Intergovernmental Vertical Fiscal Relations Reform and Grassroots-Level Government's Finance Guarantee: Based on Quasi-Natural Experimental Analysis

Jing Ning, Xujie Zhao*

Grassroots-level government's financial capability is crucial to the performance of financial functions of the whole country. How to adjust the intergovernmental vertical fiscal relations in order to improve grassroots-level government's finance situation is important for accelerating the establishment of a modern fiscal system. In recent years, Province-Directly-Governing-County (PGC) fiscal reform has been an important attempt to straighten out vertical fiscal relations between governments, and thus has made it possible for studying the effects of vertical fiscal relations reform on grassroots-level government's finance based on quasi-natural experimental analysis. Therefore, this article empirically analyzes the PGC fiscal reform based on nationwide county-level data applying Propensity Score Matching with Difference-in-Difference Method (PSM-DID), in order to investigate the effect of the reform on county governments' disposable revenue and identify the influence path. The results indicate that PGC fiscal reform has a significant effect on promoting fiscal disposable revenue of county governments. Furthermore, we find that the reform increased upper-government transfer payment more than county-level own revenue, which manifests the reform increase county governments' fiscal disposable revenue by means of restraining prefecture-level cities' from grabbing county-level transfer.

Keywords: intergovernmental vertical fiscal relations reform, grassroots-level government, finance guarantee

1. Introduction

As the foundation of the Chinese government's organizational structure, the grassroots-level government is the concrete implementation unit and the ultimate implementer of various policies of the central government, as well as the administrative unit that contacts the people most closely. The good functioning of grassroots-level government not only determines the people's impression of the

* Jing Ning (email: ningjing8687@163.com), Associate Researcher, Institute of Finance and Economics, Central University of Finance and Economics, China; Xujie Zhao (email: zhaoxujie@uibe.edu.cn), Associate Professor, School of International Trade and Economics, University of International Business and Economics, China.

state and government, but also directly relates to the long-term stability of the whole country and society. The report of the 19th National Congress of the Communist Party of China clearly put forward that "enhancing the credibility and execution of the government and building a service-oriented government which people are satisfied with". How grassroots-level government provides the high-level public services for local residents has become an unavoidable practical issue. The important prerequisite for grassroots-level government to provide adequate and sufficient public services is that the grassroots-level government has sufficient financial capacity.

Compared with the grassroots-level governments such as towns and municipal districts, county has been the most stable and important grassroots-level administrative divisions in China since ancient times. It undertakes a large number of basic public services and plays an irreplaceable role in promoting economic development and ensuring social stability. However, compared with municipal districts, the county's geographical transportation location lacks innate advantages, and it's unable to attract sufficient domestic and foreign talents and investment inflows, which leads to the weak economic development strength and lacking of sustained and stable self-income sources. Therefore, the current financial situation of the county government in China is poor with the prominent contradiction between incomes and expenditures. The gap between the average revenue and expenditure of county governments in 2016 was 1.964 billion yuan, and the ratio of revenue to expenditure was 1:2.45.[1] Moreover, in the new normal economic development situation, the fiscal revenue for both national and county government has experienced the decreasing trend. In addition, with the debt repayment burden of the county government, the financial guarantee of the future public service of the grassroots-level county government is not optimistic.

In addition to the lack of geographical advantage, an important institutional reason for the difficulty of county-level financial operation lies in the weak position of county government in fiscal decentralization after the reform of tax-sharing system in 1994 under the administrative organization system of political centralization in China. After the reform of tax sharing system, tax sources are concentrated upwards and the main categories of tax revenue are shared at different levels. It is due to the strong position of provincial and municipal governments in the administrative organizational system that leads to the small proportion of value-added tax, business tax and income tax shared by county governments. Taxes that categorized as exclusive to county governments are often small, scattered and difficult to collect. In addition, since the county-level transfer payment funds are handled by too many levels of government, the transfer payment funds of the county government are often intercepted and misappropriated.

[1] The data is calculated based on *China County Statistical Yearbook* (2016). The latest year that the *China County Statistical Yearbook* was 2017, in which the socio-economic data of 2016 at county level are collected.

In the case that the location of the county's geographic transportation is difficult to be improved in a short time, it is very important to adjust the intergovernmental vertical fiscal relations and enhance the financial status of the county governments to rapidly improve the financial security of the grassroots-level governments.

In recent years, the central and local governments have made positive attempts to adjust the intergovernmental vertical fiscal relations, as well as to improve the financial capacity of grassroots-level governments. In order to straighten out the vertical fiscal relations below the provincial level and solve the financial predicament of county government, some provinces spontaneously carry out the reform of the fiscal system that provinces directly administrate the county to fully mobilize the county's enthusiasm for self-development and increase the support of provincial government to the county government, which ensures the county government has a stable revenue source. In 2004, Anhui and Hubei took the lead in implementing the Province-Directly-Governing-County (PGC) fiscal reform, and then Henan, Jiangxi, Shanxi and Shaanxi provinces launched pilot reforms in succession. The achievement of provincial government's spontaneous reform of vertical fiscal relations has been recognized by the central government. In 2009, the "Opinions on Promoting the Fiscal Reform of PGC" promulgated by the Ministry of Finance aims to "strive to the overall goal of comprehensively promoting the fiscal reform of Province-Directly-Governing-County in addition to ethnic autonomous areas throughout the country".[1] By 2010, 970 counties in 27 provinces had carried out the Province-Directly-Governing-County[2] fiscal reform.

The implementation of this vertical fiscal relation reform has attracted wide attention of the academic community. Some scholars explore the impact of the reform on the efficiency of financial funds and administrative work from the perspective of management efficiency (Jia and Yu, 2010; Wang and Xu, 2017). There are also scholars studying the impact of reform on the local government functions and public services from the perspective of fiscal expenditure (Chen and Lu, 2014; Jia and Ning, 2015; Lu *et al.*, 2017). The empirical researches of many scholars found that the reform of PGC has not played a good role in promoting fiscal expenditure and economic growth, which indicates the overall effect of the reform is negative (Cai *et al*., 2011; Jia *et al*., 2013; Li *et al*., 2016).

[1] The main contents of the financial system reform of Province-Directly-Governing-County (PGC) include: (1) The categories of state tax and local tax revenue are directly decomposed by provincial finance to decentralize to county-level finance, and the county would directly transfer the revenue to provincial finance; (2) Fiscal transfer payments and other subsidies are directly allocated to the county by the provincial finance; (3) The base of each settlement and subsidy shall be directly approved by the provincial finance, and the funds shall be settled directly with the county at the end of the year; (4) International loans, national debt transfer funds and central government paid funds borrowed by counties shall be repaid directly to provincial governments.

[2] The data came from the Report of 2010 Central Final Accounts published by the Ministry of Finance.

At the same time, the process of the fiscal system reform of PGC has also slowed down. For example, Liaoning Province abolished the PGC fiscal management system of two counties of Suizhong and Changtu in December 2016. However, the authors suggest that the goal of the PGC fiscal reform is to improve the county financial capacity and alleviate the financial difficulties of the county government by adjusting the vertical intergovernmental fiscal relations among provinces, cities and counties. If the reform achieves the initial goal, problems arising in the process of reform should be looked at objectively and some remedial measures should be actively taken to ensure the continuation of the reform, which forms the practical significance of this study.At present, there is little literature researching on whether the reform could achieve the initial goal of the reform that enhancing the disposable financial resources of the county government, especially on how the reform affects the financial resources of the county government by identifying the different effects of the reform on the revenue of the county government and the income of the transfer payment. Therefore, based on the quasi-natural experiment of the reform of Province-Directly-Governing-County, this paper empirically analyzes how this vertical fiscal reform affects the financial capacity of grassroots-level county governments with the method of Propensity Score Matching with Difference-in-Difference Method (PSM-DID). The theoretical significance of this paper is to clarify the effecting mechanism path of the reform on the disposable financial resources of county governments through in-depth analysis of the heterogeneous impact of reform on revenue and transfer payments of county government, which provides the empirical evidence for the first link of the logical transmission chain of reform effect (namely, the reform of PGC affects fiscal revenue, which affects fiscal expenditure, which affects economic growth), as well as for the existing literature on the impact of reform on fiscal expenditure or economic growth.

2. Theoretical Framework

Many studies have shown that local governments' vertical fiscal relations have an important impact on their fiscal revenue and expenditure behavior by influencing local governments' competitive incentives (Brennan and Buchanan, 1980; Qian and Weingast, 1997; Keen, 1998; Qian *et al.*, 2006). The conclusion provides the thought and framework for the study of the impact of the vertical fiscal relations reform on county-level disposable financial resources. As a reform of intergovernmental vertical fiscal relations implemented in recent years in China, the PGC fiscal reform effects the county-level disposable financial resources mainly through the mechanism of horizontal and vertical intergovernmental financial competition.

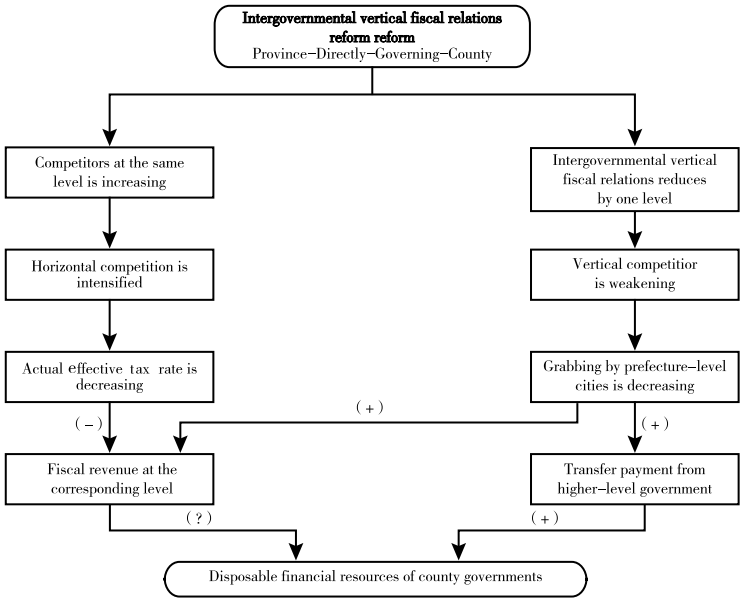

Figure 1. Theoretical Framework of the Impact of Vertical Fiscal Relations Reform (Province-Directly-Governing-County) on County-Level Disposable Financial Resources

The influencing mechanism path of the PGC fiscal reform on the disposable financial resources of county governments could be summarized as the theoretical framework of Figure 1. The left side of Figure 1 shows that the fiscal competitors faced by county-level government has a sudden increase after the vertical fiscal relations reform of PGC. The reform would reduce the actual effective tax rate at the county level by strengthening the horizontal fiscal competition of the county-level government, which further reduces the county-level fiscal revenue. The right side of Figure 1 shows that the vertical fiscal level has changed from "province-city-county" to "province-county" after the vertical fiscal relations reform of PGC. The reform reduces the seizure of county financial resources by prefecture-level cities by weakening the vertical fiscal competition between cities and counties, which increases county-level fiscal revenue and transfer payments from higher-level government. Figure 1 also shows that the final impact of the reform on county disposable financial resources depends on the comprehensive effect of the positive and negative forces. It is difficult for the simple theoretical analysis to reach the conclusion, while empirical research could find the answer through measurement methods. In view of this, this paper empirically studies the impact of the reform on the disposable financial resources of the county-level government with the national county-level financial data. In addition, in order to test the impact path of reform, this paper would also analyze the different effects of reform on fiscal revenue at the corresponding level and transfer payment at the higher level.

3. Measurement Method and Data Description

3.1. Measurement Method

This paper adopts the Propensity Score Matching with Difference-in-Difference Approach (PSM-DID).Compared with the traditional DID linear regression method, the advantages of PSM-DID method lie in the following aspects. Firstly, based on the propensity score estimated by a series of characteristic variables, it makes the treatment group matching with the control group in all aspects, constructs a control group that is infinitely close to the characteristics of the treatment group and ensures randomness of treatment group selection (Lin and Ye, 2007; Caliendo and Künn, 2011; Mendonça and Souza, 2012; Gebel and Voßemer, 2014). Secondly, it is a non-linear parameter estimation method, which relaxes the strong hypothesis of linear relationship (Persson and Tabellini, 2004).As far as the characteristics of sample data in this paper are concerned, the advantages of non-linear parameter estimation are as follows. (1) Since the criterion for selecting reform county in reform provinces is that counties should have excellent or poor economic and financial conditions, it is difficult to set characteristic variables as the correct functional form of control variables by using traditional DID linear regression method, while with no need to set function form, the PSM-DID method could ensure the randomness of treatment group selection. As long as the balance test is passed, it could be regarded that the treatment group has find the control group with similar characteristics. The criteria for selecting reform counties in reform provinces vary with different years (for example, in 2004, the criteria for selecting reform county in Henan Province is that counties should have high level of economic development, and in 2007, the criteria for selecting reform county in Shanxi Province is counties should directly under the national poverty alleviation work). Therefore, compared with the traditional DID method, the advantage of PSM-DID method is that the annual variation of selection criteria does not need to be taken into consideration since the treatment group after matching would always be compared with the control group whose characteristics are similar no matter how the selection criteria change over years.

The method of PSM-DID could be divided into three steps. In the first step, this paper constructs a binary selection Probit model with dummy variables of reform as dependent variables and the variable of county characteristic as independent variables. The estimated regression coefficient of characteristic variable is the probability of implementing reform in each county, which could be regarded as propensity score.[1]

[1] The commonly used binary selection models are Probit models and Logit models. We adopt the Probit model in benchmark analysis and Logit model is used in robustness test.

$$Probit(PGC_i = 1) = \alpha + \beta X_i^{t_0} + \varepsilon_i \quad (1)$$

The dependent variable is the dummy variable of PGC fiscal reform (PGC_i) in formula (1). The PGC_i of the county that has fiscal reform is 1 while that has no fiscal reform is 0. $X_i^{t_0}$ is the characteristic variable that affects the implementation of reform. Firstly, carefully studying the government documents of provinces on the fiscal system reform of PGC, we find that the selection of reform counties in provinces is mainly based on the county's economic development level and financial strength. Therefore, the characteristic variables selected in the benchmark analysis include the following variables. (1) Characteristic variables of economic development: this paper chooses five economic characteristic variables that included the ranking of county's real per capita GDP in the province[1], the proportion of primary industry value added to GDP, the proportion of secondary industry value added to GDP, population density (total population divided by county area) and urbanization level (the proportion of urban population to total population) to analyze the effect of economic development, the characteristics of industrial structure, population scale and urbanization on the reform probability. (2) Characteristic variables of financial strength: this paper chooses the fiscal gap (the proportion of fiscal revenue and expenditure gap to own fiscal expenditure) as the fiscal characteristic variable to analyze the impact of financial difficulties on the reform probability.[2] In addition, this paper also introduces four characteristic variables that include the dummy variable of national poverty county, dummy variable of county-level city, average elevation and average slope of the county into the Probit model for robustness test (Li *et al.*, 2016). It should also be noted that the average values from 2000 to 2002 before the reform are used to ensure the exogeneity, in order to avoid the effect of reform on these variables (Rosenbaum and Rubin, 1983; Caliendo and Kopeinig, 2008).

In the second step, the appropriate matching method is selected to match the

[1] Real per capita GDP=nominal per capita GDP/provincial consumer price index (with the year of 2000 as the base period).

[2] The reason that the variable of the ranking of the real per capita GDP of the counties in the province is selected is that the government documents of Henan, Jiangxi, Shanxi and Shaanxi provinces put forward that the economically strong counties or poor counties should be selected. The reason that population density and urbanization level are selected is that they are also reliable indicators to measure the level of economic development. The reason that the proportion of value added of primary industry in GDP is selected is that the central government document proposed that the counties that mainly produce grain, oil, cotton and pig should be included in the reform scope. The reason that the proportion of added value of secondary industry in GDP is selected is that government documents of Henan Province mentions that the industrial basis should be considered, and the proportion of secondary industry is also an important index to measure the level of economic development of a county.

treatment group (reform county) and the control group (non-reform county) after calculating propensity score, and the matching effect is evaluated by the balance test (judging whether the treatment group could find the control group with similar characteristics). The common matching methods include kernel density matching, *K* nearest neighborhood matching, radius matching and local linear regression matching (LLR). Since the two most commonly used methods (core density matching and *K* nearest neighbor matching) take into account the problem of sample size and accuracy, this paper mainly uses these two methods to match in benchmark analysis. This paper also uses radius matching method and local linear regression matching method in robustness analysis.

The third step is to calculate the average treatment effect of county-level disposable financial resources on the basis of formula (2) after the matching is completed. τ_{ATT} represents the average treatment effect on the treatment group (ATT).[1] *PGC* is the dummy variable of the fiscal system reform of PGC, county that with the fiscal reform has the *PGC* value of 1 while county that with no fiscal reform has the *PGC* value of 0. Y_1 and Y_0 represent the disposable financial resources of treatment group and control group respectively. t_0 and t_1 represent the pre-event time point and post-event time point. Y^t is the average value of county-level disposable financial resources in 2000—2002, and Y^t is the value of county-level disposable financial resources in post-event of 2007.[2] *P (X)* is the tendency score, W_{ij} is the weight assigned to the control group under different matching methods, *S* is the common support of the tendency score, N_1 is the sample number of the treatment group, and *E* is the expectation operator.

$$\begin{aligned}
\tau_{ATT}^{PSM-DID} &= E_{P(X)|PGC=1}\{[\Delta Y_1 \mid PGC=1, P(X)] \\
&\quad - E[\Delta Y_0 \mid PGC=0, P(X)]\} \\
&= E_{P(X)|PGC=1}\{[Y_1^{t_1} - Y_1^{t_0} \mid PGC=1, P(X^{t_0})] \\
&\quad - E[Y_0^{t_1} - Y_0^{t_0} \mid PGC=0, P(X^{t_0})]\} \\
&= \frac{1}{N_1}\sum_{i\in PGC_1\cap S}[(Y_1^{t_1} - Y_1^{t_0}) - \sum_{j\in PGC_0\cap S} w_{ij}(Y_0^{t_1} - Y_0^{t_0})]
\end{aligned} \tag{2}$$

[1] The reason that the fiscal gap is selected is that the document of Henan Province mentions that two counties with better financial and economic conditions should be selected to carry out the pilot project.

[2] In addition to ATT, the indicators for evaluating causal treatment effects of policy include ATU (Average Treatment Effect on the Untreated) and ATE (Average Treatment Effect). This paper pays more attention to the reform effect of treatment group, and thus the index of ATT is chosen.

3.2. Data Description

The samples in this paper are all county-level administrative units in China. The data sources are mainly *National Financial Statistics of Prefectures and Counties*, *China County (City) Socio-Economic Statistics Yearbook*, *China Statistical Yearbook*, *Province Statistical Yearbook* and official reform documents issued by various provinces. The original data has been processed as follows. Firstly, this paper excludes the samples of Tibet Autonomous Region where a large number of county-level data is missing. Secondly, this paper excludes the samples of municipal districts that have obvious differences in financial autonomy and support at the municipal level with counties. Thirdly, this paper excludes the county-level samples where administrative divisions have changed from 2000 to 2007 (such as the withdrawal of counties and the transformation of counties into districts, etc.). Fourthly, this paper excludes the county-level sample with the Province-Directly-Governing-County fiscal reform from 2000 to 2002 to ensure that all samples are in the same state of City-Directly-Governing-County from 2000 to 2002.[1] Fifthy, this paper excludes the sample of non-reform counties in the progressive reform province since the sample may be affected by the provincial reform policies.[2] Sixthy, this paper excludes the sample with the observed value is less than 1% or more than 99% quantiles in order to eliminate the influence of abnormal values. After the above data treatment, the final sample in this paper is the panel data of 1357 counties, of which 332 samples are the reform counties, namely the treatment group (the reform of Province-Directly-Governing-County was carried out from 2002 to 2007), and 1117 samples are the non-reform counties, namely the control group (the reform of City-Directly-Governing-County was carried out from 2002 to 2007).

County-level disposable financial resources Y is the result variable of this paper. This paper chooses the ratio of total fiscal revenue to GDP as the measure index of disposable financial resources. In addition, there are two main sources of disposable financial resources: county-level self-owned fiscal revenue and county-level transfer payment revenue from the city. As mentioned above, the mechanism of the Province-Directly-Governing-County fiscal system reform has different impact on the two sources. Therefore, this paper regards the ratio of fiscal revenue at the corresponding level to GDP and the ratio of transfer payment at higher level to GDP as outcome variables to examine the impact of reform on financial resources from different

[1] The county-level samples that have the Province-Directly-Governing-County fiscal system from 2000 to 2002 include: all counties under the jurisdiction of Beijing, Tianjin, Shanghai, Chongqing, Hainan, Zhejiang and Ningxia, as well as Jiyuan in Henan, Tianmen in Hubei, Qianjiang, Xiantao and Shihezi in Xinjiang.

[2] The provinces of progressive reform include Henan, Jiangxi, Shanxi, Shaanxi, Qinghai and Gansu provinces.

sources. The description statistics show that the level of disposable financial resources in reform counties is significantly higher than that in non-reform counties. However, it is unscientific that the increasing trend of county-level disposable financial resources is attributed to the Province-Directly-Governing-County fiscal system reform, which needs further quantitative analysis.

4. Results Analysis

4.1. Analysis of Matching Result of Propensity Score

This paper makes a quantitative regression based on formula (1) of the Probit model. Results show that the ranking of actual per capita GDP, population density, urbanization level and fiscal gap of a county have a significant impact on the implementation probability of a county's reform, which indicates that the implementation of the Province-Directly-Governing-County fiscal system reform is not a random decision. The necessity of adopting PSM-DID method is further verified in this paper. According to the regression coefficients of the variables, the probability of implementing reform in each county is obtained, which is regarded as the propensity score. Figure 2 is the distribution map of propensity score of reform counties and non-reform counties. The propensity score of the two counties presents normal distribution, which is concentrated in the interval from 0 to 0.6. Moreover, the two distribution areas basically coincide to meet the common support condition.[1]

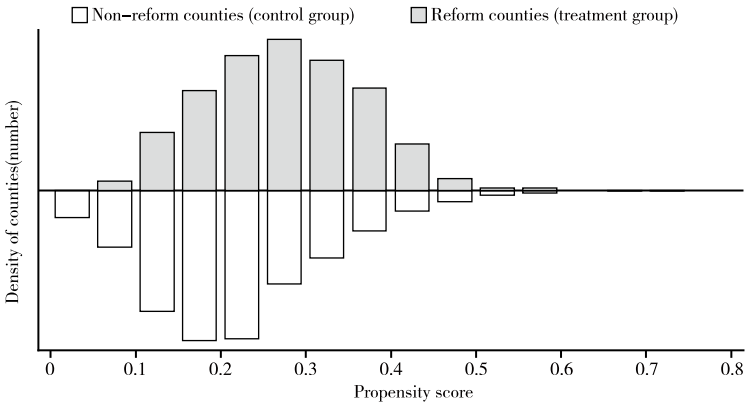

Figure 2. Density Distribution of Propensity Scores of the Control Group and the Tretment Gruop

[1] Heckman *et al.* (1997) and Lechner (2001) mentioned that if the common support condition is violated, it means that there would be more samples outside the common support area. The average processing effect estimated based on the common support area S is only a subset effect, which is not accurate and representative.

After estimating the propensity score of each county, this paper matches the treatment group with the control group by nuclear density matching method and *K* nearest neighborhood method. We set two kinds of kernel functions (Epanechnikov and Gaussian) with the bandwidth of 0.03 and 0.06 respectively in the kernel density matching method. Each matching method should make the treatment and control samples satisfy the conditional independent assumption (CIA).[1]

4.2. The Impact of Reform on Disposal Financial Resources at County Level

Table 1 shows the effect of Province-Directly-Governing-County fiscal system reform on county-level disposable financial resources under the nuclear density matching method and *K* nearest field matching method. The third column of Table 1 shows that the treatment effect estimated under the eight parameters with the two matching methods is significantly positive. The average of the treatment effect is 2.962, which indicates that the ratio of total fiscal revenue to GDP at the county level has increased by 2.962 percentage points after the reform. This also means that reform is generally conducive to the improvement of the fiscal revenue of the county-level government, which indicates that influence path that "the reform of vertical fiscal relations (PGC) weakens the vertical fisacl competition, reduces the seizure of prefecture-level cities to the county, and improves disposable fiscal revenue" in Figure 1 is more powerful. In addition, the fourth column in Table 1 shows that reform improves the ratio of income at the corresponding level to GDP by 0.105 percentage points, but the results has no statistical significance. The fifth column in Table 1 shows that reform significantly increases the ratio of transfer payments to GDP by 1.791 percentage points. It can be seen that, the growth rate of transfer payment in counties after the reform is obviously larger than revenue at the corresponding level, which indicates that the PGC fiscal reform significantly increasing the transfer payment income of county-level governments from their superiors through restricting the vertical fiscal competition of intercepting and misappropriating transfer payment at the county level by prefecture-level municipalities, which significantly increases the disposable fiscal revenue of county governments.

[1] The conditional independent assumption (CIA) refers to that the disposable financial resources have an independent relationship with the reform implementation under the condition that the tendency score is given. Satisfying CIA means that reform is conditionally exogenous and selective bias could be corrected (Lechner, 1999). Due to space limitation, the tests for CIA are not included in the paper, which are retained on request.

Table 1. The Treatment Effect of Vertical Fiscal Relations Reform on the Financial Resources in Grassroots-Level Governments

Matching method	Parameter setting	Total revenue	Revenue at the corresponding level	Transfer payment
Nuclear density matching	Kernel function of Epan; Bandwidth is 0.03	2.998*** (0.430)	0.126 (0.121)	1.773*** (0.434)
	Kernel function of Epan; Bandwidth is 0.06	2.953*** (0.425)	0.133 (0.119)	1.720*** (0.432)
	Kernel function of Gaus; Bandwidth is 0.03	2.949*** (0.425)	0.135 (0.119)	1.712*** (0.432)
	Kernel function of Gaus; Bandwidth is 0.06	2.837*** (0.424)	0.158 (0.118)	1.600*** (0.433)
K nearest neighborhoods Matching	*K* =5; Neighborhood=0.05	2.945*** (0.489)	0.058 (0.142)	1.985*** (0.502)
	K =5; Neighborhood =0.1	2.945*** (0.490)	0.058 (0.142)	1.985*** (0.502)
	K =10; Neighborhood =0.05	3.036*** (0.458)	0.087 (0.135)	1.777*** (0.471)
	K =10; Neighborhood =0.1	3.036*** (0.459)	0.086 (0.135)	1.777*** (0.471)
	Average of treatment effect	2.962	0.105	1.791
	Sample number of treatment group	314	313	312
	Sample number of control group	1,040	1,044	1,042

Notes: The numbers in parentheses are standard errors, and *, ** and *** indicate the significant levels of 10%, 5% and 1%, respectively.

4.3. Heterogeneity Analysis of the Impact of Reform on County-Level Disposable Financial Resources

The PGC fiscal reform may not have the uniform impact on all counties. The reason is that the seizure of counties by prefecture-level cities is not an inevitable phenomenon, and it mainly depends on the economic status of prefecture-level cities and counties. Yang (2009) suggested that relationship between prefecture-level city and county is different, and it could be divided into four categories: strong cities and strong counties, strong cities and weak counties, weak cities and strong counties, and weak cities and weak counties. In the relationship with the weak cities and strong counties, weak cities would not drive the economic development of strong counties while in the relationship with the strong cities and weak counties, strong cities would play a leading role in the economic development of weak counties and help to improve the public service capacity of weak counties.

4.3.1. Heterogeneity of Reform Effect: “Counties Governed in Strong Cities” and “Counties Governed in Weak Cities”

Since there is difference of economic development level of prefecture-level cities, the misappropriating behavior of different prefecture-level cities with different economic strength is also different. Prefecture-level cities (strong cities) with high level of economic development may have a weaker misappropriation of county-level financial resources than prefecture-level cities (weak cities) with low level of economic development since the strong cities have a good fiscal revenue-generating capacity. If the previous judgment on the influence path that “the reform of vertical fiscal relations (PGC) weakens the vertical fiscal competition, reduces the seizure of prefecture-level cities to the county, and improves disposable fiscal revenue” is correct, the increase of disposable financial resources of counties under the jurisdiction of “weak cities” should be greater than that of counties under the jurisdiction of “strong cities” after the PGC fiscal reform. Therefore, this paper divides the sample of the reform counties into two sub-samples: “county under the jurisdiction of the strong city” and the “county under the jurisdiction of the weak city” to compare the reform effects of different levels of economic development of prefectures and municipalities with PGC fiscal reform. Taking the ranking of the average real per capita GDP of prefecture-level cities in the provinces from 2000 to 2002 as the division criterion, this paper divides the cities that rankin the first third in the province into “strong city”, while those in the last third in the province are divided into “weak city”. Table 2 shows that the increase of overall financial level, especially transfer payment in the counties that under the jurisdiction of weak cities is significantly greater than that of the counties under the jurisdiction of strong cities after the reform, which indicates that the reform has greatly reduced the interception behavior of transfer payment of the counties that under the jurisdiction of weak cities, and the inference of the previous paper is verified. In addition, considering that the comprehensive economic development strength of provincial capital cities is superior to that of other non-provincial capital cities, this paper further divides the reform counties into “county that under the jurisdiction of the provincial capital cities (strong cities)” and “county that under the jurisdiction of non-provincial capital cities (weak cities)” according to the criteria of “whether they belong to the jurisdiction of provincial capital cities” in order to compare the reform effects of provincial capital cities and non-provincial capital cities. Table 2 shows that the effect of reform on total revenue and transfer payment is positive and statistically significant in the counties under the jurisdiction of non-provincial capital cities, while the effect of reform on the county under the jurisdiction of provincial capital cities is negative. This shows that the non-provincial capital cities with weak comprehensive strength have more grabbing behavior towards the counties under their jurisdiction before the reform, while the cities with strong comprehensive strength give support to

the counties under their jurisdiction before the reform. Therefore, the financial level of the former after the reform increases significantly, while the financial level, especially the transfer payment level of the latter decreases since it is no longer supported by the provincial capitals, which further verifies the previous inference.

Table 2. The Effect of Vertical Fiscal Relations Reform (PGC) on the Financial Resources of Counties that under Jurisdiction of "Strong City" and "Weak City"

Sample	Index	Total revenue	Revenue at corresponding level	Transfer payment	Sample	Index	Total revenue	Revenue at corresponding level	Transfer payment
Counties that under jurisdiction of "Strong City"	Treatment effect	1.141 (0.958)	-0.006 (0.262)	0.203 (0.919)	Counties that under jurisdiction of "Weak City"	Treatment effect	3.325*** (0.708)	0.061 (0.150)	1.886*** (0.625)
	Sample number of treatment group	52	50	49		Sample number of treatment group	157	159	159
	Sample number of control group	1,040	1,044	1,042		Sample number of control group	1,040	1,044	1,042
Counties that under jurisdiction of "Provincial capital City"	Treatment effect	-1.577* (0.939)	-0.299 (0.354)	-2.340*** (0.612)	Counties that under jurisdiction of "non-Provincial capital City"	Treatment effect	3.149*** (0.481)	0.161 (0.121)	1.925*** (0.475)
	Sample number of treatment group	17	15	17		Sample number of treatment group	297	298	295
	Sample number of control group	1,040	1,044	1,042		Sample number of control group	1,040	1,044	1,042

Notes: The figures in parentheses are standard deviation, and *, ** and *** indicate the significant levels of 10%, 5% and 1%, respectively. The treatment effect in the table is based on the kernel density matching method.

4.3.2. Heterogeneity of Reform Effect: Strong Counties and Weak Counties

For the strong counties that are easier to be misappropriated by prefecture-level municipal governments before the reform, the PGC fiscal reform would reduce the interception of transfer payment funds from prefecture-level cities to strong counties. For weak counties, the financial jurisdiction of prefecture-level cities to weak counties has been weakened after the reform, which would naturally reduce the support for the economic development of weak counties. If the previous judgment on the influence path that "the reform of vertical fiscal relations (PGC)

weakens the vertical fiscal competition, reduces the seizure of prefecture-level cities to the county, and improves disposable fiscal revenue" is correct, the increase of disposable financial resources of strong county governments, especially transfer payments, should be greater than that of weak county governments after the fiscal reform. This paper divides the sample of the reform counties into two sub-samples of "strong county" and "weak county" to compare the reform effects of PGC fiscal reform on weak and strong counties. With the ranking of the average real per capita GDP of reform county in the prefecture-level cities from 2000 to 2002 as the division criterion, this paper divided the counties that rank in the first third in prefecture-level cities into "strong county", while those rank in the last third in prefecture-level cities into "weak county".[1] From the results of Table 3, it can be seen that the increase of transfer payment revenue in strong counties is more obvious than that in weak counties after the reform, which indicates that the misappropriationof strong counties by prefecture-level cities before the reform is mainly reflected in the misappropriation or interception of transfer payment revenue, and fiscal reform of the PGC has well restrained this vertical fiscal competition behavior.

Table 3. The Treatment Effect of Vertical Fiscal Relations Reform on Financial Resources of "Strong Counties" and "Weak Counties"

Sample	Index	Total revenue	Revenue at the corresponding level	Transfer payment	Sample	Index	Total revenue	Revenue at the corresponding level	Transfer payment
	Treatment effect	2.820***	0.407	1.840***		Treatment effect	2.814***	0.161	1.171*
		(0.751)	(0.248)	(0.640)			(0.785)	(0.184)	(0.690)
Strong county	Sample number of treatment group	53	53	53	Weak county	Sample number of treatment group	138	138	138
	Sample number of control group	1,040	1,044	1,042		Sample number of control group	1,040	1,044	1,042

4.4. Counterfactual Analysis

In order to test the rationality and validity of the choice of matching variables and matching methods of the benchmark model, this section will carry out counterfactual

[1] The purpose of only dividing the sample of reform counties (treatment group) is to ensure that the sample of non-reform counties (control group) is consistent with the benchmark result of Table 1.

analysis, which means that constructing a set of counterfactual samples as treatment groups, and estimating the treatment effect of PGC fiscal reform by using the same measurement settings. If the setting of matching variables and the selection of matching methods of the above benchmark model are reasonable and effective, the treatment effect of the fiscal reform of PGC on county-level disposable financial resources based on the counterfactual treatment group estimates should be insignificant. The paper chooses all the non-reform counties under the non-reform cities in the provinces of gradual reform as the counterfactual sample group. The reason for this construction is that counterfactual treatment group must be the counties that have not implemented the PGC fiscal reform. If there are both reform counties and non-reform counties in the same prefecture-level city, the prefecture-level municipal government may intensify the misappropriation of the disposable financial resources of its subordinate non-reform counties, since the financial resources of the reform counties are not under control anymore. Therefore, the sample of counterfactual treatment group in this section does not include the non-reform counties subordinate to the prefecture-level cities that have already implemented the reform. All the non-reform counties in the prefecture-level city that have not been reformed are selected as the counterfactual treatment group to minimize the impact of the reform on the counterfactual treatment group.[1] Results[2] show that no matter what matching method is adopted, the treatment effect of PGC on county-level total financial revenue, local revenue and transfer payment that estimated with the counterfactual treatment group is not statistically significant, which indicates that the matching variable setting and matching method selection of the benchmark model in this paper is reasonable.

In addition to the above counterfactual analysis, we have conducted 500 random sampling in all non-reform counties, reconstructed 500 new counter-factual treatment groups, calculated the estimated coefficients of 500 reform treatment effects and drew the probability density distribution map in order to further verify the benchmark results of this paper (see Figure 3). The parabola of Figure 3 shows the probability density distributions of the treatment effect coefficients of total revenue, primary revenue and transfer payment after counterfactual estimating for 500 times. The vertical lines represent that the treatment effect coefficients of total revenue, primary revenue and transfer payment in the benchmark results are 2.962, 0.105 and 1.791 respectively. From Figure 3, it can be seen that the estimated coefficients of counterfactual treatment effect are concentrated around 0, which shows that the reform has no significant statistical impact on counterfactual treatment group. Moreover, the treatment effect coefficients of gross revenue and transfer payment in the benchmark results are 2.962 and 1.791 respectively, which

[1] The control group under counterfactual analysis is the same as that under baseline analysis.

[2] Due to the space limitation, the conterfactual results are not included in the paper, which are retained on request.

are obviously outside the probability density distribution curve. This means that the PGC fiscal reform has an effect on the significant increase of the county's total fiscal revenue and transfer payment, which is not caused by unobservable contingency factors.

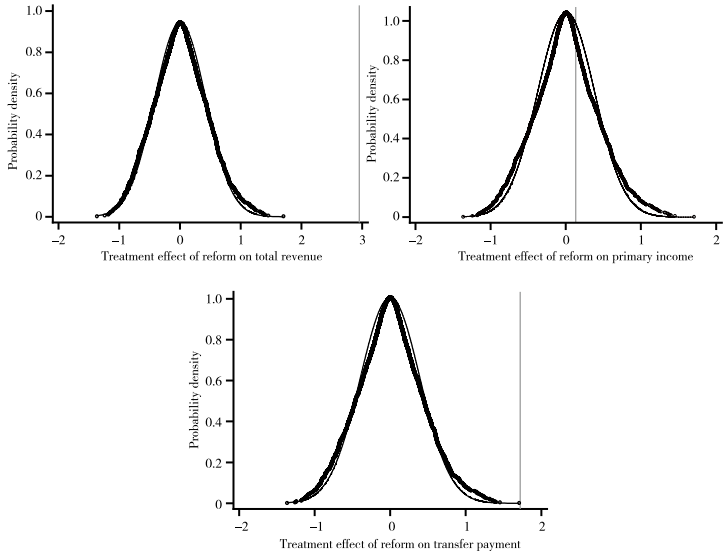

Figure 3. Counterfactual Treatment Effect Based on 500 times of Random Samples

4.5. Robustness Analysis

In order to test the robustness of the conclusion that the PGC fiscal reform is conducive to improving the financial level of grassroots-level county governments, the following analysis tests are carried out: Firstly, the last 10% of the treatment group samples with the least number of matched control groups are excluded to reduce the effect of the abnormal value samples in the treatment group on the final results when calculating the average treatment effect. Secondly, this paper clusters at the level of prefecture and provincial level to control the impact of cluster effect on the treatment effect of PGC. Thirdly, the Probit model is replaced by the Logit model for regression of propensity score equation. Fourth is to change the matching method that uses radius matching method (radius is 0.05) and local linear regression matching method (LLR) to match the treatment group with the control group, and investigating whether the treatment effect of the fiscal reform on county-level disposable financial resources is robust. Fifth is to change the measurement index of the result variable that tries to take the logarithm of the real per capita revenue of the total fiscal revenue, the revenue at the corresponding level and the transfer payment revenue as the measure index

of the financial capacity of the county-level government.[1] Sixth is to introduce four additional characteristic variables (the dummy variables of poverty-stricken counties at the national level, the dummy variables of cities at the county level, the average elevation of counties and the average slope of counties) into the Probit model.[2] The results of robustness analysis show that there is no significant difference between the effect of the reform on the total fiscal revenue, the revenue at the corresponding level and the transfer payment with that shown in Table 1, which indicates that the positive treatment effect on the county-level financial capacity is robust.[3]

5. Conclusion and Policy Suggestions

Grassroots-level government provides basic public services for local residents, and the financial level of grassroots-level government directly determines the quantity and quality of public goods, which relates to whether the public service needs of residents could be met or not. In the current fiscal decentralization system in China, the financial situation of grassroots-level county governments is generally in a dilemma. Therefore, the central and provincial governments actively take measures to adjust the intergovernmental vertical fiscal relations in order to improve the financial level of county governments. PGC fiscal reform is an important attempt to straighten out the intergovernmental vertical fiscal relations and solve the county-level financial difficulties. Based on the quasi-natural experiment of PGC fiscal reform, this paper uses PSM-DID measurement method to study the path and effect of the vertical fiscal relations reform on the financial resources of grassroots-level county governments. Econometric analysis shows that vertical fiscal reform of the PGC is beneficial to the improvement of the overall fiscal revenue and transfer payment revenue of the county government, and it has no significant impact on the revenue at the corresponding level, which indicates that influence path that "the reform of vertical fiscal relations (PGC) weakens the vertical fiscal competition, reduces the seizure of prefecture-level cities to the county, and improves disposable financial revenue" is more powerful, and the reform improves the overall financial level of the county-level government through restraining the seizure of transfer payments at the county level by the prefecture-level cities. In addition, this paper also finds that the

[1] Actual total fiscal revenue per capita (revenue at the corresponding level and transfer payment revenue) = nominal total fiscal revenue per capita (revenue at the corresponding level and transfer payment revenue) / provincial consumer price index (with the year of 2000 as the base period).

[2] This paper tries to introduce four additional characteristic variables into the Probit model one by one, and the results are not significantly different from those in Table 1.

[3] Due to the space limitation, the results of robustness test are omitted, which are retained on request.

overall financial level of the county that under the jurisdiction of the weak city has increased more than that of the county that under the jurisdiction of the strong city, and the transfer payment of the strong county has increased more than that of the weak county after the reform. The reason is that the weak city is more likely to mispropriate the county than the strong city, and the strong county is easier to be grabbed by the prefecture-level city than the weak county.[1] Based on the above analysis, this paper puts forward the following policy recommendations on how to promote the reform of vertical fiscal relations in the future.

Firstly, the reform should focus on standardizing the vertical competition between higher and lower governments. The conclusion of this paper has verified the vertical fiscal competition behavior of prefecture-level cities against counties. Although the prefecture-level municipalities could not intervene the county government in finance after the reform of PGC, they still have a certain voice in the aspect of administration and personnel. Therefore, the prefecture-level municipalities are still in an obvious dominant position in the vertical competition relationship between prefecture-level municipalities and counties. The financial interests of prefecture-level cities will be damaged after the reform, which leads to the more fierce competition between prefecture-level cities and counties in other resources. In view of the vertical competition between prefecture-level cities and counties, the provincial government fully should take the interests of prefecture-level cities into consideration in the reform to ensure that the negative impact of reform on prefecture-level cities is minimized. For example, the provincial government could implement the policy of withdrawing counties and setting districts in the reform, which means that allowing prefecture-level cities to transform some of the surrounding counties into municipal districts.[2] On the other hand, the provincial government should establish corresponding institutional norms with the prefecture-level municipal government to fundamentally restrain the bad vertical competition behavior of prefecture-level municipalities against the county. Only by securing the support and cooperation of prefecture-level cities could the

[1] Although the period of the sample is until 2007 due to the data availability of *National Financial Statistical Data of Prefectures, Cities and Counties*, the author believes that the conclusions drawn in this paper still have strong theoretical and practical significance. Firstly, the conclusion of this paper reveals the mode of vertical competition behavior among local governments at county and municipal levels below the province level, and finds that the prefecture-level municipalities do grab the fiscal revenue at county level, which provides a factual basis for the further study on the vertical fiscal relations of local governments below the province level. Secondly, the conclusion of this paper shows that the reform of the vertical fiscal relations of PGC has achieved the initial goal of alleviating the financial predicament at the county level, which provides experience support for the financial system reform of PGC in the future.

[2] At present, many provinces and municipalities have carried out the reform of setting up districts by withdrawing counties. How the vertical competition behavior of prefecture-level cities changes after setting up districts by withdrawing counties and whether setting up districts by withdrawing counties is conducive to alleviating the grabbing behavior of prefecture-level cities towards counties is a topic worthy of further study in the future.

reform of the vertical fiscal relations of PGC be carried out more smoothly in the long run.

Secondly, the reform should be tailored to local conditions. Strong and weak cities, as well as strong counties and weak counties, should be treated in different ways. This paper finds that the effect of the vertical fiscal relations reform on strong and weak cities, strong counties and weak counties is different. Therefore, the PGC fiscal system reform should take into account the difference of economic development level of prefecture-level cities in the future. For the counties under strong cities, especially those under the jurisdiction of provincial capital cities, the province could maintain the original fiscal system of Municipal-Directly-Governing-County. In addition, in considering differences of the county's economic development level, the provinces can adopt different fiscal management systems for strong counties and weak counties. For instance,implementing the PGC fiscal system reform for strong counties and implementing the City-Directly-Governing-County fiscal system reform for weak counties or encouraging prefecture-level cities to maintain their original support policies for weak counties under the PGC fiscal system reform.

Thirdly, the reform should attach importance to improving the income-generating capacity of grassroots-level county governments. According to the conclusion of this paper, the promotion of the reform of PGC to the improvement of county-level fiscal revenue is limited. Although the timely arrival of transfer payments from superiors is important to enhance county financial resources, how to cultivate the county government's own "blood-making" capacity after the provincial government governing the county finance is more important. On the one hand, provincial governments can consider setting up progressive fiscal revenue sharing ratio with counties to increase the proportion of new fiscal revenue of county governments, as well as to encourage county governments to actively develop new financial resources and fundamentally improve their own sustainable financial level. On the other hand, with the horizontal rivals of county governments having suddenly increased after the reform, provincial governments should standardize the horizontal fiscal competition among county governments to avoid the disorderly racing-to-bottom taxation of county governments, and prevent the actual effective tax rate at the county level from falling so much as to affect the fiscal revenue at the corresponding level.

References

Brennan, G., & Buchanan, J. (1980). *The Power to Tax: Analytical Foundations of a Fiscal Constitution*. Cambridge University Press.

Cai, G., & Huang, L. (2010). Research on the Influencing Factors and Economic Performance of Government Level Reform. *Management World (Guanli Shijie)*, 8, 73-83.

Cai, G., Zhang, X., & Deng, W. (2011). Will the Province-Directly-Governing-County Financial System Reform Damage the Interests of Prefecture-Level Cities? *Economic Research Journal (Jingji Yanjiu)*, 7, 65-77.

Caliendo, M., & Kopeinig, S. (2008). Some Practical Guidance for the Implementation of Propensity Score Matching. *Journal of Economic Surveys*, 22(1), 31-72.

Caliendo, M., & Künn, S.(2011). Start-Up Subsidies for the Unemployed: Long-Term Evidence and Effect Heterogeneity. *Journal of Public Economics*, 95(3), 311-331.

Chen, S., & Lu, S. (2014). Does Decentralization Increase People's Livelihood Financial Expenditure? Natural Experiment from "Province-Directly-Governing-County Fiscal System Reform" in China. *China Economic Quarterly (Jingjixue Jikan)*, 4, 1261-1282.

Gebel, M., & Voßemer, J. (2014). The Impact of Employment Transitions on Health in Germany. A Difference-in-Differences Propensity Score Matching Approach. *Social Science & Medicine*, 108(4), 128-136.

Heckman, J., Ichimura, H., & Todd, P. (1997). Matching as an Econometric Evaluation Estimator: Evidence from Evaluating a Job Training Programme. *The Review of Economic Studies*, 64(4), 605-654.

Jia, J., & Ning, J. (2015). Vertical Fiscal Governance Structure and Local Government Function Optimization. *Management World (Guanli Shijie)*, 1, 7-17.

Jia, J., Zhang, Y., & Guo, J. (2013). Province-Directly-Governing-County Fiscal System Reform, County Economic Growth and Fiscal Solution in Provincial Governance Counties. *China Soft Science (Zhongguo Ruankexue)*, 6, 22-29.

Jia, K., &Yu, C. (2010). The Significance, Content and Relevant Suggestions of the Financial Reform of "Province-Directly-Governing-County". *China Taxation (Zhongguo Shuiwu)*, 4, 27-29.

Lechner, M. (1999). Earnings and Employment Effects of Continuous Off-The-Job Trainingin East Germany after Unification. *Journal of Business & Economic Statistics*, 17(1), 74-90.

Lechner, M. (2001). Identification and Estimation of Causal Effects of Multiple Treatments under the Conditional Independence Assumption. *Econometric Evaluation of Labour Market Policies ZEW Economic Studies*, 13, 43-58.

Li, P., Lu, Y., & Wang, J. (2016). Does Flattening Government Improve Economic Performance? Evidence from China. *Journal of Development Economics*, 123, 18-37.

Lin, S., & Ye, H. (2007). Does Inflation Targeting Really Make a Difference? Evaluating the Treatment Effect of Inflation Targeting in Seven Industrial Countries. *Journal of Monetary Economics*, 54(8) 2521-2533.

Lu, H., Yu, J., & Zhang, N. (2017). Vertical Administrative Structure and Scale of

Local Government Financial Expenditure. *Journal of Financial Research (Jinrong Yanjiu)*, 10, 29-55.

Mao, J., & Zhao, J. (2012). An Empirical Analysis of the Promotion of County Economic Development by Province-Directly-Governing-County Fiscal System Reform. *Public Finance Research (Caizheng Yanjiu)*, 1, 38-41.

Mendonça, H., & Souza, G. (2012). Is Inflation Targeting a Good Remedy to Control Inflation? *Journal of Development Economics*, 98(2), 178-191.

Persson, T., & Tabellini, G. (2004). Constitutional Rules and Fiscal Policy Outcomes. *American Economic Review*, 94(1), 25-45.

Qian, Y., & Weingast, B. (1997). Federalism as a Commitment to Preserving Market Incentives. *Journal of Economics Perspectives,* 11(4), 83-92.

Qian, Y., Roland, G., & Xu, C. (2006). Coordination and Experimentation in M-Form and U-Form Organizations. *Journal of Political Economy*, 114(2), 366-402.

Rosenbaum, P., & Rubin, D. (1983). The Central Role of the Propensity Score in Observational Studies for Causal Effects. *Biometrika*, 70(1), 41-55.

Wang, X., & Xu, J. (2017). Can Fiscal Reform of Province-Directly-Governing-County Restrict On-The-Job Consumption of Grassroots Public Officials? *Finance & Trade Economy (Caimao Jingji)*, 6, 17-32.

Yang, Z. (2009). A Study on Province-Directly-Governing-County Financial System—From Provincial Governing Counties to Reconstructing Intergovernmental Financial Relations. *Finance & Trade Economics (Caimao Jingji)*, 11, 36-41.

Zheng, X., Wang, H., & Zhao, Y. (2011). Can Province-Directly-Governing-County Financial System Promote Economic Growth. *Management World (Guanli Shijie)*, 8, 34-44.