

Evading by Any Means? VAT Enforcement and Payroll Tax Evasion in China*

Lixing Li[†], Kevin Zhengcheng Liu[‡], Zhuo Nie[†], and Tianyang Xi[†]

[†]National School of Development and CCER, Peking University

[‡]Division of Social Science, HKUST

April 2020

Abstract

This paper studies how the enforcement of value-added tax affects Chinese firms' evasion of payroll tax, which is separately collected by the weakly empowered social security office. We use the central government's 2005 repeal of the agricultural tax to construct a measure of fiscal squeeze, and subsequent VAT enforcement, of the county government. The instrumental variable estimation finds that the VAT enforcement led to significantly increased evasion of the payroll tax. Investigations of firm heterogeneity and real responses support the argument that increased evasion stemmed from cost optimization by small and cash-constrained private firms. This study suggests that the lack of coordination among tax authorities hinders fiscal capability by aggravating tax evasion in weakly monitored areas.

Keywords: Tax Evasion, Value-added Tax, Payroll Tax, Evasion Substitution

JEL: D22, H25, H26

*Li: National School of Development, Peking University. E-mail: lilixing@nsd.pku.edu.cn. Liu: Division of Social Science, Hong Kong University of Science and Technology. E-mail: kevin.liu@connect.ust.hk. Nie: National School of Development, Peking University. E-mail: znie2017@nsd.pku.edu.cn. Xi: National School of Development, Peking University. E-mail: tyxi@nsd.pku.edu.cn. We would like to thank Ido Baum, Boubacar Diallo, Philip Keefer, Wojciech Kopczuk, Pinghan Liang, Yongzheng Liu, Yi Lu, Erzo Luttmer, James Poterba, Yukun Sun, Jin Wang, Xuan Wang, Wei Xiao, Longjian Yang, Yang Yao, Xiaobo Zhang, and seminar participants at the 2019 NBER-CCER Conference (Beijing), 2019 Ronald Coase Workshop (Warsaw), 2019 International Consortium for China Studies (Atlanta), 2019 China Meeting of the Econometric Society (Guangzhou), 2019 Chinese Public Finance Frontier Workshop (Beijing), 2019 Comparative Taxation and Fiscal Capacity Workshop (Beijing). Financial supports from the National Natural Science Foundation of China (#71773004 and #71874004) and the Ministry of Education of China (#16JJD790003) are gratefully acknowledged.

1 Introduction

Pervasive tax evasion imposes a constraint on fiscal capacity in developing countries (Besley and Persson, 2014). Some recent literature identifies various mechanisms for alleviating tax evasion, including auditing (Best et al., 2015; Bø et al., 2015; Kleven et al., 2011; Slemrod et al., 2001), third-party reporting (Kopczuk and Slemrod, 2006; Pomeranz, 2015), public disclosure (Luttmer and Singhal, 2014), and incentive schemes for tax agencies (Khan et al., 2015, 2019; Chen, 2017). However, evidence suggests that taxpayers may take advantage of institutional loopholes, casting doubt on the effectiveness of incremental enforcement inputs. For example, it is found that when tax authorities enhanced transparency about firms' gross revenue through improving monitoring technology, firms increased the reported volumes of input costs that are not subject to monitoring by tax agencies (Carrillo et al., 2017; Slemrod, 2019) or switch to informal sector (Waseem, 2018). Lacking policy coordination, increasing enforcement for one tax margin may aggravate evasion in other, weakly enforced areas.

Motivated by the multidimensional venues of tax evasion, this paper studies how enforcement of the value-added tax (VAT), gives rise to manufacturing firms' payroll tax evasion in China. VAT is the tax levied on the value-added of commodities during the production process. We focus on VAT as an essential dimension in tax collection enforcement for three reasons. First, VAT has been the most important source of government revenue since the central government implemented the tax-sharing reform in 1994 (Shen and Zou, 2015). Second, there is enormous variation in VAT collection capability at the local level. Local administrations play a key role in managing economic affairs, and they differ considerably in the efficacy for raising VAT revenue thanks to substantial fiscal decentralization (Jin et al., 2005; Xu, 2011; Zhang and Zou, 1998). Third, VAT collection is a fundamental public finance issue around the world (Almunia and Lopez-Rodriguez, 2018; Das-Gupta et al., 1995; Pomeranz, 2015; Tran-Nam et al., 2000). This feature warrants the external validity of our research for better understanding the multidimensional nature of fiscal capacity.

At the same time, the payroll tax (social security contribution) constitutes a sizable share of public revenue (Adam et al., 2019). Unlike VAT, payroll tax revenues are collected by social

security offices, and they accrue separately to social security funds. The separation of revenue collection responsibilities between local administrations and social security offices is conducive to unbalanced extractive capabilities. When one kind of tax burden becomes more stringent, private firms suffer from a loss in profits and a lower probability of survival. To alleviate this impact, firms evading relatively weakly enforced payroll taxes to save total costs and maintain their viability in the market.

The central government's 2005 repeal of the agricultural tax provides a reasonable identification strategy to study the impacts of VAT enforcement. Before 2005, the agricultural tax was collected by county governments and contributed to a sizable share of county governments' budget. The repeal of the agricultural tax created a revenue shortage for county governments and resulted in varying incentives to recoup revenue losses through enhancing the collection of other taxes, most notably VAT, depending on counties' preexisting fiscal dependence on the agricultural tax (Chen, 2017). Meanwhile, the repeal of the agricultural tax did not directly affect enforcement of the payroll tax, due to the separation between social security fund and local administrations' budget. Taking advantage of this feature, we calculate county-specific revenue shortage shocks based on counties' preexisting dependence on the agricultural tax, and adopt an instrumental variable estimation approach to study the effect of VAT enforcement on payroll tax evasion.

Our empirical investigations employ comprehensive panel data of industrial firms and attest to a pronounced pattern of tax evasion substitution. In the baseline estimation using all private firms, a 1 percentage point increase in the effective VAT rate led to a 1.79 percentage decrease in the effective payroll tax rate paid by the firms. This result survives a set of robustness checks that account for various confounding factors, firm dynamics, alternative measures of VAT rates and revenue losses. A placebo test using state-owned enterprises (SOEs), which are less sensitive to profit losses due to soft budget (Kornai et al., 2003), does not document a similar pattern of tax evasion substitution.

We complement the baseline results with several investigations of the potential mechanisms. The analyses show that firms facing intensive VAT enforcement responded by reducing employ-

ment, liquid assets, and debt, suggesting negative impacts of VAT enforcement on firms' profitability. Moreover, firms are more likely to evade their payroll tax obligation when they are financially constrained and when they face fiercer market competition. These results suggest that increasing VAT enforcement may unintentionally undermine tax compliance along other dimensions that have weaker ability in revenue collection. We also discuss several alternative interpretations for our results, including capital-labor substitution and government coordination between VAT and payroll tax enforcement, and provide suggestive evidences to alleviate the concern of their existence.

This research speaks to the literature examining fiscal capacity in developing countries (Besley and Persson, 2014; Best et al., 2015; Gordon and Li, 2009; Jensen, 2019). Compared with previous research, which mostly focused on evasion of one type of tax (Asatryan and Peichl, 2017; Carrillo et al., 2017; Slemrod et al., 2017), our findings shed new light on the substitution between multi-faceted tax evasion. A general policy implication is that the enhancement of state capability in one policy domain may unintentionally impose social costs in other areas. This logic extends to the phenomenon of displaced illegal activities, where strengthened enforcement in some areas aggravates institutional loopholes in import duty enforcement (Yang, 2008), crime deterrence (Amodio, 2017; Gonzalez-Navarro, 2013), and pollution regulation (Gibson, 2019; Fullerton and Karney, 2018; Hansman et al., 2018).

Our paper also relates to the literature examining the interplay between decentralization and state capacity (Bardhan, 2016). Cai and Treisman (2004) propose a model of decentralization, in which weak enforcement of taxes and the law emerges from interregional competition for investments. Mast (2020) attributes 30 percent of tax exemptions received by firms in the state of New York to interregional competition. Burgess et al. (2012) document that intensive interregional competition for revenues aggravates deforestation in Indonesia. Our paper suggests that a negative externality may arise not only from spatial interaction, but also from inter-departmental spillovers. As a result, increasing enforcement of one policy may compromise the performance of weakly empowered branches. The findings in this paper lend support to the argument for increasing policy coordination within bureaucratic systems (Weyland, 1998).

The remainder of the paper is organized as follows. Section 2 introduces the background of China's fragmented tax systems. Section 3 describes the data. Section 4 introduces the empirical strategy. Section 5 provides the baseline results and robustness checks and explores potential mechanisms. Section 6 concludes.

2 A Tale of Three Taxes

2.1 Social Security Tax in China

In China, employers and employees share the responsibilities of contributing to two kinds of social security funds: pension (basic old-age insurance, BOAI) and public health insurance.¹ The statutory social security contribution rates require that employers deposit roughly 20% for pension and 6%-10% for health insurance worth of employees' wages. Aside from employers' contribution, employees are required to make a 10% contribution out of their own wages to the social security system. Although the statutory rates were reduced in 2019 as part of the fiscal stimulus package, social security contributions remain a significant share of firms' cost.²

Two features of the social security system render social security payments a tax paid by firms rather than savings on behalf of employees. First, China's social security system is regionally fragmented (Fang and Feng, 2018). Local social security bureaus have substantial power over managing pension funds and distributing social security benefits. Absent a nationally unified pension system, employees are unable to carry their entitled benefits when they move to another city. Second, the pension system adopts a pay-as-you-go policy, which does not guarantee future benefits for employees according to the contributions by their employers. These institutional frictions undermine the incentives of compliance to social security payments (Giles et al., 2013, 2018).

In turn, evasion on the payroll tax is prevalent. Employers may resort to various mechanisms

¹There are other kinds of small social insurance program for employees, including unemployment insurance, injury insurance, and maternity insurance. Since the contributions to these programs are much less than those to basic old-age insurance and health insurance, here we only focus on the latter two programs.

²<https://tinyurl.com/tj769oz>. See Fang and Feng (2018) for a detailed introduction to China's social security system.

of payroll tax evasion, including underreporting wages, postponing social security payments, and hiring temporary workers (Nyland et al., 2006). From firms' point of view, the tax imposes a direct cost. According to a 2018 report by *Caixin*, an influential Chinese business magazine,

*If all companies are required to fully meet their social insurance payment obligations, the average costs for businesses will increase by 30% ... To reduce costs, it is common for employers to find ways to avoid making the full contributions, for example by dividing compensation into basic wages and bonuses, paying taxes only on basic wages, or by hiring more temporary workers to skirt social security obligations.*³

Local administrations are weakly incentivized to collect the payroll tax, because it hinders firms' incentives to expand investment and employment, which are the primary focus of local administrations.⁴ At the same time, stringent regulations on the usage of social security funds prohibits local administrations from diverting social security funds for other purposes (Meng, 2012). Without the assistance of local administrations and other more powerful tax agencies, social security offices have difficulty acquiring information about actual wage levels and tracking evasion behaviors. In 1998, the Ministry of Finance announced that local governments could choose to ask the local tax agency to help collect payroll taxes, and around 2000, some provinces adopted this practice. The effectiveness of this policy change has turned out to be quite limited. Some enterprise surveys reported that 70% of firms paid less than the statutory rate in 2019.⁵

2.2 VAT Collection

The collection of VAT revenue was implemented by the State Tax Administration. Although VAT is relatively easy to collect, VAT evasion is a ubiquitous phenomenon in China due to limited fiscal capability. Firms may use fake invoices for input investments to deduct from value added. Firms also rely on cash transactions or falsified accounts to circumvent tax enforcement. Fan et

³<http://weekly.caixin.com/2018-08-24/101318354.html>.

⁴Persson and Zhuravskaya (2016) find that Chinese provincial party secretaries who had spent a higher share on health care and education and a lower share on growth-enhancing infrastructure investments in the public expenditure were less likely to be promoted.

⁵<https://tinyurl.com/yx5rtq2k>.

al. (2018) find that the nationwide adoption of the electric invoice system in 2013 provided a large regulatory overhaul for revenue-collecting capabilities, attesting to severe preexisting slackness in VAT enforcement. Indeed, the average comparable VAT payment rate in our sample, which covers all above-scale manufacturing firms in 2001-2007, is only 12%, considerably lower than the statutory rate, 17%.

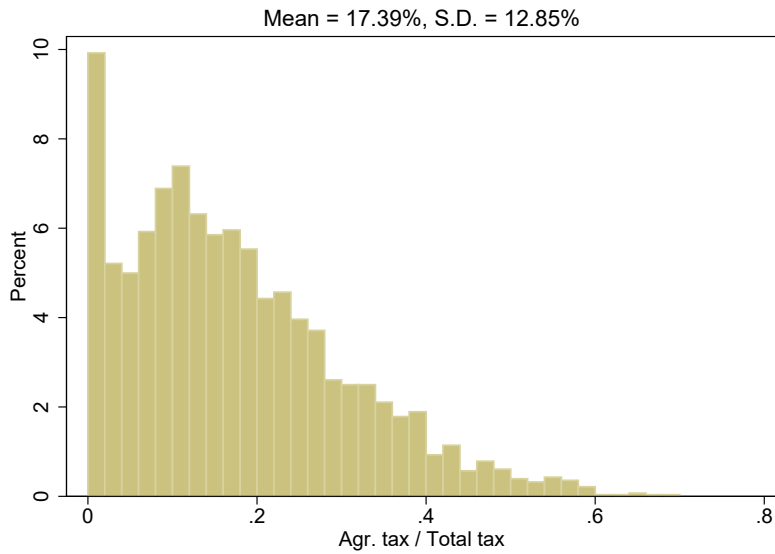
Local administrations play a pivotal role in shaping the effectiveness of VAT collection. Although all local branches of the State Tax Administration are vertically controlled (the senior officials of a lower-level tax agency are appointed by the upper-level tax agency instead of by the local government of the same level), their capabilities are limited by resources and technology. It is impossible to implement severe legal sanctions for noncompliance without the assistance of the local administration. Moreover, local administrations face a trade-off between enhancing fiscal performance and creating new jobs and investments.

2.3 Agricultural Tax

Before 2005, peasants in China paid agricultural taxes equivalent to approximately 15% of the value of total yields. Revenues from agricultural taxes mainly accrued to county governments. Over 2000-2004, agricultural taxes accounted for more than 17% of the budget revenue of county governments. Figure 1 demonstrates the distribution of the period-average ratio of agricultural taxes in budget revenue, suggesting large regional variation in dependence on agricultural taxes.

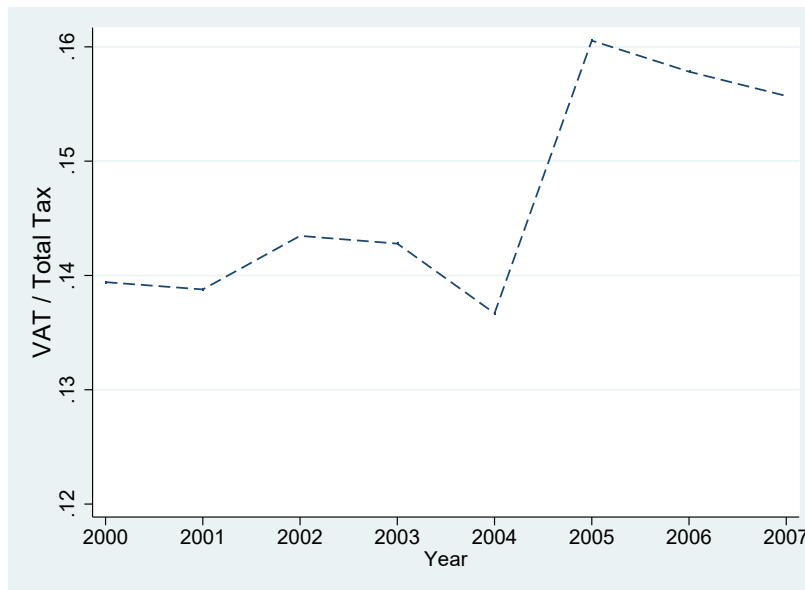
After several rounds of small-scale experimentation, the central government formally repealed the agricultural tax on the first day of 2006. Effectively, local administrations had mostly followed the instruction by the central government and stopped collecting agricultural taxes in 2005. From local administrations' perspective, the repeal of agricultural tax was an exogenous shock applied to all regions across the country. Despite increasing transfers from the central government to ease local fiscal pressure, most counties faced severe revenue shortage and had to cope with this problem through "fiscal squeeze" (Chen, 2017). Consistent with this interpretation, Figure 2 shows a dramatic increase in the average share of VAT revenue in county administrations' budget after

Figure 1: Distribution of Agricultural Tax Share



Note: This graph plots the distribution of the share of agricultural tax in total tax revenue, by county, in 2000-2004. Source: *Sub-Provincial Public Finance Statistics*, published by the Ministry of Finance.

Figure 2: VAT-to-Total Tax Ratio



Notes: The figure plots the ratio of VAT revenue to total tax revenue at the national level, by year. Source: *Sub-Provincial Public Finance Statistics*, published by the Ministry of Finance.

2005.

3 Data

3.1 Data Description

The firm-level data we use are from the *Annual Survey of Industrial Firms*, conducted by the National Bureau of Statistics of China. The data provide comprehensive information about key performance and finance indicators for all manufacturing firms with annual sales greater than 5 million yuan (approximately US\$800,000). The National Bureau of Statistics of China implements a stringent policy of data confidentiality and prohibits using the survey for tax auditing. This approach ensures firms' incentive to report truthfully of their tax payments. For our purpose, we focus on firms' payments of the VAT and payroll tax. We also utilize a set of firm characteristics, including industry, county location, ownership structure, total sales, profits, and total wages.

We examine the 2001-2007 period for two reasons. First, the payroll tax data are unavailable before 2001. Second, the composition of fiscal revenue for county governments changed considerably after 2008 due to the Chinese government's stimulus package (Bai et al., 2016; Han and Kung, 2015). We focus on the sample of private firms for most of the analyses but explore the pattern of SOEs for a comparison. Following Cai and Liu (2009), we drop outliers to obtain a consistently reliable sample.

We obtain fiscal information at the county level from the *Sub-Provincial Public Finance Statistics* published by the Ministry of Finance in China. We use agricultural tax, budget revenue, and fiscal transfer to compute revenue losses due to the repeal of agricultural tax in 2005. Counties' level of development is likely to affect their capability and incentive for tax enforcement. To address confounding factors on tax collection, we control for a set of county-level variables such as GDP per capita and social security subsidy. In addition, the regional variation in payroll tax enforcement may be shaped by the share of retirees in the county's population. We use the elderly population ratio from the 2010 Population Census data as a proxy for the ratio of retirees.

3.2 Measurement of the Main Variables

Effective payroll tax rate. We focus on two major items of social security contributions. The first is basic old-age insurance, and the second is health insurance. These two contributions consist of an overwhelming part of the social security payments by employers in China.⁶ We measure the effective payroll tax rate as the ratio between a firm's total payment on these two items and the total wage.

Effective VAT rate. In principle, the tax base of VAT is the total value-added. However, in China a large share of input, including fixed asset investments and services, was not deductible from VAT payment in 2001-2007⁷. We thus compute the effective VAT rate as the ratio of a firm's payable VAT to their total sales. We also follow the standard definition to measure the effective VAT rate as the ratio of VAT payment to total value added as a robustness check. The sample mean of VAT-sales ratio is 6.6%, and that of the VAT-value-added ratio is 12%, suggesting prevailing incompleteness of VAT enforcement compared with the statutory VAT rate, 17%.

Agricultural tax loss. The repeal of agricultural tax at the national level in 2005 incurred varying revenue losses for county governments. To relieve the revenue shortage for counties, the central and provincial governments adopted a formula-based transfer program targeting counties affected by the repeal of the agricultural tax. Overall, however, those transfers were limited, and counties were unable to recover the full revenue loss (Hou, 2011). Following Chen (2017), we measure each county's revenue loss induced by the repeal of agricultural tax as the following:

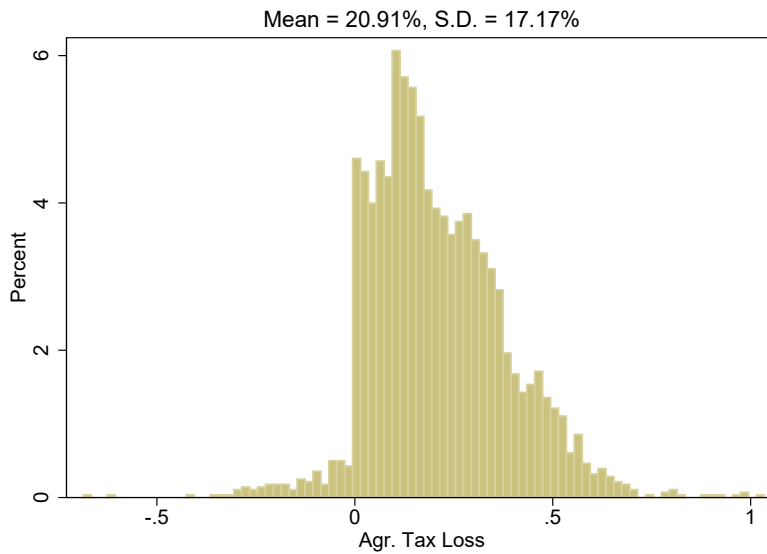
$$\text{Agr.Tax Loss}_c = \frac{\text{Agr.Tax}_{c,2000-2004} + \text{Transfer}_{c,2000-2004}}{\text{Bud.Rev}_{c,2000-2004}} - \frac{\text{Transfer}_{c,2005-2007}}{\text{Bud.Rev}_{c,2005-2007}} \quad (1)$$

In equation (1), $\text{Agr.Tax}_{c,2000-2004}$ is the period average of revenues from agricultural taxes in county c in the 2000-2004 period. $\text{Transfer}_{c,2000-2004}$ and $\text{Transfer}_{c,2005-2007}$ are the averages of formula-based transfers associated with the losses due to the repeal of the agricultural tax.

⁶The Annual Survey of Industrial Firms only report the sum of basic old-age insurance and health insurance for each firm.

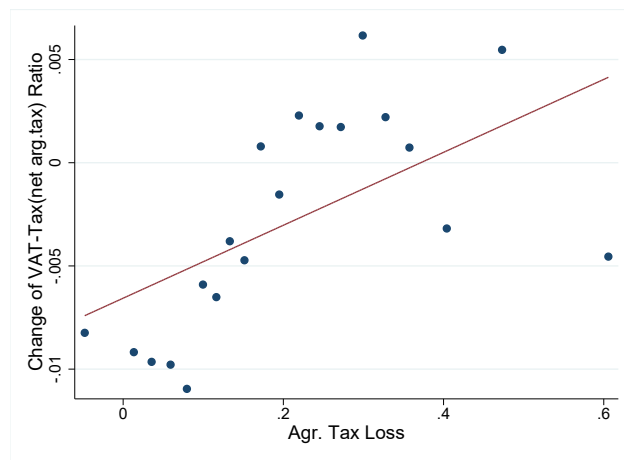
⁷Capital expenditure was not deductible until 2009. Input in the service sector was not deductible until 2016.

Figure 3: Distribution of Agricultural Tax Losses



Notes: This graph plots the distribution of $Agr.Tax Loss_c$, by county. The revenue loss is calculated based on equation (1). Source: Authors' calculation based on *Sub-Provincial Public Finance Statistics*, published by the Ministry of Finance.

Figure 4: Agricultural Tax Losses and VAT Ratios



Notes: This figure presents the binned scatterplot of before-and-after changes in VAT-to-revenue ratios against the revenue losses due to the repeal of agricultural tax. Source: *Sub-Provincial Public Finance Statistics*, published by the Ministry of Finance.

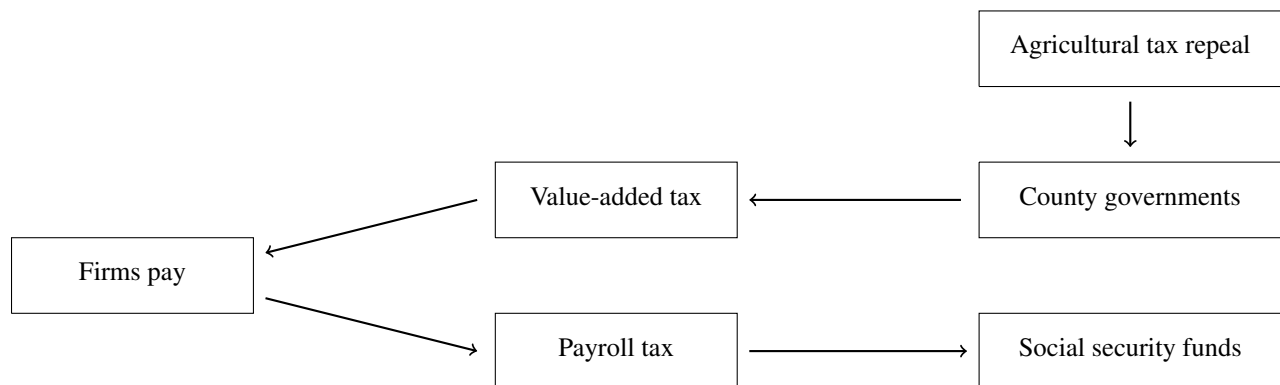
$Bud.Rev_{c,2000-2004}$ and $Bud.Rev_{c,2005-2007}$ measure counties' budget revenue, including VAT (shared with the central government), corporate income tax, business tax, and other budgetary revenues, but they do not include other off-budget revenues, such as land sales revenues⁸.

Figure 3 plots the distribution of $Agr.Tax Loss_c$ across 2,161 counties. Most of the counties incurred a loss following the reform. The average loss is about 20.9%. The ratio can be as high as 80% in extreme cases. The regional variation in revenue loss may stem from various reasons, such as the share of the agriculture sector, number of firms, social ties between heads of county governments and their superiors, and other idiosyncratic factors. The features shaping revenue dependence on agriculture are largely predetermined, and not directly related to the finance of the social security system.

The revenue losses for county governments tended to induce further fiscal squeeze, imposing greater pressure on VAT collection to recover the losses. Figure 4 shows that the revenue losses due to the repeal of agricultural tax were positively associated with the increases of VAT-to-revenue ratio after 2005 at the county level.

Table 1 provides a summary of statistics for the key variables used in the empirical analyses.

Figure 5: Illustration of the Identification Strategy



⁸We compute the correlation between the revenue loss measure and county-level fiscal revenue growth from 2005-2007 and find a non-significant coefficient, suggesting that the increase of VAT-to-revenue ratio is not driven by spurious trends that come with growth.

Table 1: Summary Statistics

Variable	Observations	Mean	S.D.	Median	Min	Max
Effective payroll tax rate	793,940	6.597	10.68	0.876	0	51.41
Payroll tax payment	793,940	399.8	6,453	9	0	1,518,000
log (payroll tax payment)	793,940	2.497	2.647	2.303	0	14.23
Effective VAT rate	793,940	3.633	2.997	3.07	0	14.48
VAT payment	793,940	2,968	59,665	480	0	22,700,000
log (VAT payment)	793,940	5.94	2.161	6.176	0	16.94
Corporate income tax/ sales	793,940	0.821	1.718	0.163	0	209.3
Corporate income tax payment	793,940	923.2	25,183	26	0	12,400,000
Wages	793,940	3,393	31,187	990	1	5,853,000
Employees	793,940	224.5	1,054	92	10	156,965
Sales	793,940	75,275	797,788	17,920	500	195,000,000
Export-sales ratio	793,940	0.104	0.302	0	0	61.79
Input-output ratio	793,940	0.736	0.13	0.75	0	0.999
Profit rate	793,940	0.105	0.275	0.039	-21.16	36.49
Capital intensity	793,940	1.157	3.519	0.669	0.003	1,320
Agricultural tax loss	793,940	0.158	0.117	0.128	-0.606	1.026

Note: This table provides descriptive statistics for private industrial firms in 2001-2007. The effective payroll tax rate is defined as social security contribution/sum of wages. The effective VAT rate is defined as VAT / sales \times 100. Capital intensity is defined as total assets/sales volume. The profit rate is defined as profits/total assets. The exports-sales ratio is defined as exports/sales \times 100. The input-output ratio is defined as intermediate inputs/total value of products and services \times 100. Agricultural tax loss is computed at the county level as net tax revenue loss due to the repeal of agricultural tax according to equation (1) in section 3.2.

4 Empirical Strategy

Estimating the effect of VAT enforcement on firms' compliance with payroll tax payment by ordinary least squares may be biased due to unobservable contextual factors shaping VAT and payroll tax compliance at the same time. Improvements in monitoring technology, tax collection personnel, economic booms, and other firm-level unobservable factors may contribute to a co-movement of revenues collected by different departments. To deal with the concern about endogeneity, we adopt an instrumental variable approach, exploiting largely exogenous regional variations in revenue losses due to the repeal of agricultural tax.

Figure 5 graphically presents the identification strategy. Firms paid payroll taxes on top of VAT. Importantly, the revenues from firms' VAT and payroll tax collection accrue to different accounts. While VAT revenues are used to finance county administrations, payroll tax payments are separately saved in social security funds. After the repeal of agricultural tax in 2005, county administrations facing more severe revenue losses were forced to exert greater effort toward VAT, but not social security payments.⁹ In turn, VAT enforcement posed more severe challenges for firms to maintain profits and survive. Thus, firms responded by evading their payroll tax duties.

Our identification assumption requires that regional variations in revenue losses were not affected directly by the efficacy of payroll tax collection. This is a plausible assumption because the social security system is separately managed and subject to stringent regulations. Diverting pension funds to ease local fiscal pressure is strictly prohibited. We adopt a two-step approach for estimation. The first step exploits cross-county and over-time variation in agricultural tax revenue losses after 2005. Specifically, we employ a difference-in-difference approach to estimate the effect of fiscal squeeze on the effective VAT ratio.

$$\text{VAT rate}_{ict} = \alpha \text{Agr. Tax Loss}_c \times \text{Post}_t + \gamma X_{it} + \delta_i + \lambda_t + \epsilon_{ict} \quad (2)$$

⁹There are other kinds of tax revenue from firms in addition to VAT, for example, corporate income tax. Since corporate income tax is collected based on profit, while VAT is computed based on value added, we only consider the VAT burden in most of our specifications. In a robustness check, we aggregate all taxes except the payroll tax as an alternative measure of the tax burden.

In equation (2), $VAT\ rate_{ict}$ is the effective VAT rate for firm i located in county c in year t . $Agr.Tax\ Loss_c$ is the revenue loss defined by equation (1). $Post_t$ is a dummy indicating the years after 2005, when the repeal of the agricultural tax was implemented across the board. X_{it} is a vector of variables for firm characteristics, including the logarithm of employees, sales, capital-intensity, profit rate, input-output ratio, and export-sales ratio. In all the regressions, we control for firm fixed effects (δ_i) and year fixed effects (λ_t). We cluster the standard errors at the county level. α is the main parameter of interest in the first-stage estimation. The parallel-trend assumption associated with equation (2) requires that there is no systematic difference in the trends of the VAT enforcement among counties exposed to different $Agr.Tax\ Loss_c$ before the treatment. We test this assumption in Section 5.1.

$$Payroll\ rate_{ict} = \beta \widehat{VAT\ rate}_{ict} + \gamma X_{it} + \eta_i + \mu_t + \sigma_{ict} \quad (3)$$

The second-stage estimates the effective payroll tax rate as a function of $VAT\ rate_{ict}$ as predicted by equation (2). In equation (3), $Payroll\ rate_{ict}$ is firm i 's effective payroll tax payment rate. β is the main parameter of interest. η_i and μ_t stand for firm and year fixed effects. σ_{it} is a term of random disturbance at the firm-year level. As in the estimation for equation (2), we cluster the standard errors of estimates at the county level. In section 5.2, we also provide reduced-form estimates for the effective payroll tax rate using $Agr.Tax\ Loss_c \times Post_t$ as an explanatory variable.

5 Results

5.1 Fiscal Squeeze

Column (1) in Table 2 presents the first-stage estimates according to equation (2), without firm-level controls. The estimated coefficient for the interaction term is 0.552, statistically significant at the 1% level. In column (2), we include additional firm-level control variables, such as logged employees and value-added, capital intensity, profit rate, export-sales ratio, and input-output ratio.

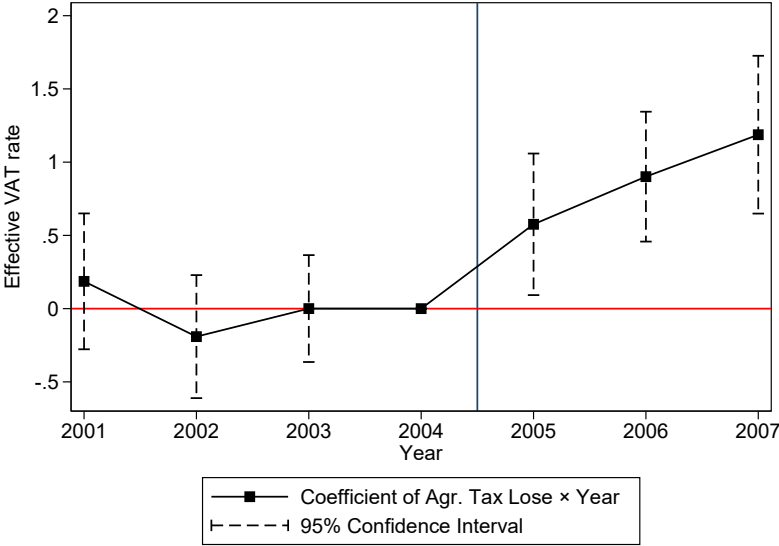
Table 2: Agricultural Tax Repeal and VAT Enforcement

<i>Dependent variable:</i>	Effective VAT rate	
Mean of D.V.	3.633	
	(1)	(2)
Agr. Tax Loss \times Post	0.552*** (0.199)	0.872*** (0.198)
ln (Sales)		-0.510*** (0.024)
ln (Employees)		0.386*** (0.021)
Export-Sales Ratio		-0.007 (0.032)
Input-Output Ratio		0.228*** (0.088)
Profit Rate		0.544*** (0.073)
Capital Intensity		-0.001 (0.003)
Firm FE	Y	Y
Year FE	Y	Y
Observations	708,374	708,374
R-squared	0.712	0.716

Note: Robust standard errors clustered at the county level are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level. Firm-level controls include logged employees and value-added, capital intensity, profit rate, export-sales ratio, and input-output ratio.

The estimated coefficient is 0.872 and remains significant. Given the average revenue loss of approximately 20.9% in the sample, the repeal of agricultural tax promotes the effective VAT rate by 0.18 percentage point, or a 5% increase from the pre-2005 level. These estimates attest to a sizable fiscal squeeze effect of the repeal of the agricultural tax.

Figure 6: Dynamic Effects on the Effective VAT Rate



Note: Robust standard errors are clustered at the county level. The points connected by the solid line indicate the estimated coefficients of the Agr. Tax Loss interacted with the year dummies. The dashed lines indicate the 95% confidence intervals. The blue vertical line marks the timing of the repeal of the agricultural tax. Year 2004 is omitted as the reference year.

Figure 6 presents the estimates for the dynamic effects of the repeal of the agricultural tax. We generalize the difference-in-difference estimations in equation (2) by interacting $Agr.Tax Loss_c$ with a set of year dummies. Using 2004 as the reference point, the results show that counties that were exposed to heavier revenue losses did not behave differently on VAT collection before 2004, and are associated with a significant rise in the effective VAT rates after 2005. Thus, the findings presented by Figure 6 do not support the premise that the motivation of the repeal of the agricultural tax is related to VAT collection.

5.2 VAT Enforcement and Payroll Tax Compliance

Table 3: Effects of Tax Enforcement on Payroll Tax Evasion

<i>Dependent variable:</i> Mean of D.V.	Effective payroll tax rate 6.597				
	(1)	(2)	(3)	(4)	(5)
	OLS	Reduced form	Reduced form	2SLS	2SLS
Effective VAT Rate	0.062*** (0.020)			-4.657** (2.378)	-3.251** (1.317)
Agr. Tax Loss \times Post		-2.572*** (0.934)	-2.835*** (0.931)		
ln (Sales)			0.375*** (0.077)		-1.282* (0.677)
ln (Employees)			-0.949*** (0.090)		0.306 (0.526)
Export-Sales Ratio			-0.075 (0.076)		-0.099 (0.143)
Input-Output Ratio			0.571** (0.262)		1.314*** (0.485)
Profit Rate			0.063 (0.166)		1.831** (0.840)
Capital Intensity			-0.005 (0.010)		-0.007 (0.015)
Firm FE	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y
1st stage Cragg-Donald Wald F				132.86	332.001
Observations	708,374	708,374	708,374	708,374	708,374

Note: Robust standard errors in parentheses are clustered at the county level. ***, **, * denote significance at the 1%, 5%, 10% level. Firm-level controls include logged sales and number of employees, capital intensity, profit rate, export-sales ratio, and input-output ratio. The means of the effective payroll tax rate and VAT rate are 6.597 and 3.633, respectively.

Table 3 presents several estimates for the relationship between VAT enforcement and payroll tax compliance. First, column (1) reports OLS estimates. The coefficient for the effective VAT rate is positive but small (0.062), suggesting potential omitted variable bias in the estimates due to contextual factors. In columns (2) and (3), we conduct a reduced-form estimation for the effective payroll tax rate, using $Agr.Tax\ Loss_c \times Post_t$ as an explanatory variable. Consistent with the

proposed argument about indirect impacts of fiscal pressures on payroll tax compliance, the coefficients of the interaction terms are negative and statistically significant. The results are similar with and without firm-level controls.

Columns (4) and (5), respectively, present the two-stage least squares estimates with and without firm-level controls. The coefficients for the effective VAT rate are negative and significant. The Cragg-Donald statistics obtained for the first-stage estimations reject the hypothesis of weak instruments by a large margin. According to column (5), a one percentage point increase in the effective VAT rate leads to a reduction of the effective payroll tax rate by 3.251 percentage points. The estimate translates to an elasticity of roughly 1.8, fixing the effective payroll tax and VAT rates at the sample means. In a back-of-the-envelope calculation, increasing the VAT payment by 1 yuan is associated with a 0.15 yuan decrease in the social security contribution.¹⁰ This finding is consistent with previous researches showing that firms deal with tax enforcement by misreporting their revenues and costs (Carrillo et al., 2017; Slemrod et al., 2017), but it suggests that there may be an additional channel of tax evasion through substitution between different types of tax liability margins.

5.3 Robustness

Table 4 provides several robustness checks, using alternative specifications and measures to estimate effective payroll tax rates and accounting for confounding factors.

County-specific features affecting payroll tax collection. First, payroll tax enforcement may be sensitive to local socioeconomic conditions that shape fiscal pressures of social security offices. We deal with this issue by including two control variables reflecting the demand and supply sides of social security funds. The first control variable is the population share of individuals over age 65, which captures the demand for pension funds. The second control variable is the ratio of social security subsidy in counties' budgets. We also control for the level of per capita GDP, which may be correlated with local fiscal capability and the abundance of social security funds. The estimated

¹⁰The calculation is as follows: average wages (3393) × 3.251 / average sales (75,275) = 0.147.

Table 4: Robustness Checks

<i>Dependent variable:</i>	Effective payroll tax rate				
Mean of D.V.	6.597				
	(1)	(2)	(3)	(4)	(5)
Effective VAT rate	-3.179** (1.495)	-3.264** (1.329)	-2.652** (1.194)		
Social security subsidy	0.175 (0.453)				
Aging Pop. ratio × Post	0.073 (0.127)				
ln GDP per capita	-0.051 (0.250)				
VAT/Value added				-1.337** (0.579)	
Effective total tax rate					-2.616** (1.151)
Firm FE	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y
Firm-level controls	Y	Y	Y	Y	Y
Province-specific trends	N	Y	N	N	N
Balanced panel	N	N	Y	N	N
Cragg-Donald Wald F	248.946	327.905	114.777	157.799	165.479
Observations	695,571	708,374	125,841	708,374	708,284

Notes: Robust standard errors in parentheses are clustered at the county level. ***, **, * denote significance at the 1%, 5%, 10% level. Firm-level controls include logged sales and the number of employees, capital intensity, profit rate, export-sales ratio, and input-output ratio. The mean of the effective payroll tax rate is 6.597. Column (4) presents the results using the ratio of VAT to value added as an alternative VAT rate (mean value: 12.50). In column (5), we replace the VAT rate with the effective total tax rate (including VAT, corporate income tax, business tax, consumption tax, and other tax, divided by sales). The average total tax rate is 5.47.

coefficient presented by column (1) in Table 4 is close to the one by column (5) in Table 3, and is significant at the 5% level.

Province-specific trends. Second, we include a set of province-specific time trends to alleviate the concern that our estimates may be driven by a co-movement of revenue collection activities among different government branches pertaining to the same political jurisdiction. The estimate reported in column (2) of Table 4 has similar magnitude (-3.264) and is statistically significant.

Accounting for firm entries and exits. Third, there may be a concern that firms' entries and attrition were driven by increasing VAT collection efforts. The estimates may be biased if firms complying with tax duties incurred larger losses and were forced to exit the market, and non-complying firms managed to survive. To deal with this concern, we estimate equation (3) using only firms that are present throughout the 2001-2007 period. The estimated coefficient is -2.652 and the significance level remains the same (column (3)).

Alternative measure of the effective VAT rate. Fourth, we use total value-added as the denominator for the effective VAT ratio. Column (4) reports a statistically significant coefficient. The elasticity of payroll tax rate with regard to the value-added based VAT rate is 2.53, or, 0.19 yuan in payroll tax evasion associated with an increase in the VAT payment of one yuan. This is pretty close to the baseline results in Table 3.

Other tax margins. In addition to revenues from VAT, county administrations obtain revenues from several other types of taxation, such as corporate income tax and sales tax. The logic of induced payroll tax evasion should apply to the total volume of tax revenue. Column (5) in Table 4 adopts the total tax payments of each firm (except payroll tax) as a measure of the intensity of tax enforcement.¹¹ The result is similar, with an elasticity of approximately 2.17.

Alternative instrumental variables. In calculating agricultural tax losses, we take local tax revenues and subsidies as given. A concern is that revenues and subsidies may have been shaped by bargaining between the central and local governments before the repeal of agricultural tax in 2005. In this case, the bargaining power of local governments may be correlated with the capability

¹¹More precisely, the effective tax rate used in column (5) is obtained through dividing the sum of VAT, corporate income tax, and business tax by the total sales.

of payroll tax enforcement by social security offices. To address this concern, we extrapolate the tax revenues of county governments over 2005-2007 based on the growth trajectory of tax revenues over 2000-2004 period, and use the simulated values Tax^{sim} to substitute for the actual value $TaxRevenue_{c,2005-2007}$ in estimating equation (2). By a similar token, we use $Transfer^{sim}$, the simulated transfer, to substitute $Transfer_{c,2005-2007}$. We then use Tax^{sim} and $Transfer^{sim}$ to construct an instrumental variable of revenue loss as in equation (1). Table A.1 in the appendix reports the estimates using alternative instrumental variables. As evident from Table A.1, the results are quite similar compared with the baseline.

5.4 Does Tax Evasion Matter for State-Owned Enterprises?

We have obtained the baseline results using only the information of privately owned firms. We expect that payroll tax evasion is less significant for SOEs than private firms. The first reason is that SOEs face a soft budget constraint and thus are less sensitive to profit loss (Kornai et al., 2003). The second reason is that taxpayers tend to have lower tax evasion when they are politically connected with the administration, as illustrated by research based on U.S. personal income taxes (Cullen et al., 2018). In the Chinese context, SOEs tend to follow the party line. Instead of being purely driven by profit maximization, SOEs share various policy burdens, such as maintaining employment, and they also bear a large political cost of evading taxation (Lin et al., 1998). Based on this logic, we conduct a placebo test using the sample of SOEs.¹²

Table 5 presents the reduced-form estimates using the SOE sample. Contrary to the case of private firms, the coefficients of $Agr.Tax Loss_c \times Post_t$ are negative and statistically insignificant, failing to support the existence of a similar fiscal squeeze effect for SOEs (columns (1) and (2)). We attribute this discrepancy to the high compliance rate on VAT among SOEs. In columns (3) and (4), the reduced-form estimates for the effective payroll tax rate are insignificant, with a considerably

¹²In our sample, SOEs' VAT rate is much higher than that of private-owned enterprises in both VAT compliance measurements. The ratio of VAT over total sales for SOEs (4.850%) is 33.5% higher than that for private firms (3.633%). If we measure VAT compliance by the ratio of VAT to value added, the ratio for SOEs (15.410%) is 23.2% higher than that for the privately owned firms (12.505%).

smaller magnitude compared with the results obtained for private firms. The results on SOEs provide tentative support for attributing payroll tax evasion to profit-driven motives.

Table 5: State-Owned Enterprises

<i>Dependent variable:</i>	Effective VAT rate		Effective payroll tax rate	
	(1)	(2)	(3)	(4)
Mean of D.V.	4.85		15.90	
Agr. Tax Loss \times Post	-0.708 (0.760)	-0.624 (0.821)	-1.494 (3.973)	-1.045 (3.995)
Firm FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Firm-level controls	Y	Y	Y	Y
Province-specific trends	N	Y	N	Y
Observations	7,192	7,192	7,192	7,192
R-squared	0.79	0.798	0.627	0.629

Notes: Robust standard errors in parentheses are clustered at the county level. ***, **, * denote significance at the 1%, 5%, 10% level. Firm-level controls include logged sales and the number of employees, capital intensity, profit rate, export-sales ratio, and input-output ratio.

5.5 Coordination between VAT and Payroll Tax Collection?

An alternative interpretation of the results is that the drop in payroll tax payment rate may stem from growth or revenue maximization led by local governments. It is possible that local governments attach more importance to more salient performance indicators, such as collection of VAT revenue (Lü and Landry, 2014). To induce firms' compliance on VAT payments, local governments may press social security bureaus to relax payroll tax enforcement, leading to a negative association between the effective VAT rate and the payroll tax rate. To test this argument, we divide the sample of private firms into two groups, with stronger and weaker political ties, respectively, according to whether firms received government subsidy and whether the firm's share in local revenue is ranked in the top 50% among all firms. The rationale is that firms contributing a larger share in local tax revenue are in a stronger bargaining position and likely to benefit from such policy coordination. By a similar token, receiving a subsidy is sign of political ties. Following the coordination argument, closely tied firms should be associated with more pronounced payroll tax

Table 6: Government Collusion with Firms

Dependent variable: Sampled by	Effective payroll tax rate			
	Government subsidy		Local fiscal importance	
Political ties	Yes	No	High	Low
	Strong	Weak	Strong	Weak
	(1)	(2)	(3)	(4)
Effective VAT Rate	-2.343 (2.846)	-3.283** (1.401)	-2.642* (1.355)	-3.287** (1.381)
Firm FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Firm-level Controls	Y	Y	Y	Y
Cragg-Donald Wald F	10.233	279.196	134.526	184.511
Observations	74,357	445,279	280,126	230,124

Notes: The dependent variable is effective payroll tax rate. Robust standard errors in parentheses are clustered at county level. ***, **, * denote significance at the 1%, 5%, 10% level. Firm-level controls include logged sales and the number of employees, capital intensity, profit rate, export-sales ratio, and input-output ratio. In columns (1) and (2), we divide the sample based on firms' political connection (proxied by whether receiving any government subsidy in 2004). In column (3) and (4), we divide the sample based on firm's regional fiscal importance (above and below the within-county median total tax payment in 2004).

evasion in response to increasing VAT enforcement.

Table 6 presents the results. As is evident from columns (1) through (4), in contrast to the hypothesized mechanism of coordination, firms with stronger political ties are not more inclined to be engaged in evading paying payroll taxes when facing VAT enforcement pressure. The estimated coefficients are of a relatively smaller magnitude and not statistically significant. It appears that coordination by local governments does not undermine our interpretation of firms' tax evasion.

Aside from firms' political ties, we account for several characteristics of local leaders (mayors) that may shape their political incentive of colluding with firms. These variables include whether mayors' current jurisdiction is located in their home cities; whether mayors are older than age 57, such that their promotion incentives are weak due to retirement age limits; and whether mayors have served in the current jurisdictions for more than three years, such that they were able to establish strong local connections. The results presented in Table A3 in the appendix show no significant evidence that these contextual features shape the tax evasion behaviors of firms differently. On top of the insignificance of the interactions, the coefficients of effective VAT rates are similar as in the

baseline estimations.

5.6 Real Responses of Firms

Table 7: Real Responses to VAT Enforcement

<i>Dependent variable:</i>	Employee	Fixed assets	Liquid assets	Debt	Wage per labor
	(1)	(2)	(3)	(4)	(5)
Effective VAT Rate	-0.230*** (0.075)	-0.03 (0.051)	-0.221*** (0.077)	-0.407*** (0.114)	0.168*** (0.064)
Firm FE	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y
Firm-level Controls	Y	Y	Y	Y	Y
Cragg-Donald Wald F	279.054	328.444	331.266	306.653	332.001
Observations	708,374	705,589	708,132	703,139	708,374

Notes: Robust standard errors in parentheses are clustered at the county level. ***, **, * denote significance at the 1%, 5%, 10% level. Firm-level controls include logged sales and the number of employees, capital intensity, profit rate, export-sales ratio, and input-output ratio. All dependent variables are in logarithm.

In this section, we focus on firms' real responses to rising tax burdens. It is plausible that firms' adjustments of their investment plans led to substantial decreases in the effective payroll tax rate. Employers may choose to promote profits through streamlining the number of employees, or they may turn to service purchases for non-essential work. Such adaptations help firms shoulder the responsibilities of social security tax payments and increase the deductions from the VAT. We conduct similar two-stage estimations as in equation (2) and (3) to investigate the effects of VAT enforcement on a set of firm-level management indicators, including the number of employees, fixed assets, liquid assets, total debt, and the level of wages per employee.

The results presented in Table 7 suggest that firms respond to increasing VAT burdens by decreasing the number of employees (column (1)), reducing liquid assets (column (3)), and borrowing less (column (4)). By contrast, the intensity of VAT does not affect existing firms' size of fixed assets (column (2)). Finally, column (5) shows that increasing the VAT burden is associated with higher wages per employee. This effect is likely to be driven by firms laying off low-skill and low-wage workers. It is noteworthy that in China, firms normally pay a higher rate of social se-

curity contribution for higher-wage employees.¹³ As a result, the effective payroll tax rates should increase, unless firms take extra measures to evade making payroll tax payments. Taken together, the results presented in Table 7 support the cost-driven motives of firms in response to increased VAT burden.

5.7 Heterogeneity in Financial Constraints and Profitability

Table 8: Heterogeneity in Financial Constraints

<i>Dependent variable:</i> Sampled by	Effective payroll tax rate					
	Cash flow/fixed assets		Sales		Credit marketization index	
	High	Low	Large	Small	High	low
Mean of D.V.	6.750	7.946	7.628	5.924	6.547	6.646
	(1)	(2)	(3)	(4)	(5)	(6)
Effective VAT Rate	-3.117*	-8.400**	-2.294*	-3.801**	0.265	-6.182**
	(1.699)	(3.832)	(1.281)	(1.624)	(2.601)	(2.749)
Firm FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Firm-level Controls	Y	Y	Y	Y	Y	Y
Cragg-Donald Wald F	81.205	27.907	199.064	122.8	115.06	123.966
Observations	145,720	144,645	286,751	223,516	357,216	351,155

Notes: This table displays the effects of tax enforcement on payroll tax evasion for financially constrained and unconstrained firms. We divide the firms in 2004 by various measures of financial constraint and split the sample into above the median of each of those variables and below. Robust standard errors in parentheses are clustered at the county level. ***, **, * denote significance at the 1%, 5%, 10% level. The credit marketization index is from Wang et al. (2017), which evaluates the extent to which credit resources flow into the non-state sector in different regions. Firm-level controls include logged sales and the number of employees, capital intensity, profit rate, export-sales ratio, and input-output ratio.

We also conduct a set of tests of the effects of firm heterogeneity in financial constraints and competitiveness to further assess potential mechanisms of payroll tax evasion. Stringent VAT enforcement not only imposes extra cost on firms, but also entails firms having less cash in hand. Column (3) in Table 7 supports such a cash flow shock. This constraint poses a more severe threat to market survival where firms are credit constrained. We follow the idea of Saez et al. (2019) to adopt two measures, the cash flow-to-asset ratio and the size of total sales, as proxies for the

¹³According to the sample we investigate, the mean of the effective payroll tax rate is 6.851% for firms whose average wages are above the sample median, and 5.786% for firms whose average wages are below the median. The difference is statistically significant. Table A2 in the appendix reports these statistics.

credit constraints faced by firms. In addition, we employ a credit marketization index developed by Wang et al. (2017), which is based on the share of banking credits flowing into non-state sectors in different cities.

The results reported in Table 8 are consistent with the credit constraint explanation as the motive for payroll tax evasion. The coefficients associated with VAT intensity and the effective payroll tax rate are larger (more negative) for firms with less cash in hand, a relatively small scale of sales, and in prefectures with more severe financial repression. In comparison, the coefficients for larger and more cash abundant firms are smaller, and the coefficient for firms located in credit abundant regions becomes insignificant.

In addition to the heterogeneity of financial constraints, we explore whether the effects vary with firms' profit margin and market power. A plausible conjecture following the logic of financial constraints is that firms with higher profit margins and market power are less financially pressured by VAT enforcement. To that end, we divide the sample into high- and low-profitability groups depending on profit-to-assets and profit-to-value added ratios. Using a similar approach, we group firms according to their market share and the industry-specific Herfindahl-Hirschman index. The results presented by Tables A4 and A5 in the appendix demonstrate that firms evade their payroll tax duties more strongly when the firms are less profitable and control a smaller market share. We further explore firm heterogeneity and labor intensity according to the wages-to-sales and employees-to-sales ratios. The results presented in Table A6 of the appendix suggest that stronger patterns of payroll tax evasion in response to VAT enforcement are present among firms with a larger share of labor cost. Altogether, these results spell out a picture that smaller and more marginal entities in the market struggle to survive by evading making payroll tax payments.

6 Conclusion

This research studies how VAT enforcement by local administrations affects firms' payroll tax evasion in China. Using the repeal of agricultural tax in 2005 as a natural experiment, we capture

varying VAT enforcement efforts by county administrations and adopt an instrumental variable approach to study the effects of VAT intensity. The estimations document a sizable increase in payroll tax evasion by firms in the face of increased VAT enforcement. The effect is more pronounced among firms that are more financially constrained, less profitable, and those with a larger labor share in total cost. Investigations based on firm and region heterogeneities suggest that payroll tax evasions is more likely to stem from unbalanced state capabilities of different policy dimensions, which induces firms to shift tax burdens toward weakly regulated domains.

The key message is that multifaceted institutional loopholes may adversely affect state capability. When the bureaucratic system is short of inter-departmental coordination, enhancing enforcement by one branch may unintendedly compromise on regulatory performance along other policy dimensions. The findings thus suggest a useful perspective for understanding the under-performance of policy areas that are less salient for revenue generation, such as the environment, public health, and social security.

References

- Adam, Stuart, David Phillips, and Barra Roantree**, “35 years of reforms: A panel analysis of the incidence of, and employee and employer responses to, social security contributions in the UK,” *Journal of Public Economics*, 2019, 171, 29–50.
- Almunia, Miguel and David Lopez-Rodriguez**, “Under the radar: The effects of monitoring firms on tax compliance,” *American Economic Journal: Economic Policy*, 2018, 10 (1), 1–38.
- Amodio, Francesco**, “Crime protection investment spillovers: Theory and evidence from the city of Buenos Aires,” *Journal of Economic Behavior & Organization*, 2017.
- Asatryan, Zareh and Andreas Peichl**, “Responses of firms to tax, administrative and accounting rules: Evidence from Armenia,” *CESifo Working Paper Series*, 2017, (6754).

- Bai, Chong-En, Chang-Tai Hsieh, and Zheng Michael Song**, “The Long Shadow of China’s Fiscal Expansion,” *Brookings Papers on Economic Activity*, 2016, 2016 (2), 129–181.
- Bardhan, Pranab**, “State and development: The need for a reappraisal of the current literature,” *Journal of Economic Literature*, 2016, 54 (3), 862–92.
- Besley, Timothy and Torsten Persson**, “Why do developing countries tax so little?,” *Journal of Economic Perspectives*, 2014, 28 (4), 99–120.
- Best, Michael Carlos, Anne Brockmeyer, Henrik Jacobsen Kleven, Johannes Spinnewijn, and Mazhar Waseem**, “Production versus revenue efficiency with limited tax capacity: Theory and evidence from Pakistan,” *Journal of Political Economy*, 2015, 123 (6), 1311–1355.
- Bø, Erlend E, Joel Slemrod, and Thor Thoresen**, “Taxes on the internet: Deterrence effects of public disclosure,” *American Economic Journal: Economic Policy*, 2015, 7 (1), 36–62.
- Burgess, Robin, Matthew Hansen, Benjamin Olken, Peter Potapov, and Stefanie Sieber**, “The political economy of deforestation in the tropics,” *The Quarterly Journal of Economics*, 2012, 127 (4), 1707–1754.
- Cai, Hongbin and Daniel Treisman**, “State corroding federalism,” *Journal of Public Economics*, 2004, 88 (3-4), 819–843.
- **and Qiao Liu**, “Competition and corporate tax avoidance: Evidence from Chinese industrial firms,” *The Economic Journal*, 2009, 119 (537), 764–795.
- Carrillo, Paul, Dina Pomeranz, and Monica Singhal**, “Dodging the taxman: Firm misreporting and limits to tax enforcement,” *American Economic Journal: Applied Economics*, 2017, 9 (2), 144–64.
- Chen, Shawn Xiaoguang**, “The effect of a fiscal squeeze on tax enforcement: Evidence from a natural experiment in China,” *Journal of Public Economics*, 2017, 147, 62–76.

- Cullen, Julie Berry, Nicholas Turner, and Ebonya Washington**, “Political alignment, attitudes toward government and tax evasion,” *NBER Working Paper*, 2018, (24323).
- Das-Gupta, Arindam, Radhika Lahiri, and Dilip Mookherjee**, “Income tax compliance in India: An empirical analysis,” *World Development*, 1995, 23 (12), 2051–2064.
- Fan, Haichao, Yu Liu, Nancy Qian, and Jaya Wen**, “The Dynamic Effects of Computerized VAT Invoices on Chinese Manufacturing Firms,” *CEPR Discussion Paper*, 2018, (12786).
- Fang, Hanming and Jin Feng**, “The Chinese Pension System,” *NBER Working Paper*, 2018, (25088).
- Fullerton, Don and Daniel Karney**, “Multiple pollutants, co-benefits, and suboptimal environmental policies,” *Journal of Environmental Economics and Management*, 2018, 87, 52–71.
- Gibson, Matthew**, “Regulation-induced pollution substitution,” *Review of Economics and Statistics*, 2019, 101 (5), 827–840.
- Giles, John, Dewen Wang, and Albert Park**, “Expanding social insurance coverage in urban China,” in “Labor Market Issues in China,” Emerald Group Publishing Limited, 2013, pp. 123–179.
- , **Xin Meng, Sen Xue, and Guochang Zhao**, “Can Information Influence the Social Insurance Participation Decision of China’s Rural Migrants?,” *Policy Research Working Paper*, 2018, (8658).
- Gonzalez-Navarro, Marco**, “Deterrence and geographical externalities in auto theft,” *American Economic Journal: Applied Economics*, 2013, 5 (4), 92–110.
- Gordon, Roger and Wei Li**, “Tax structures in developing countries: Many puzzles and a possible explanation,” *Journal of Public Economics*, 2009, 93 (7-8), 855–866.
- Han, Li and James Kai-Sing Kung**, “Fiscal incentives and policy choices of local governments: Evidence from China,” *Journal of Development Economics*, 2015, 116, 89–104.

- Hansman, Christopher, Jonas Hjort, and Gianmarco León**, “Interlinked firms and the consequences of piecemeal regulation,” *Journal of the European Economic Association*, 2018, 17 (3), 876–916.
- Hou, Yilin**, “Establishing a New Intergovernmental Fiscal Transfer System in China: The State of the Field, 1994-2010,” *China Review*, 2011, pp. 213–243.
- Jensen, Anders**, “Employment Structure and the Rise of the Modern Tax system,” *NBER Working Paper*, 2019, (25502).
- Jin, Hehui, Yingyi Qian, and Barry Weingast**, “Regional decentralization and fiscal incentives: Federalism, Chinese style,” *Journal of Public Economics*, 2005, 89 (9-10), 1719–1742.
- Khan, Adnan, Asim I Khwaja, and Benjamin Olken**, “Tax farming redux: Experimental evidence on performance pay for tax collectors,” *The Quarterly Journal of Economics*, 2015, 131 (1), 219–271.
- , **Asim Ijaz Khwaja, and Benjamin Olken**, “Making moves matter: Experimental evidence on incentivizing bureaucrats through performance-based postings,” *American Economic Review*, 2019, 109 (1), 237–70.
- Kleven, Henrik Jacobsen, Martin Knudsen, Claus Thustrup Kreiner, Søren Pedersen, and Emmanuel Saez**, “Unwilling or unable to cheat? Evidence from a tax audit experiment in Denmark,” *Econometrica*, 2011, 79 (3), 651–692.
- Kopczuk, Wojciech and Joel Slemrod**, “Putting firms into optimal tax theory,” *American Economic Review*, 2006, 96 (2), 130–134.
- Kornai, Janos, Eric Maskin, and Gérard Roland**, “Understanding the soft budget constraint,” *Journal of Economic Literature*, 2003, 41 (4), 1095–1136.
- Lin, Justin Yifu, Fang Cai, and Zhou Li**, “Competition, policy burdens, and state-owned enterprise reform,” *The American Economic Review*, 1998, 88 (2), 422–427.

- Lü, Xiaobo and Pierre Landry**, “Show me the money: Interjurisdiction political competition and fiscal extraction in China,” *American Political Science Review*, 2014, 108 (3), 706–722.
- Luttmer, Erzo and Monica Singhal**, “Tax morale,” *Journal of Economic Perspectives*, 2014, 28 (4), 149–68.
- Mast, Evan**, “Race to the bottom? Local tax break competition and business location,” *American Economic Journal: Applied Economics*, 2020, 12 (1), 288–317.
- Meng, Xin**, “Labor market outcomes and reforms in China,” *Journal of Economic Perspectives*, 2012, 26 (4), 75–102.
- Nyland, Chris, Russell Smyth, and Cherrie Jihua Zhu**, “What determines the extent to which employers will comply with their social security obligations? Evidence from Chinese firm-level data,” *Social Policy & Administration*, 2006, 40 (2), 196–214.
- Persson, Petra and Ekaterina Zhuravskaya**, “The limits of career concerns in federalism: Evidence from China,” *Journal of the European Economic Association*, 2016, 14 (2), 338–374.
- Pomeranz, Dina**, “No taxation without information: Deterrence and self-enforcement in the value added tax,” *American Economic Review*, 2015, 105 (8), 2539–69.
- Saez, Emmanuel, Benjamin Schoefer, and David Seim**, “Payroll taxes, firm behavior, and rent sharing: Evidence from a young workers’ tax cut in Sweden,” *American Economic Review*, 2019, 109 (5), 1717–63.
- Shen, Chunli and Hengfu Zou**, “Fiscal Decentralization and Public Services Provision in China,” *Annals of Economics and Finance*, 2015, 16 (1), 53–78.
- Slemrod, Joel**, “Tax compliance and enforcement,” *Journal of Economic Literature*, 2019, 57 (4), 904–54.

- , **Brett Collins, Jeffrey Hoopes, Daniel Reck, and Michael Sebastiani**, “Does credit-card information reporting improve small-business tax compliance?,” *Journal of Public Economics*, 2017, *149*, 1–19.
- , **Marsha Blumenthal, and Charles Christian**, “Taxpayer response to an increased probability of audit: Evidence from a controlled experiment in Minnesota,” *Journal of Public Economics*, 2001, *79* (3), 455–483.
- Tran-Nam, Binh, Chris Evans, Michael Walpole, and Katherine Ritchie**, “Tax compliance costs: Research methodology and empirical evidence from Australia,” *National Tax Journal*, 2000, pp. 229–252.
- Wang, Xiaolu, Gang Fan, and Jingwen Yu**, *Marketization Index of China’s Provinces: NERI Report 2016*, Social Sciences Academic Press, Beijing, China (in Chinese), 2017.
- Waseem, Mazhar**, “Taxes, informality and income shifting: Evidence from a recent Pakistani tax reform,” *Journal of public economics*, 2018, *157*, 41–77.
- Weyland, Kurt**, “From Leviathan to Gulliver? The decline of the developmental state in Brazil,” *Governance*, 1998, *11* (1), 51–75.
- Xu, Chenggang**, “The fundamental institutions of China’s reforms and development,” *Journal of Economic Literature*, 2011, *49* (4), 1076–1151.
- Yang, Dean**, “Can enforcement backfire? Crime displacement in the context of customs reform in the Philippines,” *The Review of Economics and Statistics*, 2008, *90* (1), 1–14.
- Zhang, Tao and Hengfu Zou**, “Fiscal decentralization, public spending, and economic growth in China,” *Journal of Public Economics*, 1998, *67* (2), 221–240.

Appendix Not for Publication

Table A1: Alternative Measurements of Agricultural Revenue Loss

<i>Dependent variable:</i>	Effective payroll tax rate		
	Tax ^{sim}	Transfer ^{sim}	Transfer ^{sim} + Tax ^{sim}
	(1)	(2)	(3)
Effective VAT Rate	-3.873** (1.708)	-3.154** (1.281)	-3.672** (1.608)
Firm FE	Y	Y	Y
Year FE	Y	Y	Y
Firm-level controls	Y	Y	Y
Cragg-Donald Wald F	232.727	337.21	248.649
Observations	708,374	708,374	708,374

Note: Robust standard errors in parentheses are clustered at the county level. ***, **, * denote significance at the 1%, 5%, 10% level. Firm-level controls include logged sales and the number of employees, capital intensity, profit rate, export-sales ratio, and input-output ratio.

Table A2: Comparison of Payroll Tax Compliance between Wage Levels

Years	Effective payroll tax rate	
	2001-2004	2004
Firms with high average wage	6.851	7.267
Firms with low average wage	5.786	5.091
F-test for difference	27.053	35.995
p-value for F-test	0.000	0.000

Table A3: Government Collusion with Firms: Politicians' Characteristics

<i>Dependent variable:</i>	Effective payroll tax rate		
	(1)	(2)	(3)
Effective VAT Rate	-3.558** (1.543)	-3.668** (1.554)	-3.962** (1.746)
Effective VAT Rate × mayor (home-originated)	-0.487 (4.619)		
Effective VAT Rate × mayor (age>57)		1.132 (1.336)	
Effective VAT Rate × mayor (tenure>3)			-1.94 (3.083)
Mayor (home-originated)	2.926 (17.599)		
Mayor (age>57)		-2.45 (4.771)	
Mayor (tenure>3)			7.052 (11.045)
Firm FE	Y	Y	Y
Year FE	Y	Y	Y
Firm-level Controls	Y	Y	Y
Cragg-Donald Wald F	69.386	135.289	58.488
Observations	634,825	628,270	635,323

Notes: Robust standard errors in parentheses are clustered at the county level. ***, **, * denote significance at the 1%, 5%, 10% level. Firm-level controls include logged sales and the number of employees, capital intensity, profit rate, export-sales ratio, and input-output ratio. Mayor (home-originated) is defined by whether the mayor serves in the same city as her hometown. Mayor (age>57) is a dummy variable that equals 1 if the mayor's age is above 57 when he has no promotion opportunity, and 0 otherwise. Mayor (tenure>3) is a dummy that takes the value 1 if the mayor has been in the current position for more than 3 years, suggesting higher likelihood to establish strong local connections.

Table A4: Heterogeneity in Profitability

<i>Dependent variable:</i> Sampled by	Effective payroll tax rate			
	Profits/assets		Profits/value-added	
	High	Low	High	Low
Mean of D.V.	5.817	7.959	6.308	7.46
	(1)	(2)	(3)	(4)
Effective VAT Rate	-1.993** (0.996)	-6.406* (3.375)	-1.604* (0.936)	-6.134** (3.056)
Firm FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Firm-level Controls	Y	Y	Y	Y
Cragg-Donald Wald F	384.834	34.156	340.5	50.451
Observations	260,124	250,143	262,201	248,066

Notes: This table displays the effects of tax enforcement on payroll tax evasion for firms with different levels of profitability. We divide the firms by the profits/assets ratio and profit/value-added ratio in 2004, and split the sample into above the median and below. This division drops all firms for which there is no observation for 2004. Robust standard errors in parentheses are clustered at the county level. ***, **, * denote significance at the 1%, 5%, 10% level.

Table A5: Heterogeneity in Market Competition

<i>Dependent variable:</i> Sampled by	Effective payroll tax rate			
	Firm market share		Industry Herfindahl Index	
	High	Low	High	Low
Mean of D.V.	7.575	6.066	7.636	6.149
	(1)	(2)	(3)	(4)
Effective VAT Rate	-1.216 (1.049)	-5.280** (2.217)	-2.375** (1.145)	-3.651** (1.719)
Firm FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Firm-level Controls	Y	Y	Y	Y
Cragg-Donald Wald F	221.44	101.635	167.235	143.232
Observations	273,580	236,687	247,083	263,184

Notes: This table displays the effects of tax enforcement on payroll tax evasion for firms facing more and less market competition. We divide the firms by firm market share and the Herfindahl index in 2004, and split the sample into above the median and below. This division drops all firms for which there is no observation in 2004. Robust standard errors in parentheses are clustered at the county level. ***, **, * denote significance at the 1%, 5%, 10% level. Firm market share is computed by the share of sales in a 4-digit industry. The Herfindahl index is the sum of squares of the market shares (by sales) of all firms in a 4-digit industry. A lower value of the index implies a higher degree of competition and lower market power.

Table A6: Heterogeneity in Labor Intensity

<i>Dependent variable:</i> Sampled by	Effective payroll tax rate			
	Wage/sales		Labor/sales	
	High (1)	Low (2)	High (3)	Low (4)
Mean of D.V.	7.477	2.268	6.823	6.916
Effective VAT Rate	-4.197*** (1.435)	-2.275 (1.754)	-3.883*** (1.253)	-1.346 (1.384)
Firm FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Firm-level Controls	Y	Y	Y	Y
Cragg-Donald Wald F	122.936	150.115	161.664	204.954
Observations	253,983	256,284	253,443	256,824

Notes: This table displays the effects of tax enforcement on payroll tax evasion for firms with different levels of labor intensity. We divide the firms by wage/sales ratio and labor/sales ratio in 2004, and split the sample into above the median and below. This division drops all firms for which there is no observation in 2004. Robust standard errors in parentheses are clustered at the county level. ***, **, * denote significance at the 1%, 5%, 10% level.