China Economic Review 59 (2020) 101371

Contents lists available at ScienceDirect

China Economic Review

journal homepage: www.elsevier.com/locate/chieco

Fiscal incentives, competition, and investment in China☆

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ARTICLE INFO

Keywords:
Fiscal incentives
Local tax competition
Investment
China

JEL classification:
H72
H77
O16
R53

ABSTRACT

This paper explores how fiscal incentives offered to local governments in China affect investment rates in their jurisdictions. Theoretically, we build a simple fiscal competition model to establish the linkage between local fiscal incentives and expenditure policy and consequently, capital movement. The key prediction of the model, borne out by data from Chinese provinces spanning 2004–2013, is that an increase in the local corporate income tax-sharing ratio, which proxies fiscal incentives offered to local governments, motivates local governments to compete for capital investment through increased public expenditure. Our results contribute to the literature on both fiscal federalism and state capacity by showing that local fiscal incentives significantly shape policy choices and local economic performance. In addition, by exploring fiscal incentives offered to local governments, we offer a novel explanation for the unusually high investment rate in China that has been sustained over a prolonged period.

1. Introduction

The investment rate in China has remained at an unusually high level since the start of the country's market reforms in 1978. Gross fixed capital formation averaged 35.4% of GDP between 1980 and 2015, compared to 23.1% in OECD countries and 22.6% in other developing countries for the same period (see Fig. 1).[1] What is the explanation for this high investment rate in China? A significant amount of research has been devoted to understanding this and the country's remarkable economic growth over the past decades. In particular, early studies have identified several important contributors, including the attractive return on investment (e.g., Bai, Hsieh, & Qian, 2006), the high saving rate in the economy (e.g., Barnett & Brooks, 2006), the vast labor surplus in rural areas, the relatively low cost of credit provided by the state banking system (e.g., Gong & Lin, 2008), the expansion of non-state sectors (e.g., Barnett & Brooks, 2006), and high expectation and investment confidence (e.g., Knight & Ding, 2010). Recent studies

☆ This paper is supported by the National Natural Science Foundation of China (No. 71773128, No. 71533006), the MOE Project of Key Research Institute of Humanities and Social Sciences at Universities (No. 16JJD790058), and the Fok Ying Education Foundation (No. 151085). Some of this work was conducted when Yongzheng Liu was a visiting researcher at the Bank of Finland's Institute for Economies in Transition (BOFIT). We are grateful to the anonymous referee and the co-editor (Zheng Michael Song) for many helpful comments and suggestions that have substantially improved the paper.

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[1] The data are from the 2017 World Development Indicators of the World Bank.

https://doi.org/10.1016/j.chieco.2019.101371
Received 14 August 2018; Received in revised form 18 October 2019; Accepted 25 October 2019
Available online 30 October 2019
1043-951X/

Fig. 1. Investment rates around the world, 1980–2015.
Source: World Development Indicators Database.

have emphasized the importance of Chinese political and fiscal institutions, which successfully foster strong incentives for local governments to aid business and thus compete for capital investment for promoting local economic development (e.g., Gordon & Li, 2011; Xiong, 2018; Xu, 2011).[2]

Politically, since local government officials in China are appointed by the upper level government, the central authority maintains absolute control in the promotion or dismissal of local officials based on criteria strongly associated with improved economic performance. As a result, motivated by their aspiration to progress within the government hierarchy, local officials have had strong political incentives to promote the local economy in order to stay ahead in terms of the professional career ladder. Beyond political incentives, strong fiscal incentives significantly affect local governments' policy choices and, as a result, investment and economic performance in their jurisdictions. This is largely attributed to Chinese fiscal institutions. Starting from the early-1980s, the previous fiscal system of "unified revenue collection and unified spending" (*tongshou tongzhi*) was replaced by the so-called "fiscal contracting system" (*caizheng chengbao zhi*), in which each province was assigned an independent responsibility to collect tax revenues in its domain and was entitled to retain a significant portion of the revenues, that is, any residual "fiscal profits," after they fulfilled the predetermined sharing schemes. Local officials were therefore motivated by incentive contracts to promote local business development, which eventually increased their residual "fiscal profits" (Oi, 1992). After over a decade of the "fiscal contracting system," in 1994 the central government launched a new round of fiscal reforms featuring a tax-sharing scheme between the central and local governments that is still in effect today. These reforms largely recentralized revenue assignments, while keeping the assignment of expenditure responsibilities virtually unchanged. As a consequence, local officials experienced mounting fiscal pressures regarding financing their expenditure needs. This added to the increase of local incentives to support business development to increase local and shared revenues.[3]

This paper aims to explore this latter (fiscal) mechanism, that is, the strong fiscal incentives implied by the tax-sharing system (TSS) for local governments to promote investment in their jurisdictions.[4] In particular, we build a simple theoretical model under the fiscal competition framework to establish the linkage between the tax sharing ratio at the sub-provincial level (a proxy of fiscal incentives offered to local governments) and the investment rates in the provinces. In the model we demonstrate that a higher tax-sharing rate to local governments increases local retained tax revenues, which provides more incentives for local governments to support business development (by increased government expenditures) to attract more capital investment. Relying on a provincial-level panel dataset, we use both fixed effects estimation and instrumental variables estimation to test the theoretical predictions empirically. We find supporting evidence that the corporate income tax (CIT) sharing ratio at the sub-provincial level is positively associated with the level of investment in the provinces; we then show that the effect is heterogeneous across investments by firms with different ownerships, which, in turn, is explained by our extended theoretical model. In particular, the CIT sharing ratio at the sub-provincial level and hence the fiscal incentives offered to local governments have a larger quantitative effect on promoting

[2] In particular, in what he defined as the "Mandarin" model of growth, Xiong (2018) explicitly shows how the strong incentives induced by the economic tournament among regional governors in China have led local governments to make more investment on infrastructure for promoting regional economic growth. Equally importantly, he demonstrates that these incentives have also led local governments to engage in short-termist behaviors such as overreporting GDP and excessive use of leverage, which, in turn, threaten China's economic and financial stability.

[3] Weingast (2009) also highlights that whatever the goals of subnational officials, greater revenue relaxes their budget constraint, allowing them to further their goals. Political officials of all ranks are therefore biased toward policies that increase their revenue, allowing them to finance more activities.

[4] In this paper, fiscal incentives refer to the proportion of local generated fiscal revenues that can be retained by local governments (i.e., sub-provincial governments).

investment by state-owned enterprises (SOEs) than investment by non-state-owned enterprises (non-SOEs), due largely to the easier access to credits and the more effective government expenditures obtained by the former than that of the latter. Finally, we shed light on the argument that government expenditures potentially act as an important conduit for local fiscal incentives to affect investment rates in their domains.

The paper contributes to the literature in three aspects. First, we provide evidence that fiscal incentives offered to local governments significantly shape their policy choices, which has been the central argument of the "second generation fiscal federalism" literature (see Weingast (2009) for a review). China provides a unique institutional setting to study this issue. This is because provincial governments in China have been granted substantial discretion in determining their own tax-sharing rules within their borders, which has given rise to a high level of variation in sub-provincial treatments. This variation is so substantial that it creates wide-ranging incentive effort for local governments to attract investment. In this regard, we also contribute to the literature by proposing a more accurate measure to capture fiscal incentives offered to local governments — the actual tax-sharing ratio at the *sub-provincial* level for each province, which fully reflects the discretionary policy across the provinces.

Second, we add to the literature on the impact of China's fiscal decentralization policy. Over the past decade, there has been growing interest in China's fiscal decentralization policy, especially with respect to its potential impact on economic growth and regional inequality (e.g., Lin & Liu, 2000; Liu, Martinez-Vazquez, & Wu, 2017; Song, 2013; Zhang, 2006; Zhang & Zou, 1998). However, the role of fiscal decentralization in providing incentives for local officials to compete for capital investment has not been directly tested. In this respect, our paper is among the first to explicitly establish the relationship between provincial tax-sharing rules and investment rates in the provinces. Along the same line, by exploring fiscal incentives offered to local governments, we offer a novel explanation for the unusually high investment rate in China, which has been maintained for a prolonged period.

Lastly, our paper is also related to the recent literature on state capacity for what we show that when (local) governments are confronted with higher revenue potentials, they tend to support market development to a larger extent by making more public investment. This is in line with the key argument on the complementary in building different state capacities — that is, when further fiscal capacity is higher (i.e., a higher tax-sharing ratio in our context), additional fiscal benefits provide stronger incentives for governments to invest more market-supporting capacity to expand market income and prospective higher tax base (Besley & Persson, 2009, 2011, 2014).

The rest of the paper is organized as follows. Section 2 provides a brief background on the fiscal institutions in China and builds a simple theoretical model to establish the linkage between local fiscal incentives and investment rates in the regions. Section 3 describes the empirical strategy and data. Section 4 presents the main empirical results, the effect of heterogeneity, and the potential mechanism of impact. Section 5 concludes the paper.

2. Institutional background and theoretical considerations

2.1. Institutional background

China has maintained a hierarchical structure of governance since the formation of its current system in 1949. There are currently five levels of government 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, such as center-managing-province and province-managing-others. In the meantime, general fiscal arrangements are only clearly defined between the central and provincial 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, Qiao, & Zhang, 2008). Thus, this institutional setup implies many different fiscal arrangements at the sub-provincial level that depend on the specific province.

More specifically, the Chinese government implemented the 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 retained by the central government, local governments exclusively retain local taxes within the provinces. Being the most important sources of revenue for the Chinese governments, value-added taxes (VAT) and income taxes (including personal and corporate income taxes) are shared proportionally between the central 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 income tax-sharing rule has undergone two adjustments, one in 2002 and one in 2003. Before 2002, the central government assigned 50% of income taxes to itself and in 2003, it raised this ratio to 60%, with the rest allocated to provincial governments. Furthermore, the 1994 TSS reform only explicitly stipulated the tax-sharing rules between the central and provincial governments, leaving provincial governments the discretion 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 via ad hoc negotiation ratios between provincial and sub-provincial governments across different provinces.[5] As shown in Table 1, the mean of the corporate income tax (CIT) sharing ratio at the sub-provincial level across provinces for the sample period 2004–2013 is

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

Table 1
Summary statistics.

Variable	Obs	Mean	Std. dev.	Min	Max
Invest	280	0.554	0.178	0.243	1.267
Invest_fcf	280	0.509	0.144	0.284	1.298
Invest_central	280	0.050	0.040	0.007	0.203
Invest_noncentral	280	0.456	0.179	0.186	1.110
Invest_soe	224	0.185	0.090	0.058	0.588
Invest_nonsoe	224	0.402	0.133	0.159	0.797
CITsp	271	0.233	0.077	0.056	0.429
CITsp_simuIV	271	0.235	0.081	0.060	0.492
SD_Edu	280	0.009	0.005	0.003	0.059
GDP per capita, log	280	5.297	0.605	3.702	6.596
Secondary industry	280	48.794	6.806	22.300	60.133
Openness	280	0.354	0.438	0.036	1.722
Urbanization	280	0.373	0.171	0.158	0.906
Finance	280	1.037	0.362	0.000	2.555
Young population	280	23.725	7.210	9.600	44.700
Old population	280	12.183	2.214	7.400	20.300
Age of leader	280	59.711	4.340	47.000	70.000
Govexp	280	0.195	0.088	0.079	0.612

0.233, with a minimum value of 0.056 and a maximum value of 0.429. Thus, the significant variation in tax-sharing ratios across provinces generates different fiscal incentives for local governments within the provinces, which significantly influences their behaviors.

2.2. Theoretical considerations

2.2.1. Basic setup of the model

Based on the institutional setup of the Chinese fiscal system, in this subsection we establish a simple theoretical model based on Cai and Treisman (2005) to examine how local fiscal incentives, captured by local tax-sharing ratio, may affect government expenditures and, as a result, capital investment in the regions.

Consider an economy consisting of N regions, indexed by i. In each region, a representative firm produces a numeraire output that can be used either for private or government consumption. More specifically, the production function of the representative firm (and so the region) is given by the standard Cobb-Douglas form,

$$F_i = Ak_i^{\alpha} G_i^{\beta} \tag{1}$$

where $\alpha + \beta < 1$,[6] $\alpha > 0$, $\beta > 0$, and $A > 0$. k_i is the amount of perfectly mobile capital; G_i is the amount of public expenditure made by the regional government that enhances the productivity of private capital; A is the firm's technology parameter that reflects its initial productivity.[7]

Following Cai and Treisman (2005), we assume the governments to be partially self-interested, in which case governments care about private consumption, government consumption (i.e., the incumbent officials' consumption of budget funds), or some combination of the two. That is, the objective of each region is to maximize the payoff function,

$$U_i = (1 - t)F_i + \lambda c_i \tag{2}$$

where t is the ad valorem tax rate on output in region i and it is assumed to be fixed and coordinated by the central government for all i.[8] $(1 - t)F_i$ represents the disposable private consumption; c_i refers to government consumption. $\lambda > 0$ measures governments' preference for government consumption relative to private consumption.

As what we described in the previous subsection, regional governments in China use their retained tax revenues ($s_i t F_i$) to finance public expenditure (G_i) and government consumption (c_i). Thus, the budget constraint of each region is given by,

$$G_i + c_i = s_i t F_i \tag{3}$$

where s_i $(0 \leq s_i \leq 1)$ is the retained rate of tax revenue for regional government i. This latter parameter is determined by the upper-level government and is therefore exogenously given.

We then examine a game in which all regional governments simultaneously choose the levels of G_i, and then the investors make the decisions on where to invest their capital k_i. In the equilibrium, we particularly focus on the impact of the tax-sharing ratio for

[6] For analytical convenience, other fixed factors such as land or labor are normalized to unity and so not included in the production function. The assumption that $\alpha + \beta < 1$, therefore, reflects this point.

[7] For now, we assume the technology is the same for all firms in the region; in Section 2.2.3, we extend the model to consider two types of firms (private firms and SOEs) that are differentiated in several dimensions to better characterize the Chinese economy.

[8] Tax legislation in China is highly centralized, with the central government setting uniform statutory tax rates across all local jurisdictions.

regional governments and how this impact may be heterogenous across different types of firms.

2.2.2. Equilibrium

Since capital is assumed to be perfectly mobile across regions, the market clearing condition implies an allocation of capital across regions such that its net return in all regions is equalized to the given economy-wide net return to capital (r),[9] that is,

$$(1-t)\frac{\partial F_i}{\partial k_i} = r \tag{4}$$

where $\frac{\partial F_i}{\partial k_i}$ denotes the marginal product of capital and the net return of capital is assumed to be positive in order to ensure a non-zero allocation of capital in each region (i.e., $r > 0$). With Eqs. (1) and (2), we can solve for the capital allocated in region i to obtain $k_i = \left[\frac{1}{r}A\alpha(1-t)G_i^{\beta}\right]^{\frac{1}{1-\alpha}}$. As indicated, capital investment in region i is determined by both exogenous initial productivity (A) and endogenous public expenditure policy (G_i).

The problem of each region is to choose G_i independently so as to maximize its objective function (Eq. (2)), subject to its budget constraint (Eq. (3)). The resulting equilibrium of investments on public expenditure and capital allocation are given as follows.

$$G_i^* = (A\tau_i^{\alpha-1}r_i^{-\alpha}B)^{\frac{1}{1-\alpha-\beta}} \tag{5}$$

$$k_i^* = (A\tau_i^{-\beta}r_i^{\beta-1}H)^{\frac{1}{1-\alpha-\beta}} \tag{6}$$

where, with the property that $\frac{\partial \tau_i}{\partial s_i} < 0$; $B = \alpha^{\alpha}(1-\alpha)^{\alpha-1}(1-t)^{\alpha}\beta^{1-\alpha}$; $H = \alpha^{1-\beta}(1-\alpha)^{-\beta}(1-t)^{1-\beta}\beta^{\beta}$. Therefore, Eqs. (5) and (6) provide the following proposition for empirical testing.

Proposition 1. *In equilibrium, a region's public expenditure $G_i^*$and so the capital investment $k_i^*$is increasing in the tax-sharing ratio for the region s_i.*

Intuitively, a larger value of s_i implies a higher retained rate of tax revenue at the regional level and therefore a stronger incentive for the locality to utilize government expenditure policy to influence capital flows for a larger tax base. In the Chinese context, this conveys a clear message that local fiscal incentives, in the form of local tax-sharing ratios, help to explain the variation in capital investment across provinces.

2.2.3. An extension

To better characterize the Chinese economy, we now extend the model to consider the stylized fact that there are broadly two different types of firms in a region, that is, private firms (or non-SOEs) and SOEs. While both types of firms contribute significantly to the growth of the Chinese economy over the past decades, they differ in the following aspects: (i) private firms are, in general, more productive but have less access to external credits than do the SOEs; (ii) private firms may obtain less direct benefits from government expenditure than do the SOEs.[10]

To capture this, instead of assuming a single representative firm in a region, we now assume that there are two representative firms — one is the private firm and the other is the SOE, and so the aggregate production function of the region is modified to,

$$F_i = A_1 k_{1i}^{\alpha} G_i^{\beta} + A_2 k_{2i}^{\alpha}(\theta G_i)^{\beta} \tag{7}$$

where 1 represents the SOE and 2 is the private firm. By definitions, private firm has a higher initial productivity than the SOE and hence; the amount of public expenditure for SOE is normalized, and so the positive parameter $0 < \theta \leq 1$ captures the relative benefit of government expenditure obtained by the private firm. Lastly, since private firms face financial constraints and lending to this group of firms is subject to an iceberg cost $0 \leq v < 1$ such as additional operational costs and red tape,[11] the new market equilibrium is characterized by,

$$(1-t)\frac{\partial F_i}{\partial k_{1i}} = r \tag{8}$$

$$(1-t-v)\frac{\partial F_i}{\partial k_{2i}} = r \tag{9}$$

With Eqs. (7), (8) and (9), we can solve for the capital investment in two types of firms in the region to obtain,

$$k_{1i} = \left[\frac{1}{r}A_1\alpha(1-t)G_i^{\beta}\right]^{\frac{1}{1-\alpha}} \tag{10}$$

[9] Here, we basically assume that each region is small relative to the whole economy.

[10] In another word, government expenditure may bias toward benefit more the SOEs. Practically, government expenditures include investment on public infrastructures, tax expenditures, and even government subsidies that help improve productivity or profitability of firms. Given the institutional fact that SOEs make up a larger part of the Chinese economy and they are either directly or indirectly controlled by governments, they usually enjoy more special treatments from the government policies.

[11] See Song, Storesletten, and Zilibotti (2011) for a similar setup.

$$k_{2i} = \left[\frac{1}{r}A_2\alpha(1-t-v)\theta^{\beta}G_i^{\beta}\right]^{\frac{1}{1-\alpha}} \tag{11}$$

Analogously, the objective of each region remains to maximize Eq. (2), subjecting to the budget constraint of Eq. (3) along with the new capital determining Eqs. (10) and (11), we subsequently end up with the new equilibrium as,

$$G_i^* = \left\{\left[A_1^{\frac{1}{1-\alpha}}(1-t) + A_2^{\frac{1}{1-\alpha}}(1-t-v)\theta^{\frac{\beta}{1-\alpha}}\right]^{\beta} W_{1i}\right\}^{\frac{1-\alpha}{1-\alpha-\beta}} \tag{12}$$

$$k_{1i}^* = \left\{[A_1(1-t)]^{\frac{1-\alpha-\beta}{1-\alpha}}\left[A_1^{\frac{1}{1-\alpha}}(1-t) + A_2^{\frac{1}{1-\alpha}}(1-t-v)\theta^{\frac{\beta}{1-\alpha}}\right]^{\beta} W_{2i}\right\}^{\frac{1}{1-\alpha-\beta}} \tag{13}$$

$$k_{2i}^* = \left\{[A_2(1-t-v)]^{\frac{1-\alpha-\beta}{1-\alpha}}\theta^{\frac{(1-\alpha-\beta)\beta}{1-\alpha}}\left[A_1^{\frac{1}{1-\alpha}}(1-t) + A_2^{\frac{1}{1-\alpha}}(1-t-v)\theta^{\frac{\beta}{1-\alpha}}\right]^{\beta} W_{2i}\right\}^{\frac{1}{1-\alpha-\beta}} \tag{14}$$

where $W_{1i} \equiv \frac{1}{\tau_i}\frac{1}{1-\alpha}\beta\left(\frac{1}{r}\alpha\right)^{\frac{\alpha}{1-\alpha}}$, $W_{2i} \equiv \left(\frac{1}{\tau_i}\frac{1}{1-\alpha}\beta\right)^{\beta}\left(\frac{1}{r}\alpha\right)^{1-\beta}$, with the properties that $\frac{\partial W_{1i}}{\partial s_i} > 0$ and $\frac{\partial W_{2i}}{\partial s_i} > 0$. Apparently, in addition to the finding we already obtained in Proposition 1, the new equilibrium provides some new insights that we summarize in the following.

Proposition 2. *(i) Other things being equal for the two types of firms (i.e., $\theta = 1$ and $v = 0$), given the relative higher productivity of private firms ($A_2 > A_1$), we have ${k_{2i}}^* > {k_{1i}}^*$ and $\frac{\partial k_{2i}^*}{\partial s_i} > \frac{\partial k_{1i}^*}{\partial s_i}$; (ii) Other things being equal for the two types of firms (i.e., $A_2 = A_1$ and $\theta = 1$), given the financial friction faced by the private firms ($0 < v < 1$), we have ${k_{2i}}^* < {k_{1i}}^*$ and $\frac{\partial k_{2i}^*}{\partial s_i} < \frac{\partial k_{1i}^*}{\partial s_i}$; (iii) Other things being equal for the two types of firms (i.e., $A_2 = A_1$ and $v = 0$), given the relative lower level of effective government expenditure obtained by private firms ($0 < \theta < 1$), we have ${k_{2i}}^* < {k_{1i}}^*$ and $\frac{\partial k_{2i}^*}{\partial s_i} < \frac{\partial k_{1i}^*}{\partial s_i}$.*

The intuition of these results is relatively straightforward. Since private firms are endowed with higher initial productivity and so higher marginal return of capital to a given unit of public expenditure, the improved public expenditure (as induced by the increased tax-sharing ratio) will then bring more investment to private firms. On the other hand, the existence of financial frictions for the private firms will ask for a higher capital return and hence leading to a lower level of capital investment to maintain it. The lower effective government expenditure obtained by private firms simply results in a lower benefit for the private firms from the expanded public expenditure, leading to less increase in capital investment in this group of firms. In summary, the net impact of the increased tax-sharing ratio (and hence the increased public expenditure) on the investment of different types of firms depends on the relative strength of the gaps in these different dimensions for the two types of firms.

3. Econometric strategy and data

3.1. Econometric specification

To empirically assess the impacts of local fiscal incentives on investment rates of the provinces, we estimate a standard two-way fixed effects model of the form,

$$Invest_{it} = \alpha + \beta CITsp_{it} + \gamma X_{it} + \mu_i + \varphi_t + \varepsilon_{it} \tag{15}$$

where i represents province and t denotes year. The dependent variable $Invest_{it}$ is the investment rate of the province, which is measured by the ratio of total investment in fixed assets to GDP. $CITsp_{it}$ is our measure of local fiscal incentives, which is proxied by the CIT sharing rate at the sub-provincial level of the province[12]; since the tax-sharing rule at this level is set up by the provincial government, we calculate it as the ratio of total retained CIT revenues for all sub-provincial governments to total CIT revenues

[12] Practically, we use tax-sharing ratio at the sub-provincial level (including city, county, and township governments) as a proxy of s_i in the theoretical model. This is indeed in line with the Chinese institutional background that the main expenditure responsibilities for basic public goods and services are at the sub-provincial levels including prefectural city, county, and township governments (e.g., Liu & Alm, 2016; Liu, Martinez-Vazquez, & Qiao, 2015). Meanwhile, another implicit assumption is that local governments at the sub-provincial levels face stronger incentives than provincial governments to compete for mobile capital and so local economic growth; therefore, assigning more tax revenue to local governments is potentially more effective in promoting investment in the province. Again, this is supported by the Chinese political institution: since China has maintained a highly centralized political system with strong top-down mandates, in which local officers are appointed by the upper-level government and based on local economic performance (e.g., GDP growth), this has triggered an intensive political competition among Chinese local officials at different hierarchical levels (Li, Liu, Weng, & Zhou, 2012; Li & Zhou, 2005; Liu & Martinez-Vazquez, 2014; Xu, 2011). Furthermore, as most local leaders start their careers from low-level governments and move up sequentially to a higher level and local governments are responsible for providing the majority of public goods such as infrastructure, the political competition is even stronger for those at prefectural and county levels (Cull, Xu, Yang, Zhou, & Zhu, 2017; Han & Kung, 2015; Li et al., 2012). More recently, Li, Liu, Weng, and Zhou (2019) show that there is a "top-down amplification" of economic growth targets along the hierarchical levels in China, providing explicit evidence on the fact that lower levels of governments are facing stronger incentives to promote local economic development.

generated in that province.[13] μ_i is the time-invariant and province-specific effect for province i, φ_t is a set of year dummies, and ε_{it} is an *i.i.d.* error term. In all regressions the standard errors are clustered by province.

As control variables X_{it}, we seek to capture factors that are typically found to be significant in determining investment rates. This leads to the inclusion of real GDP per capita (in log form), and the share of secondary industry in GDP, urbanization, openness, financial development, proportion of young population, proportion of old population, and age of the provincial secretary. Real GDP per capita and the share of secondary industry capture economic development and structure of the province, which generally have strong implications for investment activities in the region. Urbanization, measured by the proportion of urban population, is a proxy for the demographic features of a province that may influence the needs of the residents for investment in fixed assets. Openness, measured by the ratio of total trade (i.e., imports plus exports) to GDP, aims to capture the exposure of a province to trade and therefore the potential needs for investment in fixed assets. Financial development is measured by total loan amount to GDP, and it potentially represents the supply of credit for investment in the province. In addition, demographic characteristics including proportion of young and old population serve to characterize a region's special needs for certain investment programs. Finally, we additionally control for the age of provincial secretary in order to capture the impact of political promotion incentives faced by the provincial leaders on promoting investment.[14]

3.2. Endogeneity

A potential concern in estimating specification (Eq. (15)) relates to the endogeneity of the sub-provincial CIT sharing ratio. This issue may be present because sub-provincial governments that have higher levels of investment may have stronger incentives to negotiate with the provincial government for a larger share of the created tax bases, giving rise to the issue of reverse causality. In addition, the endogeneity may also be due to the potential measurement errors in using the local CIT sharing ratio as a measure of local fiscal incentives, which, by its very nature, may be difficult to measure accurately given the limited availability of data.

To circumvent the endogeneity issue, we use an instrumental variables estimation. The instruments we use include: (i) the simulated CIT sharing ratio at the sub-provincial level of a province (denoted as $CITsp\_simuIV_{it}$); and (ii) intra-provincial disparity of local public goods and services in a province (denoted as SD_Edu_{it}). More specifically, the first instrument is calculated as $CITsp\_simuIV_{it} = CITsp_{i,2003} \times \prod_{2004}^{t}(1 + nc_{it})$, where $CITsp_{i2003}$ represents the actual CIT sharing ratio of province i in 2003 (the year before the start of our sample period), and nc_{it} is the annual rate of change of the average CIT sharing ratio at the sub-provincial level for the whole nation excluding province i in year t.[15] The validity of the instrument is that this latter variable nc_{it} captures the potential policy change at the central level in terms of the setting of the tax-sharing rule between the central and provincial governments and hence the corresponding exogenous change in the tax-sharing rule between the provincial and sub-provincial governments within a province. Thus, the simulated CIT sharing ratio, by utilizing the information on the initial value of the actual CIT sharing ratio and the exogenous policy change, should be highly correlated with the actual CIT sharing ratio of the provinces but not directly related to the investment activities of the provinces. This makes the simulated variable a potentially good instrument for the estimations.

Intra-provincial disparity of local public goods and services in a province is also considered to have an impact on the design of fiscal decentralization policy within the province. In particular, a larger geographical disparity of local public goods and services in a province may result in a higher demand for the redistributive transfers from the provincial governments and so a lower level of tax revenue assignment to the sub-provincial governments (Zhou & Wu, 2015). Meanwhile, this variable does not appear to have a direct impact on the aggregated investment level of the province. As a proxy, we use the teacher-student ratio for secondary school in a locality to measure local public goods and services and calculate the standard deviation of this ratio across all prefectural cities within a province to capture intra-provincial disparity of it.

In Section 4.1, we provide more formal evidence to show that both the relevance and exogeneity conditions for valid instruments are indeed satisfied by the selected instrumental variables.

3.3. Data

The panel dataset we use for the quantitative analysis covers 28 provinces in China for 2004–2013. Due to the availability of data, Tibet, Hainan, and Chongqing are excluded. Given the unstable time period for the setting of the CIT sharing rule at the central-provincial level around 2000–2003, we select 2004 as the starting period for our analysis.

Data used for the calculation of the CIT sharing ratio at the sub-provincial level are taken from the *Prefecture, City, and County Public Finance Statistics* (*Quanguo Dishixian Caizheng Tongji Ziliao*), the *China Statistical Yearbook for Regional Economy,* and the *China Taxation Yearbooks*. Other data such as provincial investment rates and all control variables are obtained from the *China Statistical Yearbook*. Table A1 (see Appendix) provides a detailed description and sources of all the variables, while their summary statistics are reported in Table 1.

[13] As illustrated in Section 2.1, the specific tax-sharing rule between the provincial and the sub-provincial governments is set up under the provincial governments' direction.

[14] In general, young politicians face stronger incentives to promote investment and local economic growth, as there exists age limitation for politicians to be promoted in Chinese political system.

[15] To ensure the exogeneity of the constructed IV, we exclude the self-province's CIT sharing ratio in the calculation of the average CIT sharing ratio for the whole nation.

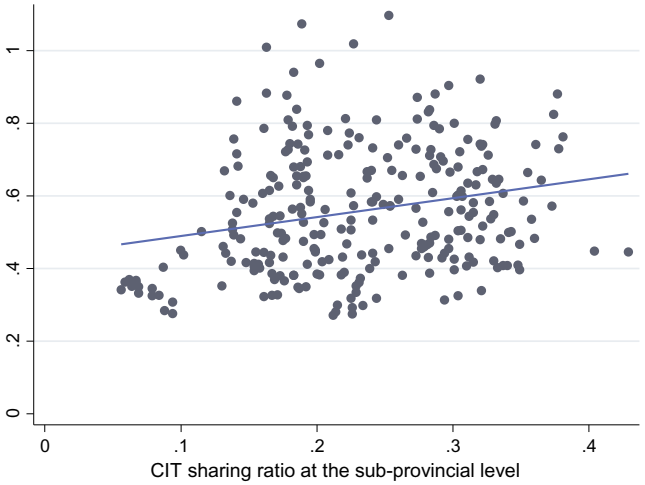

Fig. 2. Scatter plot of local fiscal incentives and investment rates in the provinces.
Source: Authors' calculation.

4. Empirical results

4.1. Baseline results

Fig. 2 presents the scatter plot for the relationship between the CIT sharing ratio at the sub-provincial level and investment rate of the provinces for the sample period covered. As shown, there is a strong and positive relationship between the two variables, providing tentative evidence regarding the potential role of local fiscal incentives on promoting investment in the provinces. However, this evidence itself is not sufficient to establish a causal relationship between the two, we therefore revert to more formal

Table 2
Baseline results: fixed effects and IV estimations.

	OLS		IV	
	(1)	(2)	(3)	(4)
CITsp	0.302**	0.364***	0.665**	0.744***
	(0.139)	(0.109)	(0.291)	(0.246)
GDP per capita, log		0.163		0.176
		(0.124)		(0.113)
Secondary industry		0.002		0.003
		(0.003)		(0.003)
Openness		0.221**		0.224**
		(0.106)		(0.095)
Urbanization		−0.116		0.018
		(0.277)		(0.305)
Finance		0.214**		0.222**
		(0.094)		(0.089)
Young population		−0.006		−0.007
		(0.005)		(0.004)
Old population		0.020**		0.019**
		(0.009)		(0.008)
Age of leader		−0.001		−0.001
		(0.002)		(0.002)
Province fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	271	271	271	271
R-squared	0.777	0.844	0.771	0.837
Number of provinces	28	28	28	28
Cragg-Donald F Statistic	–	–	49.44	39.59
Hansen test (p-value)	–	–	0.558	0.533

Note: The dependent variable is the ratio of total investment to GDP. Columns (1)–(2) report the fixed effects estimation results. Columns (3)–(4) report the instrumental variables estimation results, where the instruments include the simulated CIT sharing ratio at the sub-provincial level and the intra-provincial disparity of local public goods and services in a province. Standard errors are clustered at province level for all regressions; ***p < 0.01, **p < 0.05, *p < 0.1.

Table 3
Validity test of the instruments.

	IV first-stage		Exogenous test	
	(1)	(2)	(3)	(4)
CITsp			0.148	0.230*
			(0.130)	(0.114)
CITsp_simuIV	0.471***	0.443***	0.236	0.222
	(5.735)	(5.272)	(0.152)	(0.136)
SD_Edu	−0.526***	−0.530***	−0.879	−0.611
	(−2.998)	(−4.051)	(1.249)	(0.669)
GDP per capita, log		−0.044		0.155
		(−0.794)		(0.124)
Secondary industry		−0.000		0.003
		(−0.070)		(0.003)
Openness		0.005		0.225**
		(0.175)		(0.105)
Urbanization		−0.161		−0.068
		(−1.094)		(0.265)
Finance		−0.029*		0.207**
		(−1.738)		(0.092)
Young population		0.001		−0.006
		(0.881)		(0.005)
Old population		0.001		0.020**
		(0.462)		(0.009)
Age of leader		0.000		−0.001
		(0.400)		(0.002)
Province fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	271	271	271	271
R-squared	0.519	0.540	0.780	0.846
Number of province	28	28	28	28

Note: The dependent variable in Columns (1)–(2) is the CIT sharing ratio at the sub-provincial level, while the dependent variable in Columns (3)–(4) is the ratio of total investment to GDP. Standard errors are clustered at province level for all regressions; ***p < 0.01, **p < 0.05, *p < 0.1.

evidence from the empirical estimations.

Table 2 presents the results for specification (Eq. (15)), using the fixed effects and IV estimation approaches. We begin the estimation by only controlling for province fixed effects and year fixed effects in Column (1). We find that the coefficient of the sub-provincial CIT sharing ratio (i.e., $CITsp_{i,\ t}$) is positive and statistically significant at the 5% level, supporting Proposition 1 that an increase in the local CIT sharing ratio leads to a higher level of investment rate in the province. This estimation, however, is less precise. Column (2) then adds other control variables to the specification. The estimated coefficient remains positive and statistically significant at the 1% level. As shown, our results are quite robust across both specifications.

The next step that we propose in our identification strategy is to account for the potential endogeneity issue of the sub-provincial CIT sharing ratio in the estimations. Before we present the instrumental variable estimation results, we provide some evidence that both the relevance and exogenous conditions are indeed satisfied using the selected instrument. First, Columns (1) and (2) of Table 3 report the first-stage estimation results, where the endogenous variable (i.e., $CITsp_{it}$) is regressed on the instruments (i.e., $CITsp\_simuIV_{it}$ and SD_Edu_{it}) plus the included exogenous variables. We find the coefficients of the selected instruments to have the expected signs and be statistically significant,[16] confirming the relevance condition for our chosen variables as valid instruments. For both specifications, the F-statistics are significantly greater than 10, suggesting that the relevance of our instruments is indeed strong. Next, we check for the exogenous condition, which means that the instruments should have affected the investment rate in the provinces *only* through its impact on the sub-provincial CIT sharing ratio. To validate this, we include the instruments in the baseline specification (Eq. (15)) as additional explanatory variables and anticipate insignificant results of the selected instruments in this augmented specification; it would otherwise indicate that the instruments do have other channels through which to influence provincial investment rates after controlling for their impacts on the sub-provincial CIT sharing ratio. Columns (3) and (4) of Table 3 report the results for the augmented specification. We find the estimates of the instruments to be consistently insignificant across specifications with and without adding control variables. Taken all together, this significantly increases our confidence in the validity of the instruments.

The panel instrumental variables estimation results are reported in Columns (3) and (4) of Table 2. As shown, the IV estimates of the sub-provincial CIT sharing ratio remain significantly positive across both specifications and are quantitatively larger than the fixed effects estimates. In our preferred IV specification in Column (4), the coefficient of the sub-provincial CIT sharing ratio is 0.744. This implies that a one percentage point increase in the share of CIT for sub-provincial governments will increase the investment rate of the province by 0.744 percentage points. Finally, it is also noted that the Hansen statistic (p value) reported at the bottom of

[16] More specifically, the simulated CIT sharing ratio is positively associated with the actual CIT sharing ratio at sub-provincial level; a higher level of intra-provincial disparity of local public goods and services tends to be associated with a lower level of tax assignment to the sub-provincial level.

Table 4
Robustness: alternative measures of investment.

	Per capita investment in fixed assets (log)		Fixed capital formation/GDP		Per capita fixed capital formation (log)	
	OLS	IV	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)	(5)	(6)
CITsp	0.609***	1.155**	0.047	0.452*	0.118	0.803*
	(0.218)	(0.470)	(0.162)	(0.270)	(0.272)	(0.457)
GDP per capita, log	1.148***	1.166***	0.041	0.054	0.967***	0.990***
	(0.220)	(0.203)	(0.112)	(0.068)	(0.177)	(0.121)
Secondary industry	0.001	0.001	0.002	0.003	0.002	0.002
	(0.006)	(0.006)	(0.004)	(0.002)	(0.007)	(0.004)
Openness	0.269	0.273*	0.019	0.022	0.009	0.014
	(0.180)	(0.165)	(0.109)	(0.054)	(0.166)	(0.095)
Urbanization	−0.390	−0.196	−0.332	−0.189	−0.600	−0.357
	(0.425)	(0.455)	(0.335)	(0.206)	(0.532)	(0.322)
Finance	0.248*	0.259**	0.164	0.172***	0.191	0.205**
	(0.138)	(0.129)	(0.100)	(0.062)	(0.139)	(0.096)
Young population	−0.005	−0.006	0.001	0.001	0.001	0.001
	(0.008)	(0.007)	(0.004)	(0.002)	(0.007)	(0.004)
Old population	0.036**	0.035**	0.011	0.010**	0.023*	0.021**
	(0.016)	(0.015)	(0.007)	(0.005)	(0.012)	(0.008)
Age of leader	−0.003	−0.003	−0.002	−0.002*	−0.006*	−0.006***
	(0.003)	(0.003)	(0.002)	(0.001)	(0.003)	(0.002)
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	271	271	271	271	271	271
R-squared	0.972	0.971	0.612	0.596	0.959	0.957
Number of province	28	28	28	28	28	28
Cragg-Donald F Statistic	–	39.59	–	39.59	–	39.59
Hansen test (p-value)	–	0.903	–	0.706	–	0.625

Note: The dependent variables include the logarithm of per capita investment in fixed assets in Column (1)–(2), the ratio of gross fixed capital formation to GDP (invest_fcf) in Column (3)–(4), and the logarithm of per capita fixed capital formation in Column (5)–(6). Columns (1), (3), and (5) report the fixed effects estimation results. Columns (2), (4), and (6) report the instrumental variables estimation results, where the instruments include the simulated CIT sharing ratio at the sub-provincial level and the intra-provincial disparity of local public goods and services in a province. Standard errors are clustered at province level for all regressions; ***p < 0.01, **p < 0.05, *p < 0.1.

Table 2 is higher than 0.5, implying that we cannot reject the null hypothesis of no correlation between the instruments and the error term in the regressions. This provides further evidence on the validity of the instruments we used.

With regard to the control variables that are included in the model, GDP per capita and openness are positively associated with higher levels of investment rate, which reflects a higher demand for investment in these provinces. As predicted, provinces with a higher level of financial development tend to have a higher level of investment rate, supporting that the expansion of credit markets helps improve investment in the provinces. The proportion of old population also has a positive impact on the investment rate of the provinces, potentially reflecting the investment needs for social programs. Other explanatory variables are generally found to be not significant in the estimations.

4.2. Robustness

In order to test for the robustness of the main results, we conduct sensitivity analysis along three dimensions. First, instead of using investment rate, we look at investment level by using the logarithm of per capita investment in fixed assets in the provinces as the dependent variable. Second, since local officers are usually promoted basing on criteria strongly associated with improved local economic growth and investment, they face an incentive to manipulate local statistics on these variables by overstating them (Chen, Chen, Hsieh, & Song, 2019). According to several recent studies (e.g., Chen et al., 2019; Holz, 2015; Liu, Zhang, & Zhu, 2016), there exists an unusual large gap between the local statistics on total investment in fixed assets and gross fixed capital formation, with the gap hardly explained by the difference in their definitions.[17] This potentially indicates that the local statistics on total investment in fixed assets are highly inflated by local governments.[18] For this concern, we alternatively use gross fixed capital formation (in the

[17] By definitions, the difference between total investment in fixed assets and gross fixed capital formation should be land sales and purchase of used assets by local governments.

[18] It is noted that the misreporting of investment data constitutes a source of measurement errors in the dependent variable. Nevertheless, as long as the measurement error in investment is not directly correlated with the sub-provincial CIT sharing ratio (which appears to be the case), this issue will not bias our estimate. To see this, suppose that $y = y^* + v$, where y is the observed investment, y^* is the latent true investment, and v is the additive measurement error. Then, $y = y^* + v = \beta x + e + v$. Since v is uncorrelated with x, we can estimate β consistently by OLS in this case (Chen, Hong, & Nekipelov, 2011).

Table 5
Placebo test: central investment vs. non-central investment.

	Central investment		Non-central investment	
	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)
CITsp	−0.039	−0.083	0.324**	0.680***
	(0.029)	(0.053)	(0.122)	(0.244)
GDP per capita, log	−0.041	−0.043	0.212*	0.224**
	(0.032)	(0.030)	(0.121)	(0.109)
Secondary industry	0.001	0.001	0.000	0.001
	(0.001)	(0.001)	(0.003)	(0.003)
Openness	−0.005	−0.005	0.201**	0.204***
	(0.013)	(0.012)	(0.085)	(0.075)
Urbanization	0.048*	0.033	−0.125	0.001
	(0.027)	(0.025)	(0.234)	(0.262)
Finance	0.008	0.007	0.209**	0.216***
	(0.010)	(0.009)	(0.084)	(0.079)
Young population	−0.001	−0.001	−0.005	−0.005
	(0.001)	(0.001)	(0.005)	(0.004)
Old population	−0.000	−0.000	0.020**	0.019**
	(0.001)	(0.001)	(0.008)	(0.007)
Age of leader	−0.001	−0.000	0.000	0.000
	(0.000)	(0.000)	(0.002)	(0.002)
Province fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	271	271	271	271
R-squared	0.220	0.209	0.876	0.871
Number of province	28	28	28	28
Cragg-Donald F Statistic	–	39.59	–	39.59
Hansen test (p-value)	–	0.209	–	0.157

Note: The dependent variable in Columns (1)–(2) is the ratio of total investment made by central government to GDP; and the dependent variable in Columns (3)–(4) is the ratio of total investment made by non-central authorities to GDP. Columns (1) and (3) report the fixed effects estimation results. Columns (2) and (4) report the instrumental variables estimation results, where the instruments include the simulated CIT sharing ratio at the sub-provincial level and the intra-provincial disparity of local public goods and services in a province. Standard errors are clustered at province level for all regressions; ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

forms of both ratio and level) as a measure of investment. The new estimation results are reported in Table 4, where we find that the main results are largely unchanged with these alternative dependent variables — the sub-provincial CIT sharing ratio is positively and statistically associated with investment in the provinces.

In the last dimension, we conduct a placebo test by examining the nature of the investment entity. Depending on the investment entity, total investment in the provinces can be classified as central and non-central investment. Central investment refers to the investment in fixed assets made directly by the central government and/or its affiliated organizations, while non-central investment refers to all other investment made by sub-national governments and their affiliated organizations, private enterprises, and foreign enterprises. An important distinction between these two types of investment is that the former is carried out by the central authority in order to fulfill its specific policy objectives and most often, it is not driven by the goal of maximizing economic profits. Therefore, fiscal incentives offered to local governments, and the competition policies adopted by them, should have less impact on the allocation of central investment. To explore this point and also use it as a placebo test of our baseline results, we alternatively employ central investment rate and non-central investment rate (scaled by GDP) as the dependent variables and re-estimate specification (Eq. (15)). In line with our prediction, Table 5 shows that the estimate of the sub-provincial CIT sharing ratio remains positive and statistically significant in the estimations when the non-central investment rate is used as the dependent variable. However, the same estimate is negative and statistically insignificant when the central investment rate is treated as the dependent variable. Thus, these results support our main conjecture from a different perspective.

4.3. Heterogeneity

We have shown evidence in support of Proposition 1 that a higher level of fiscal incentives leads to a higher level of investment rate in the provinces, the reason being that fiscal incentives motivate local governments to attract more capital investment through increased public expenditures. This effect, however, may be heterogenous across different types of firms for the reason summarized in Proposition 2 of the theoretical model. More specifically, thanks to the relative higher level of initial productivity of private firms (or non-SOEs), they may respond more to the expanded government expenditures (induced by a larger share of CIT sharing ratio) and so they are expected to increase more investment than that of the SOEs. On the other hand, because of the financial friction costs for private firms in the lending markets and the relative lower level of effective government expenditures obtained, private firms may be

Table 6
Effect heterogeneity: SOEs versus non-SOEs.

	OLS		IV	
	SOEs	Non-SOEs	SOEs	Non-SOEs
	(1)	(2)	(3)	(4)
CITsp	0.167*	0.120	0.493**	0.383*
	(0.090)	(0.091)	(0.204)	(0.209)
GDP per capita, log	0.009	0.241**	0.011	0.242***
	(0.088)	(0.092)	(0.083)	(0.083)
Secondary industry	−0.001	−0.002	−0.001	−0.002
	(0.002)	(0.003)	(0.002)	(0.003)
Openness	0.077	0.197***	0.078**	0.197***
	(0.046)	(0.059)	(0.037)	(0.053)
Urbanization	0.028	−0.275**	0.136	−0.188
	(0.127)	(0.116)	(0.154)	(0.133)
Finance	0.173***	0.119**	0.172***	0.118**
	(0.059)	(0.056)	(0.054)	(0.051)
Young population	−0.009***	−0.002	−0.008***	−0.002
	(0.003)	(0.003)	(0.003)	(0.003)
Old population	0.006	0.007	0.006	0.007
	(0.004)	(0.005)	(0.004)	(0.005)
Age of leader	0.000	0.000	0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.001)
Province fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	218	218	218	218
R-squared	0.628	0.883	0.586	0.877
Number of province	28	28	28	28
Cragg-Donald F Statistic	–	–	26.97	26.97
Hansen test (p-value)	–	–	0.140	0.504

Note: The dependent variable in Columns (1) and (3) is the ratio of total investment made by SOEs to GDP; and the dependent variable in Columns (2) and (4) is the ratio of total investment made by non-SOEs to GDP. Columns (1) and (2) report the fixed effects estimation results. Columns (3) and (4) report the instrumental variables estimation results, where the instruments include the simulated CIT sharing ratio at the sub-provincial level and the intra-provincial disparity of local public goods and services in a province. Standard errors are clustered at province level for all regressions; ***p < 0.01, **p < 0.05, *p < 0.1.

less responsive to the expanded government expenditures than that of the SOEs. Thus, the relative strength of the investment effect of local fiscal incentives across SOEs and private firms is theoretically unclear and opens for empirical examination. To uncover this potential heterogeneous effect, we alternatively use total investment made by SOEs and non-SOEs as the dependent variables and re-estimate specification (Eq. (15)). The results are presented in Table 6. As shown, while the estimated coefficients of the sub-provincial CIT sharing ratio are positive and generally statistically significant in both specifications with alternative dependent variables, the estimate is quantitatively larger for Column (1) (Column (3)) than that of Column (2) (Column (4)), suggesting that local fiscal incentives promoted more investment from SOEs than from private firms. This may indicate that the distinctions in access to credits and government expenditures between the two groups of firms have dominated the heterogenous effect of local fiscal incentives.

4.4. Mechanism of the impact

In this subsection, we clarify the potential mechanism of the impact that we highlight in Proposition 1 of the theoretical model. More specifically, we explore government expenditures as an important conduit for local fiscal incentives to exert an impact on investment in the provinces.

First, we replace the dependent variable in specification (Eq. (15)) with government expenditures scaled by GDP and formally test the impact of the sub-provincial CIT sharing ratio on government expenditures.[19] The estimation results are reported in Table 7, where the estimated coefficient of the CIT sharing ratio is positive and statistically significant at the margin in the fixed effects estimations (see Columns (1) and (2)). However, it becomes statistically significant when the endogeneity concern is controlled for in Columns (3) and (4). This confirms the stimulating effect of the sub-provincial CIT sharing ratio on government expenditures, which ultimately affects capital investment. Quantitatively, a one percentage point increase in the sub-provincial CIT sharing ratio is associated with a 0.255 percentage point increase in government expenditures (as a percent of GDP).

Next, we test for the role of government expenditures in shaping the net impact of the sub-provincial CIT sharing ratio on

[19] Alternatively, it would be interesting to use the measure of productive government expenditures as the dependent variable. However, due to the change of the functional classification of government expenditures in China in 2007, it became unfeasible to isolate the so-called productive items. Moreover, the functional classification of productive items appears to be quite controversial in the literature.

Table 7
The effect of local fiscal incentives on government expenditures.

	OLS		IV	
	(1)	(2)	(3)	(4)
CITsp	0.135	0.140	0.238**	0.255**
	(0.137)	(0.106)	(0.117)	(0.103)
GDP per capita, log		−0.093		−0.089***
		(0.069)		(0.034)
Secondary industry		0.002		0.002*
		(0.002)		(0.001)
Openness		0.105***		0.105***
		(0.026)		(0.016)
Urbanization		−0.041		−0.000
		(0.108)		(0.070)
Finance		0.058		0.061***
		(0.037)		(0.023)
Young population		−0.005***		−0.005***
		(0.001)		(0.001)
Old population		0.007***		0.006***
		(0.002)		(0.002)
Age of leader		0.001		0.001*
		(0.001)		(0.000)
Province fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	271	271	271	271
R-squared	0.635	0.738	0.629	0.731
Number of province	28	28	28	28
Cragg-Donald F Statistic	–	–	49.44	39.59
Hansen test (p-value)	–	–	0.111	0.370

Note: The dependent variable is the ratio of government expenditures to GDP. Columns (1)–(2) report the fixed effects estimation results. Columns (3)–(4) report the instrumental variables estimation results, where the instruments include the simulated CIT sharing ratio at the sub-provincial level and the intra-provincial disparity of local public goods and services in a province. Standard errors are clustered at province level for all regressions; ***p < 0.01, **p < 0.05, *p < 0.1.

investment in the provinces. We add the additional variable, government expenditures, to specification (Eq. (15)) and re-estimate the model. A confirmation of our hypothesized mechanism of local fiscal incentives would then predict a diminishing (if not completely vanishing) estimated effect of the sub-provincial CIT sharing ratio in the new specification. In line with our prediction, after adding government expenditures, we find that the estimate of sub-provincial CIT sharing ratio becomes quantitatively smaller and statistically insignificant (or only significant at the margin), as shown in Table 8. The estimated coefficients of government expenditures across all specifications reveal a positive association between government expenditures and investment rate in the provinces. This points to the fact that government expenditures generated a direct positive effect on investment in the provinces. By isolating the positive influence of the increase in government expenditures, the positive effect of the sub-provincial CIT sharing ratio on investment rate in the provinces is largely weakened, thus confirming the role of government expenditures as a potential channel of impact.

5. Concluding remarks

Fiscal incentives offered to local governments have long been regarded as having important implications for local government behaviors and the economic performance of local jurisdictions. This paper aims to provide supporting evidence for this by studying how fiscal incentives offered to Chinese local governments have affected their choice of competing policies regarding capital, and therefore the investment rate in the locality. In addition, answering this question helps explain the unusually high investment rate in China, which has been one of the main driving forces of Chinese economic growth over the past decades. To this end, we first build a simple fiscal competition model to demonstrate that a higher level of fiscal incentives for local governments, proxied by the sub-provincial CIT sharing ratio, motivates local governments to adopt an expansive expenditure policy, resulting in a higher level of investment. We then test this theoretical hypothesis by using both fixed effects and instrumental variables models and a province-level panel dataset for the period 2004–2013. Our empirical results indicate that a larger CIT sharing ratio at the sub-provincial level is positively associated with a higher investment rate in the provinces and the results are shown to be robust across alternative measures of investment and a placebo test. We also provide evidence that local governments are more likely to promote investment made by SOEs (rather than non-SOEs). Finally, we shed some light on the mechanism of the impact by identifying the role of government expenditure in affecting the nexus between local fiscal incentives and investment rate in the provinces.

Our findings have significant policy relevance. First, we offer a novel explanation for the long-standing and unusually high investment rate in China. While a significant body of research has contributed to the understanding of this phenomenon, there has been little research from the perspective of exploiting the incentives offered to local governments. We therefore fill the gap in this regard. Second, under the fiscal competition framework, fiscal incentives appear to successfully motivate local governments to

Table 8
Mechanism of impact: the role of government expenditures.

	OLS		IV	
	(1)	(2)	(3)	(4)
CITsp	0.125	0.217	0.364	0.493*
	(0.167)	(0.142)	(0.235)	(0.268)
Govexp	1.319***	1.055***	1.268***	0.979***
	(0.218)	(0.243)	(0.219)	(0.243)
GDP per capita, log		0.261*		0.263**
		(0.128)		(0.117)
Secondary industry		0.000		0.001
		(0.003)		(0.003)
Openness		0.111		0.121
		(0.105)		(0.096)
Urban		−0.073		0.018
		(0.214)		(0.222)
Finance		0.153*		0.163**
		(0.078)		(0.076)
Young population		−0.002		−0.002
		(0.004)		(0.004)
Old population		0.013		0.013*
		(0.008)		(0.008)
Age of leader		−0.001		−0.002
		(0.002)		(0.001)
Province fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	271	271	271	271
R-squared	0.831	0.869	0.829	0.865
Number of province	28	28	28	28
Cragg-Donald F Statistic	–	–	46.02	35.76
Hansen test (p-value)	–	–	0.901	0.824

Note: The dependent variable is the ratio of total investment to GDP. Columns (1)–(2) report the fixed effects estimation results. Columns (3)–(4) report the instrumental variables estimation results, where the instruments include the simulated CIT sharing ratio at the sub-provincial level and the intra-provincial disparity of local public goods and services in a province. Standard errors are clustered at province level for all regressions; ***p < 0.01, **p < 0.05, *p < 0.1.

intensify competition, which contributes to the high investment rate in the provinces. However, this rigorous fiscal competition has to some extent also been argued as being the cause of some unintended consequences regarding local behaviors, such as overspending on productive expenditures and attracting polluting industries. If this is deemed undesirable by the central authority, there will be a need to recentralize the tax-sharing rules in order to organize fiscal incentives for local governments and their distortionary behaviors.

Appendix A

Table A1
Description and sources of variables.

Variable	Definition	Source
Invest	Ratio of total investment in fixed assets to GDP	China Statistical Yearbook
Invest_fcf	Ratio of gross fixed capital formation to GDP	China Statistical Yearbook
Invest_central	Ratio of total investment made by the central authority to the GDP	China Statistical Yearbook
Invest_noncentral	Ratio of total investment made by the non-central authorities to the GDP	China Statistical Yearbook
Invest_soe	Ratio of total investment made by SOEs to the GDP	China Statistical Yearbook
Invest_nonsoe	Ratio of total investment made by non-SOEs to the GDP	China Statistical Yearbook
CITsp	The ratio of total retained CIT revenues for all sub-provincial governments to total CIT revenues generated in that province	The Prefecture, City, and County Public Finance Statistics, the China Statistical Yearbook for Regional Economy, and the China Taxation Yearbooks
CITsp_simuIV	Simulated CIT sharing ratio at the sub-provincial level	Authors' calculation
SD_Edu	Intra-provincial disparity of local public goods and services in a province	The China Statistical Yearbook for Regional Economy
GDP per capita, log	Real GDP per capita, log	China Statistical Yearbook

(*continued on next page*)

Table A1 (*continued*)

Variable	Definition	Source
Secondary industry	Ratio of secondary industry to total GDP, %	China Statistical Yearbook
Openness	Ratio of total trade (exports plus imports) to GDP	China Statistical Yearbook
Urbanization	Ratio of urban population to total population	China Statistical Yearbook
Finance	Ratio of total loan amount to GDP	China Statistical Yearbook
Young population	Ratio of young population to total population	China Statistical Yearbook
Old population	Ratio of old population to total population	China Statistical Yearbook
Age of leader	Age of provincial secretary	Authors' calculation
Govexp	Ratio of government expenditures to GDP	China Statistical Yearbook

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