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Yongzheng Liu
Renmin University of China, yongzheng.liu@ruc.edu.cn

Bingyang Lv
Renmin University of China & Indiana University Bloomington

Hang Tai
People's Bank of China

Chenping Yang
Renmin University of China

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Yongzheng Liu

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International Center for Public Policy
Andrew Young School of Policy Studies
Georgia State University
Atlanta, Georgia 30303
United States of America

Phone: (404) 413-0235
Fax: (404) 651-4449
Email: paulbenson@gsu.edu
Internet: http://icepp.gsu.edu/

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Fiscal Incentives and Local Tax Competition: Evidence from China[1]

Yongzheng Liu

Renmin University of China

Bingyang Lv

Renmin University of China

Hang Tai

People's Bank of China

Chenping Yang

Renmin University of China

Abstract

This paper explores how fiscal incentives affect capital tax decisions by local governments in the Chinese context. We develop a model in which local governments, facing different fiscal incentives, compete for mobile capital over corporate taxes. The key prediction of the model, borne out in data from Chinese cities over the years 2004-2013, is that an increase in the local corporate income tax-sharing ratio, proxying local fiscal incentives, makes city governments' horizontal tax reactions stronger. Our results contribute to the fiscal federalism literature by providing evidence in support of the argument that fiscal incentives faced by local governments significantly shape their

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policy choices. Additionally, we provide explicit evidence on local tax competition within provinces in China, which has long been regarded as one of the driving forces of China's rapid economic growth.

Keywords: Fiscal Incentives; Local Tax Competition; China

JEL codes: H25; H73; H77

1. Introduction

The nexus of fiscal decentralization and economic development has long been debated in the fiscal federalism literature. Recent studies emphasize the role of local governments under decentralized economies (Bardhan and Mookherjee, 2006). In particular, fiscal incentives faced by local governments are deemed to have strong influences in shaping local policy choices, and consequently local economic development (Weingast, 2009).

This fiscal incentive hypothesis underlines the importance of local revenue generation. It is argued that fiscal arrangements allowing local governments to capture a large portion of local revenue are generally correlated with faster economic growth. This is because local governments care about revenue, and hence they tend to contemplate how best to generate revenue and take measures to maximize it in response to different fiscal arrangements (Oi, 1992, 1999; Jin et al., 2005; Goron and Li, 2012). Thus, a high tax revenue retention rate motivates local governments to promote economic development to obtain more revenue.

The existing empirical literature has provided either direct or indirect evidence in support of this hypothesis. For instance, Careaga and Weingast (2003) find that marginal revenue retention rates for local governments in Mexico are positively associated with real GDP growth in the country for the period 1980-1995. Singh and Srinivasan (2006) point out that local governments raising a larger portion of their own revenue have more incentives to stimulate the growth of tax revenue, which in turn stimulates local economic development in India. Indirect evidence from other federal countries such as Russia also shows that economic growth tends to be slow in countries lacking local incentives (Zhuravskaya, 2000). Many scholars have examined the case of China, where economic performance has been quite remarkable in recent decades.

Jin et al. (2005) show that China's fiscal contracting system in the 1980s provided local governments with strong fiscal incentives. During this period, a high overall economic growth was maintained, while provincial governments on average retained 89 percent of the additional tax revenues generated within their borders, and 68 percent of all provinces enjoyed a marginal retention rate of 100 percent. Consequently, subnational governments were inclined to provide market-enhancing public goods, to attenuate rent-seeking activities, and to be less corrupt (Oi, 1992, 1999; Weingast, 1995; Qian and Weingast, 1997). In addition, by exploiting an exogenous change in the intergovernmental revenue-sharing scheme in China, Han and Kung (2015) investigate in detail how the change in fiscal incentives for local governments induced them to shift their efforts from boosting industrialization to facilitating urbanization. Along the same lines, in this paper we study how local fiscal incentives might affect the extent of tax competition among local governments, and hence the choice of local tax policies in China.

China provides a unique institutional setting to study this issue. Tax legislation in China is highly centralized, with the central authority stipulating the uniform tax-sharing rules between the central and provincial governments. However, provincial governments have been granted substantial discretion in determining their own tax-sharing rules within their borders, which has actually given rise to a high level of variation in sub-provincial policy. This variation is so substantial that it creates varied fiscal incentives for local governments, significantly shaping local government behavior across provinces. Thus, we take advantage of this variation across provinces to examine how fiscal incentives in a province may affect the extent of local tax competition within that province; local tax competition is often considered to be a

crucial factor in explaining the rapid economic growth in China (Xu, 2011; Liu and Martinez-Vazquez, 2014).

To proceed, we first build a simple theoretical model under the tax competition framework to establish the linkage between the local tax-sharing ratio (a proxy of fiscal incentives faced by local governments) and the extent of local tax competition within provinces. We find that, in equilibrium, there exists a positive tax reaction function in the setting of local tax policies, and an increase in the local tax-sharing ratio tends to strengthen local jurisdictions' horizontal tax reactions. Empirically, we employ prefecture-city level panel data for the years 2004-2013 and a spatial lag model to test the prediction, where we find supporting evidence for it.

Our findings contribute to the literature in two aspects. First, we provide explicit evidence in support of the fiscal incentives hypothesis—fiscal incentives faced by local governments significantly shape their policy choices. While this hypothesis has been well discussed in the theoretical literature about fiscal federalism (see Weingast (2009) for a detailed review), few empirical studies have examined it rigorously. We complement this work by looking at how fiscal incentives may shape local government tax policies, which, in turn, also reveals a novel explanation for the observed heterogeneous tax polices across localities in China. Second, we are among the first to provide empirical evidence on local tax competition within provinces in China. Tax competition has long been regarded as one of the driving forces of China's rapid economic growth. However, most existing studies have mainly focused on tax competition across provinces (e.g., Liu and Martinez-Vazquez, 2014). Given that it is actually lower level governments (i.e., prefectural and county governments) that have the most responsibility in collecting revenue and conducting expenditures in China, an

examination of tax competition at the local level should provide a better picture for understanding this issue.

The rest of this paper is organized as follows. Section 2 provides a brief background on the fiscal institutions in China. Section 3 establishes a simple tax competition model and derives the main theoretical prediction. Section 4 develops the empirical methodology and discusses the data. Section 5 presents the empirical results. Finally, Section 6 concludes.

2. Institutional Background

China has maintained a hierarchical structure of governance since the formation of its current system in 1949. Currently, there are five levels of governments in China. Starting with the highest, these levels are the center, provinces, prefecture-level cities (hereafter, cities), counties, and townships. Under the hierarchical system, each subnational level of government is wholly subordinate to the next higher order of government. Thus, intergovernmental fiscal relationships are typically defined and implemented between the government at the corresponding level and its immediate upper level of government (i.e., center-managing-province, province-managing-others). In the meantime, general fiscal arrangements are only clearly defined between the central and province levels, while sub-provincial fiscal arrangements are not formalized by any laws or regulations. Instead, the central government grants provincial governments the discretion to set up their own intergovernmental fiscal relationships within the provinces. Practically, provincial governments have mostly followed the hierarchical system to determine their fiscal relationships within provinces (Martinez-

Vazquez et al., 2008). Thus, this institutional setup implies many different fiscal arrangements at the sub-provincial level depending on the specific province.

More specifically, the Chinese government implemented the tax-sharing system (TSS) reform in 1994. During the reform, all taxes were categorized into three categories: central taxes, local taxes, and shared taxes between the central and provincial governments. While central taxes are entirely retained by the central government, local taxes are exclusively obtained by local governments within the provinces.[2] Being the most important sources of revenue for the Chinese governments, the value-added taxes (VAT) and income taxes (including personal and corporate income taxes) are shared proportionally between the central government and provincial governments. In particular, the TSS reform defined the VAT sharing ratio as 75% to the central government and 25% to provincial governments. The sharing rule of income taxes between the central government and provincial governments has undergone two adjustments in 2002 and 2003, respectively. That is, the central government assigned to itself 50% of income taxes before 2002 and raised this ratio to 60% in 2003, with the rest allocated to provincial governments. Furthermore, the 1994 TSS reform only explicitly

[2] Central taxes include tariffs and tonnage taxes, excise taxes, and VAT levied by customs; excise and income taxes from enterprises that are subordinate to the central government; and income taxes from rail transportation, state post, state-owned commercial banks, and head offices of insurance companies. Local taxes include business and urban infrastructure taxes (other than from the headquarters of banks and insurance companies or rail transportation), income taxes from locally owned enterprises, urban land use taxes, taxes on the occupation of arable land, VAT on land, property and inheritance taxes, contract taxes, motor-vehicle and ship use taxes, agriculture taxes, banquet taxes, livestock slaughter taxes, farmland conversion taxes, and reorientation taxes on capital construction. Shared taxes include VAT (75% central: 25% local), personal and enterprise income taxes (50:50 in 2002; 60:40 from 2003), excise and urban infrastructure taxes (rail transportation as well as headquarters of banks and insurance companies 100% central, others 100% local), resource taxes (offshore 100% central, on land 100% local), and stamp taxes on security transactions (97% central: 3% local).

stipulated the tax sharing rules between the central government and provincial governments, leaving discretion for provincial governments to specify their own sharing rules for revenue retained at the sub-provincial level (including city, county, and township governments). In practice, the retained shared taxes (including 25% of the total VAT and 40% of total income tax) are usually shared in ad hoc negotiation ratios between provincial and sub-provincial governments across different provinces.[3] In Figure 1, we depict the average value of the corporate income tax-sharing ratio at the sub-provincial level across provinces for the sample period 2004-2013. As shown, the average retaining ratio at the sub-provincial level varied significantly across provinces, with a minimum value of 0.141 in Yunnan province and a maximum value of 0.332 in Zhejiang province. Thus, the great variation in tax-sharing ratios across provinces generates different fiscal incentives for local governments within the provinces, which significantly shapes local tax policies.

3. A Simple Model

Consider an economy consisting of two regions *i* and *j*. In each region, the local government chooses a tax rate t_i levied on mobile capital, which eventually determines the allocation of capital across regions. The economy implements a tax-sharing system where both regions share a proportion λ of their tax revenues.

In particular, we assume that each region has an immobile (representative) resident, who owns identical endowments with fixed amounts of an immobile factor (e.g., land or labor) $\bar{L}$ and fixed amounts of mobile capital $\bar{K}$. The production function in region *i* is given by $F_i = F(K_i, L_i)$, where K_i is the amount of mobile capital and L_i is the

[3] See Li (2010) for a comprehensive description of the sub-provincial fiscal system in China.

amount of a fixed production factor, such as labor or land. For analytical convenience, the fixed factor is normalized to unity and the production function can be simplified as $f(k_i)$, which is increasing, twice continuously differentiable, and concave in the level of capital k_i, i.e., $\frac{\partial f_i}{\partial k_i} > 0 > \frac{\partial^2 f_i}{\partial {k_i}^2}$. Without loss of generality, we follow Bucovetsky (1991) and Hindriks et al. (2008) to assume a quadratic specification of the production, which is well behaved over its increasing range and allows us to introduce several simplifications. Specifically, the production function is given by

$$f_i(k_i) = \alpha k_i - \frac{\beta}{2} {k_i}^2, \tag{1}$$

where β is the rate of decline of the marginal product of capital with the amount of capital invested in the region; technology parameter α is assumed to be sufficiently large relative to β, which ensures a positive level of production and the standard properties of the production function.

Since capital is perfectly mobile across regions, the market clearing condition implies that the net return of capital in the two regions must be equalized; that is,

$$\frac{\partial f_i}{\partial k_i} - t_i = \frac{\partial f_j}{\partial k_j} - t_j, \tag{2}$$

where $\frac{\partial f_i}{\partial k_i}$ denotes the marginal production of capital and t_i is the capital tax rate levied by region *i*. With equation (1) and the condition $k_i + k_j = 2\overline{k}$, we can solve (2) for the capital allocated in jurisdiction *i*:

$$k_i = \overline{k} + \frac{t_j - t_i}{2\beta}. \tag{3}$$

As indicated, the stock of capital in region *i* is decreasing in its own tax rate t_i and increasing in the tax rate of the other region t_j. To complete the model, we assume the governments are partially self-interested, caring about private income, government

revenue, and some combination of the two. That is, the objective function W_i of region *i* is the sum of private income and local tax revenue:

$$W_i = f_i(k_i) - \frac{\partial f_i}{\partial k_i} k_i + \lambda_i t_i k_i \,, \tag{4}$$

where $f_i(k_i) - \frac{\partial f_i}{\partial k_i} k_i$ is the return to the immobile factor (i.e., private income) and $\lambda_i t_i k_i$ represents local tax revenues, with λ_i ($0 \leq \lambda_i \leq 1$) being the capital tax-sharing ratio for local government *i*.

The problem of each region is to choose its capital tax rate t_i so as to maximize its objective function (4), subject to the capital allocation rule specified in equation (3). The first-order condition (FOC) gives

$$\frac{\partial W_i}{\partial t_i} = -\frac{1}{2} k_i + \lambda_i (k_i - \frac{t_i}{2\beta}) = 0. \tag{5}$$

Taking the derivative of $\frac{\partial W_i}{\partial t_i}$ with respect to t_i and t_j, respectively, and applying the Envelop Theorem to equation (6), we obtain

$$\frac{\partial {t_i}^*}{\partial {t_j}^*} = \frac{1-2\lambda_i}{1-4\lambda_i}. \tag{6}$$

Apparently, the slope of the tax reaction function of the regions depends on the value of the tax-sharing ratio, λ_i. To be more specific,

$$\frac{\partial (\frac{\partial {t_i}^*}{\partial {t_j}^*})}{\partial \lambda_i} = \frac{2}{(1-4\lambda_i)^2} > 0. \tag{7}$$

In sum, equations (6) and (7) provide the following proposition for empirical estimations.

Proposition 1. *(i) There exists a strategic interaction of local tax rates between regions; (ii) An increase in the local tax-sharing ratio, λ_i, will increase the sensitivity of the tax reaction function evaluated at the tax rate equilibrium.*

Intuitively, local governments react strategically in the setting of their tax policies because when region *j* increases its tax rate, it alleviates the competitive pressure on region *i* as this decision reduces the incentive of capital to relocate from *i* to *j*. Furthermore, a larger value of λ_i implies a higher retained rate of tax revenues at the local level, and hence a stronger incentive for the region to utilize tax policy to influence capital flow for a large tax base. Correspondingly, in the Chinese context, this theoretical exercise conveys a clear message that fiscal incentives, in the form of local tax sharing ratios, set by provincial governments (λ_i) do contribute to asymmetric tax policy responses across localities within provinces. In the subsequent sections, we utilize data from China for empirical evidence.

4. Empirical Methodology and Data

To test this theoretical prediction, which is explicitly summarized in Proposition 1, we rely on a panel dataset of prefecture-level cities over the period of 2004-2013 to conduct empirical estimations.

4.1. Econometric Specification

Tax competition theory suggests that the tax rate of city *i* in the year *t* is a reaction function of its neighboring cities' tax rates. We therefore employ a spatial lag specification in the most general form that has been widely used in the previous empirical research on tax competition (Devereux et al., 2008; Jacobs et al., 2010; Klemm and Van Parys, 2012):

$$\tau_{it} = \alpha\tau_{-it} + \beta\tau_{-it} \times TS_{pt} + \beta TS_{pt} + \gamma \mathbf{X}_{it} + \eta_i + tt_t + \epsilon_{it}, \qquad (8)$$

where τ_{it} is the effective corporate income tax rate of city i in year t, measured as the ratio of total corporate income taxes to GDP.[4] TS_{pt} is the corporate income tax sharing rate at the sub-provincial level in province p, to which city i is subordinate; since the tax-sharing rule at the sub-provincial level is the same for all cities within a province, we calculate it as the ratio of total retained corporate income tax revenues for all sub-provincial governments to total corporate income tax revenues generated in that province. τ_{-it} denotes the weighted average of corporate income tax rates of all other cities, j, in the same province as p, i.e., $\tau_{-it} = \sum_{j \neq i} \omega_{ij} \tau_{jt}$. Following the standard practice of the spatial econometrics literature, we define the exogenous weights as the inverse distance between the cities (i.e., $\frac{1}{d_{ij}}$) and normalize them so that the summation of all weights equal to 1, i.e., $\omega_{ij} = \frac{\frac{1}{d_{ij}}}{\sum_j \frac{1}{d_{ij}}}$. $\tau_{-it} \times TS_{pt}$, is the interaction term between the weighted average tax rate and the local corporate income tax sharing ratio; η_i is city-specific fixed effects, to allow for unexplained heterogeneity across prefectures that are constant over time; tt_t is a linear time trend; and ϵ_{it} is an idiosyncratic error term. Thus, a confirmation of Proposition 1 would predict a significant coefficient for α and a positive and significant coefficient for β.

$\mathbf{X}_{it}$ is a set of control variables that may influence the selection of (effective) corporate income tax rates by local governments based on the existing theoretical and empirical literature. These include real GDP per capita, the share of secondary industry in GDP, openness, urbanization, and population density. Real GDP per capita serves as

[4] Although tax legislation in China is highly centralized, there are high levels of administrative discretion for local governments to manipulate the effective tax rate on capital (Liu and Martinez-Vazquez, 2014).

a measure of income level. Higher incomes are generally related to greater demand for public services that may ultimately affect a city's choice of tax policies. The share of secondary industry to GDP captures the effect of economic structure. Openness, measured by the ratio of imports plus exports to GDP, points to the exposure of a city to trade and competition for capital. Finally, urbanization, defined as the share of urban population in the total population, and population density represent local demographic characteristics that may characterize a city's special needs for public goods and hence tax policies.

4.2. Estimation

In the estimation of specification (8), tax policies of the competitors enter contemporaneously, so that the competitors' tax decisions are endogenous and correlated with the error term (ϵ_{it}), which yields biased and inconsistent results if OLS or fixed effect estimators are applied (Anselin, 1988). To circumvent this problem, we employ an instrumental variables approach that has been used quite often in the recent studies on tax competition (e.g., Foucault et al., 2008; Jacobs et al., 2010; Klemm and Van Parys, 2012). That is, we use the competitors' weighted real GDP per capita, weighted share of secondary industry to GDP, weighted openness, weighted urbanization, and weighted population density as exogenous instruments for the spatial lag variable (τ_{-it}) in specification (8).

Additionally, in the estimations we include a linear time trend that captures a common trend for all cities, rather than time dummies. This is because the inclusion of time dummies in a model with spatial lag variables results in a possible multicollinearity issue among the spatial lag variables and the time dummies, which makes it hard to identify the true impact of each variable (Devereux et al., 2008; Klemm and Van Parys, 2012).

4.3. Data

The panel dataset we use for the quantitative analysis covers 279 prefecture-level cities in China for the years 2004-2013. We exclude the four province-level municipality cities, Beijing, Tianjin, Shanghai, and Chongqing, as the legal status of these municipalities is non-comparable to other regular cities. Cities in Tibet are also excluded from the sample because of data unavailability. Given the significant change in the corporate income tax-sharing rule in 2003 at the central-provincial level, we select 2004 as the starting period in our analysis.

Data used for the calculations of the key variables are taken from various issues of the *China City Statistical Yearbooks,* the *China Statistical Yearbook for Regional Economy,* and the *China Taxation Yearbooks.* Table A1 in the Appendix provides a detailed description and sources of all the variables, while their summary statistics are reported in Table 1.

5. Results

5.1. Main Results

Table 2 presents the estimation results for our main specification (8). To begin with, we estimate the model by using a fixed effects approach assuming no endogeneity issue of the spatial lag variable (i.e., the weighted average tax rates). Columns (1) and (2) report the corresponding results from estimations controlling and not for the linear time trend. Consistent with the prediction of Proposition 1(i), we find a positive and statistically significant coefficient for the competitors' weighted average tax rates, suggesting the existence of tax competition among city governments within the provinces. Additionally, the estimated coefficient of the interaction term between the weighted average tax rates and the tax-sharing ratio is also positive and statistically significant,

confirming Proposition 1(ii) in the sense that a larger share of corporate income tax at the sub-provincial level strengthens tax competition among city governments.

However, these results from the fixed effects estimations are very likely to be biased due to the fact that the competitors' weighted average tax rate is endogenous. Therefore, we now resort to the instrumental variables estimations, where the competitors' weighted average tax policy τ_{-it} is instrumented by the competitors' weighted average for the explanatory variables. The results are reported in Columns (3) and (4) of Table 2. As shown, the estimated coefficients of the key variables of interest, the weighted average tax rate and its interaction term with the local tax sharing ratio, both remain positive and statistically significant. This suggests that our theoretical prediction still holds true. Quantitatively, the estimated coefficient of the weighted average tax rates is around 0.6 in all specifications, which is well below one, hence ensuring the stationarity of the spatial lag model. The magnitude of the interaction term becomes quantitatively larger when the endogeneity concern of the weighted average of tax rates is controlled for.

While the results obtained above are clearly informative, they remain somewhat limited. After all, the results do not directly indicate the net slope of the tax rate reaction function over the range of the local corporate income tax sharing ratio.[5] Therefore, based on our preferred specification in Column (4) of Table 2, we graphically illustrate in Figure 2 the net slope of the tax reaction function across the observed range of local tax sharing ratio. The solid sloping line indicates how the net slope of the tax reaction function changes as the local

[5] In the specifications with interaction terms, the statistical significance of an individual variable does not necessarily imply that the marginal effect of it is statistically significant (see Brambor et al. 2006).

corporate income tax sharing ratio increases, while the two dashed lines represent the 95% confidence intervals. As shown, the net slope of the tax reaction is positive and statistically significant over the entire range of the local tax sharing ratio, confirming the existence of strong tax competition across localities within provinces.

For the other control variables, the estimated coefficient of real GDP per capita in Column (4) of Table 2 is negative, potentially suggesting that richer cities might be capable of offering more tax credits and/or other benefits to compete for capital. The share of secondary industry in GDP has a positive and statistically significant coefficient, which may reflect the simple fact that corporate income taxes are mainly collected from the secondary sector. Finally, openness, urbanization, and population density are all positively correlated with the effective corporate income tax rate, yet they are generally not statistically significant in our estimations.

5.2. Robustness

In order to test for the robustness of the main results, we conduct a sensitivity analysis along two dimensions. First, we employ three alternative weighting matrices that are beyond the geographical criteria initially proposed by Devereux et al. (2008) to define tax competition patterns among cities within a province. These include uniform weights (i.e., the simple average of all other cities in the province); weights based on the size of the city economy, measured by total population in year 2000 (i.e., pop_{j2000}), that is, $\omega_{ij} = \frac{pop_{j2000}}{\sum_j pop_{j2000}}$; and weights intended to simultaneously capture the geographical distance between two cities and the size of the city economy, that is, $\omega_{ij} = \frac{\frac{1}{d_{ij}} * pop_{j2000}}{\sum_j \frac{1}{d_{ij}} * pop_{j2000}}$.

In the second dimension we exploit two alternative subsamples that are restricted so as to be more comparable, and hence, less likely to be subject to certain heterogeneous effects. First, we exclude from the sample cities located in minority autonomous provinces. In these provinces, minority ethnic groups make up the majority of total population, and so the primary policy objective of these provincial governments tends to be pursuing social stability by reducing ethnic conflict, rather than pursing local economic growth through tax competition. Second, we restrict our estimations to a reduced sample size that excludes the capital city of each province. The rationale here is that the legal status of a capital city is not really comparable to other prefecture cities in the same province since they may differ dramatically in terms of administrative and fiscal status. In addition, since provincial governments are physically located in capital cities and since these cities are also generally endowed with the best economic and political resources for development, we expect that capital cities may be less involved in competition with other prefecture cities.

Tables 3 and 4 present the corresponding estimation results for the robustness check. As shown, in all estimations, our main results remain mostly unchanged—the weighed tax rate of the competitors is positively and significantly associated with the effective tax rate of a city, and the estimated coefficient of the interaction term is also persistently positive. This confirms our main argument in the paper that there exists strong tax competition among local governments within provinces in China, and the extent of the competition tends to be strengthened by a higher level of fiscal incentives for local governments.

6. Concluding Remarks

The fiscal decentralization literature has emphasized that fiscal incentives play an important role in shaping local government behaviors and thereby affecting local economic performance. Our paper aims to provide supporting evidence for this by studying how local tax competition in China may be affected by the tax-sharing rules set up by provincial governments. To this end, we first build a simple tax competition model to show that the slope of the tax rate reaction function among local jurisdictions is increasing with the local tax sharing ratio. We then test this theoretical hypothesis by using a spatial lag model and a city-level panel dataset for the period 2004-2013. Our results indicate that positively strategic tax interactions exist among city governments within provinces and that an increase in the tax sharing ratio at the sub-provincial level intensifies the detected strategic tax interaction among city governments. These results largely support our theoretical predictions.

Our findings have significant policy implications. First, tax competition among subnational governments is often considered to be a crucial factor in explaining the rapid economic growth in China. Evidence on the existence of inter-jurisdictional tax competition, however, is still rare, and much of the evidence is at the cross-provincial level. Our study, thus, complements the literature with evidence on local tax competition within provinces. Second, if rigorous tax competition among localities and the associated distortion of local tax policies is deemed undesirable by national authorities, there will be a need to recentralize the tax-sharing rules to organize fiscal incentives for local governments, and hence the distortionary behaviors of local governments.

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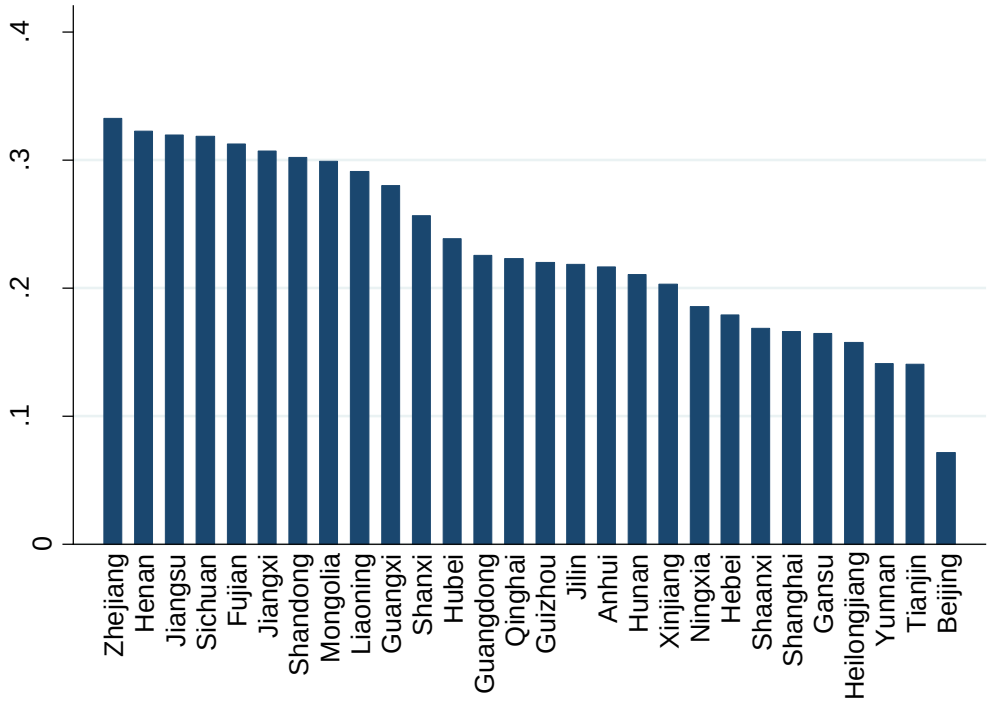

Figure 1. Mean of Local Corporate Income Tax (CIT) Sharing Ratio (2004-2013)

Note: Local corporate income tax is defined as the ratio of total retained corporate income tax revenues for all sub-provincial governments to total corporate income tax revenues generated in that province.

Source: Authors' calculation

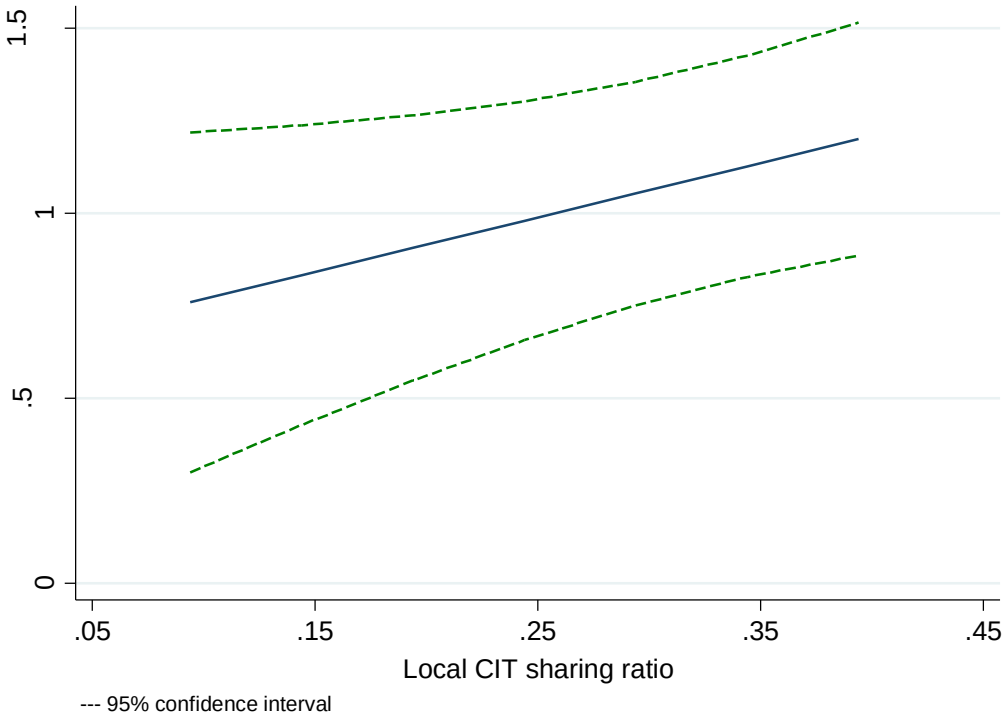

Figure 2. Estimated slope of tax reaction function conditional on local CIT sharing ratio

Note: These slopes are calculated basing on specification (4) of Table 2

TABLE 1. Summary Statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
Effective tax rate	3206	0.443	0.342	0.043	1.932
Weighted tax rate of neighbors	3242	0.449	0.237	0.057	1.868
Local CIT sharing ratio	3242	0.245	0.070	0.094	0.438
GDP per capita	3234	9.671	0.805	7.569	12.722
Openness	3112	0.196	0.346	0.001	2.297
Industrialization	3241	0.481	0.122	0.165	0.807
Urbanization	2779	0.352	0.191	0.100	0.998
Population density	2790	0.125	0.021	0.084	0.173

Notes: Time period is 2004-2013.

TABLE 2. Fiscal Incentives and Tax Competition: Main Results

	Fixed Effects		Fixed Effects + IV	
	(1)	(2)	(3)	(4)
Weighted tax rate of neighbors	0.576***	0.537***	0.649**	0.621**
	(-7.504)	(-6.855)	(-2.208)	(-2.01)
Weighted tax rate of neighbors*Local CIT sharing ratio	0.442*	0.519**	1.742*	1.471*
	(-1.827)	(-2.131)	(-1.695)	(-1.819)
Tax-sharing ratio	0.248*	0.191	-0.915*	-0.678*
	(-1.737)	(-1.32)	(-1.725)	(-1.721)
GDP per capita	0.043***	-0.011	-0.048*	-0.053*
	(-3.655)	(-0.459)	(-1.733)	(-1.851)
Industrialization	0.001*	0.002**	0.003***	0.003***
	(-1.775)	(-2.219)	(-3.246)	(-3.248)
Openness	0.049	0.052	0.032	0.037
	(-1.517)	(-1.605)	(-0.956)	(-1.126)
Urbanization	0.05	0.047	0.069	0.065
	(-1.049)	(-0.996)	(-1.37)	(-1.285)
Population density	0.120***	0.076**	0.068*	0.059
	(-3.986)	(-2.178)	(-1.958)	(-1.64)
City fixed effects	Yes	Yes	Yes	Yes
Time trends	No	Yes	No	Yes
Observations	2,760	2,760	2,748	2,748
R-squared	0.472	0.473	0.431	0.448
Number of cities	279	279	278	278
Cragg-Donald F-statistics	-	-	14.71	12.21
Hansen test (p-value)	-	-	0.754	0.742

Notes: Robust *t*-statistics in parentheses. ***, ** and * denote significance at the 1 percent, 5 percent and 10 percent level, respectively.

TABLE 3. Robustness Checks: Alternative Weighting Matrices

	Weight I		Weight II		Weight III	
	(1)	(2)	(3)	(4)	(5)	(6)
Weighted tax rate	0.615**	0.539*	0.609**	0.516*	0.719***	0.558*
of neighbors	(-2.212)	(-1.771)	(-2.496)	(-1.722)	(-2.788)	(-1.743)
Weighted tax rate*Local CIT sharing ratio	1.51†	1.196†	1.401**	1.314*	1.405**	1.559**
	(-1.477)	(-1.495)	(-2.035)	(-1.869)	(-1.961)	(-2.082)
Local CIT sharing ratio	-0.687	-0.362	-0.564*	-0.411	-0.716**	-0.668**
	(-1.260)	(-0.891)	(-1.694)	(-1.302)	(-2.064)	(-2.011)
GDP per capita	-0.027	-0.032	-0.023	-0.043	-0.047	-0.062**
	(-0.959)	(-1.130)	(-0.819)	(-1.502)	(-1.557)	(-2.055)
Industrialization	0.003***	0.002***	0.003***	0.003***	0.003***	0.003***
	(-2.708)	(-2.616)	(-3.046)	(-3.024)	(-3.457)	(-3.491)
Openness	0.028	0.037	0.076**	0.081**	0.094***	0.095***
	(-0.857)	(-1.107)	(-2.144)	(-2.325)	(-2.592)	(-2.687)
Urbanization	0.049	0.043	0.06	0.053	0.08	0.07
	(-1.005)	(-0.896)	(-1.157)	(-1.035)	(-1.503)	(-1.316)
Population density	0.082**	0.070*	0.088**	0.066*	0.075**	0.057
	(-2.387)	(-1.955)	(-2.458)	(-1.791)	(-2.009)	(-1.514)
City fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Time trends	No	Yes	No	Yes	No	yes
Observations	2,748	2,748	2,720	2,720	2,720	2,720
R-squared	0.452	0.467	0.404	0.426	0.377	0.403
Number of id	278	278	275	275	275	275
Cragg-Donald F-statistic	11.17	12.11	16.37	8.627	14.16	7.512
Hansen test (p-value)	0.597	0.612	0.567	0.318	0.359	0.332

Notes: Robust *t*-statistics in parentheses. ***, ** and * denote significance at the 1 percent, 5 percent and 10 percent level, respectively. †represents that the variable is jointly significant at the 5% level. Weight I, Weigh II, Weight III represent uniform weights (i.e., the simple average of all other cities in the province), weights based on the size of the city economy, and weights based on both geographical distance between two cities and the size of the city economy, respectively.

TABLE 4. Robustness Checks: Alternative Subsamples

	Non-minority provinces		Non-capital cities	
	(1)	(2)	(3)	(4)
Weighted tax rate of neighbors	0.811***	0.660**	0.479†	0.503†
	(-2.721)	(-2.027)	(-1.603)	(-1.581)
Weighted tax rate*Local CIT sharing ratio	1.6†	1.596*	2.675**	2.196***
	(-1.49)	(-1.87)	(-2.537)	(-2.608)
Local CIT sharing ratio	-1.058*	-0.879*	-1.672***	-1.327***
	(-1.764)	(-1.833)	(-2.991)	(-3.183)
GDP per capita	-0.074**	-0.081***	-0.072**	-0.075**
	(-2.449)	(-2.652)	(-2.510)	(-2.532)
Industrialization	0.004***	0.004***	0.004***	0.004***
	(-3.555)	(-3.628)	(-4.29)	(-4.315)
Openness	0.056	0.064*	0.001	0.009
	(-1.542)	(-1.78)	(-0.031)	(-0.265)
Urbanization	0.134**	0.125**	0.068	0.066
	(-2.32)	(-2.179)	(-1.261)	(-1.234)
Population density	0.047	0.033	0.06	0.052
	(-1.249)	(-0.821)	(-1.441)	(-1.237)
City fixed effects	Yes	Yes	Yes	Yes
Time trends	No	Yes	No	Yes
Observations	2,457	2,457	2,512	2,512
R-squared	0.412	0.439	0.397	0.421
Number of cities	248	248	254	254
Cragg-Donald F-statistics	12.13	8.105	13.85	11.79
Hansen test (p-value)	0.779	0.836	0.738	0.649

Notes: Robust *t*-statistics in parentheses. ***, ** and * denote significance at the 1 percent, 5 percent and 10 percent level, respectively. †represents that the variable is jointly significant at the 5% level. "Non-minority provinces" represents the subsample that excludes cities located in minority autonomous provinces. "Non-capital cities" represents the subsample that excludes the capital city of each province.

Appendix

TABLE A1. Description of Variables and Sources

Variable	Definition	Source
Effective tax rate	The ratio of the total corporate income taxes to GDP	the China City Statistical Yearbooks
Weighted tax rate of neighbors	The weighted average of effective tax rates of all other cities in the same province, weighted by inverse distance	Authors' calculation
Local CIT sharing ratio	The ratio of total retained corporate income tax revenues for all sub-provincial governments to total corporate income tax revenues generated in that province	the China Statistical Yearbook for Regional Economy, the China Taxation Yearbook, and authors' calculation
GDP per capita	Real GDP per capita	the China City Statistical Yearbooks
Openness	The ratio of imports plus exports to GDP	the China City Statistical Yearbooks
Industrialization	The share of secondary sector in total GDP	the China City Statistical Yearbooks
Urbanization	The share of urban population in total population	the China City Statistical Yearbooks
Population density	Population density	the China City Statistical Yearbooks