




# Intergovernmental transfers and tax noncompliance

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Published online: 23 July 2019

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## Abstract

This study investigates the effect of intergovernmental transfers on firms' tax noncompliance. Using data from China where intergovernmental transfers vary substantially, we find that a large amount of intergovernmental transfers leads to a high degree of firms' tax noncompliance. This finding is robust to the instrumental variable approach, an analysis based on a natural experiment, and various robustness checks. We also find that firms that communicate more frequently with the government than others engage more in tax noncompliance. In addition, the composition of intergovernmental transfers matters, that is, a high proportion of conditional transfers decreases firms' tax noncompliance. Finally, we find that intergovernmental transfers are negatively correlated with the effective corporate income tax rate.

**Keywords** Intergovernmental transfers · Tax noncompliance · Tax burden · China

**JEL Classification** H26 · H77

## 1 Introduction

How intergovernmental relationships shape the relationship between the government and the market is a big question. One dimension of intergovernmental relationships can be represented by intergovernmental transfers, whereas one dimension of the relationship between the government and the market can be represented by the tax burdens of firms and individuals. By taking these dimensions into account, how intergovernmental transfers affect the tax burdens of firms and individuals is a relevant question.

The existing literature provides several reasons why intergovernmental transfers affect local governments' choice of tax level and, in turn, the tax burdens of firms

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and individuals. For example, intergovernmental transfers relieve the fiscal stress of local governments, weaken the incentives of local governments to shift tax burden, and lead local governments to reduce the tax burdens of firms and individuals (Shen et al. 2012). However, through which way do intergovernmental transfers affect the tax burdens of firms and individuals? Taxes that firms and individuals pay are equal to the taxable income multiplied by tax rate. Accordingly, we can distinguish two ways. First, intergovernmental transfers influence local governments' choice of tax rate. An increase in tax rate leads to an increase in tax burden when taxable income is held constant. Second, intergovernmental transfers influence local governments' choice of tax enforcement and, in turn, the tax noncompliance (including tax evasion and avoidance) of firms and individuals. An increase in the degree of tax noncompliance results in a reduction in taxable income and tax burden when tax rate is held constant. Although the effect of intergovernmental transfers on the tax rate of firms or individuals has been investigated (Dahlberg et al. 2008; Liu and Ma 2016; Buettner 2006; Egger et al. 2010), to the best of our knowledge, the effect of intergovernmental transfers on the tax noncompliance of firms or individuals has yet to be investigated.

This study examines how intergovernmental transfers affect firms' tax noncompliance using data from China. We use Chinese data because the intergovernmental transfers in China vary substantially, providing a good opportunity to precisely estimate intergovernmental transfers' effects on firms' tax noncompliance. By combining data on intergovernmental transfers at the prefecture level and survey data of manufacturing firms in 1998–2007, we find that a large amount of intergovernmental transfers leads to a high degree of firms' tax noncompliance. This finding is robust to the instrumental variable (IV) approach and an analysis based on a natural experiment. We also find that firms that communicate more frequently with the government than others engage more in tax noncompliance, and this outcome is consistent with the hypothesis that intergovernmental transfers influence firms' tax noncompliance through their effect on the tax enforcement of local governments. In addition, the composition of intergovernmental transfers matters; that is, a high proportion of conditional transfers decreases tax noncompliance. Finally, the results reveal that intergovernmental transfers are negatively correlated with the effective corporate income tax rate.

As far as we know, this study is the first to examine the effect of intergovernmental transfers on tax noncompliance. It contributes to the literature in two aspects. First, it highlights a new way through which intergovernmental transfers affect the tax burdens of firms. It complements the literature on the effect of intergovernmental transfers on the tax burdens of firms. Second, this study shows for the first time that intergovernmental transfers represent a determinant of firms' tax noncompliance. It adds to the literature on the determinants of the tax noncompliance of firms and individuals. Overall, this study bridges the gap between the literature on intergovernmental transfers' effects on the tax burdens of firms and individuals and that on the determinants of the tax noncompliance of firms and individuals.

This study is related to the literature on intergovernmental transfers' effects on the tax burdens of firms and individuals. The literature can be subdivided into three strands. The first strand discusses intergovernmental transfers' effects on local government spending and taxes. Theoretically, Bradford and Oates (1971) argue that local governments choose the tax level on behalf of their constituents. An increase in inter-

governmental transfers is equivalent to an increase in private income of the same amount and leads to a reduction in local government taxes. To the contrary, Gamkhar and Shah (2007) contend that intergovernmental transfers' effects on local government spending can be larger than those of private income because of fiscal illusions. Intergovernmental transfers do not necessarily lead to tax reductions. Mixed evidence exists. Some studies report that intergovernmental transfers decrease tax burden (Lutz 2010; Lundqvist 2015), but others demonstrate that intergovernmental transfers do not have a tax reduction effect (Dahlberg et al. 2008; Litschig and Morrison 2013).

The second strand emphasizes the role of regional competition in the effect of the equalization transfer on taxation. The basic idea is that the equalization transfer weakens the incentives of local governments to attract mobile capital and thus increases taxation (Bucovetsky and Smart 2006). Buettner (2006), Smart (2007) and Egger et al. (2010) provide supporting evidence for this theory. However, the effect of the equalization transfer on taxation may be moderate in China because the equalization transfer during the sample period was small. Although the proportion of the equalization transfer in intergovernmental transfers at the prefecture level more than tripled during the sample period, it only accounted for 11.5% in 2007.

The third strand discusses the amplifications of the fiscal stress of local governments in China following the tax-sharing reform in 1994. One amplification is predatory taxation (World Bank 2002; Chen 2003; Shen et al. 2012). Given that intergovernmental transfers help lessen the fiscal pressures of local governments, they should help alleviate the problem of predatory taxation and reduce the tax burdens of firms or individuals.

To summarize, the effect of intergovernmental transfers on either tax burden or tax rate is studied but no consensus is reached. The present work examines the effect of intergovernmental transfers on tax noncompliance, providing new evidence that intergovernmental transfers reduce the tax burdens of firms or individuals.

This study is also related to works that investigate the determinants of the tax noncompliance of firms. Most of these studies associate firms' tax noncompliance with the characteristics or incentives of firms or managers of firms, including corporate social responsibilities (Hoi et al. 2013), institutional ownership (Bird and Karolyi 2016), managerial abilities (Koester et al. 2016), and managers' incentives (Desai and Dharmapala 2006). In addition, some studies show that the external environment of firms affects their tax noncompliance as well. These studies propose several determinants of firms' tax noncompliance, including public pressure (Dyregang et al. 2016), market competition (Cai and Liu 2009), the incentives of tax collectors or inspectors (Khan et al. 2015; Alm et al. 2016), tax enforcement (Fan and Tian 2013; Hoopes et al. 2012), the government policy of deterrence and social norms (Feld and Larsen 2012), and government size (Ma and Li 2012; Pappa et al. 2015). The present work reveals that intergovernmental transfers also affect firms' tax noncompliance.

Becker et al. (1987) study the effect of transfer payments to individuals on their tax evasion. Both Becker et al. (1987) and this study emphasize fiscal transfers' effects on tax noncompliance. However, unlike Becker et al. (1987) who focus on fiscal transfers to individuals, we focus on fiscal transfers among governments. In addition, we investigate the determinants of the tax noncompliance of firms, whereas they investigate

the determinants of the tax noncompliance of individuals. Moreover, our analysis is based on real-world data, while they use a laboratory approach.

The remainder of this paper is arranged as follows. Section 2 introduces intergovernmental transfers in China. Section 3 explains our empirical strategy. Section 4 presents basic results, followed by further analyses in Sect. 5. The final section concludes.

## 2 Intergovernmental transfers in China

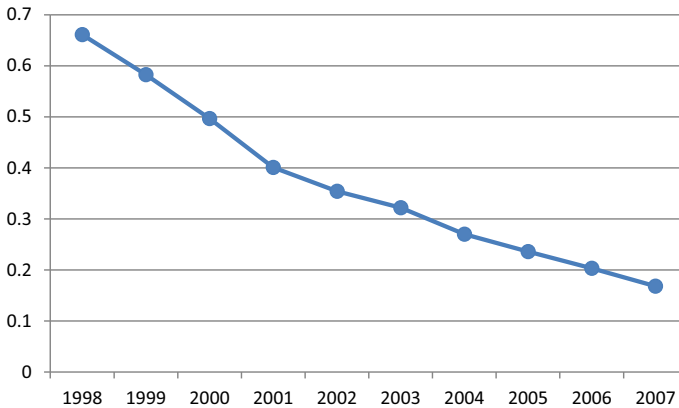
In China, intergovernmental transfers consist of tax rebates, earmarked transfers, and other transfers. Tax rebates were established in 1994 when the central government initiated the tax-sharing reform. This reform recentralized revenue. To compensate for the revenue loss of local governments, the central government established tax rebates, including value-added and consumption tax rebates. Tax rebates are characterized by three features. First, they are formula-based, suggesting that the smaller the proportion of tax rebates in intergovernmental transfers is, the more freedom the central government has in allocating intergovernmental transfers.<sup>1</sup> Second, tax rebates are used as a tool to guarantee that the vested interests of local governments are unaffected. Specifically, the lower bound of tax rebates is the corresponding taxes prior to the reform minus those following the reform. Third, by using tax rebates, the central and local governments share in the increase in value-added and consumption taxes with the central government getting most of the increase.<sup>2</sup> As a result of the second feature, rich regions obtained more tax rebates than the poor ones. This outcome is against regional redistribution, which is an important goal of the central government. Owing to the third feature and the rapid increase in value-added and consumption taxes following the tax-sharing reform, the relative importance of tax rebates declines over time.

We depict the proportion of tax rebates in 1998–2007 in Fig. 1. The proportion is defined as the ratio of the sum of the tax rebates of 282 prefectures to the sum of the intergovernmental transfers of these prefectures. The proportion decreases sharply from 66.1% in 1998 to 16.8% in 2007. As the proportion of tax rebates decreases, the central government enjoys increased freedom to allocate intergovernmental transfers to achieve its goals. In other words, intergovernmental transfers become an increasingly useful tool for the central government.

To examine how the central government allocates intergovernmental transfers, we classify prefectures as the East, the Middle, and the West in descending order in terms

<sup>1</sup> In Appendix A, we provide background information and explain why we relate the proportion of tax rebates to the freedom to allocate the intergovernmental transfers of the central government, rather than that of provincial governments.

<sup>2</sup> In this study, tax rebates refer to value-added tax and consumption tax rebates. We do not consider the income tax rebate established in 2002 and the rebate for the export tax refund established in 2004. In 2002, the central government initiated the income-tax-sharing reform. The reform converted the income tax, which had been a local tax, into a sharing tax. To compensate for local governments' revenue loss, the central government returned a portion of the income tax revenue that it got to local governments in the form of the income tax rebate. This tax rebate first went to the account of the central government and then returned to local governments. Its introduction does not mean that local governments received more support from the central government than before. Not incorporating it into tax rebates is better for the comparability of intergovernmental transfers across years. Moreover, we do not consider the rebate for the export tax refund because the data are only available in 2004.

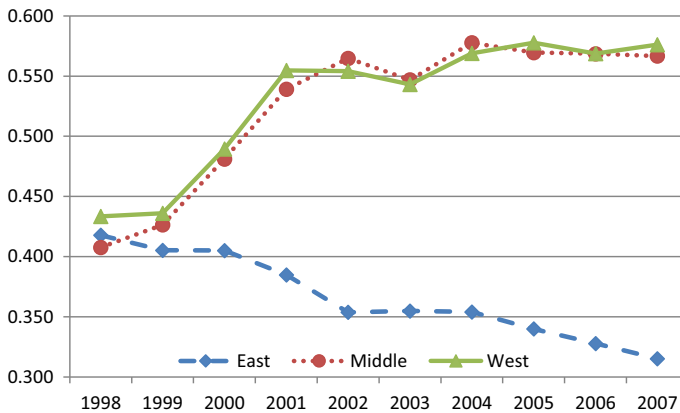


**Fig. 1** Proportion of tax rebates. *Notes* The proportion of tax rebates is defined as the ratio of the sum of tax rebates of 282 prefectures to the sum of intergovernmental transfers of these prefectures. We exclude Municipalities directly under the central government (i.e., Beijing, Chongqing, Shanghai and Tianjin) because they are provincial-level cities and are not comparable with prefecture-level cities. The prefectures of Tibet are also excluded due to lack of data

of economic development level. We also divide intergovernmental transfers by the budgetary expenditure of local governments to normalize intergovernmental transfers. This division is to adhere to the three strands of literature mentioned in Introduction. The three strands are similar in that they all compare intergovernmental transfers with the expenditure or own revenue of local governments. Specifically, the literature on the effects of intergovernmental transfers on local government spending and taxes discusses the effects of a one-unit increase in intergovernmental transfers when the own revenue of local governments is fixed. That is, intergovernmental transfers increase relative to the own revenue of local governments. The literature that investigates the effect of the equalization transfer on taxation in the framework of regional competition compares the equalization transfer with the revenue of local governments from mobile capital. The literature that examines the amplifications of the fiscal stress of Chinese local governments suggests that an increase in intergovernmental transfers relative to local government spending helps lessen the fiscal stress of local governments and reduce the tax burdens of firms or individuals.

Figure 2 shows that the intergovernmental transfers (relative to the local government spending) of these regions are nearly the same in 1998, suggesting almost no regional redistribution at that time. However, the evolution of the intergovernmental transfers of these regions diverges in the following years: The intergovernmental transfers of the East show a declining trend in 1998–2007, the intergovernmental transfers of the Middle exhibit a large increase in 1998–2002 and fluctuate after 2002, and the intergovernmental transfers of the West increase rapidly in 1999–2001 but increase slightly after 2001. To summarize, the regional redistribution from the East to the Middle and the West emerges, widens, and then remains constant.

We illustrate two variations in intergovernmental transfers in Fig. 2, namely variations in the average and time trend of intergovernmental transfers among these regions. Apart from the two variations, the variation in intergovernmental transfers within a



**Fig. 2** Ratio of intergovernmental transfers to budgetary expenditure: by regions. *Notes* The East includes Shandong, Guangdong, Jiangsu, Hebei, Zhejiang, Hainan, Fujian, and Liaoning. The Middle includes Jilin, Anhui, Shanxi, Jiangxi, Henan, Hubei, Hunan, and Heilongjiang. And the West includes Yunnan, Inner Mongolia, Sichuan, Ningxia, Guangxi, Xinjiang, Gansu, Guizhou, Shaanxi, and Qinghai

region is also sizable.<sup>3</sup> We exploit these variations to identify the effect of intergovernmental transfers on firms' tax noncompliance.

### 3 Empirical strategies and data

#### 3.1 Empirical strategies

Researchers often use book income as a proxy for true profits and book-tax gap as a measure of tax noncompliance (Desai 2003, 2005). This approach works for public companies but not for nonlisted companies because book income is usually unavailable for the latter. Cai and Liu (2009) propose an approach that applies to nonlisted companies. They calculate imputed corporate profits based on the national income account. The gap between imputed corporate profits and reported accounting profits is not an appropriate measure of tax avoidance because imputed corporate profits based on the national income account can systematically differ from true accounting profits based on the generally accepted accounting principles. Nevertheless, Cai and Liu (2009) argue that under reasonable assumptions,<sup>4</sup> the sensitivity of reported profits to true accounting profits is carried over to the sensitivity of reported profits to imputed profits. Therefore, the determinants of tax noncompliance can be identified by investigating the sensitivity of reported profits to imputed profits. Cai and Liu (2009) use this approach to examine whether competition affects firms' tax noncompliance.

<sup>3</sup> We delegate the demonstration of this variation to Appendix B.

<sup>4</sup> They assume that imputed profits and true accounting profits are positively correlated.

Following the approach of Cai and Liu (2009), we study how intergovernmental transfers affect tax noncompliance. We assume that firm  $i$  reports its profits according to the following equation:

$$RPRO_{i,t} = d_{i,t} \widetilde{PRO}_{i,t} + \lambda_{i,t} + \zeta_{it}, \quad (1)$$

where  $\widetilde{PRO}_{i,t}$  and  $RPRO_{i,t}$  denote firm  $i$ 's true accounting profits and reported pre-tax accounting profits in year  $t$ , respectively.  $d_{i,t} < 1$  and  $\lambda_{i,t} \leq 0$  are two parameters that measure firm  $i$ 's tax noncompliance. Lower values of  $d_{i,t}$  or  $\lambda_{i,t}$ , compared with higher values of  $d_{i,t}$  or  $\lambda_{i,t}$ , suggest that the firm reports less truthfully or the degree of tax noncompliance is higher.  $\zeta_{i,t}$  is the error term.

True accounting profits are not observable. However, we can calculate imputed corporate profits based on the national income account, expressed as follows:

$$PRO_{i,t} = VA_{i,t} - FC_{i,t} - WAGE_{i,t} - CURRD_{i,t} - INDT_{i,t}, \quad (2)$$

where  $PRO_{i,t}$  is the firm's imputed profits,  $VA_{i,t}$  is the firm's industrial value added,  $FC_{i,t}$  is the firm's financial charges,  $WAGE_{i,t}$  is the firm's labor compensations,  $CURRD_{i,t}$  is the firm's current depreciation, and  $INDT_{i,t}$  is the indirect taxes that the firm pays.

We assume that imputed profits are positively related to true accounting profits in the following way:

$$\widetilde{PRO}_{i,t} = PRO_{i,t} + \eta_{i,t} + \theta_{i,t} \quad (3)$$

where  $\eta_{i,t}$  represents the difference in profits calculation between the accounting system and the national income account system.  $\theta_{i,t}$  is the error term.

By substituting (3) into (1), we obtain the following equation:

$$RPRO_{i,t} = d_{i,t} PRO_{i,t} + \Lambda_{i,t} + \epsilon_{i,t}, \quad (4)$$

where  $\Lambda_{i,t} \equiv d_{i,t} \eta_{i,t} + \lambda_{i,t}$  and  $\epsilon_{i,t} \equiv d_{i,t} \theta_{i,t} + \zeta_{it}$ . As shown in (4),  $d_{i,t}$  measures the sensitivity of reported profits to imputed profits. Potential determinants of this sensitivity, such as firm size and age, are proposed in the literature. This study proposes intergovernmental transfers as another potential determinant of this sensitivity. Specifically, we incorporate intergovernmental transfers and other potential determinants of the sensitivity investigated in the literature into  $d_{i,t}$  in the following manner:

$$d_{i,t} = \alpha + \beta TRAN_{p,t} + \gamma X_{i,t} + \omega_{i,t}, \quad (5)$$

where  $p$  denotes the prefecture where firm  $i$  is located.  $TRAN_{p,t}$ , the key independent variable of this study, is defined as the ratio of intergovernmental transfers to the budgetary expenditure of local governments. We measure intergovernmental transfers in the relative sense, rather than in the absolute sense, to adhere to the three strands of literature mentioned in Introduction.  $TRAN_{p,t}$ 's coefficient,  $\beta$ , measures the effect of

intergovernmental transfers on firms' tax noncompliance and is the focus of this study. If  $\beta$  is negative, then a large amount of intergovernmental transfers increases firms' tax noncompliance. Conversely, a positive  $\beta$  means that intergovernmental transfers are negatively correlated with firms' tax noncompliance. Finally,  $X_{i,t}$  and  $\omega_{i,t}$  denote the control variables and the error term, respectively.

On the basis of (4) and (5), we estimate the following equation:

$$RPRO_{i,t} = (\alpha + \beta TRAN_{i,t} + \gamma X_{i,t}) PRO_{i,t} + \bar{\alpha} + \bar{\beta} TRAN_{i,t} + \bar{\gamma} X_{i,t} + \varepsilon_{i,t}. \quad (6)$$

We normalize the imputed and reported profits of firm  $i$  using the firm's total assets. Following Cai and Liu (2009) and Ma and Li (2012), we include the following variables as control variables: the logarithm of the number of employees (*LNLABOR*), which is a measurement of firm size; firm age (*AGE*); the ratio of sales to total industrial output (*SALER*), which somewhat controls the difference between the accounting system and the national income account system; the ratio of financial charges to total assets (*FINANCE*), which is a proxy for firms' access to credit markets; four dummy variables that represent firms' ownership status, including state-owned, collective, private, and mixed; and year dummies that capture time-varying effects.

### 3.2 Data

Data on intergovernmental transfers at the prefecture level come from the Support System for China Statistics Application. We exclude four municipalities directly under the central government (i.e., Beijing, Chongqing, Shanghai, and Tianjin) because they are provincial-level cities and thus not comparable with prefecture-level ones. The prefectures of Tibet are also excluded due to lack of data. Ultimately, we obtain a sample of 282 prefectures.

Firm-level data come from annual surveys conducted by China's National Bureau of Statistics. The survey, which has been conducted annually since 1998, covers all state-owned and above-scale nonstate-owned firms in the industrial sector, including mining, manufacturing, and public utilities. We only consider manufacturing because mining and public utilities may not be comparable with the former. In addition, some key variables are missing for years after 2007,<sup>5</sup> so we use the data in 1998–2007. We then combine the data of intergovernmental transfers at the prefecture level with the data of above-scale industrial firms.

To obtain a clean sample, we exclude firms paying corporate income tax to the State Taxation Bureau.<sup>6</sup> Our hypothesis is that intergovernmental transfers affect tax noncompliance through tax enforcement. For the hypothesis to be true, local officials should have an influence on the behavior of tax administration agencies. To expect

<sup>5</sup> In 2008, the National Bureau of Statistics of China stopped reporting industrial value added in the firm-level data files (Brandt et al. 2014). As a result, we cannot calculate imputed profits defined in Eq. (2). Using this dataset up to 2007 is actually common in the literature (e.g., Brandt et al. 2012, 2017; Huang et al. 2017; Mayneris et al. 2018; Zhang et al. 2018).

<sup>6</sup> The firms that paid corporate income taxes to the State Taxation Bureau consisted of state-owned firms affiliated with the central government, foreign-funded firms, and firms established in or after 2002. The remaining firms paid corporate income taxes to the Local Taxation Bureau.



**Table 1** A summary of the statistics of key variables

Variable	Obs	Mean	Median	Std. Dev.	Min	Max
<i>TRAN</i>	2804	0.5143	0.5141	0.1796	-0.0279	1.4227
<i>RPRO</i>	903,739	0.0649	0.0273	0.1275	-0.2330	0.9574
<i>PRO</i>	903,739	0.2656	0.1201	0.4650	-0.5063	3.9740
<i>LNLABOR</i>	903,739	4.9070	4.7958	1.0769	2.0794	8.3347
<i>AGE</i>	903,739	12.4246	10	7.5986	1	30
<i>SALER</i>	903,739	0.9515	0.9720	0.2226	0.2666	2.6154
<i>FINANCE</i>	903,739	0.0188	0.0120	0.0246	-0.0051	0.1879
<i>D<sub>collective</sub></i>	903,739	0.1783	0	0.3827	0	1
<i>D<sub>private</sub></i>	903,739	0.4345	0	0.4957	0	1
<i>D<sub>others</sub></i>	903,739	0.2939	0	0.4555	0	1

The period is 1998–2007. *TRAN* denotes intergovernmental transfers divided by budgetary expenditure. *RPRO* and *PRO* denote pre-tax profits and imputed profits scaled by total assets, respectively. *LNLABOR* represents the logarithm of the number of employees. *AGE* represents firm age. *SALER* is the ratio of sales to total industrial output. *FINANCE* is the ratio of financial charges to total assets. *D<sub>collective</sub>*, *D<sub>private</sub>*, and *D<sub>others</sub>* are dummy variables for collective firms, private firms, and mixed firms, respectively. To avoid the results driven by extreme values, we winsorize *LNLABOR* at the 99.5 percentile and winsorize *SALER* and *FINANCE* at the 0.5 and 99.5 percentiles

that local governments influence the Local Taxation Bureau is reasonable because the latter is affiliated with the former. However, as the State Taxation Bureau is a line organization, in principle, it is immune from the intervention of local officials.

We also exclude observations satisfying one of the following conditions:

- (i) The values of key variables are missing (e.g., total industrial output, value-added tax, intermediate inputs, financial charges, labor compensations, current depreciation, indirect taxes, total assets, pre-tax profits, employment, founding year, sales, and control variables);
- (ii) The amount of total assets is below RMB 2.5 million, the amount of sales is below RMB 2.5 million, or the number of employees is less than 8;
- (iii) Total industrial output is nonpositive, total assets are less than liquid assets, total assets are less than fixed assets, or accumulated depreciation is less than current depreciation;
- (iv) The value of *PRO* or that of *RPRO* is extreme. (Extreme values refer to values larger than the 99.5 percentile or smaller than the 0.5 percentile.)

Finally, we link firms across years using the method of Brandt et al. (2014). We obtain a sample of 903,739 observations, representing 222,343 firms. Table 1 summarizes the statistics of key variables.

## 4 Basic results

### 4.1 OLS estimates

We first estimate Eq. (6) using the OLS approach. We report the results in Table 2. In column (1), we only use imputed profits, intergovernmental transfers, and their interactions as independent variables. The estimated  $\beta$  is negative and statistically significant, indicating that a large amount of intergovernmental transfers results in a high degree of tax noncompliance. In column (2), we add control variables to independent variables. The estimated  $\beta$  remains negative and statistically significant, and its absolute value is even larger than that in column (1). With respect to economic magnitude, the result in column (2) suggests that a one-standard-deviation increase in *TRAN*, from which all independent variables take their mean values, leads to a 10.6% decrease in the sensitivity of reported profits to imputed profits.

We also check the robustness of the results in columns (3) and (4) by using an alternative measurement of intergovernmental transfers, that is, the ratio of intergovernmental transfers to the sum of intergovernmental transfers and budgetary revenue of local governments (*TRAN2*). Intergovernmental transfers and budgetary revenue are the two main financial sources of local governments. This measurement exploits the information on the importance of intergovernmental transfers relative to budgetary revenue. We report the result without control variables in column (3) and that with control variables in column (4). The results reveal that the estimated  $\beta$  values are similar to those in columns (1) and (2).

The estimated coefficients of the control variables are consistent with findings in the literature (Cai and Liu 2009; Ma and Li 2012). The estimated coefficient of the interaction between the logarithm of the number of employees and imputed profits is positive and statistically significant, indicating that large firms engage in tax noncompliance to a small degree. The estimated coefficient of the interaction between firm age and imputed profits is also positive and statistically significant, indicating that firms founded earlier than others engage less in tax noncompliance. The estimated coefficient of the interaction between the ratio of sales to total industrial output and imputed profits is positive and statistically significant, which is consistent with the finding of Ma and Li (2012). Finally, the estimated coefficient of the interaction between the ratio of financial charges to total assets and imputed profits is positive and statistically significant, indicating that tax noncompliance is negatively correlated with access to external financing.

One concern is that intergovernmental transfers may be correlated with the error term due to omitted variables. If this is true, then the estimated  $\beta$  will be inconsistent. To address this concern, we use the IV approach to check the robustness of the results in Sect. 4.2. We further exploit exogenous variations in intergovernmental transfers generated by the “Province-Managing-County” (PMC) fiscal reform in Hubei to identify the effect of intergovernmental transfers on tax noncompliance in Sect. 4.3.

**Table 2** Results based on the OLS approach

	(1) <i>RPRO</i>	(2) <i>RPRO</i>	(3) <i>RPRO</i>	(4) <i>RPRO</i>
<i>PRO</i>	0.170*** (0.002)	- 0.066*** (0.006)	0.167*** (0.002)	- 0.071*** (0.006)
<i>TRAN</i> × <i>PRO</i>	- 0.074*** (0.004)	- 0.088*** (0.004)		
<i>TRAN</i>	- 0.029*** (0.001)	- 0.007*** (0.001)		
<i>TRAN2</i> × <i>PRO</i>			- 0.071*** (0.004)	- 0.086*** (0.004)
<i>TRAN2</i>			- 0.026*** (0.001)	- 0.006*** (0.001)
<i>LNLABOR</i> × <i>PRO</i>		0.011*** (0.001)		0.011*** (0.001)
<i>AGE</i> × <i>PRO</i>		0.001*** (0.000)		0.001*** (0.000)
<i>SALER</i> × <i>PRO</i>		0.152*** (0.003)		0.151*** (0.003)
<i>FINANCE</i> × <i>PRO</i>		0.311*** (0.019)		0.315*** (0.019)
<i>LNLABOR</i>		- 0.001*** (0.000)		- 0.001*** (0.000)
<i>AGE</i>		- 0.001*** (0.000)		- 0.001*** (0.000)
<i>SALER</i>		0.026*** (0.001)		0.026*** (0.001)
<i>FINANCE</i>		0.242*** (0.010)		0.244*** (0.010)
Year, ownership dummies and their interactions with <i>PRO</i>	No	Yes	No	Yes
<i>N</i>	903,739	903,739	903,739	903,739
<i>R</i> <sup>2</sup>	0.262	0.320	0.261	0.320

The dependent variable *RPRO* is defined as pre-tax profits scaled by total assets. *PRO* is defined as imputed profits scaled by total assets. *TRAN* denotes intergovernmental transfers divided by budgetary expenditure, and *TRAN2* is the ratio of intergovernmental transfers to the sum of intergovernmental transfers and budgetary revenue. *LNLABOR* represents the logarithm of the number of employees. *AGE* represents firm age. *SALER* is the ratio of sales to total industrial output. *FINANCE* is the ratio of financial charges to total assets. Standard errors are clustered at the firm level

\* $p < 0.10$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$

## 4.2 IV estimates

To address the potential endogeneity, we first use the average *TRAN* of other prefectures in the same province (*TRAN\_NEI*) and its interaction with imputed profits ( $TRAN\_NEI \times PRO$ ) as instrumental variables. Intergovernmental transfers are usually designed to favor a region instead of a single prefecture. For example, after the implementation of the Western Development Program, the central government gave more intergovernmental transfers to the West than before. Consequently, the intergovernmental transfers that a prefecture receive tend to be correlated with the intergovernmental transfers that its neighboring prefectures receive. In addition, the intergovernmental transfers that other prefectures receive are less likely to affect the tax noncompliance of firms in the concerned prefecture compared with the intergovernmental transfers that the concerned prefecture receives. Therefore, it is plausible to assume that the instrumental variables are uncorrelated with the error term. Our instrumental strategy is actually common in the literature. For example, the literature on the effects of tax structure (Lee and Gordon 2005; Liu and Feng 2015; Liu and Martinez-Vazquez 2015) considers the potential endogeneity of variables measuring a jurisdiction's tax structure and uses variables measuring the tax structure of its neighboring jurisdictions as instrumental variables.

We report the IV regression results in Table 3. In column (1), we report the second-stage regression result. The estimated  $\beta$  remains negative and statistically significant. Its absolute value nearly doubles compared with the OLS result. The economic magnitude nearly doubles as well. A one-standard-deviation increase in *TRAN*, from which all independent variables take their mean values, leads to a 20.3% decrease in the sensitivity of reported profits to imputed profits. Thus, the IV estimates provide strong evidence of the positive effect of intergovernmental transfers on tax noncompliance. In columns (2) and (3), we report the first-stage regression results for intergovernmental transfers and their interaction with imputed profits, respectively. The results reveal that the estimated coefficients of the instrumental variables are highly significant. Moreover, we use the Cragg–Donald Wald *F* statistic to test instrument relevance. Its value is  $1.8 \times 10^5$ , suggesting that our instrumental variables are strong.

One concern is that the instrumental variables may not be exogenous. However, the intergovernmental transfers that other prefectures in the same province receive are less likely to affect the tax noncompliance of firms in the concerned prefecture compared with the intergovernmental transfers that the concerned prefecture receives. Implementing this empirical strategy remains a useful exercise. Moreover, to boost our confidence in the results, we exploit a natural experiment to construct alternative instrumental variables in the subsequent subsection.

## 4.3 Results based on a natural experiment

We further exploit the opportunity provided by the PMC fiscal reform in Hubei, a province in Middle China, which generated an exogenous increase in intergovernmental transfers, to address the concern of potential endogeneity.

**Table 3** Results based on the IV approach

	(1) <i>RPRO</i>	(2) <i>TRAN</i> × <i>PRO</i>	(3) <i>TRAN</i>
<i>PRO</i>	− 0.024*** (0.007)	0.076*** (0.008)	0.006 (0.004)
<i>TRAN</i> × <i>PRO</i>	− 0.169*** (0.007)		
<i>TRAN</i>	− 0.014*** (0.002)		
<i>TRAN</i> <sub><i>NEI</i></sub> × <i>PRO</i>		0.856*** (0.009)	0.025*** (0.005)
<i>TRAN</i> <sub><i>NEI</i></sub>		− 0.003 (0.002)	0.815*** (0.003)
<i>LNLABOR</i> × <i>PRO</i>	0.011*** (0.001)	0.001 (0.001)	− 0.002*** (0.001)
<i>AGE</i> × <i>PRO</i>	0.001*** (0.000)	0.001*** (0.000)	− 0.000* (0.000)
<i>SALER</i> × <i>PRO</i>	0.150*** (0.003)	− 0.008** (0.004)	0.010*** (0.002)
<i>FINANCE</i> × <i>PRO</i>	0.314*** (0.019)	0.110*** (0.023)	− 0.135*** (0.011)
<i>LNLABOR</i>	− 0.001*** (0.000)	0.000** (0.000)	0.005*** (0.000)
<i>AGE</i>	− 0.001*** (0.000)	0.000* (0.000)	0.001*** (0.000)
<i>SALER</i>	0.025*** (0.001)	0.000 (0.000)	− 0.020*** (0.001)
<i>FINANCE</i>	0.250*** (0.010)	0.071*** (0.007)	0.409*** (0.012)
Year, ownership dummies and their interactions with <i>PRO</i>	Yes	Yes	Yes
<i>N</i>	903,739	903,739	903,739
<i>R</i> <sup>2</sup>	0.316	0.882	0.340

Column (1) reports the second-stage regression result, and columns (2) and (3) report the first-stage regression results. *RPRO* and *PRO* denote pre-tax profits and imputed profits scaled by total assets, respectively. *TRAN* denotes intergovernmental transfers divided by budgetary expenditure, and *TRAN*<sub>*NEI*</sub> is the average *TRAN* of other prefectures in the same province. *LNLABOR* represents the logarithm of the number of employees. *AGE* represents firm age. *SALER* is the ratio of sales to total industrial output. *FINANCE* is the ratio of financial charges to total assets. Standard errors are clustered at the firm level

\**p* < 0.10; \*\**p* < 0.05; \*\*\**p* < 0.01

For decades, provincial governments had managed prefecture governments, while prefecture governments had managed county governments.<sup>7</sup> In this regime, provin-

<sup>7</sup> There are exceptions, though. The provincial government of Hubei directly managed four county governments. We exclude these counties.

cial governments send intergovernmental transfers, including those for prefecture governments and county governments, to prefecture governments. Then, prefecture governments are supposed to pass on the intergovernmental transfers for county governments to county governments. Typically, prefecture governments withhold a portion of the intergovernmental transfers for county governments, which aggravates the already severe fiscal stress of county governments.

To lessen the fiscal stress of county governments and improve administrative efficiency, the provincial government of Hubei implemented the PMC fiscal reform in 2004. The reform covered all the counties in the province, except those affiliated with an autonomous prefecture, namely Enshi. After the reform, the provincial government directly managed prefecture and county governments in terms of fiscal matters. The provincial government directly sent intergovernmental transfers to county governments. The de facto intergovernmental transfers that county governments received increased because prefecture governments could no longer withhold the intergovernmental transfers for county governments. Moreover, after the reform, the provincial government gave more intergovernmental transfers to county governments than before, further increasing the intergovernmental transfers that county governments received. Overall, the PMC fiscal reform generated an exogenous increase in intergovernmental transfers to county governments.

We use this exogenous increase in intergovernmental transfers to identify the effect of intergovernmental transfers on the tax noncompliance of firms. For convenience, we refer to these counties in Hubei that implemented the PMC fiscal reform as the treatment group and refer to the remaining eight counties in Hubei that did not implement the reform and the counties of Hunan as the control group. The counties of Hunan are used as members of the control group because Hunan is geographically, culturally, and economically similar to Hubei. To expect that the counties of Hunan are comparable with the counties of Hubei is reasonable.

*TREAT* is the dummy variable for the treatment group, and *POST* is the dummy variable for the years following the reform.<sup>8</sup> Therefore, the interaction of *TREAT* and *POST* ( $TREAT \times POST$ ) is the dummy variable for the reform. We use it and its interaction with imputed profits ( $TREAT \times POST \times PRO$ ) as instrumental variables. We also add *TREAT* and  $TREAT \times PRO$  to independent variables to control the inherent differences in the tax noncompliance of firms between the treatment and control groups and add *POST* and  $POST \times PRO$  to independent variables to control the differences in the tax noncompliance of firms over time.

We report the results in Table 4. The period is 2002–2005. In column (1), we report the OLS regression results. The estimated  $\beta$  is near that in Table 2. In column (2), we report the second-stage regression result of the IV approach. The estimated  $\beta$  is negative and statistically significant. Its absolute value is large, providing strong evidence of the positive effect of intergovernmental transfers on the tax noncompliance of firms. In columns (3) and (4), we report the first-stage regression results of the IV approach. For intergovernmental transfers, the estimated coefficient of  $TREAT \times POST$  is positive, which is consistent with our inference that the PMC fiscal reform

<sup>8</sup> *TREAT* is set as 1 for the counties in the treatment group and set as 0 otherwise. *POST* is set as 1 for the years following the reform and set as 0 for the years prior to the reform.

leads to an exogenous increase in the intergovernmental transfers that county governments receive. The coefficients of the instrumental variables are highly significant. Moreover, we use the Cragg–Donald Wald  $F$  statistic to test instrument relevance. Its value is 183.068, indicating an adequate level of strength.<sup>9</sup>

#### 4.4 Robustness checks

In this subsection, we discuss additional robustness checks. First, we examine whether the results are robust for large firms. We exclude observations where total assets are below RMB 5 million or sales are below RMB 5 million. The regression results are reported in column (1) of Table 5. The estimated  $\beta$  has the same sign, and its absolute value increases.

The jurisdictions of some prefectures changed during the sample period. Prefectures with the same name but different jurisdictions may not be comparable, so we only use the information of prefectures with stable jurisdiction.<sup>10</sup> The regression result reported in column (2) of Table 5 shows that the estimated  $\beta$  is almost the same.

Ma and Li (2012) find that government size and economic development level affect the tax noncompliance of firms. One concern is that these effects may be confounded by the effect of intergovernmental transfers on tax noncompliance. To address this concern, we use the ratio of budgetary expenditure to GDP (*GOVTSIZE*) to measure government size and GDP per capita (*GDPPC*) to measure economic development level. By adding the two variables and their interactions with imputed profits to independent variables, we find that the estimated  $\beta$  remains negative and statistically significant, as reported in column (3) of Table 5.

In addition, Cai and Liu (2009) find that competition affects tax noncompliance. Following Cai and Liu (2009), we use the logarithm of the number of firms in each four-digit industry (*LN FIRMNO*) as a measurement of competition. We add this variable and its interaction with imputed profits to independent variables to control the potential effect of competition on tax noncompliance. The result reported in column (4) of Table 5 reveals that the estimated  $\beta$  is nearly unaffected.

## 5 Further analyses

Our basic results reveal that a large amount of intergovernmental transfers leads to a high degree of firms' tax noncompliance. The underlying hypothesis is that intergovernmental transfers affect the tax enforcement of local governments, which further affect firms' tax noncompliance. We cannot directly test this hypothesis as tax enforce-

<sup>9</sup> One concern is that the PMC fiscal reform may affect firms' tax noncompliance through its effect on economic growth. To address this concern, we add the growth rate of GDP per capita and its interaction with imputed profits to independent variables. The estimated coefficients of the two variables are not statistically significant. The estimated  $\beta$  remains negative and statistically significant, with its value near that in column (2) of Table 4.

<sup>10</sup> For example, the jurisdiction of Liuzhou changed in 2003, so we only use the information of Liuzhou from 2004.

**Table 4** Results based on a natural experiment

	(1) <i>RPRO</i>	(2) <i>RPRO</i>	(3) <i>TRAN × PRO</i>	(4) <i>TRAN</i>
<i>PRO</i>	0.050*** (0.013)	0.163*** (0.051)	0.685*** (0.009)	0.008 (0.015)
<i>TRAN × PRO</i>	− 0.085*** (0.012)	− 0.224*** (0.076)		
<i>TRAN</i>	− 0.063*** (0.007)	− 0.171*** (0.039)		
<i>TREAT × POST × PRO</i>			0.075*** (0.005)	− 0.025*** (0.008)
<i>TREAT × POST</i>			0.000 (0.003)	0.108*** (0.006)
<i>TREAT × PRO</i>		− 0.031*** (0.006)	− 0.102*** (0.003)	− 0.027*** (0.005)
<i>TREAT</i>		− 0.016*** (0.002)	0.005** (0.002)	− 0.059*** (0.004)
<i>POST × PRO</i>		0.028*** (0.007)	0.058*** (0.003)	0.033*** (0.005)
<i>POST</i>		0.016*** (0.003)	0.002 (0.002)	0.020*** (0.003)
<i>LNLABOR × PRO</i>	− 0.004*** (0.002)	− 0.005*** (0.002)	− 0.004*** (0.001)	0.002 (0.002)
<i>AGE × PRO</i>	− 0.001*** (0.000)	− 0.000 (0.000)	0.001*** (0.000)	− 0.000 (0.000)
<i>SALER × PRO</i>	0.080*** (0.006)	0.060*** (0.008)	− 0.062*** (0.005)	− 0.031*** (0.009)
<i>FINANCE × PRO</i>	− 0.069** (0.032)	− 0.043 (0.034)	0.149*** (0.025)	0.032 (0.042)
<i>LNLABOR</i>	− 0.000 (0.001)	− 0.001 (0.001)	− 0.001 (0.001)	− 0.008*** (0.001)
<i>AGE</i>	− 0.001*** (0.000)	− 0.000*** (0.000)	− 0.000** (0.000)	0.001*** (0.000)
<i>SALER</i>	0.027*** (0.004)	0.023*** (0.005)	− 0.007** (0.003)	− 0.031*** (0.006)
<i>FINANCE</i>	0.674*** (0.034)	0.701*** (0.035)	0.022 (0.027)	0.078* (0.046)
Ownership dummies and their interactions with <i>PRO</i>	Yes	Yes	Yes	Yes
Year dummies and their interactions with <i>PRO</i>	Yes	No	No	No



Table 4 continued

	(1) <i>RPRO</i>	(2) <i>RPRO</i>	(3) <i>TRAN</i> × <i>PRO</i>	(4) <i>TRAN</i>
<i>N</i>	13,441	13,441	13,441	13,441
<i>R</i> <sup>2</sup>	0.268	0.245	0.957	0.138

Column (1) reports the OLS regression result. Column (2) reports the second-stage regression result, and columns (3) and (4) report the first-stage regression results for the IV approach. *RPRO* and *PRO* denote pre-tax profits and imputed profits scaled by total assets, respectively. *TRAN* denotes intergovernmental transfers divided by budgetary expenditure. *TREAT* is the dummy variable for the treatment group, and *POST* is the dummy variable for years following the PMC reform. *LNLABOR* represents the logarithm of the number of employees. *AGE* represents firm age. *SALER* is the ratio of sales to total industrial output. *FINANCE* is the ratio of financial charges to total assets. Standard errors are in parentheses

\* $p < 0.10$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$

ment is unobservable. Instead, we provide an indirect evidence by testing an inference of the hypothesis.

We can assume that firms' tax noncompliance depends on the tax enforcement of local governments that they observe and how they understand the intentions of local governments. Firms that interact more frequently with the government than others are more likely to understand the intentions of the government and engage more in tax noncompliance when intergovernmental transfers increase.

To test this inference, we need information regarding firms' interactions with the government. Fortunately, this information is available in the Survey of Chinese Enterprises (SCE) in 2004, which was conducted by World Bank and covered 12,400 firms in 120 cities. Based on the survey, we construct two variables to measure firms' interactions with the government. One variable is *GOVTINTER*, which is the average time spent in interacting with the government for all the firms in a province. It measures the time costs of interacting with the government. The other variable is *TER*, which is the average ratio of business travel and entertaining expenses to core business income for all the firms in a province. Business travel and entertaining expenses are mainly incurred to build a relationship with the government. Thus, *TER* measures the out-of-pocket costs of interacting with the government.

We combine the data of the two variables with the existing data and test the inference using two approaches. First, we add the interaction between *GOVTINTER* and *TRAN* × *PRO* to independent variables. The coefficient of the interaction is expected to be negative. The regression result in column (1) of Table 6 shows that the estimated coefficient of the interaction is indeed negative and statistically significant. Second, we classify firms into two groups: the firms located in provinces whose *GOVTINTER* values are smaller than the median and the remaining firms. *GOVTINTERL* and *GOVTINTERH* are the dummy variables for the first and second groups, respectively. We add the interactions between each dummy variable with *TRAN* × *PRO* to independent variables. The coefficient of *GOVTINTERH* × *TRAN* × *PRO* is expected to

Table 5 Robustness checks

	(1) <i>RPRO</i>	(2) <i>RPRO</i>	(3) <i>RPRO</i>	(4) <i>RPRO</i>
<i>PRO</i>	- 0.052*** (0.008)	- 0.064*** (0.006)	- 0.021*** (0.006)	- 0.042*** (0.007)
<i>TRAN</i> × <i>PRO</i>	- 0.101*** (0.005)	- 0.088*** (0.004)	- 0.106*** (0.005)	- 0.088*** (0.004)
<i>TRAN</i>	- 0.006*** (0.001)	- 0.006*** (0.001)	- 0.013*** (0.001)	- 0.006*** (0.001)
<i>GOVTSIZE</i> × <i>PRO</i>			- 0.360*** (0.023)	
<i>GOVTSIZE</i>			- 0.031*** (0.003)	
<i>GDPPC</i> × <i>PRO</i>			- 0.007*** (0.000)	
<i>GDPPC</i>			- 0.001*** (0.000)	
<i>LN FIRMNO</i> × <i>PRO</i>				- 0.004*** (0.001)
<i>LN FIRMNO</i>				- 0.002*** (0.000)
<i>LN LABOR</i> × <i>PRO</i>	0.009*** (0.001)	0.011*** (0.001)	0.011*** (0.001)	0.011*** (0.001)
<i>AGE</i> × <i>PRO</i>	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)
<i>SALER</i> × <i>PRO</i>	0.159*** (0.003)	0.152*** (0.003)	0.151*** (0.003)	0.152*** (0.003)
<i>FINANCE</i> × <i>PRO</i>	0.402*** (0.024)	0.314*** (0.019)	0.281*** (0.019)	0.309*** (0.019)
<i>LN LABOR</i>	0.000** (0.000)	- 0.001*** (0.000)	- 0.001*** (0.000)	- 0.001*** (0.000)
<i>AGE</i>	- 0.001*** (0.000)	- 0.001*** (0.000)	- 0.001*** (0.000)	- 0.001*** (0.000)
<i>SALER</i>	0.026*** (0.001)	0.026*** (0.001)	0.025*** (0.001)	0.026*** (0.001)
<i>FINANCE</i>	0.135*** (0.012)	0.244*** (0.010)	0.226*** (0.010)	0.247*** (0.010)
Year, ownership dummies and their interactions with <i>PRO</i>	Yes	Yes	Yes	Yes

Table 5 continued

	(1) <i>RPRO</i>	(2) <i>RPRO</i>	(3) <i>RPRO</i>	(4) <i>RPRO</i>
<i>N</i>	741,438	897,576	903,739	903,739
<i>R</i> <sup>2</sup>	0.328	0.320	0.327	0.321

In column (1), we drop observations where total assets are below RMB 5000 thousand or sales are below RMB 5000 thousand. In column (2), we only use the information of prefectures with stable jurisdiction. *RPRO* and *PRO* denote pre-tax profits and imputed profits scaled by total assets, respectively. *TRAN* denotes intergovernmental transfers divided by budgetary expenditure. *GOVTSIZE* is the ratio of budgetary expenditure to GDP. *GDPPC* is GDP per capita. *LN FIRMNO* is the logarithm of the number of firms in each four-digit industry. *LN LABOR* is the logarithm of the number of employees. *AGE* represents firm age. *SALER* is the ratio of sales to total industrial output. *FINANCE* is the ratio of financial charges to total assets. Standard errors are clustered at the firm level

\* $p < 0.10$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$

be smaller than that of  $GOVTINTERL \times TRAN \times PRO$ . The result reported in column (2) of Table 6 confirms this expectation. Moreover, we repeat this procedure for *TER*. The results reported in columns (3) and (4) are consistent with the inference as well.<sup>11</sup> These findings may have other explanations, but they are at least consistent with our inference.

We examine the average effect of intergovernmental transfers on the tax noncompliance of firms in Sect. 4. We then examine whether the effect of intergovernmental transfers on the tax noncompliance of firms depends on the composition of intergovernmental transfers. Specifically, we investigate the possible heterogeneous effect across prefectures with different proportions of conditional transfers in intergovernmental transfers. Conditional and unconditional transfers constitute intergovernmental transfers.<sup>12</sup> Unconditional transfers are spent at the discretion of local governments, whereas conditional transfers must be spent in the way specified by their providers. Furthermore, local governments are usually required to provide matching funds for conditional transfers. Given that more restrictions are imposed on conditional transfers, a high proportion of conditional transfers should increase local government spending and decrease tax reductions. In other words, a high proportion of conditional transfers should lead to a small degree of firms' tax noncompliance.

To test this inference, we add the interaction between the proportion of conditional transfers (*TRANCS*) and imputed profits to independent variables. The regression result reported in column (1) of Table 7 shows that the estimated coefficient of  $TRANCS \times PRO$  is positive and statistically significant, which is consistent with the inference.

Thus far, we investigate the effect of intergovernmental transfers on firms' tax noncompliance. This is one way through which intergovernmental transfers affect the tax burdens of firms. The effect of intergovernmental transfers on tax rate is the other way. Finally, we examine the possible effect of intergovernmental transfers on the

<sup>11</sup> The results remain robust if we aggregate firms' interactions with the government at the prefecture level.

<sup>12</sup> In China, conditional transfers consist of earmarked transfers and transfers for the wages of public employees and teachers in primary and middle schools.

**Table 6** Firms' interactions with the government and their tax noncompliance

	(1) <i>RPRO</i>	(2) <i>RPRO</i>	(3) <i>RPRO</i>	(4) <i>RPRO</i>
<i>PRO</i>	- 0.065*** (0.006)	- 0.063*** (0.006)	- 0.081*** (0.006)	- 0.069*** (0.006)
<i>TRAN</i>	- 0.006*** (0.001)	- 0.006*** (0.001)	- 0.008*** (0.001)	- 0.006*** (0.001)
<i>TRAN</i> × <i>PRO</i>	- 0.039*** (0.008)		0.176*** (0.009)	
<i>GOVTINTER</i> × <i>TRAN</i> × <i>PRO</i>	- 0.299*** (0.043)			
<i>TER</i> × <i>TRAN</i> × <i>PRO</i>			- 19.217*** (0.501)	
<i>GOVTINTERL</i> × <i>TRAN</i> × <i>PRO</i>		- 0.067*** (0.004)		
<i>GOVTINTERH</i> × <i>TRAN</i> × <i>PRO</i>		- 0.114*** (0.004)		
<i>TERL</i> × <i>TRAN</i> × <i>PRO</i>				- 0.015*** (0.005)
<i>TERH</i> × <i>TRAN</i> × <i>PRO</i>				- 0.144*** (0.004)
<i>LNLABOR</i> × <i>PRO</i>	0.011*** (0.001)	0.010*** (0.001)	0.010*** (0.001)	0.009*** (0.001)
<i>AGE</i> × <i>PRO</i>	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)
<i>SALER</i> × <i>PRO</i>	0.151*** (0.003)	0.152*** (0.003)	0.153*** (0.003)	0.155*** (0.003)
<i>FINANCE</i> × <i>PRO</i>	0.309*** (0.019)	0.299*** (0.019)	0.284*** (0.019)	0.257*** (0.019)
<i>LNLABOR</i>	- 0.001*** (0.000)	- 0.001*** (0.000)	- 0.001*** (0.000)	- 0.001*** (0.000)
<i>AGE</i>	- 0.001*** (0.000)	- 0.001*** (0.000)	- 0.001*** (0.000)	- 0.001*** (0.000)
<i>SALER</i>	0.026*** (0.001)	0.025*** (0.001)	0.025*** (0.001)	0.024*** (0.001)
<i>FINANCE</i>	0.242*** (0.010)	0.242*** (0.010)	0.237*** (0.010)	0.235*** (0.010)
Year, ownership dummies and their interactions with <i>PRO</i>	Yes	Yes	Yes	Yes

Table 6 continued

	(1) <i>RPRO</i>	(2) <i>RPRO</i>	(3) <i>RPRO</i>	(4) <i>RPRO</i>
<i>N</i>	903,739	903,739	903,739	903,739
<i>R</i> <sup>2</sup>	0.320	0.322	0.330	0.334

*RPRO* and *PRO* denote pre-tax profits and imputed profits scaled by total assets, respectively. *TRAN* denotes intergovernmental transfers divided by budgetary expenditure. *GOVTINTER* is the average time spent in interacting with the government for all the firms in a province. *GOVTINTERL* is the dummy variable for the firms located in provinces whose *GOVTINTER* is smaller than the median, while *GOVTINTERH* is the dummy variable for the remaining firms. *TER* is the ratio of business travel and entertaining expenses to core business income. *TERL* is the dummy variable for the firms located in provinces whose *TER* is smaller than the median, and *TERH* is the dummy variable for the remaining firms. *LNLABOR* represents the logarithm of the number of employees. *AGE* represents firm age. *SALER* is the ratio of sales to total industrial output. *FINANCE* is the ratio of financial charges to total assets. Standard errors are clustered at the firm level

\* $p < 0.10$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$

effective corporate income tax rate (*ETR*), which is defined as the ratio of corporate income tax to reported pre-tax profits.<sup>13</sup> The regression result is listed in column (2) of Table 7. Intergovernmental transfers are negatively correlated with the corporate income tax rate. In column (3) of Table 7, we further control the fixed effects of firms. Although the magnitude of the estimated coefficient of *TRAN* decreases, the estimated coefficient remains negative and statistically significant.

## 6 Conclusion

Previous studies do not consider the possibility of intergovernmental transfers affecting the tax burdens of firms through their effect on the tax noncompliance of firms. Moreover, previous studies do not report intergovernmental transfers as a determinant of firms' tax noncompliance. This study contributes to the literature by investigating how intergovernmental transfers affect firms' tax noncompliance. Using data from China, we find that a large amount of intergovernmental transfers leads to a high degree of firms' tax noncompliance. This finding is robust to the IV approach, an analysis based on a natural experiment, and various robustness checks.

Our hypothesis is that intergovernmental transfers affect the tax enforcement of local governments and, in turn, firms' tax noncompliance. We provide indirect evidence by testing an inference of this hypothesis. However, we do not directly investigate the role of tax enforcement due to the difficulty resulting from the fact that tax enforcement is unobservable. The role of tax enforcement is worth exploring in future studies.

<sup>13</sup> In China, de jure tax rates are set by the central government. However, local governments can exempt taxes according to policies. Illegal tax exemptions also exist, although they are under the pressure of the central government.

**Table 7** Composition of intergovernmental transfers, tax noncompliance, and tax rate

	(1) <i>RPRO</i>	(2) <i>ETR</i>	(3) <i>ETR</i>
<i>PRO</i>	- 0.079*** (0.006)		
<i>TRAN</i> × <i>PRO</i>	- 0.112*** (0.005)		
<i>TRAN</i>	- 0.006*** (0.001)	- 0.132*** (0.002)	- 0.036*** (0.003)
<i>TRANCS</i> × <i>PRO</i>	0.072*** (0.005)		
<i>TRANCS</i>	- 0.004*** (0.001)		
<i>LNLABOR</i> × <i>PRO</i>	0.011*** (0.001)		
<i>AGE</i> × <i>PRO</i>	0.001*** (0.000)		
<i>SALER</i> × <i>PRO</i>	0.152*** (0.003)		
<i>FINANCE</i> × <i>PRO</i>	0.293*** (0.019)		
<i>LNLABOR</i>	- 0.001*** (0.000)	0.003*** (0.000)	0.014*** (0.001)
<i>AGE</i>	- 0.001*** (0.000)	- 0.000*** (0.000)	0.000 (0.000)
<i>SALER</i>	0.025*** (0.001)	0.005*** (0.001)	0.004*** (0.001)
<i>FINANCE</i>	0.241*** (0.010)	- 0.254*** (0.010)	- 0.066*** (0.011)
Year, ownership dummies	Yes	Yes	Yes
Year, ownership dummies × <i>PRO</i>	Yes	No	No
Firms' fixed effects	No	No	Yes
<i>N</i>	903,739	899,017	899,017
<i>R</i> <sup>2</sup>	0.321	0.046	-

*RPRO* and *PRO* denote pre-tax profits and imputed profits scaled by total assets, respectively. *ETR* is the ratio of corporate income tax to reported pre-tax profits. *TRAN* denotes intergovernmental transfers divided by budgetary expenditure. *TRANCS* is the proportion of conditional transfers. *LNLABOR* represents the logarithm of the number of employees. *AGE* represents firm age. *SALER* is the ratio of sales to total industrial output. *FINANCE* is the ratio of financial charges to total assets. In columns (2)–(4), we drop the observations whose *ETR* is larger than the 99.5 percentile or smaller than the 0.5 percentile. Standard errors are clustered at the firm level

\* $p < 0.10$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$

**Acknowledgements** The authors thank the editor and anonymous referees for very useful comments and suggestions. The authors are also grateful to financial support from National Natural Science Foundation of China (Grant No. 71803060), Major Program of the National Social Science Foundation (Grant No. 17ZDA047), and Natural Science Foundation of Guangdong Province (Grant No. 2018A030310620). This study has also been supported by Industrial big data and economic decision-making Laboratory of Jinan University, Guangzhou Key Research center of Humanities, and Social Science “Research center of new system of modern industry”. All errors remain the authors’ own.

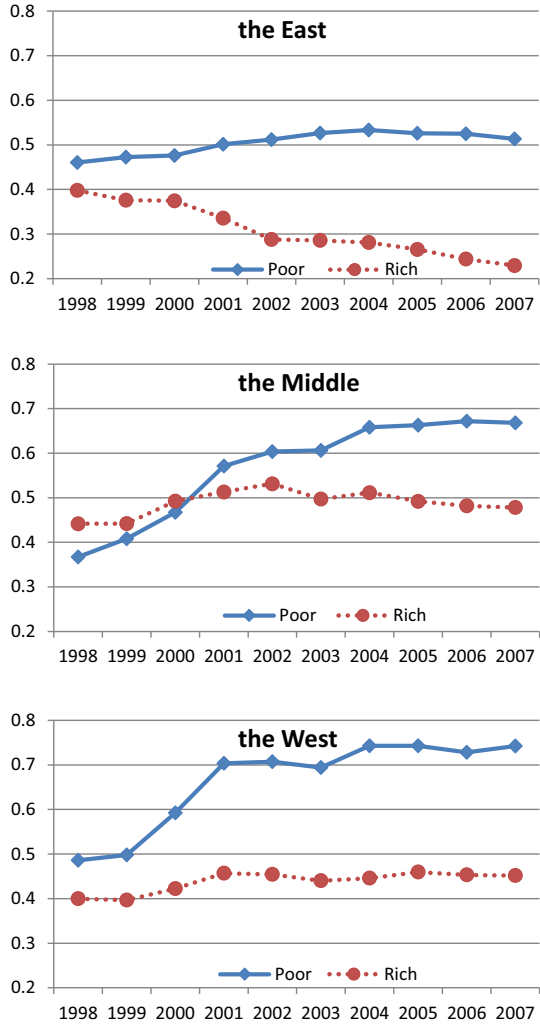
## **Appendix A: Why do we relate the proportion of tax rebates to the freedom of the central government to allocate intergovernmental transfers?**

Intergovernmental transfers, excluding tax rebates, can be classified as those from provincial governments and the central government. Intergovernmental transfers from provincial governments have been relatively small since the tax-sharing reform in 1994 because the budgetary revenue of provincial governments was less than their budgetary expenditure since the reform (Shen et al. 2012). Consequently, provincial governments were limited to give intergovernmental transfers to prefecture governments. Conversely, the budgetary revenue of the central government has been much larger than its budgetary expenditure since the reform. The central government had ample funds. A sizable proportion (80.2% in 2017) of the budgetary revenue of the central government was assigned as intergovernmental transfers. The allocation of these intergovernmental transfers reflects the will of the central government. For example, the central government allocates earmarked transfers for ad hoc programs. A program is processed as follows. First, prefecture governments submit applications to participate in the program. Then, the central government chooses the participants of the program among the applicants and determines the amount of earmarked transfers for each participant. As another example, the central government allocates the equalization transfer. The amount for each prefecture depends on the formula and the total amount, both of which are set by the central government. Although intergovernmental transfers are appropriated through the ranks (i.e., they are appropriated from the central government to provincial governments and then appropriated from provincial governments to prefecture governments), misappropriation by provincial governments is forbidden, ensuring that the will of the central government is respected. Overall, because the intergovernmental transfers from the central government were much larger than those from provincial governments, we can roughly claim that a small proportion of tax rebates was related to a high degree of freedom of the central government to allocate intergovernmental transfers.

## **Appendix B: The variation of intergovernmental transfers within a region**

In this appendix, we examine the variation of intergovernmental transfers within a region. For each of the three regions, we assign prefectures to two groups according to their GDP per capita in 1998. The prefectures whose GDP per capita in 1998 is

**Fig. 3** Ratio of intergovernmental transfers to budgetary expenditure: by regions. *Notes* The Poor group consists of the prefectures whose GDP per capita in 1998 is smaller than the median. The Rich group consists of the remaining prefectures



smaller than the median are assigned to the Poor group, and the remaining prefectures are assigned to the Rich group. We depict the intergovernmental transfers of the two groups in 1998–2007 in Fig. 3.

The figure shows that the intergovernmental transfers of the Rich group in the East decline, whereas the intergovernmental transfers of the Poor group in the East increase slightly. Although the intergovernmental transfers of both groups in the Middle increase, the increase in the intergovernmental transfers of the Poor group is larger than that of the Rich group. Specifically, the intergovernmental transfers of the Poor group increase in 2002–2007, whereas the intergovernmental transfers of the Rich group decline slightly during this subperiod. Moreover, the increase in intergovernmental transfers of the Poor group in the West is larger than that of the Rich group in the West.



**Table 8** Robustness checks: time- or location-varying coefficients for  $(1, TRAN_{i,t}, X_{i,t})$

	(1) <i>RPRO</i>	(2) <i>RPRO</i>	(3) <i>RPRO</i>	(4) <i>RPRO</i>
<i>PRO</i>	- 0.059*** (0.006)	- 0.056*** (0.006)	- 0.042*** (0.006)	- 0.043*** (0.006)
<i>TRAN</i> × <i>PRO</i>	- 0.090*** (0.004)	- 0.075*** (0.004)	- 0.080*** (0.004)	- 0.080*** (0.004)
<i>LNLABOR</i> × <i>PRO</i>	0.010*** (0.001)	0.010*** (0.001)	0.008*** (0.001)	0.008*** (0.001)
<i>AGE</i> × <i>PRO</i>	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)
<i>SALER</i> × <i>PRO</i>	0.150*** (0.003)	0.144*** (0.003)	0.144*** (0.003)	0.145*** (0.003)
<i>FINANCE</i> × <i>PRO</i>	0.224*** (0.019)	0.157*** (0.018)	0.058*** (0.018)	0.056*** (0.018)
Provincial-specific coefficients	No	Yes	-	-
Year-specific coefficients	Yes	No	-	-
Provincial-specific linear trends	-	-	Yes	-
Provincial-specific quadratic trends	-	-	-	Yes
Year, ownership dummies, and their interactions with <i>PRO</i>	Yes	Yes	Yes	Yes
<i>N</i>	903,739	903,739	903,739	903,739
<i>R</i> <sup>2</sup>	0.324	0.368	0.381	0.385

*RPRO* and *PRO* denote pre-tax profits and imputed profits scaled by total assets, respectively. *TRAN* denotes intergovernmental transfers divided by budgetary expenditure. *LNLABOR* represents the logarithm of the number of employees. *AGE* represents firm age. *SALER* is the ratio of sales to total industrial output. *FINANCE* is the ratio of financial charges to total assets. Standard errors are clustered at the firm level  
 \**p* < 0.10; \*\**p* < 0.05; \*\*\**p* < 0.01

### Appendix C: Time- or location-varying coefficients for $(1, TRAN_{i,t}, X_{i,t})$

In the context, we follow Cai and Liu (2009) and implicitly assume that the coefficients of  $(1, TRAN_{i,t}, X_{i,t})$  are constant. To demonstrate this, we substitute (5) into (4) and obtain the following equation:

$$RPRO_{i,t} = (\alpha + \beta TRAN_{p,t} + \gamma X_{i,t}) PRO_{i,t} + (\eta_{i,t} + \theta_{i,t}) \alpha + (\eta_{i,t} + \theta_{i,t}) \beta TRAN_{p,t} + (\eta_{i,t} + \theta_{i,t}) \gamma X_{i,t} + \varepsilon_{i,t} \tag{C1}$$

We define  $\bar{\alpha}_{i,t} = (\eta_{i,t} + \theta_{i,t})\alpha$ ,  $\bar{\beta}_{i,t} = (\eta_{i,t} + \theta_{i,t})\beta$ , and  $\bar{\gamma}_{i,t} = (\eta_{i,t} + \theta_{i,t})\gamma$ . In general,  $\bar{\alpha}_{i,t}$ ,  $\bar{\beta}_{i,t}$ , and  $\bar{\gamma}_{i,t}$  vary over time and across locations. Given that these coefficients are not the focus of this work, we follow Cai and Liu (2009) and make the simplified assumption that they are constant (i.e., they are present in Eq. (6) as  $\bar{\alpha}$ ,  $\bar{\beta}$ , and  $\bar{\gamma}$ ).

One concern is that imposing this assumption may have a bearing on the estimated coefficient  $\beta$ . We address this concern by allowing the coefficients of  $(1, TRAN_{i,t}, X_{i,t})$  to vary over time or across locations in Table 8. Specifically, we assume that the coefficients vary across years in column (1), vary across provinces in column (2), show provincial-specific linear trends in column (3), and show provincial-specific quadratic trends in column (4). The estimated coefficients of  $TRAN \times PRO$  change slightly, suggesting that the concern is a minor issue.

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