, although the central government could use monitoring and auditing to enforce the appropriate use of these transfers, increasing inter-governmental transfers leads to greater monitoring costs, and sometimes lower level governments collude with each other in order to outwit the monitoring and investigation by upper-tier governments (Zhou 2010; Zhao forthcoming).

Some preliminary evidence suggests that inter-governmental transfers do not effectively increase local public goods and services provision in China. For example, Duan and Zhan (2009) do not find much evidence that inter-governmental transfers enhance county social spending in one province (Shanxi). Liu et al. (2009), based on a detailed case study of a western county, contend that earmarked subsidies are sometimes ineffective in China because local governments, particularly poor ones, are interested in using these funds for patronage purposes. Jiang et al. (1997) find that there is a variation in local governments' effort in education provision among national poverty counties.

In sum, I have discussed several factors indicating that larger spending budgets resulting from inter-governmental transfers are an insufficient condition to promote local education

[3] A deputy major that I interviewed told me a story about how recent provincial government transfers resulted in less effort to invest in education from their own budgets.

spending in China. In other words, an improvement in a county government's fiscal resources does not necessarily induce local governments to spend more on education. However, existing research has provided little systematic evidence to evaluate the effects of inter-governmental transfers on education spending in China. Although county governments are mainly responsible for local public goods and services provision, few studies have conducted an analysis based on a full sample of all counties in China. The following sections will provide the first set of empirical evidence that assesses the effectiveness of inter-governmental transfers on local education spending in China. Before I present the evidence, I will briefly discuss the Chinese inter-governmental fiscal arrangement.

3. Inter-governmental Fiscal Arrangement and Public Spending in China

The inter-governmental fiscal arrangement between the central government and sub-national governments has undergone several cyclical reforms since 1949 in China[4]. The 1994 Tax Sharing Scheme (TSS 分税制) is the most significant reform in the last two decades. Prior to this reform, the share of central government's revenues in total government revenues had been dwindling in the 1980s, in part because the early economic reforms generated more benefits to local governments' revenues than to central governments' revenues. Thus, the share of central government's revenues in overall government revenues was smaller than local governments' revenues throughout the 1980s. Further, the local governments sometimes colluded with local enterprises and firms to evade taxes in order to boost local economies.

The Chinese central government introduced a fiscal reform, the TSS, in 1994 in order to strengthen the control of local governments and increase the central government's revenue without stigmatizing local economic development. The TSS is a fiscal revenue sharing scheme

[4] For an overview of these reforms, see Li (2006) and Jia and Zhao (2008).

aimed at improving regional fiscal revenue mobilization and equalization, tax simplification, and re-centralization of revenues. This reform explicitly defined the ways by which the central government and local governments could share the revenues of various types of taxes, and the central government often obtained 100% of the tax revenues from stable income sources, such as tariffs, consumption taxes, and revenues from state-owned enterprises. As a result, the central government's revenues increased substantially after 1994. For example, the central government's share of total government revenues rose from around 32% in the 1980s to more than 50% since the 1994 reform.

Meanwhile, the central government continued to decentralize the fiscal responsibility of local public goods and services provision. A report by the World Bank (2002) points out that sub-national governments were responsible for financing nearly 70% of public spending, and among all levels of sub-national governments, county government are responsible for financing 55% of total government public spending. Specifically in education spending, county level governments accounted for more than 90% of total pre-tertiary education spending. Figure 1 illustrates the central government's shares in total government revenues and expenditures in China from 1978 to 2008. This figure clearly shows that the share of revenues by the central government jumps significantly in 1994, and the share of expenditure by local governments have not changed much in the 1990s and even increased since 2000.

Figure 1 about here

This re-centralization of revenues and decentralization of public goods and services provision was motivated by the fact that the central government did not have complete information about local governments' extra-budgetary revenues and the ways through which local governments used these revenues. By centralizing revenues and using administrative power and "unfunded

mandates" to coerce local governments to provide public goods and services, the central government hoped to direct these extra-budgetary revenues into proper use, particularly in more developed areas. This strategy is thought to be a successful commitment device by the central government to encourage local economic development in the name of "market-preserving federalism" (Qian and Weingast 1997).

Given the inter-governmental fiscal arrangement illustrated above, it is not hard to understand why many suggest that the TSS reform is partly responsible for the under-provision of local public goods and services in China. A report by the World Bank (2002) concludes that, while the TSS reform has achieved its goals in revenue centralization and tax simplification, its failures are equally remarkable. For example, the TSS "failed to make revenue-sharing more rule-based and transparent given the proliferation of ad-hoc transfers, and it has also failed to counter the trend toward growing regional disparities." (World Bank 2002). This view is shared by many scholars in China. For example, Zhou (2006) points out that the fiscal burdens of public goods provision are largely borne by county level governments. More importantly, the counties in the central part of China in general have the worst fiscal capacities. This is arguably due to the fact that they are not as rich as counties in the eastern part of China which can, to some extent, self-finance public goods from economic development, and they are not as poor as counties in the western part of China which receive transfers from the central government's "Go West" initiative. Zhou (2008) suggests that while the combination of TSS, inter-governmental sub-contracting, and political competition among each level of government is a successful strategy to promote economic growth and attract FDI at the local level, this strategy does not provide an effective incentive structure to encourage spending on public goods and services by the local governments.

If the reasoning that the TSS suffocates local social spending were true, one may argue that increasing inter-governmental transfers from the central or provincial governments is the solution to resolve the under-provision of local public goods and services. Indeed, many local politicians in my fieldwork interviews reflect this view, as they often suggest that their hands are tied by a tight budget and the spending necessary to maintain government operation and economic development. Without more inter-governmental transfers, they maintain, little is left to increase social spending, such as in education. For these complaints and policy prescription to be compelling, inter-governmental transfers should have a positive effect on local education spending. The next two sections will evaluate this claim by providing a systematic analysis of the effect of inter-governmental transfers on county education spending in China.

4. The Baseline Model: OLS Analysis

OLS models are a common strategy for analyzing panel data. In this section, I provide empirical evidence from a baseline model: a county fixed effects OLS model with or without a lagged dependent variable. The results suggest that while the correlation between inter-governmental transfers and education spending is positive in the OLS models, the correlation between the percentage of transfers in local government revenues and education spending is negative in these models. Hence, the OLS models provide mixed evidence. I then argue that the estimates from the OLS models are likely to be biased because they suffer from omitted variable biases and endogeneity of the inter-governmental transfers.

4.1. The Data

The source of the total and budgetary education spending county-level data, the key dependent variables, is the 1994 – 2001 *China Education Finance Statistical Yearbooks* (中国教

育经费统计年鉴)[5]. Most existing studies of sub-national social spending in China are only able to use data at the provincial level, whereas this data offers a more detailed analysis of approximate 2110 counties and county-level cities in China, which account for 80% of the county-level jurisdictions in China[6]. Further, I take advantage of these yearbooks that report total education spending, which includes both budgetary education spending and extra-budgetary education spending. The use of both total education spending and budgetary education spending measures allows me to investigate whether there is a crowding-out effect. That is, governmental transfers only have a positive effect on budgetary education spending but not on total education spending. Due to missing data, this dataset is an unbalanced panel[7].

The key independent variable is a measure of inter-governmental transfers received by county governments from provincial and central governments. In the analysis of this section, I use two measures. The first is the level of transfers defined as a county's total transfers per capita. The second is the dependency on transfers defined as the percentage of transfers in county total government revenues. The data is obtained from the *National Prefecture and County Finance Statistics Yearbooks* (全国地市县财政统计资料) between 1994 and 2001[8]. This is a unique dataset from the Ministry of Finance that offers a more comprehensive coverage of local government revenues and spending than the data from the National Bureau of Statistics does.

It's worth noting that the definition of inter-governmental transfers in this paper differs slightly from the typical notion of inter-governmental transfers defined by the Chinese

[5] These data were obtained from the Barometer of Chinese Development project at the Universities Service Centre for China Studies, The Chinese University of Hong Kong. I have conducted several consistency checks of the data to eliminate scanning errors and data input errors.
[6] Districts within major cities are also counted as county-level jurisdictions, but all the data for these districts are not available in the *China Education Finance Statistical yearbooks*.
[7] Around 15% of the observations were missing in various model specifications, but only 10~15 national poverty counties were missing for each year in the regression discontinuity design in section 5.
[8] See footnote 5

government finance system. Generally under the Chinese government finance system, the inter-governmental transfers that county governments receive consist of three main categories: *tax rebate transfers* (税后返还); *fixed/original system transfers* (原体制定额补助); and *special transfers* (专项补助). The *tax rebate transfer* is an important component of the TSS reform. Essentially, the central and local governments share the revenues of some local taxes, such as Value Added Taxes (VAT), consumption taxes, and individual and corporate taxes[9]. The *fixed/original system transfer* is a type of transfer that existed prior to 1994, which aimed at equalizing county fiscal capacities, particularly those of poor counties and counties with large minority population. The specific rule for this transfer was set prior to the 1994 reform, and did not change much during 1994 and 2001. Lastly, the *special transfers*, which is equivalent to *earmarks transfers*, is a type of transfer[10] from the central or provincial government to county governments that promotes local public spending in areas such as construction, education, and agriculture.

One way to construct a measure for inter-governmental transfers is to follow the definition of the Chinese government finance system. That is, total county inter-governmental transfers equal the sum of these three types of transfers. However, I argue that the appropriate measure in this paper is the sum of the last two types of transfers, that is, the sum of *fixed/original system transfers* and *special transfers*. The reason to exclude the first type of "transfer," *tax rebate transfer*, is because this so-called "transfer" is essentially a component of local tax revenues, and it is a function of the local tax base. According to Jia and Zhao (2008), the *tax rebate transfer* is

[9] The local tax bureau will collect these taxes first, and then turn them over to the central government. The central government then returns a certain percentage of these tax revenues to local governments. This percentage is set by the central government and is the same across all localities.
[10] These *specific transfers* are either unconditional grants or matching grants.

fully refunded to county governments in most cases[11]. As a consequence, the measure of inter-governmental transfers in following analysis will only include *fixed/original system transfers* and *special transfers*, which constitute genuine transfers from the central government.

Note that the central government has introduced more inter-governmental transfers since 2001, such as transfers to minority counties, and various subsidies to fill the void after the elimination of agriculture taxes and education fees. Due to data limitation, this paper is not able to evaluate the impact of these transfers. However, the results of this paper, which analyze the effects of transfers during 1990s, provide some implications of these recent transfers since 2001, largely because the local political environment has not changed significantly in the last two decades.

4.2. OLS Analysis

I consider the following two pooled OLS fixed effects models, which are common specifications when analyzing panel data in existing studies of inter-governmental transfers.

$$LnY_{i,t} = \gamma T_{i,t} + X'_{i,t}\beta + \mu_i + \delta_t + \varepsilon_{i,t} \quad (1)$$

$$LnY_{i,t} = \alpha Y_{i,t-1} + \gamma T_{i,t} + X'_{i,t}\beta + \mu_i + \delta_t + \varepsilon_{i,t} \quad (2)$$

The difference between these two models is that equation (2) includes a lagged dependent variable. $Y_{i,t}$ is either total education spending per capita or budgetary education spending per capita for county i at year t. The lagged dependent variable $Y_{i,t-1}$ captures the persistence of education spending in a county. $T_{i,t}$ is the key independent variable, logged inter-governmental transfers per capita, that measures the effect of inter-governmental transfers on county education

[11] Occasionally some provincial governments may keep a small part of *tax rebate transfers to* the county governments (Shih and Zhang 2007). Nonetheless, county government will receive the majority, if not all, of the *tax rebate transfers*.

spending. I use the log-linear model in order to interpret the results in percentage terms, and to capture any decreasing returns in education spending. In a separate model, I consider an alternative key independent variable that measures the dependency of local government's revenues on inter-governmental transfers. This variable measures inter-governmental transfers as a percentage of total government revenues. $X'_{i,t}$ is a vector of control variables, which includes local agriculture and industrial production per capita, population, and the dependency of agriculture production in the local economy. I also include μ_i (county dummies) to capture the time-invariant local fixed effects, and δ_t (year dummies) to capture the macroeconomic and political common shocks. $\varepsilon_{i,t}$ is the error term. I use clustered standard errors in these models to deal with the serial correlation in the panel data.

Table 1 reports the pooled OLS results. In columns (1) and (2) which report the results when *inter-governmental transfers per capita* is the independent variable, I find a positive correlation between the level of transfers and county education spending. The estimates are statistically significant[12], but substantively small. For instance, column (1), which does not include the lagged dependent variable, suggests that a 1% increase in transfers only leads to approximately a 0.03% *increase* in total education spending, holding everything else constant. The marginal effect is even smaller for budgetary education spending, as column (3) suggests that a 1% increase in transfers only leads to a 0.014% *increase* in budgetary education spending. These positive correlations remain in columns (2) and (4) that include a lagged dependent variable.

Meanwhile, the results in columns (5) – (8) indicate that the more a local government's revenues depend on transfers, the less the government spends on education. The estimates of the dependency of local government's revenues on inter-governmental transfers are negative and statistically significant. For example, column (5) indicates that a one percentage point increase in

[12] The positive coefficient estimates of transfers persist in models that do not include the lagged dependent variable.

a county government's transfers of the overall government revenues leads to a 0.09% *decrease* in total education spending. Thus, results from columns (5) – (8) provide some preliminary evidence for the argument that the more transfers a local government receives, the more likely it will shift the burden of social spending to the central government, thus undermining its own efforts in education spending.

Estimates reported in Table 1, however, are potentially biased for two reasons. First, the estimates based on equation (2) above are likely to be biased and inconsistent because "county fixed effects" μ_i is correlated with $y_{i,t\text{-}1}$ by construction, which means the disturbance term $\varepsilon^*_{i,t}$ is correlated with $y_{i,t\text{-}1}$. Further, if μ_i is correlated with $X'_{i,t}$, the problem is exacerbated. Wawro (2002) provides a detailed discussion on the perils of estimating dynamic panel model with lagged dependent variable and unit fixed effects. In addition, Monte Carlo simulations suggest that the LSDV model generates more biased estimates when *T,* the time period, is less than 10 (Beck and Katz 2009), which is the case in the current dataset.

Second, even if we adopt the specification in equation (1), which does not include the lagged dependent variable, this model specification still suffers from the problems of endogeneity of inter-governmental transfers and omitted variable bias. In particular, although some transfers are based on a specific formula devised by the central and/or provincial governments, other transfers, especially special transfers, are ad-hoc transfers that result from political decisions (World Bank 2002).

These special transfers are often the result of political connections and inter-governmental bargaining in China. These unobserved factors in turn shape the incentives for local governments to provide public goods and services in different ways. For example, the central government or provincial government could strategically target some regions for greater transfers in order to

promote economic development, which affects local education spending. Further, if a county government obtains more transfers because the county party secretary has a better connection with officials in the provincial government, then this connection could either enhance local education spending if party secretary's connection is mainly through politicians in the provincial education bureau, or it could undermine education spending if local government needs to spend money to build these connections in the first place. Hence, the estimation results in the pooled OLS models above are likely to generate spurious correlations.

In sum, these analyses based on the OLS models provide mixed evidence about the positive correlation between inter-governmental transfers and local education spending. The mixed evidence is in part due to model mis-specification, and more importantly, omitted variable bias and the endogeneity of transfers that cannot be addressed in the OLS models. Hence, these analyses provide inconclusive evidence of the effect of inter-governmental transfers on local government's education spending. The next section uses a fuzzy regression discontinuity design as an identification strategy to estimate the causal effect of inter-governmental transfers on county education spending. I argue that this identification strategy helps address the empirical issues in the OLS models.

5. Estimating the Causal Effect of Inter-Governmental Transfers

To identify the causal effect of inter-governmental transfers on education spending, I explore a regression discontinuity (RD hereafter) design through the designation of "National Poverty County" in China in 1994. The RD design provides a quasi-experimental setting to estimate the causal effect of a treatment, where the treatment is determined completely or partly by being on either side of a fixed threshold of a continuous forcing variable X. In this case, the treatment is the designation of "National Poverty County" in 1994, and the "forcing variable" is the 1992

county personal income used by the central government during the designation process. Previously researchers have shown that the designation has had a positive effect on individuals' income gains and poverty alleviation (Park et al. 2002; Wang et al. 2004; Chen et al. 2009). However, little research has evaluated the impact of the designation on a county's social spending. In what follows, I first describe the background and benefits of "National Poverty County" designation in 1994 in China, and the ways through which it affects county education spending. Next, I discuss the justification for using a fuzzy RD design to estimate the causal effect, and then report the results.

5.1. The 8-7 Poverty Reduction Plan for Poverty Alleviation

The Chinese central government has initiated several poverty relief programs since 1986. In particular, the central government introduced the "*8-7 Poverty Reduction Plan*" (八七扶贫攻坚计划) in 1994 with the hope of lifting 80 million citizens above the poverty line in 592 counties[13]. This plan targeted counties and was carried out between 1994 and 2000, and it was later replaced by the *Rural Poverty Relief and Development Plan* (农村扶贫开发纲要) in 2001 that targeted villages. The benefits of the "National Poverty County" designation mainly consist of a subsidized loan program, a public works program, and budgetary grant program, which are all directly funded by the central government. The size of these three programs grew from 11.5 billion yuan (approximately US $1.37 billion) in 1994 to 26.5 billion yuan (approximately US $3.31 billion) in 2000. Considering the average government spending of these designated poor counties was 46 million yuan in 1994 and 120 million yuan in 2000 respectively, these funds were quite a sizeable addition to local governments' budgets, as they averaged 19 million yuan per county in 1994 and 45 million yuan in 2000. In addition, these designated counties often

[13] See Wang, Li and Ren (2004) for a detailed discussion of the *8-7 Poverty Reduction Plan*.

receive preferential treatment when applying for discretionary grants from prefectural and provincial governments, and they also receive grants from international organizations, private donors, and other government programs. The funding from various sources essentially improves the fiscal resources for these counties. Not only are funds directly infused into county governments' budgets, but they also financially assist economic development as well as social spending in these counties. For example, the budgetary grant program specifically allocates funding for education spending. Hence, the designation increases inter-governmental transfers and subsequently reduces local governments' budgetary constraints for education spending to some extent.

The main criterion for the 1994 "National Poverty County" designation was based on county personal income in 1992. Specifically, the 1994 "*8-7 Poverty Reduction Plan*" suggests that any county's personal income below 400 yuan in 1992 should be designated, and any county that was designated prior to 1994 but whose county personal income exceeded 700 yuan should not be designated again. As a result, 592 counties across 27 provinces were being designated as "National Poverty Counties" and the designation status did not change until the new poverty relief plan started in 2001. It is worth noting that some studies revealed that the designation of poverty counties did not strictly follow the criterion of county personal income. As discussed in Park et al. (2002), the selection of nationally designated poor counties tended to favor counties with a large minority population and counties that were revolutionary bases prior to 1949. Further, counties that were designated in the 1980s maintained their designation unless their net income per capita exceeded 700 yuan in 1992. In addition, provincial governments have played an important role during the designation process. Although the selection for the designation was not perfect, Park et al. (2002) point out that the designation in 1994 was a significant

improvement because it covered most poor counties that had been neglected in the earlier designation process in the 1980s. As a result, poor counties are mostly designated in spite of the politics in the designation process. As shown in Figure 2 below, most counties whose personal income was below 400 yuan were designated and only a few counties whose personal income was above 700 yuan were still designated in 1994.

Figure 2 about here

5.2. Fuzzy regression discontinuity analysis

The designation of "National Poverty County" offers an excellent opportunity to estimate the causal effect of inter-governmental transfers on education spending. If the argument that education spending is mostly impeded by limited county fiscal resources were true, a RD design should reveal a positive local average treatment effect (LATE) of the "National Poverty County" designation on a county's education spending. This is largely due to the fact that inter-governmental transfers and other grants improve the fiscal resources available to those counties being designated. In other words, those counties that barely qualified for the designation should have higher education spending than those counties that barely disqualified. In what follows, I will detail the implementation of the fuzzy RD design in the case of poverty county designation to ensure this identification strategy is a proper approach to estimate the causal effect of inter-governmental transfers. I then report the estimation results.

5.2.1. The Validity of using fuzzy RD Analysis

The use of RD design relies on the key assumption that the designation of treatment is *random* within a certain bandwidth of the cutoff point. This assumption could be violated in reality, as the discussion above suggests. The main concern is the manipulation of the selection, such as the forcing variable (i.e., county personal income), by the county governments because

of the potential benefits from these transfers. As pointed out in Park et al. (2002), political considerations sometimes also played a role during the designation process. Further, the *8-7 plan* complicates the RD design because it implies two cutoff points for the designation. That is, there is a cutoff of 400 yuan for those that have not been designated prior to 1994, and 700 yuan for those have been designated prior to 1994.

There are two reasons to believe that the existence of any potential manipulation by county governments does not invalidate the fuzzy RD design for the analysis in this paper. First, the central government used the 1992 county personal income during the designation process in 1994, and the statistics were obtained from the National Bureau of Statistics. It would have been hard for counties to revise these numbers. Second, I analyze only the 400 yuan cutoff point[14]. The assignment of "National Poverty County" suffers less from potential manipulation at the 400 yuan cutoff point than at the 700 cutoff point, largely because political manipulation likely occurs more often when counties had been designated prior to 1994, whose county personal incomes were above 400 yuan or even exceeded the 700 yuan[15]. That is, those counties that had previously benefited from transfers have greater incentives to keep the designation status than those that have not. To evaluate any potential manipulation during the designation process, I use a density function test of the forcing variable (i.e., county personal income) developed by McCrary (2008)[16]. In essence, this density function test is similar to a series of tests of RD

[14] All the results presented in the next section still hold if I choose the 700 yuan as the cutoff point.
[15] An alternative RD design is to split the observations into two samples: those have not been designated prior to 1994, and use 400 yuan as the cutoff point; those have been designated prior to 1994 and use 700 yuan as the cutoff point. The limitations of this approach are twofold: the first sample excludes some counties have been designated but the provincial governments did not take this into account during the 1994 designation (Cheng 2000); the second sample yield very few observations for RD analysis because only around 20 counties lost the designation status. I still replicated the RD analysis below to the first sample, and the results are consistent with the main finding in this section.
[16] The test may not be informative if there are incentives for some counties to opt in and for others to opt out of the designations. In this case, counties have few reasons to refuse more transfers from upper-tier government as a result of the designation.

validity that ensures there is no discontinuity in the covariates at the cutoff point (Lee and Lemieux 2010). As shown in Figure 3 below, the density function of the forcing variable, county personal income, does not have a significant discontinuity at the 400 yuan cutoff point. A formal test suggests the Log discontinuity estimate, $\hat{\theta}$, is statistically insignificant[17], thus indicating there is no evidence of a discontinuity in the distribution of county personal income around the cutoff point.

Figure 3 about here

In addition, I use the fuzzy RD design rather than the sharp RD design[18] to analyze the data. As shown in Figure 2 above, there were a few counties whose personal incomes were below 400 yuan but were not designated, and a few counties whose personal incomes were above 700 yuan and were designated. Thus, this pattern violates a key assumption in the Sharp RD design that the treatment assignment is a deterministic function of the forcing variable. The benefit of fuzzy RD design is that it allows a jump in the probability of assignment to the treatment at the cutoff point, thus taking into account the political consideration in the designation process in the case of the "National Poverty County" designation in China. Hahn, Todd and van der Klaauw (2001) make important theoretical and conceptual contributions to the application of this approach. It has been used in estimation of financial transfers to schools to enhance student performance among New York public schools (van der Klaauw 2008), the PROGRESA program (Battistin and Rettore 2007), and financial aid offers for college enrollment (van der Klaauw 2002). Formally, the estimand of the fuzzy RD design is as follow:

[17] The estimate for $\hat{\theta}$ is 0.040 with a standard error of 0.110.
[18] For the difference in theoretical and implementation aspects of Strict and fuzzy regression discontinuity designs, see Imbens and Lemieux (2008).

$$\tau_{FRD} = \frac{\lim_{x \downarrow c} \mathbb{E}[Y|X = x] - \lim_{x \uparrow c} \mathbb{E}[Y|X = x]}{\lim_{x \downarrow c} \mathbb{E}[D|X = x] - \lim_{x \uparrow c} \mathbb{E}[D|X = x]} \quad (3)$$

In the equation (3) above, *Y* is the outcome variable, *X* is the forcing variable, *c* is the cutoff point, and *D* is the treatment. Hence, the average treatment effect is the ratio of the jump in the regression of the outcome on the covariate to the jump in the regression of the treatment indicator on the covariate. The causal effect can be interpreted as an "intent to treat" effect (Lee and Lemieux 2010).

5.2.2. Estimation Results

The county education spending data under investigation is the same as in section 3. The list of 592 nationally designated poverty counties comes from the Statistics Bureau of China[19]. The poverty county designation status prior to 1994 and the 1992 county personal income are obtained from Park et al. (2002). Specifically, the county personal income data in Park et al. (2002) is based on data from Ministry of Agriculture (MOA), but not from the National Bureau of Statistics (NBS), and some claim governments use the latter source for income data during the designation[20].

I use the following 2SLS specification to estimate the causal effect of designation:

$$LnY = \alpha + \tau D + f(X - c) + \rho D f(X - c) + \varepsilon \quad (4)$$

$$D = \beta + \delta T + g(X - c) + \varphi T g(X - c) + \mu \quad (5)$$

$$Df(X - c) = \pi + \rho T + g(X - c) + \theta T g(X - c) + \vartheta \quad (6)$$

[19] http://www.stats.gov.cn/tjsj/qtsj/xianshi/fqzl/fn1901.txt

[20] According to Park et al. (2002), NBS data was used during the designation process. However, Cheng (2000) suggests that MOA data were used. Park et al. (2002) test the correlation between these two data series, and find that the correlation of these two data series is very high (the rank correlation is more than 0.90).

where T=1[X≤ c] . Y is the county education spending per capita[21], X is the 1992 county personal income, c is the 400 yuan cutoff point, and D is the 1994 designation status (1 if National Poverty County). $f(\cdot)$ and $g(\cdot)$ are functional forms that indicate the order of polynomial regression. In the analysis of this section, I use a linear functional form, and I will explore higher order polynomial regression in the next section. The inclusion of interaction terms, $Df(X-c)$ and $Tg(X-c)$ ensures that I do not constrain the slopes of the regression lines to be the same on both sides of the cutoff point[22]. In addition, I include covariates in both equations in some specifications. For example, I include a vector of variables that measure population, local agricultural and industrial production, and the percentage of the economic production from the agricultural sector in the second stage. For the first stage, I include a vector of variables that indicates previous poverty county designation status, and whether a county has a large minority population. If the fuzzy RD design were valid, the inclusion of these covariates would not affect the consistency of the estimator for τ. Further, the inclusion of these covariates helps control for potential factors that lead to manipulation. Finally, including these covariates reduces sampling variability, which is critical because the results below show that the number of observations within certain bandwidth is not very large.

Before I present the 2SLS estimation results, I first provide a graphical illustration of the effect through the distribution of county personal income. As Figure 4 and Figure 5 show, there is little evidence for a discontinuity of either total county education spending or budgetary county education spending around the 400 yuan cutoff point in the distribution of county personal income across all years. These findings do not change with different sizes of non-overlapping bins used when generating these graphs.

[21] I use the log form of the dependent variable in order to make the interpretation comparable with results reported in Table 1. The estimation results do not change if I do not use the log of the dependent variable.
[22] I have conducted RD analysis without the interaction terns, and the findings are consistent with the main results.

Figure 4 about here

Figure 5 about here

Table 2 reports the effects of designation on total education spending per capita. The first panel in Table 2 follows the exact specification based on equations (4) – (6). The second panel reports results based on equations (4) – (6) but includes covariates as discussed above. Further, I consider two bandwidths around the county personal income cutoff point of 400 yuan (± 100 yuan and ± 50 yuan), and analyze the data as a pooled sample as well as yearly samples. The estimates of designation have negative signs in most models, and they are not statistically significant from zero. For a narrower bandwidth, the magnitudes of the estimates are all negative, and statistically insignificant. Note the null-effects are largely consistent between models with and without covariates, because the magnitudes of the estimates of designation (the treatment) are very similar. Hence, these results suggest that we cannot rule out either negative or positive effects of inter-governmental transfers through designation on local spending education. They then raise questions about the positive effect of transfers on local education spending that many observers generally advocate for. Further, the standard errors of these estimates are rather stable across all models for either bandwidth, thus providing consistent evidence that the estimates of designation are statistically insignificant.

Table 2 about here

Next, I turn to budgetary education spending per capita as the dependent variable. Since the transfers are through the existing formal institutional channels, one may expect these transfers at least have a positive effect on budgetary education spending. Yet, the results in Table 3 are consistent with the findings in Table 2. Again, the results in the first panel do not include any covariates and the second panel reports estimation with covariates. As shown, estimates of

designation are not statistically significant in all models. In addition, the estimates of designation are negative in some models with a narrower bandwidth. Due to space limitation, I only report results in 1995, 1997, and 1999, and the results in other years are consistent with the findings in Tables 2 and 3. Finally, there is no evidence of any crowding-out effects of inter-governmental transfer. That is, there is no evidence that the transfers increase budgetary education spending while having null effect on total education spending.

Table 3 about here

In sum, the empirical evidence from the regression discontinuity design refutes the common consensus that inter-governmental transfers tend to increase county education spending. By using a fuzzy RD design, I find the designation of "National Poverty County" does not have any short-term or long-term effect on local education spending. Note that the fuzzy RD analysis only identifies a local average treatment effect (LATE) near the cutoff point, thus implying limited external validity in the full sample because this is not an average treatment effect (ATE). However, these analyses provide some strong evidence that inter-governmental transfers fail to shape local governments' incentives in greater social spending. Further, the failure to identify a local average treatment effect (LATE), which is an "intent to treat" effect under the fuzzy RD design, suggests that inter-governmental transfers do not shape local governments' social spending decisions even for counties that were specifically targeted by the Chinese central government. This is substantively important because of its policy relevancy to not only China, but also many other developing countries that hope to enhance local public goods and services provision through inter-governmental transfers.

6. Robustness Checks

To this point, I have shown that the positive effects of inter-governmental transfers on education spending identified in the OLS models disappear when using a regression discontinuity design to analyze the data. Some may argue that the null-result in the fuzzy RD design could be due to model mis-specification. In this section, I provide several robustness checks to the main findings in section 5. First, I report the Wald estimator, a non-parametric analysis, for the local average treatment effect based on equation (2), and the results are consistent with the findings in Tables 2 and 3. Second, I explore second order polynomial regressions to ensure the results above are not driven by the functional forms of the regressions. I also evaluate whether a discontinuity exists around the cutoff point for some important covariates relevant to county social spending. Lastly, I show that while the "National Poverty County" designation does not have a positive effect on county education spending, it does have a positive effect on the inter-governmental transfers that these counties receive. Hence, this result shows that these county governments did not increase spending in education even though they received more transfers.

To begin with, I consider a non-parametric analysis. The 2SLS estimates reported in the last section are numerically identical to τ_{FRD} in equation (3) if equations (4) – (6) do not include any covariates (Hahn, Todd and van der Klaauw 2001; Imbens and Lemieux 2008; Lee and Lemieux 2010), as long as the outcome and treatment regressions use the same bandwidth. Since I have included several covariates in some specifications reported in Tables (2) – (3), I report the Wald estimator for the local average treatment effect based on equation (3) to show that the results are not sensitive to the inclusion of the covariates. As expected, the results in Table 4 do not show any evidence that the designation of "National Poverty County" has a positive effect on total education spending per capita or on budgetary education spending per capita. Not only do the

estimates of the treatment are negative in some years, but the standard errors are also very large. This null-effect remains in both analyses of different years and that of different bandwidths.

Table 4 about here

Next, I evaluate a second order polynomial regression to illustrate the robustness of the result. High order polynomial regressions help improve the explanatory power away from the cutoff point[23]. Again, Table 5 reports results consistent with those in Tables 2 and 3, as the designation has null effect on local education spending. Exploring a higher order of polynomial regression is not particularly useful because Figures 4 and 5 show that the trends in education spending before and after the cutoff point are largely linear. I also investigate the distribution of relevant covariates. For example, Figure 6 shows that there is no discontinuity in the level of economic conditions around the 400 yuan cutoff point across all years. In addition, Figure 7 shows a similar pattern, as there is lack of discontinuity in the total government spending per capita in all years. I explore different bin sizes when constructing these graphs, and the patterns in these two figures do not change.

Table 5 about here

Figure 6 about here

Figure 7 about here

Lastly, the RD design is essentially a reduced form analysis because it rests on the argument that the designation of national poverty county increases transfers. If these designated national poverty counties do not receive more transfers in reality, it is hard to conclude that inter-governmental transfers do not have any effect on education spending. To ensure this is not the case, I investigate inter-governmental transfers between these two groups of counties. Table 6 first shows the descriptive statistics of inter-governmental transfers received by counties near the

[23] I include covariates in the analysis.

cutoff points. In all years, counties who were designated have received 40% ~ 50% more transfers than those who were not on average for both bandwidths, and the mean differences are statistically significant. I conduct a similar fuzzy RD analysis using inter-governmental transfers per capita as the dependent variable[24]. As Table 7 shows, the designation has a positive and substantial effect on transfers, and the estimates are statistically significant in both pooled samples and yearly samples. Substantively, column (1) suggests that these designated poverty counties receive on average 50% more transfers than those were not designated during the period of 1994 – 2000. Even if we restrict the sample to a narrower bandwidth, column (2) suggests that these poverty counties still receive 33% more inter-governmental transfers. As a consequence, these results show that the counties that were designated did receive more transfers than those that were not designated above the 400 yuan cutoff point.

Table 6 about here

Table 7 about here

7. Conclusion

How to efficiently provide public goods and services is a central topic in studies of political economy. Although the nature of externality in public goods and services suggests that a centralization scheme is more suitable for the provision of these goods and services, inter-governmental transfers from the central government is not guaranteed to be effective, as suggested in the existing literature. China is not an exception, as this paper finds that inter-governmental transfers have no long-term or short-term effects on county education spending between 1994 and 2000 in China. While the pooled OLS fixed effects models, a commonly used specification, suggest a positive correlation, this effect is not robust because of model mis-

[24] I include covariates in the analysis.

specification and omitted variable biases. Alternatively, a fuzzy regression discontinuity design, which identifies a local average treatment effect, does not find any causal effect of inter-governmental transfers on county education spending. Specifically, I make use of the 1994 designation of "National Poverty County" in this regression discontinuity design, and the designation was largely determined by a threshold in the 1992 county personal income. Since these designated counties receive more transfers, the designation should, in theory, improve a county's social spending, such as in education. However, I find no positive effects on education spending between those counties that were above the county personal income threshold and those that were below.

Note that the regression discontinuity design only identifies a local average treatment effect (LATE), and generalizing the finding to the entire sample requires further investigation. However, the lack of a local average treatment is substantively important, because inter-governmental transfers are often used to target certain needy counties, such as poor counties in the case of China. The results of this paper indicate that these inter-governmental transfers fail to enhance education spending in these poor counties. Hence, it offers some implications for evaluation of the Chinese government's strategy of public goods and services provision in recent years. Specifically, the Chinese central government has revamped its effort in public goods and services provision since 2001, and has increased inter-governmental transfers to fund these efforts. The implications of this paper raise questions about the effectiveness of these transfers. On the one hand, the transfers help ensure less IOUs for teachers' salaries, which was a serious issue in poor areas during the 1990s. On the other hand, the new transfers do not necessarily enhance local governments' incentives to provide public goods and services. Moreover, some case studies found that these transfers did not completely fill the void of schools fees and other

extra-budgetary revenues that are important sources of local education spending (Ge 2003, Ge and Lin 2004). Finally, another potential peril of recent transfers is that many decisions to allocate education funds to different schools are increasingly made by the local finance bureau but not by the local education bureau. It's not clear if the finance bureau makes better decisions about the allocation of education funds, and it intervenes indirectly in the functioning of local education bureau.

Interesting areas of future research might follow several strategies to evaluate the effects of inter-governmental transfers on public goods and services provision in China. First, do inter-governmental transfers become effective in promoting local social spending if the central government imposes more conditionalities on these transfers? Second, how do these transfers affect unequal school quality within a locality? Since good schools often have more extra-budgetary sources for their funding than other schools do, do these transfers help close the gap in operating budgets of these schools? Finally, an increase of transfers may lead local governments to be more dependent on central government rather than to be more responsive to local residents' demand for education spending.

The increase of local governments' dependency on transfers potentially has two implications. First, do residents shift the blame of under-provision of public goods and services from the local government to the central government as a consequence of increasing inter-governmental transfers? Second, do these transfers undermine local governments' incentives to provide public goods and services, and crowd out any local influence? These transfers may undercut any mechanisms through which residents hold local government accountable for public goods and services provision. This is a problem suggested in the study of the interaction between the central

government and local governments. If this is the case in China, then increasing inter-governmental transfers could be a cure that is worse than the disease.

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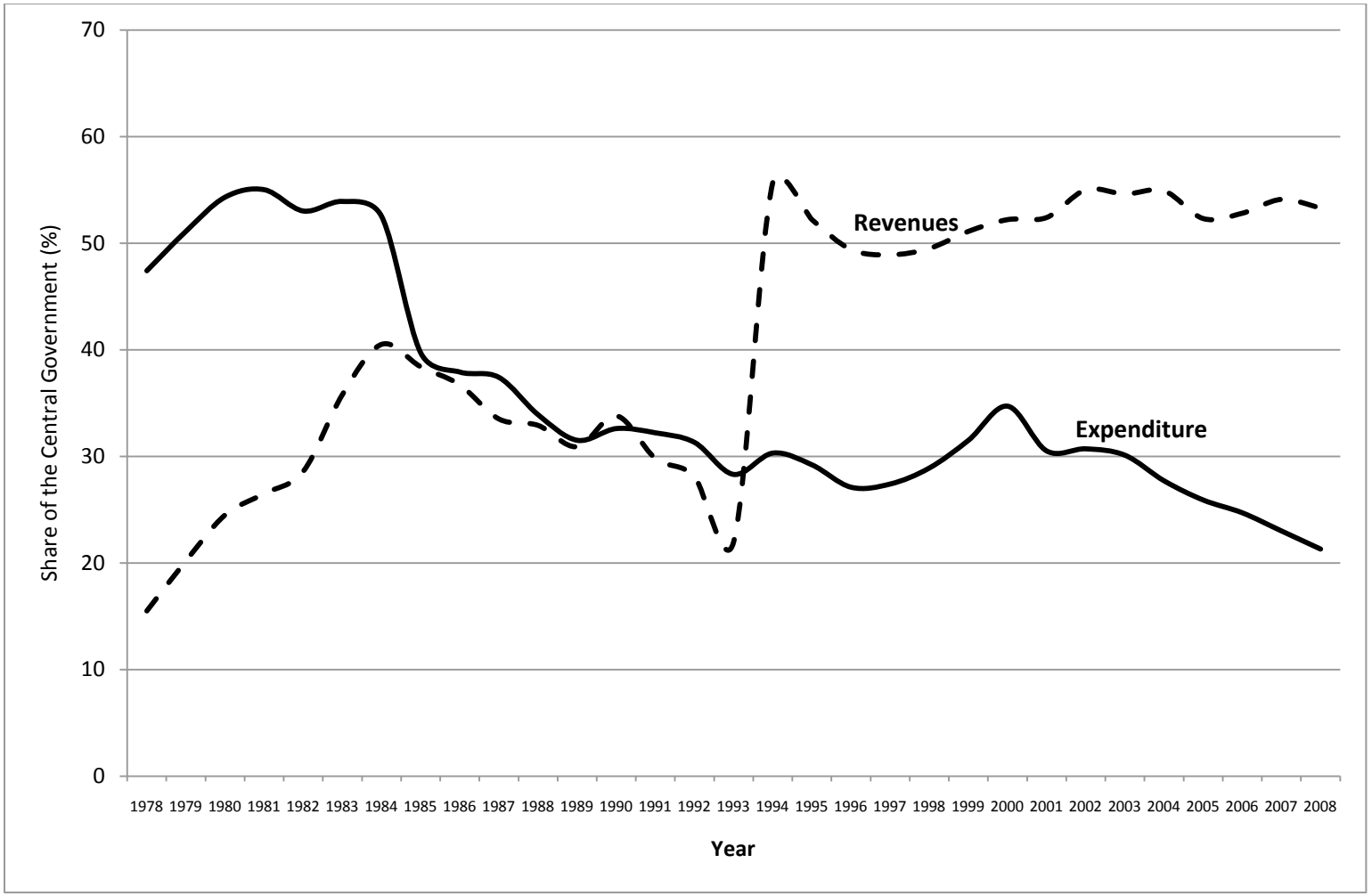

Source: China Statistical Yearbook (1991, 2008).

Figure 1: Central Government's Shares in Total Government Revenues and Expenditures in China (1978 – 2008)

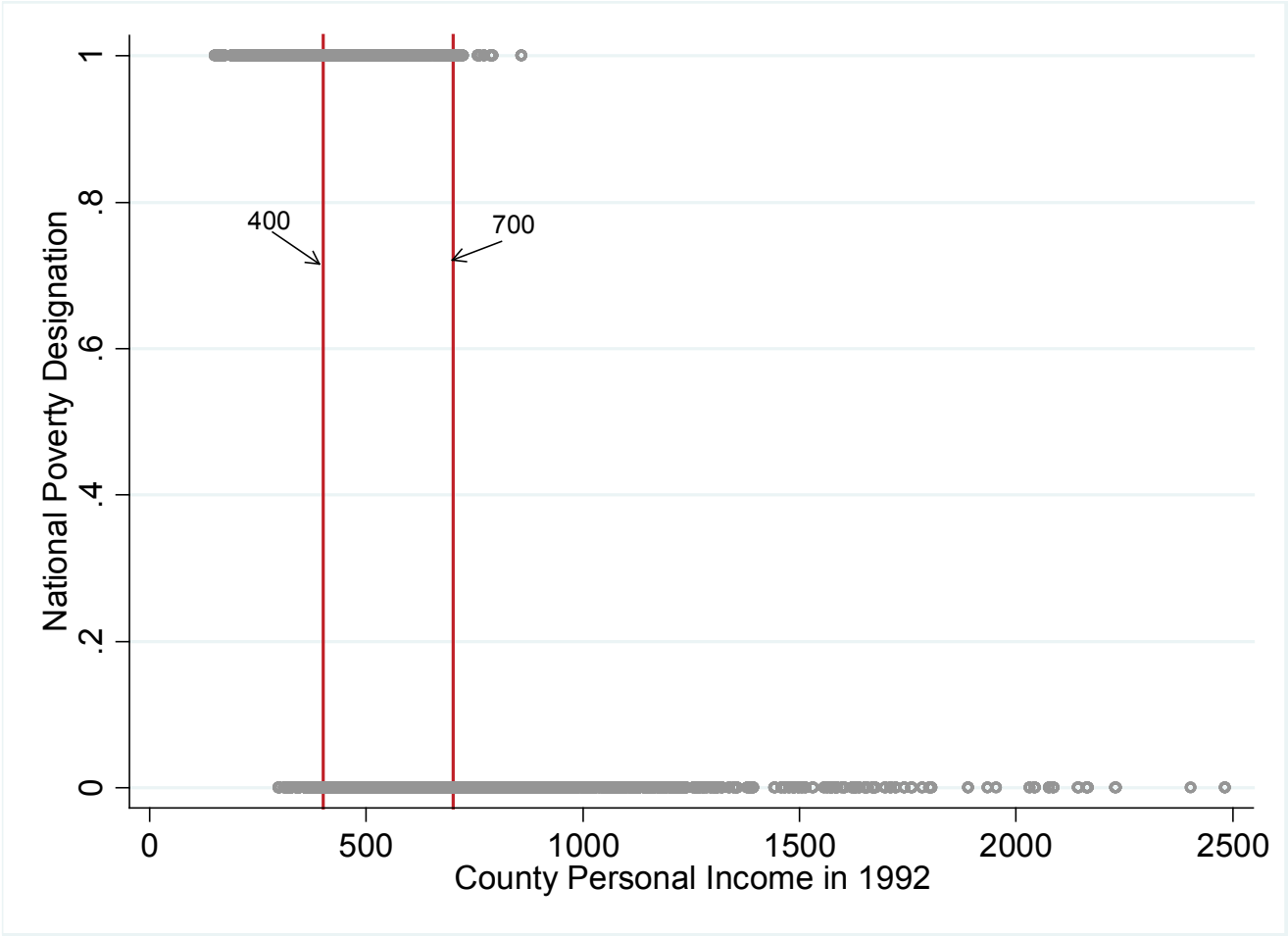

Figure 2: The Designation of National Poverty County based on the 1992 County Personal Income

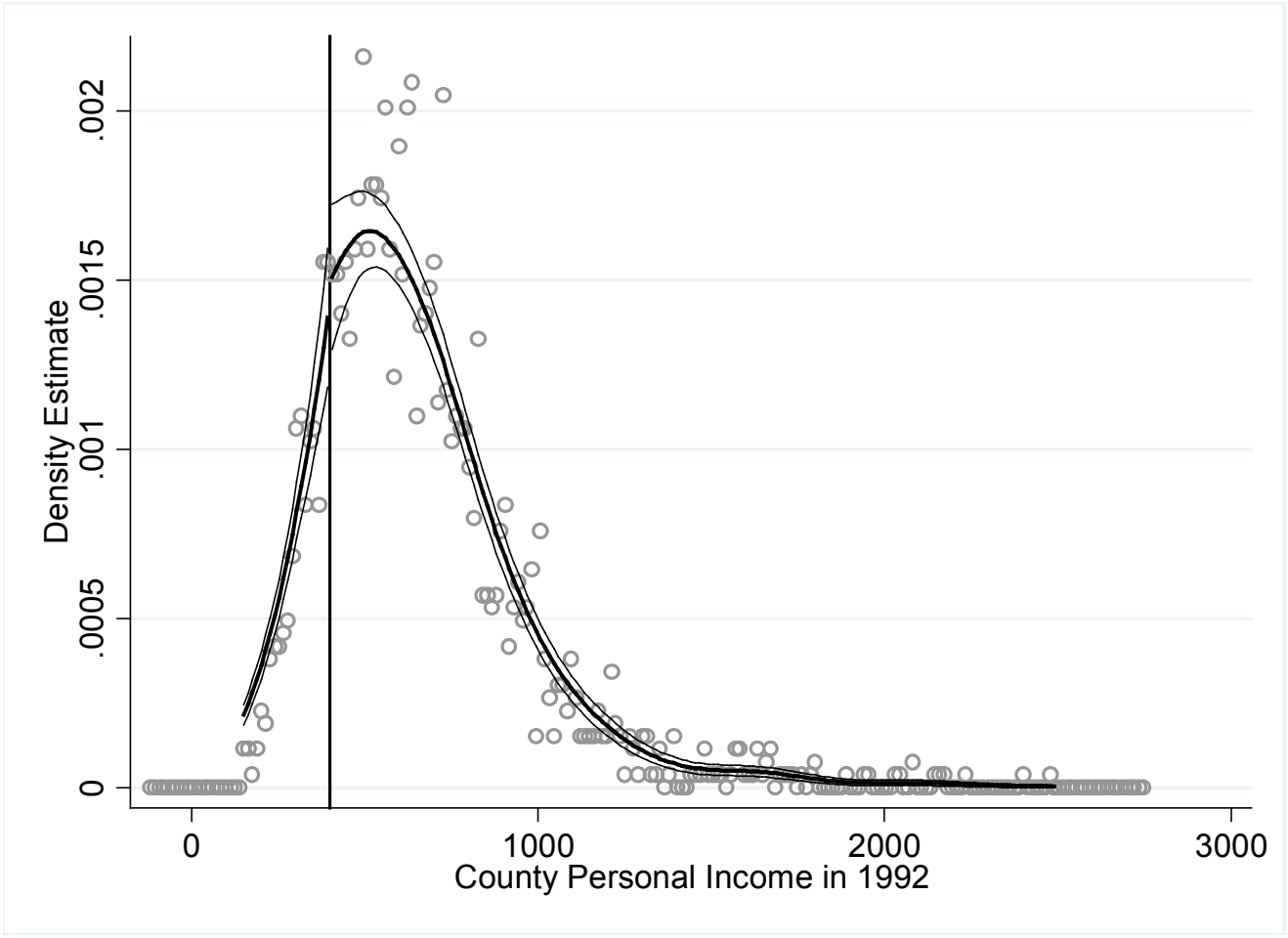

Figure 3: The Density Distribution of County Personal Income in 1992

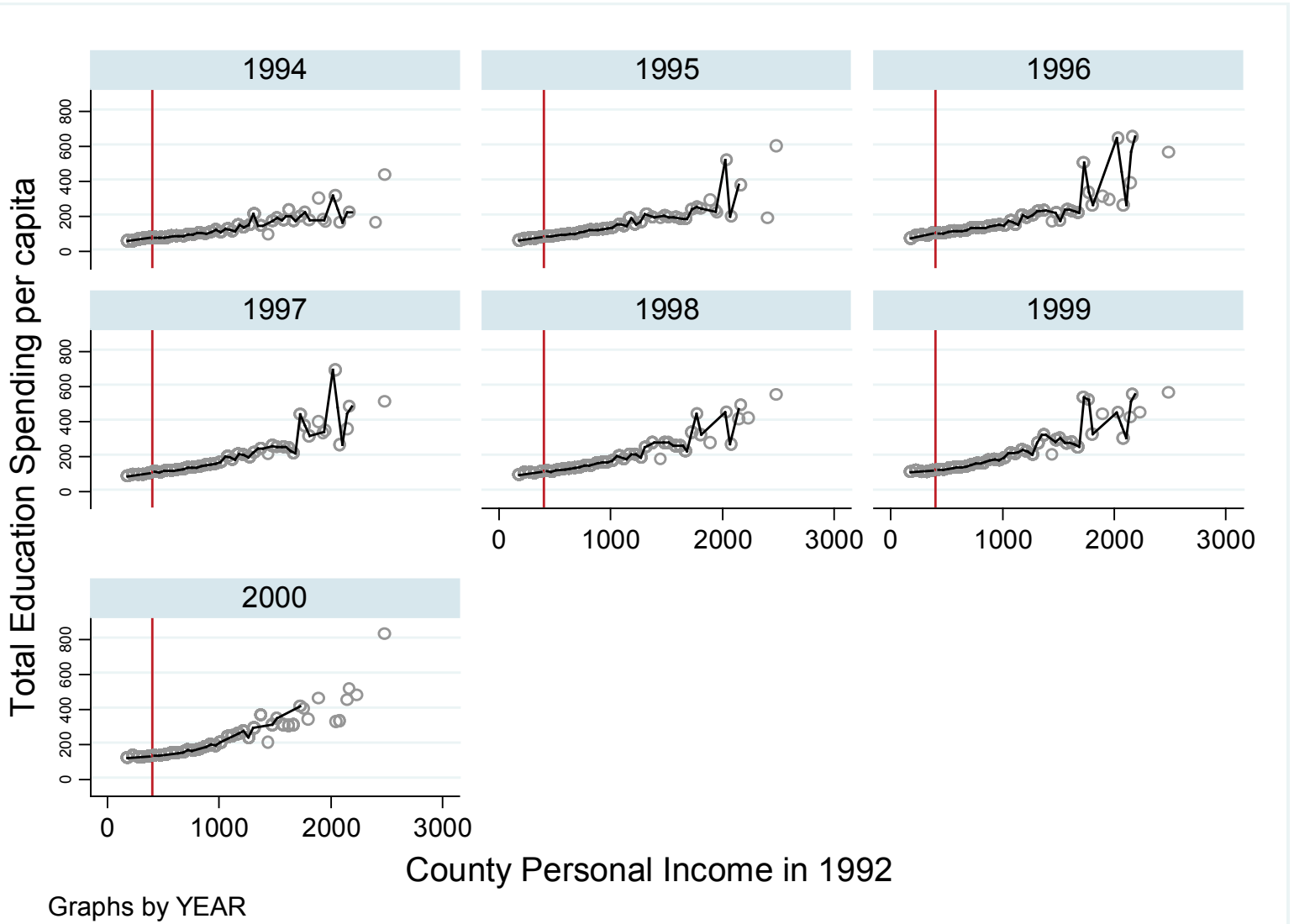

Figure 4: Total Education Spending Per Capita (Bandwidth of 50)

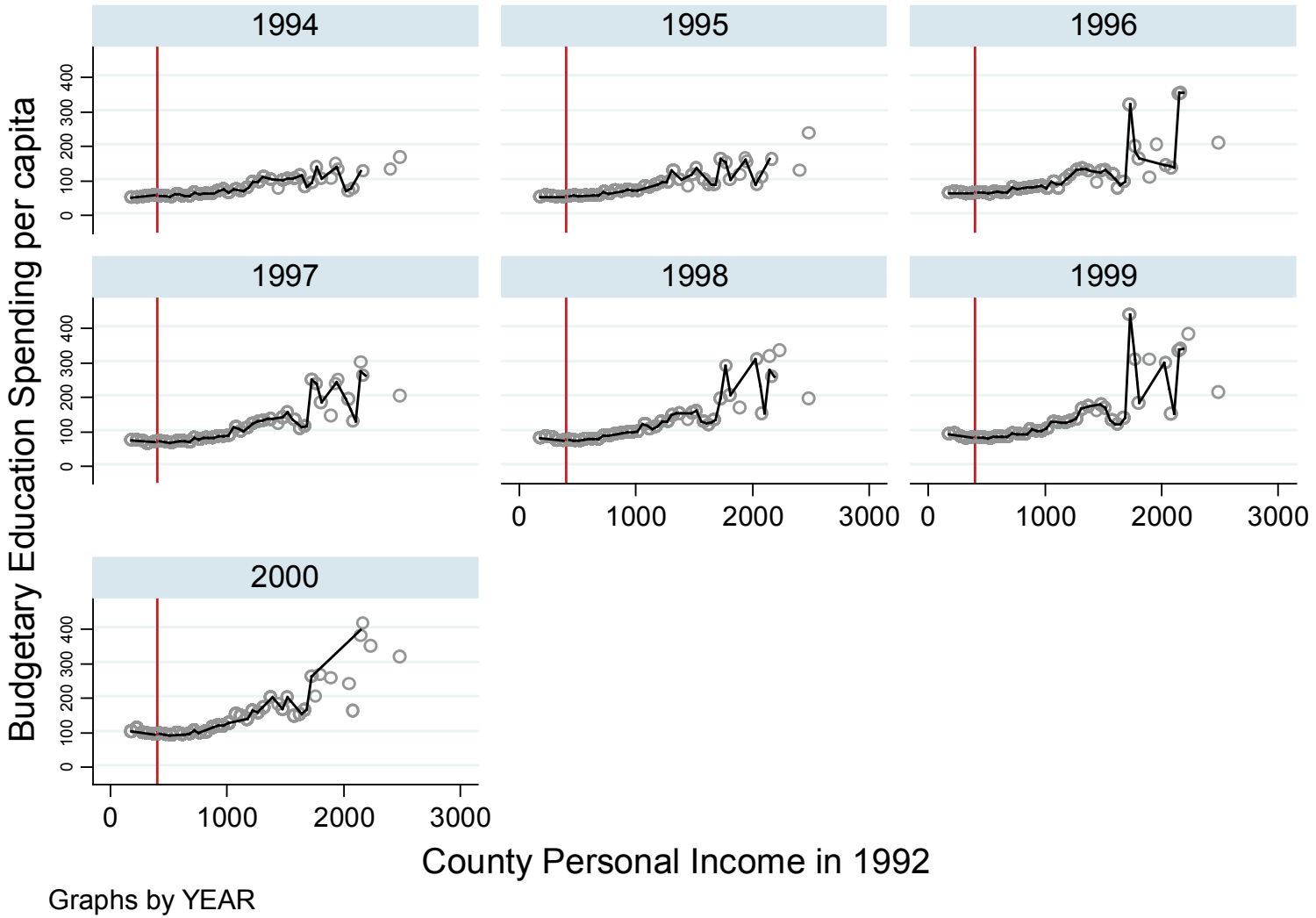

Figure 5: Budgetary Education Spending Per Capita (Bandwidth of 50)

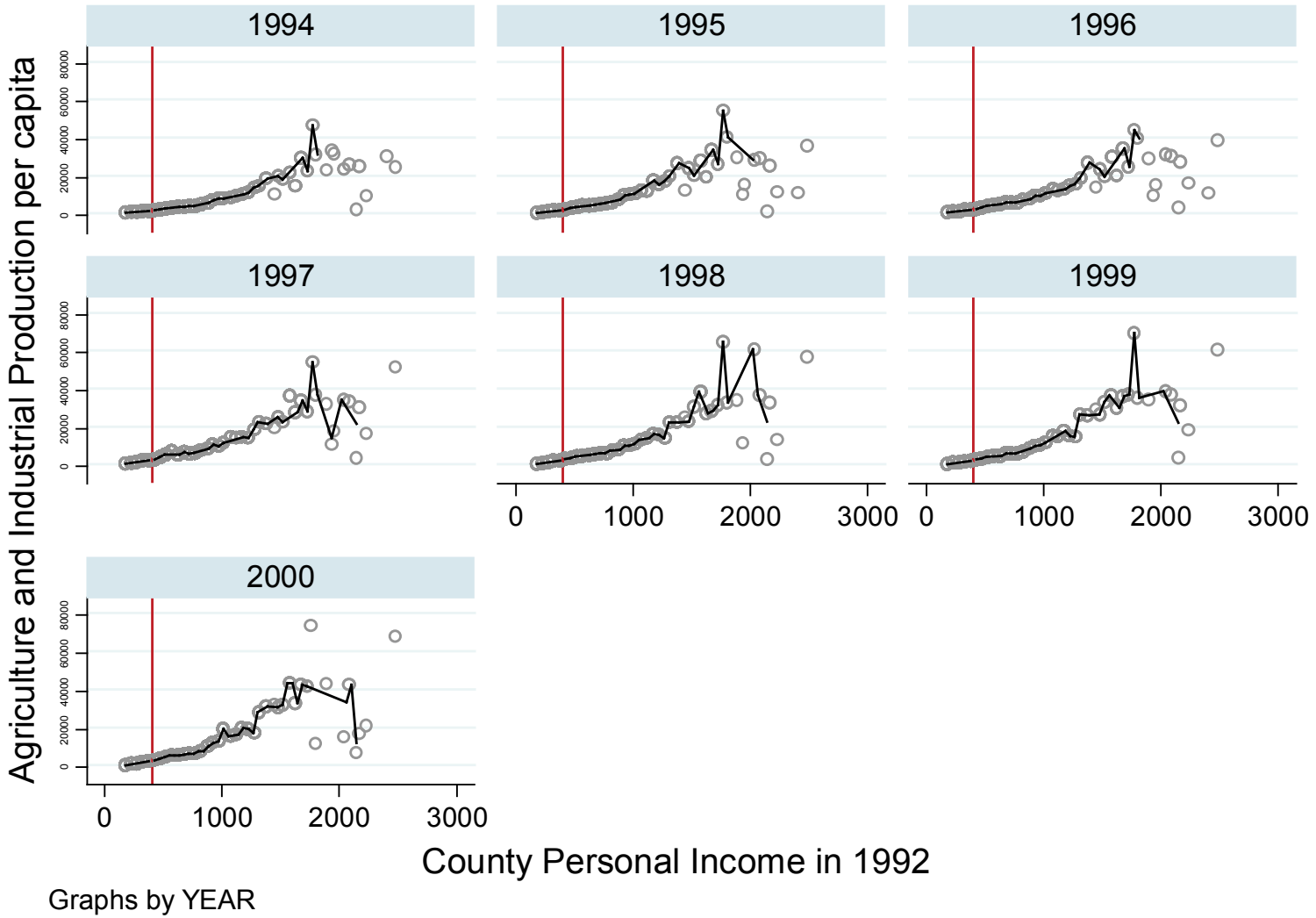

Figure 6: Agricultural and Industrial Production Per Capita (Bandwidth of 50)

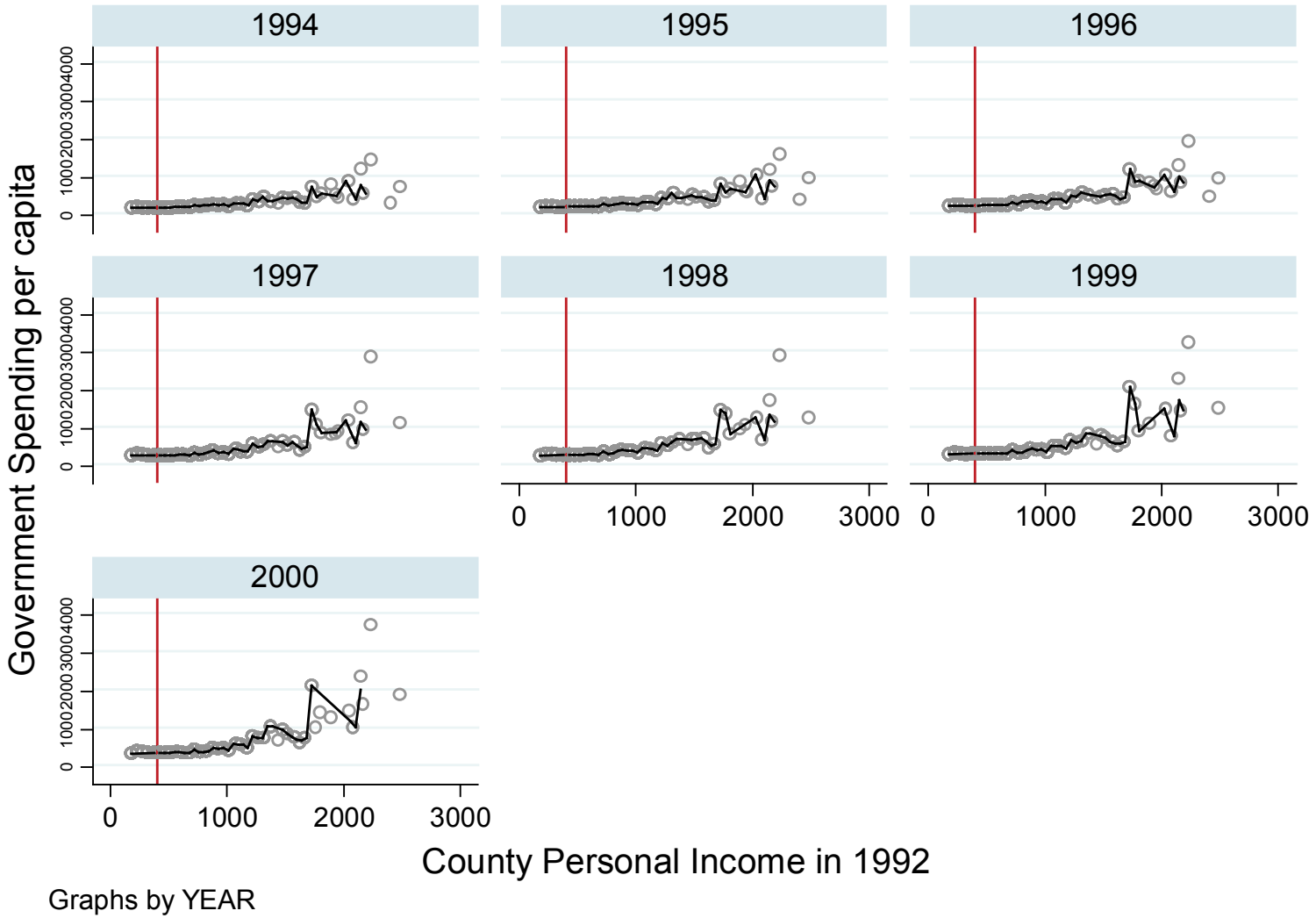

Figure 7: Government Spending Per Capita (Bandwidth of 50)

Table 1 Education Spending Per Capita and Inter-Governmental Transfers (OLS Analysis)

	Log Total Education Spending Per Capita		Log Budgetary Education Spending Per Capita		Log Total Education Spending Per Capita		Log Budgetary Education Spending Per Capita	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log(transfer per capita)	0.0273	0.0380	0.0139	0.0335				
	(0.0057)	(0.0059)	(0.0056)	(0.0055)				
	0.000	0.000	0.013	0.000				
Percentage of Transfers in Total Government Revenue					-0.0009	-0.0006	-0.0007	-0.0003
					(0.0002)	(0.0002)	(0.0002)	(0.0002)
					0.000	0.004	0.002	0.057
Lagged Dependent variable		0.1679		0.1645		0.1641		0.1615
		(0.0215)		(0.0256)		(0.0213)		(0.0254)
		0.000		0.000		0.000		0.000
% of Agricultural Production in Total Economy	-0.0009	-0.0005	-0.0009	-0.0005	-0.0008	-0.0005	-0.0008	-0.0005
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
	0.000	0.002	0.000	0.001	0.000	0.002	0.000	0.001
Log(Agricultural and Industrial Production per capita)	0.0100	0.0057	0.0074	0.0027	0.0095	0.0054	0.0070	0.0024
	(0.0046)	(0.0031)	(0.0043)	(0.0031)	(0.0046)	(0.0031)	(0.0043)	(0.0032)
	0.030	0.062	0.090	0.393	0.039	0.079	0.106	0.450
Log(Population)	-0.1051	-0.0893	-0.1345	-0.1397	-0.1363	-0.1271	-0.1508	-0.1708
	(0.0284)	(0.0287)	(0.0344)	(0.0290)	(0.0281)	(0.0277)	(0.0337)	(0.0275)
	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000
Observations	14367	11757	14419	11857	14453	11823	14505	11923
County Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Clustered standard errors are reported in parenthesis, followed by p-values. I do not report the estimates of county and year dummies.

Table 2 Fuzzy RD: Total Education Spending Per Capita

	All Year		1995		1997		1999	
	[300~500]	[350~450]	[300~500]	[350~450]	[300~500]	[350~450]	[300~500]	[350~450]
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
				Without Controls				
Nationally	0.256	-0.201	-0.143	-0.188	-0.199	-0.374	0.196	-0.799
Designated	(0.836)	(0.662)	(1.172)	(0.724)	(1.393)	(0.857)	(1.158)	(0.970)
Poverty County	0.760	0.762	0.903	0.795	0.886	0.663	0.865	0.411
Observations	3483	1770	533	274	519	265	523	265
				With Controls				
Nationally	0.245	-0.235	-0.007	-0.220	-0.265	-0.327	0.149	-0.822
Designated	(0.580)	(0.528)	(0.633)	(0.527)	(0.954)	(0.735)	(0.902)	(0.772)
Poverty County	0.673	0.657	0.991	0.676	0.781	0.657	0.869	0.288
% of Agricultural	-0.002	-0.002	-0.002	-0.003	-0.001	-0.001	0.000	-0.002
Production in	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)
Total Economy	0.075	0.081	0.386	0.280	0.235	0.685	0.723	0.397
Log(Agricultural								
and Industrial	0.137	0.114	0.105	0.105	0.179	0.221	0.190	0.032
Production per	(0.033)	(0.044)	(0.025)	(0.041)	(0.081)	(0.129)	(0.132)	(0.157)
capita)	0.000	0.010	0.000	0.011	0.028	0.086	0.151	0.839
Log(Population)	-0.199	-0.233	-0.207	-0.231	-0.212	-0.244	-0.222	-0.300
	(0.038)	(0.055)	(0.042)	(0.061)	(0.070)	(0.074)	(0.056)	(0.083)
	0.000	0.000	0.000	0.000	0.003	0.001	0.000	0.000
Observations	3474	1766	532	274	518	264	522	264

Notes: The dependent variable is log total education spending per capita. In columns (1) - (2), clustered standard errors at the county level are reported in parenthesis, followed by p-values. In columns (3) - (6), standard errors at the county level are reported in parenthesis, followed by p-values. Columns (1) - (2) include times dummies. All models include D, f(•), Df(•), T, g(•), Tg(•),.

Table 3 Fuzzy RD: Budgetary Education Spending Per Capita

	All Year		1995		1997		1999	
	[300~500]	[350~450]	[300~500]	[350~450]	[300~500]	[350~450]	[300~500]	[350~450]
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
				Without Controls				
Nationally	-0.089	-0.549	-0.380	-0.361	-0.097	-0.614	-0.506	-1.159
Designated Poverty	(0.922)	(0.894)	(1.359)	(0.818)	(1.433)	(1.053)	(1.546)	(1.345)
County	0.923	0.540	0.780	0.659	0.946	0.561	0.744	0.389
Observations	3497	1779	533	274	519	265	525	270
				With Controls				
Nationally	0.160	-0.532	0.150	-0.320	0.151	-0.569	-0.276	-1.026
Designated Poverty	(0.561)	(0.655)	(0.592)	(0.490)	(0.827)	(0.802)	(0.987)	(0.922)
County	0.775	0.418	0.800	0.515	0.855	0.479	0.780	0.267
% of Agricultural	-0.001	-0.001	-0.001	-0.001	0.000	-0.001	-0.001	-0.003
Production in Total	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)	(0.001)	(0.003)
Economy	0.362	0.362	0.562	0.539	0.917	0.634	0.316	0.290
Log(Agricultural and	0.064	0.023	0.036	0.040	0.147	0.102	0.006	-0.127
Industrial Production	(0.030)	(0.049)	(0.021)	(0.035)	(0.072)	(0.145)	(0.151)	(0.190)
per capita)	0.033	0.643	0.089	0.249	0.042	0.481	0.968	0.503
Log(Population)	-0.330	-0.391	-0.325	-0.367	-0.320	-0.415	-0.365	-0.448
	(0.036)	(0.068)	(0.040)	(0.058)	(0.060)	(0.081)	(0.056)	(0.101)
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Observations	3488	1775	532	274	518	264	524	264

Notes: The dependent variable is log budgetary education spending per capita. In columns (1) - (2), clustered standard errors at the county level are reported in parenthesis, followed by p-values. In columns (3) - (6), standard errors at the county level are reported in parenthesis, followed by p-values. Columns (1) - (2) include times dummies All models include D, f(•), Df(•), T, g(•), Tg(•),.

Table 4 Poverty County: fuzzy regression discontinuity Analysis (Non-parametric Analysis)

	Log Total Education Spending Per Capita		Log Total Budgetary Education Spending Per Capita	
	Wald Estimator [300~500]	Wald Estimator [350~450]	Wald Estimator [300~500]	Wald Estimator [350~450]
1994 τ_{FRD}	0.17	-0.34	0.06	-0.70
Std. Err.	(2.82)	(3.15)	(110.65)	(7.36)
1995 τ_{FRD}	-0.31	0.10	-0.65	-0.28
Std. Err.	(7.33)	(5.92)	(4.33)	(2.97)
1996 τ_{FRD}	0.15	0.21	-0.19	-0.19
Std. Err.	(2.71)	(1.26)	(112.21)	(0.74)
1997 τ_{FRD}	-0.07	-0.12	-0.88	-0.47
Std. Err.	(0.09)	(1.25)	(29.38)	(9.55)
1998 τ_{FRD}	-0.34	-0.06	-0.86	-0.49
Std. Err.	(4.45)	(0.87)	(145.90)	(3.55)
1999 τ_{FRD}	-0.61	-0.41	-1.17	-0.78
Std. Err.	(9.84)	(1.45)	(6.44)	(2.84)
2000 τ_{FRD}	-0.05	0.00	-0.61	-0.31
Std. Err.	(2.14)	(0.95)	(2.40)	(1.23)
All years τ_{FRD}	-0.29	-0.07	-0.66	-0.44
Std. Err.	(0.60)	(0.25)	(2.01)	(0.24)

Notes: The dependent variables are log total education spending per capita and log budgetary education spending per capita respectively. Bootstrap standard errors are reported in parentheses. I do not report the estimates of covariates for the fuzzy regression discontinuity.

Table 5 Second Order Polynomial Regression

	Log Total Education Spending Per Capita		Log Budgetary Education Spending Per Capita	
	[300~500]	[350~450]	[300~500]	[350~450]
All Year	-0.373	-0.078	-0.271	-0.475
	(0.734)	(0.404)	(2.375)	(0.518)
	0.612	0.847	0.909	0.361
1995	0.030	0.104	-1.595	-0.295
	(3.802)	(0.443)	(13.035)	(0.474)
	0.994	0.814	0.903	0.535
1997	-0.601	-0.079	-1.395	-0.422
	(2.475)	(0.474)	(8.084)	(0.575)
	0.808	0.867	0.863	0.464
1999	-0.729	-0.355	-1.507	-0.709
	(1.148)	(0.508)	(3.270)	(0.665)
	0.526	0.485	0.645	0.288

Notes: In the first panel (All Year), clustered standard errors at the county level are reported in parenthesis, followed by p-values. In the second, third, and forth panel, standard errors at the county level are reported in parenthesis, followed by p-values. Models in the first panel include times dummies. All models include D, f(•), Df(•), T, g(•), Tg(•), and their second order.

Table 6 Inter-governmental Transfers per Capita Descriptive Statistics

	Inter-governmental Transfers Per Capita			
Personal Income 92	**[300, 400)**	**[400, 500)**	**[350, 400)**	**[400, 450)**
National Poverty County Status	**NPC=1**	**NPC=0**	**NPC=1**	**NPC=0**
1994	78.18	53.89	80.05	58.20
	(95.43)	(57.65)	(118.01)	(60.13)
Between Group Mean Difference	24.30		21.85	
	(8.23)		(13.96)	
	0.00		0.12	
1995	79.51	54.95	79.49	59.03
	(88.47)	(58.06)	(106.55)	(60.81)
Between Group Mean Difference	24.55		20.47	
	(7.88)		(13.12)	
	0.00		0.12	
1996	108.25	71.79	111.18	79.15
	(143.25)	(76.06)	(175.47)	(75.09)
Between Group Mean Difference	36.46		32.04	
	(11.98)		(19.90)	
	0.00		0.11	
1997	136.17	82.55	134.66	88.76
	(195.42)	(95.03)	(198.10)	(94.49)
Between Group Mean Difference	53.62		45.90	
	(16.02)		(23.06)	
	0.00		0.05	
1998	139.26	84.73	136.38	89.92
	(175.30)	(91.89)	(181.07)	(104.71)
Between Group Mean Difference	54.53		46.46	
	(14.64)		(22.36)	
	0.00		0.04	
1999	163.06	110.73	169.15	115.77
	(175.46)	(108.64)	(215.37)	(111.60)
Between Group Mean Difference	52.34		53.37	
	(15.27)		(25.69)	
	0.00		0.04	
2000	146.61	97.57	149.66	105.43
	(181.54)	(110.98)	(207.82)	(120.16)
Between Group Mean Difference	49.05		44.24	
	(15.80)		(25.66)	
	0.00		0.09	

Notes: The t-tests are mean tests with unequal variances.

Table 7 fuzzy RD: Inter-governmental Transfers Per Capita

	All Year		1995		1997		1999	
	[300~500]	[350~450]	[300~500]	[350~450]	[300~500]	[350~450]	[300~500]	[350~450]
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Nationally Designated Poverty County	0.506	0.333	0.533	0.455	0.651	0.491	0.345	0.334
	(0.128)	(0.162)	(0.145)	(0.200)	(0.156)	(0.205)	(0.146)	(0.177)
	0.000	0.041	0.000	0.023	0.000	0.018	0.018	0.060
% of Agricultural Production in Total Economy	0.007	0.005	0.005	0.003	0.003	0.003	0.003	0.002
	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)
	0.000	0.000	0.000	0.124	0.013	0.080	0.006	0.319
Log(Agricultural and Industrial Production per capita)	0.136	0.153	0.023	0.027	-0.003	0.065	-0.076	-0.024
	(0.024)	(0.036)	(0.033)	(0.052)	(0.040)	(0.065)	(0.042)	(0.056)
	0.000	0.000	0.488	0.598	0.948	0.320	0.070	0.666
Log(Population)	-0.798	-0.819	-0.780	-0.792	-0.813	-0.831	-0.708	-0.731
	(0.025)	(0.039)	(0.031)	(0.048)	(0.030)	(0.043)	(0.029)	(0.042)
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Observations	3861	1999	550	285	550	285	555	285

Notes: The dependent variable is log inter-governmental transfers per capita. In columns (1) - (2), clustered standard errors at the county level are reported in parentheses, followed by p-values. In columns (3) - (6), robust standard errors are reported in parentheses, followed by p-values. Columns (1) - (2) include times dummies. All models include D, f(•), Df(•), T, g(•), Tg(•), and covariates.