Local Taxation and Firm Employment: Evidence from Chinese Listed Companies*

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Abstract

This paper examines the effects of province corporate income tax policies on firm employment. It uses A-share listed Chinese firms' panel data for 2004 to 2014. To control for unobservable time-varying province characteristics, we employ a quadratic function of time to approximate the effect of time-varying province heterogeneity. We also construct an instrumental variable to deal with the potential endogeneity problem. The empirical results in this paper show that there is a statistically significant negative effect of the local corporate income tax rate on the number of employees, which means that increasing the local tax rate results in reduced labor input of firms. In addition, the results in this paper suggest that Chinese central government should reform the supervision and management of regional tax preferential policies, and address existing unreasonable tax incentives.

Keywords: Local corporate income tax policy; Firm employment; Unobservable time-varying heterogeneity

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1 Introduction

There are many ways that the corporate income tax rate can impact a firm's decisions, and the government can lower the tax rates or use regional tax incentive policies to attract investment and influence a firm's relocation. Since the beginning of the 21st century, China has made several adjustments to the corporate income tax system, including the reform of the income tax sharing system in 2002 as well as adjustments to the regional taxation preferential policies. The most important change is the implementation of a new corporate income tax law in 2008, which combined the foreign-funded as well as the domestic corporate income tax laws into a new one. The new law unified the statutory tax rate for both domestic enterprises and foreign-funded enterprises. Before 2008, the statutory tax rate for domestic enterprise was 33%, while the rate was 30% for foreign enterprises which could also enjoy a preferential tax rate at 24% or 15%. Since 2008, the standard corporate income tax rate of both domestic and foreign-funded enterprise has been adjusted to 25%.

China's tax legislation is concentrated in the central government. Although Chinese local governments do not have independent tax legislative powers and the corporate income tax rate is identical in all the provinces in China, local governments do have great power and decision-making space with respect to the income tax preferences of the firms. That is, the local governments in China do have the ability to provide income tax incentives for local firms. Moreover, it is noted that they do also have the motivation to provide such income tax incentives for local firms.

On the one hand, the development of local firms determines the regional economic growth rate and the scale of employment, which also have an important impact on the promotion of officials. Thus, the local government may actively endeavor to provide income tax concessions for local enterprises from the central government as well as within the scope of their own functions and powers. On the other hand, the revenue of local governments includes not only the tax revenue, but also the transfers from higher levels of government. When the proportion of corporate income tax revenue decreases, they can obtain the same or even greater revenues through other means (Li and Song, 2011). In addition, the local governments may use various tax incentive policies to seek to win the tax competition with other provinces. Therefore, local government has the motivation for corporate tax cuts. However, the strength of the motivation can vary. Hence, there exist big dissimilarities with respect to tax policies of different local governments in China, which fact has a deep impact on the firms' performance.

The effect of local tax policy is widely considered theoretically in the literature. Tax competition theory holds that the local government will use differentiated tax policy to attract investment. Based on this, many empirical studies have then analyzed the impact of local tax policy on the exit, movement and location decision of the firms (Giroud and Rauh, 2015).

The existing research results are not agreed on whether the local tax differentials have an impact on the firms' location decision. On the one hand, high-tax areas will prevent firms from establishing in those regions, however the effect is weak (Rathelot and Sillard, 2008), and only the highest marginal tax rates have the predicted negative impact on the firm' formation rate (Gale et al.2015). On the other hand, reduction of tax may not attract investment because it subsequently reduces public expenditure, and some high expenditure preference firms may not locate in this area (Gabe and Bell, 2004). Also, agglomeration economies can relieve the influence of tax difference on firm location choice (Brullhart et al.,2012).

There are some other literatures studying the impact of local tax policies on other firm decisions. More specifically, the effect of corporate income tax on the economic activities of firms includes the impact of corporate income tax on wage (Arulampalam et al., 2012), the impact of corporate income tax on firm's organizational form (Goolsbee, 2004), as well as the impact of local government taxation policies on firm capital structure (Auerbach, 2002; Graham, 2008).

Local government tax policies have both positive and negative effects on firms. On the one hand, local government tax policies can encourage firms to adopt the production and organizational form which can share tax incentives, while government tax revenues can be used to provide public goods for improving regional business environment. On the other hand, different tax policies among different regions result in different tax burdens for firms, and the increase of tax burden will affect the labor and investment decisions of the firms, which may cause production reduction, exit or migration of the firms (Giroud and Rauh, 2015).

However, Duranton et al. (2011) pointed out that unobservable time-varying regional heterogeneity has a significant impact on business decision-making. Unobservable time-varying heterogeneity includes the convenience of transport in various regions, the cultural background of the region, the implementation of tax policies, and so forth. These variables are assumed to vary across provinces and to change over time. However, the previous literature only took the economic performance of firms as a function of local tax rate and firms' characteristics without considering the impact of regional characteristics, which will have biased the results. Therefore, Duranton et al. (2011) control for the unobservable time-varying site-specific effects, and estimate the effect of the local tax policy on the location and growth of firms in the UK by using the time difference and spatial difference method. Belotti et al. (2016) used the identification strategy proposed by Duranton et al. (2011) to estimate the impact of Italian business property taxation on firm performance.

This present paper also draws on the practice of Duranton et al. (2011) to control for unobservable time-varying province-specific effects when estimating the effect of local corporate income tax policies on firm employment in China. There are 31 provincial administrative areas in China, and the heterogeneity between the areas is obvious. The province-specific characteristics will affect not only the behavior of firms, but also the

provincial government's tax policy decisions. Hence, it is necessary to control the unobservable time-varying characteristics of the region when estimating the effect of local tax policies.

In this paper, we use the identification strategy of Wolfers (2006), and Islam and Lopez (2014) to estimate the local policy effect of China's corporate income tax on economic performance. Wolfers (2006), and Islam and Lopez (2014) use the polynomials of time trends to estimate the unobservable time varying state heterogeneity. We exploit the quadratic function of time to identify regional unobserved time-varying heterogeneity by use of the financial data and province-level macro data of Chinese A-share listed companies from 2004 to 2014.

In addition, we construct an instrumental variable and employ two-stage least squares (2SLS) methods, which can reduce the estimated bias caused by reverse causality and omitted variables. We use the weighted tax rate as the instrument for tax rate which may be a good choice for tax policy (Lee and Gordon, 2005). More specifically, we construct an instrumental variable by weighting the effective tax rate in other regions (excluding the region itself), and the weight is the inverse of distance between the two regions. The instrumental variable is constructed in this way as follows: given a province i (or a province-equivalent municipal city), its instrumental variable of tax rate is calculated as the sum of weighted corporate income tax rate of all the other provinces j (or province-equivalent municipal cities), using the inverse distance as the weight. Local governments have tax competitions in order to attract productive factors and promote regional economic development. Hence, the tax rate in one province or a province-equivalent municipal city is correlated to its competitors.

An instrumental variable should be correlated to the independent variable and uncorrelated to the error term. The weighted tax rate meets the correlation condition. The weighted tax rate is obtained by summing the tax rate in other regions and then timing the inverse of the corresponding distance. On the one hand, the distance between the two regions is naturally determined, not affected by economic and social conditions. On the other hand, firm employment in one certain region does not have a significant impact on the tax rates in these other regions. Therefore, the instrumental variable we construct can also meet exogenous conditions.

2 Estimation Strategy

We assume that production of firms needs two factors: labor and capital. In China, corporate income tax is levied on the income of firms. With a low degree of share distribution, a large portion of profits is retained and used for reproduction. Corporate income tax affects the firm's production by reducing disposable profits in two ways. For one thing, it affects the number of employees negatively due to the decrease in capable expenditures of employment. For another, with less profit used for re-investment, the ac-

cumulation process of capital is negatively affected. Due to the imperfect substitutability between labor and capital (Belotti et al., 2016), the increase of corporate income tax may possibly affect the number of employees negatively, or possibly not. That is, the effect of corporate income tax on the employment of firms is determined by the elasticity of substitution between labor and capital, which should be tested as the elasticity is still ambiguous.

As mentioned above, we mainly focus on the empirical test of the effects of corporate income tax policy on firms' employment. Therefore, we establish the model as follows:

$$y_{iat} = \beta_1 r_{at} + \beta_2 X_{iat} + \beta_3 \psi_{at} + \mu_i + \delta_a + \theta_{at} + \varepsilon_{iat} \tag{1}$$

where y_{iat} denotes the employments of firm i in province a at time t, and r_{at} is the effective corporate income tax rate in province a. X_{iat} stands for the firm-specific time-varying observable variables, such as the asset size, the age and the asset-liability ratio of a firm. ψ_{at} denotes the regional level control variables capturing the time-varying province-specific observable variables, which reflects the economic and social characteristics of province at time t, including regional per capita GDP and marketization index. μ_i controls for firm fixed-effect and captures the impact of unobservable firm characteristics. δ_a is a regional fixed effect. To deal with the unobservable time-varying regional heterogeneity, based on the specifications of Wolfers (2006) and Islam and Lopez (2014), we introduce θ_{at} to the model, which is a function of time that control for unobservable time-varying province-specific effects. ε_{iat} is an idiosyncratic error and we cluster our standard error at the firm level.

If we ignore the time-varying unobservable heterogeneity in estimating β_1, the effective corporate income tax rate r_{at} is likely to be correlated with the error term. That is, if we exclude θ_{at} in model (1), the specification becomes:

$$y_{iat} = \beta_1 r_{at} + \beta_2 X_{iat} + \beta_3 \psi_{at} + \mu_i + \delta_a + \epsilon_{iat} \tag{2}$$

where $\epsilon_{iat} = \theta_{at} + \varepsilon_{iat}$ is the error term for model (2), including the unobservable time-varying regional heterogeneity. Because $\text{cov}(r_{at}, \theta_{at}) \neq 0$, we have $\text{cov}(r_{at}, \epsilon_{iat}\}) \neq 0$. Therefore controlling for θ_{at} can reduce the estimated bias caused by endogeneity.

A standard way to deal with unobservable heterogeneity is to use a variety of dummy variables and time functions (Kim and Oka, 2014). θ_{at} in model (1) is a province specific quadratic of a time trend that captures the effects of certain province level omitted variables.

We approximately estimate the θ_{at} effect by a quadratic function of time trend:

$$\theta_{at} = b_{1a} t + b_{2a} t^2 + e_{at} \tag{3}$$

Where b_{1a},b_{2a} are the linear and quadratic coefficients of the function of time trend,

respectively, and e_{at} is the residual. The coefficients capture the province-specific time-varying effects. Substituting (3) into (1) we obtain the estimating equation with a new disturbance term.

Since the 1990s, many economists have used the quadratic function of time to approximate the unobservable heterogeneity (Cornwell et al., 1990; Jacobsen et al., 1993; Friedberg, 1998; Wolfers, 2006). This method controls the time-varying factors compared with the standard fixed-effect model. In addition, there is another common method using the time trend term, but this method assumes that the omitted variables are in the form of linear functions, and the quadratic form used in this paper is more flexible.

Another important issue is the possible reverse causality between tax rate and firm employment. Although the quadratic time trends can reduce the estimated bias caused by endogeneity to a certain extent, reverse causality can still bias the results. The standard way to solve this problem is to find an appropriate instrumental variable. It is noted that using the weighted tax rate as the instrument for regional tax rate may be a good choice (Lee and Gordon, 2005). In this paper, we construct an instrumental variable by the weighted sum of the effective tax rate in other regions (excluding the region itself), in which the weight is the inverse of distance between the two regions.

Local governments have tax competitions in order to attract productive factors and promote regional economic development and the tax rate in one province or a province-equivalent municipal city is correlated to its competitors. An instrumental variable needs to be correlated to the independent variable and uncorrelated to the error term. The weighted tax rate is highly related to the local tax rate. However, the key point for a valid instrumental variable is whether it satisfies the condition of exogeneity (Duranton et al., 2011). The weighted tax rate is obtained by summing the tax rate in other regions and timing the inverse of the corresponding distance. On the one hand, the distance between the two regions is naturally determined, not affected by economic and social conditions. On the other hand, firm employment does not have a significant impact on the tax rates in these other regions. Therefore, the instrumental variable we constructed can also meet exogenous conditions.

3 Data

The resulting sample we use in this paper contains a balanced panel of A-share listed firms in Shanghai and Shenzhen Stock Exchange over the period of 2004 to 2014. It is worth noting that the corporate income tax system reformed in 2002, in which the corporate income tax changed from local tax to central and local sharing tax. Further adjustment of the distribution ratio between central and local governments was made in 2003. To avoid the effect of this adjustment on the income tax policy of local government, this paper selects the data sample after year 2003. Thus, the entire sample of this study contains 1291 listed firms, amounting to 14198 observations.

In this paper, the dependent variable is the firms' employment in the logarithmic form. The dataset is obtained from the huge influx of information networks, which provide the annual reports of each A-share listed firms.[1]

The core independent variable is the province corporate income tax rate. Although the statutory corporate income tax rate is identical among provinces, local governments hold the rights to reduce tax burden by using a set of tax concessions to encourage the re-production of firms and to induce new firms to enter the local market, which could produce a wide range of fluctuation of effective corporate income tax rate. In this paper, we first calculate the firms' effective tax rate. After the calculation of the effective income tax rate of each firm, the listed companies are classified according to the provinces where they are registered, and then we calculate the average effective tax rate of each year, which can be used to measure the difference of province corporate income tax policy. It is noted that the effective corporate income tax rate reflects the real tax burden of corporate income tax, not only considering the tax rate concessions, but also including pre-tax deductions and tax breaks (Wu et al., 2009).

The method used to calculate effective tax rate is: firms' current income tax expense minus the deferred income tax and then divided by their pre-tax income (Porcano, 1986). We first adopt this method in calculation, then use an alternative method to conduct the robustness test. We denote the effective tax rate computed as Effective Tax Rate 2 (R2). The income tax expense and pre-tax income are derived from the WIND database.

The control variables can be divided by province and firm level. To be more specific, the regional level control variables include regional per capita GDP, public expenditures and marketization index, where the former two sources from 'China Statistical Yearbook' over the years in the logarithmic form and the marketization index indicates the marketization degree and sourcing from Fan et al. (2010; 2017).[2]On the other hand, firm level control variables contain the firms' assets size, assetsliability ratio and firms' age since its first registration. The assets size (logarithmic form) and assets-liability ratio data is obtained from the China Stock Market & Accounting Research (CSMAR) Database which offers data of the China stock markets and the financial statements of China's listed companies maintained by Guotai'an. The date of first registration of the firm is searched from its annual report as provided by the huge influx of information networks.

The instrumental variable is constructed as follows: given a province i (or a province-equivalent municipal city), its instrumental variable of tax rate is calculated as the sum of weighted corporate income tax rate of all the other provinces j (or province-equivalent municipal cities), using inverse distance weighing. The competitors of a given province are not constrained to the nearby provinces, and the economic strength and other criteria can also be used to determine the competitors (Wang and Ren, 2008). Referred to the works

[1]Huge influx of information networks: `http://www.cninfo.com.cn/cninfo-new/index`

[2]The index of marketization for china's provinces during 2004 to 2007 and during 2008 to 2014 separately come from Chinese Index of Marketization(Fan et al., 2010) and Marketization index of China's provinces: NERI REPORT(Wang et al., 2017).

Table 1: Summary Statistics

Variable	Mean	Std. Dev.	Min	Max	Obs.
Lnemp	7.455972	1.493047	0	12.87249	14201
R2	0.2321635	1.851319	-11.6021	48.21812	14201
Lnasset	21.7389	1.410894	10.8422	29.18533	14201
Lngdp	10.37425	0.6555883	8.370316	11.56391	14201
Lnexp	7.692063	0.7842542	4.812347	9.121798	14201
Market	7.35167	1.926336	-0.3	11.71	14201
Age	14.7471	5.01591	2.083333	35.58333	14201
Age^2	242.6344	161.5676	4.340278	1266.173	14201
Debt	0.697051	7.735519	-0.194698	877.256	14198

of Genser and Weck-Hannemann (1993), Wang and Ren (2008), we consider all other provinces (or province-equivalent municipal cities) as competitors of a given province (or a province-equivalent municipal city), then weighted them by distance. More specifically, we denote the inverse of the distance between given province i and other province j as d_{ij}^{-1} assign the standardised value of $\frac{d_{ij}^{-1}}{\sum d_{ij}^{-1}}(i \neq j)$ as the distance weighting w_{ij}. Then the corporate income tax rate of given province i is equal to $\sum_j w_{ij} r_j$, where r_j is the effective tax rate of other competitive provinces (or province-equivalent municipal cities). Weighted tax rates of competitive provinces are correlated to the tax rate of given province i, while the total number of firm's employee in province i will not affect the tax rate of other competitive provinces. The variable d_{ij} is the distance between two provincial capitals, which calculated from the latitude and longitude position referring to Baidu map and then transformed to actual distance. Note that d_{ij}^{-1} increase with a shorter distance, which indicates a stronger competitive relationship between the two provinces.

In this paper, we construct three dummy variables, $D^{central}$,D^{local},D^{other} to represent firms are owned by central government, local government and others, respectively. Firms owned by others consist of collective firms, foreign owned firms, social groups and natural person etc. The ownership type is worked out through aggregate analyses of actual controller, first major shareholders and top 10 shareholders of each firm which reported in firm's annual report.

In addition, due to the impact of the corporate income tax system reform and financial crisis in 2008, we introduce a year dummy variable in our model. If the sample year is later than or equal to 2008, it takes the value of 1, and is 0 otherwise.

Summary statistics of variables are reported in table 1.

4 Empirical Results

4.1 OLS Regression

We first use the pooled OLS regression to estimate the impact of regional tax rate on firm's employment. The results are reported in Table 2. Columns (1)-(3) present regression results without considering the tax reform and financial crisis in 2008 and firm's ownership status. Columns (4)-(6) provide results including the year dummy and firm's ownership dummy. Columns (2) and (5) control the province-specific linear time trends only, while columns (3) and (6) control for the province-specific quadratic time trends.

The results show that all the coefficients of the tax rate are positive. The coefficients for the local tax incentive are statistically insignificant except columns (3) and (6). After controlling for the province time-varying unobservable heterogeneity in columns (2) and (5), the t-value of the tax rate is increased. And in columns (3) and (6), the tax policy has statistically significant positive effect on firm's employment. In other words, considering the province time-varying unobservable characteristics has an important impact on tax policy. There is a positive correlation between the size of the assets and the number of employees, that is, the larger the assets scale of the firm, the more employees are employed. Moreover, the firm's age has a significant impact on the number of employee, and the coefficient show that the older firms have higher employment (Duranton et al., 2011).

Table 2: Pooled OLS (R2)

Lnemp	(1)	(2)	(3)	(4)	(5)	(6)
R2	0.001	0.001	0.004***	0.000	0.002	0.004***
	(0.005)	(0.002)	(0.001)	(0.005)	(0.002)	(0.001)
Lnasset	0.719***	0.718***	0.717***	0.702***	0.700***	0.699***
	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)
Lngdp	-0.457***	-0.481***	-0.491***	-0.431***	-0.440***	-0.470***
	(0.064)	(0.073)	(0.074)	(0.078)	(0.082)	(0.081)
Lnexp	0.281***	0.229***	0.255***	0.322***	0.289***	0.288***
	(0.052)	(0.065)	(0.067)	(0.059)	(0.072)	(0.070)
Market	-0.037***	-0.010	0.006	-0.053**	-0.043*	-0.013
	(0.013)	(0.009)	(0.007)	(0.023)	(0.024)	(0.017)
Age	-0.081***	-0.094***	-0.083***	-0.069***	-0.083***	-0.075***
	(0.019)	(0.019)	(0.021)	(0.019)	(0.020)	(0.021)
Age^2	0.002***	0.002***	0.002***	0.001**	0.002***	0.002***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Debt	0.002**	0.002***	0.002***	0.002**	0.002***	0.002***

(Continued)

Table 2: (Continued)

Lnemp	(1)	(2)	(3)	(4)	(5)	(6)
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
D^{2008}				-0.116	-0.165**	-0.088*
				(0.089)	(0.074)	(0.053)
$D^{central}$				0.248***	0.269***	0.270***
				(0.068)	(0.070)	(0.071)
D^{local}				0.150**	0.165***	0.162***
				(0.060)	(0.060)	(0.060)
Constant	-4.501***	-4.066***	-4.313***	-4.762***	-4.442***	-4.433***
	(0.509)	(0.689)	(0.694)	(0.697)	(0.802)	(0.769)
Province dummy× (time trend)	No	Yes	Yes	No	Yes	Yes
Province dummy× (time trend)^2	No	No	Yes	No	No	Yes
Observations	14,198	14,198	14,198	14,198	14,198	14,198
R-squared	0.461	0.473	0.478	0.465	0.477	0.482

Notes. Effective Tax Rate 2 (R2) is calculated by dividing current tax expense minus deferred income tax expenses by pre-tax income. Robust standard errors are reported in parenthesesclustered at firm level. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Because we use panel data in this paper, Table 3 reports the results of fixed-effect model. We employ the Hausman test and find the fixed effect model is superior to the random effect model. Thus, we use the fixed-effect model in the present paper. The empirical regression results described in Table 2 consider the individual and province fixed effects. These results show that the local tax rate on the number of employees is still positive. Columns (1) and (4) do not consider the province unobservable time-varying heterogeneity, where the coefficient of the regional effective corporate income tax rate is positive, but statistically insignificant. Columns (2) and (5) show the regression results of the province-specific linear time trend, where the coefficient is positive and significant at 1% level. After adding the quadratic time trend term, the result is still positive and significant. Therefore, considering the province unobservable time-varying heterogeneity is useful and has a significant impact on local government corporate income tax policy decisions. In addition, the results also show that there is a positive correlation between the assets size and the number of employees.

Table 3: Fixed Effects Tax Rate 2 (R2)

Lnemp	(1)	(2)	(3)	(4)	(5)	(6)
R2	0.000	0.004***	0.003***	0.000	0.004***	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Lnasset	0.611***	0.609***	0.607***	0.610***	0.608***	0.607***
	(0.028)	(0.027)	(0.027)	(0.028)	(0.027)	(0.027)
Lngdp	-0.251*	-0.332**	-0.077	-0.245*	-0.327**	-0.073
	(0.147)	(0.147)	(0.137)	(0.147)	(0.146)	(0.137)
Lnexp	0.007	-0.059	0.057	-0.006	-0.049	0.057
	(0.133)	(0.112)	(0.110)	(0.140)	(0.112)	(0.110)
Market	0.023***	0.015**	0.012**	0.028	0.010	0.016
	(0.007)	(0.006)	(0.006)	(0.018)	(0.012)	(0.012)
Age	0.019	0.062**	0.025	0.019	0.063***	0.023
	(0.024)	(0.024)	(0.023)	(0.024)	(0.024)	(0.023)
Age^2	-0.000	-0.001	-0.001*	-0.000	-0.001	-0.001*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Debt	0.004***	0.004***	0.004***	0.004***	0.003***	0.004***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
D^{2008}				0.018	-0.021	0.014
				(0.055)	(0.036)	(0.035)
$D^{central}$				0.110	0.127*	0.124*
				(0.071)	(0.071)	(0.071)
D^{local}				0.057	0.043	0.044
				(0.060)	(0.059)	(0.059)
Constant	-3.456***	-2.516*	-5.552***	-3.509***	-2.652**	-5.659***
	(1.110)	(1.293)	(1.325)	(1.119)	(1.283)	(1.328)
Province dummy× (time trend)	No	Yes	Yes	No	Yes	Yes
Province dummy× $(\text{time trend})^2$	No	No	Yes	No	No	Yes
Province Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	14,198	14,198	14,198	14,198	14,198	14,198

(Continued)

Table 3: (Continued)

Lnemp	(1)	(2)	(3)	(4)	(5)	(6)
R-squared	0.363	0.373	0.377	0.363	0.374	0.377
Number of Firms	1,291	1,291	1,291	1,291	1,291	1,291

Notes. Effective Tax Rate 2 (R2) is calculated by dividing current tax expense minus deferred income tax expenses by pre-tax income. Robust standard errors are reported in parenthesesclustered at firm level. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

4.2 Instrumental Variable Estimates

The empirical regression results of Table 2 and Table 3 indicate that the increase of corporate income tax rates by local government will encourage firms to hire more employees. This result though is inconsistent with traditional theoretical prediction and is not statistically robust.

The empirical results may have the following problems, which lead to estimation bias. First, the firms' employment decisions may have an impact on the regional tax policy. As is shown in the above regression results, the number of employees is significantly positively correlated with the firms' assets scale. The larger the assets scale, the greater the impact on the local government tax policy decisions. Hence, the number of employees can impact on the corporate income tax policy. Second, there may be omitted variables in the regression model, i.e., some variables that affect both the regional income tax rate and the number of employees (Duranton et al., 2011), resulting in endogeneity problems. Thirdly, in the above regression equation, the method used to calculate local governments' effective corporate income tax rates may have measurement errors, in which case will bias the OLS estimates.

To respond, first, we use the DWH test to check for the endogenous variables. For province effective tax rate 2, the $\chi^2(1)$ is 9.565, and p-value equal to 0.002,which reject the null hypothesis that all explanatory variables are exogenous, so tax rate 2 can be seen as an endogenous variable. The traditional way to deal with endogenous problems is to use the instrumental variables. In this paper, given one province or a province-equivalent municipal city, we use the sum of weighted tax rate of all the competitive provinces as the instrument for each given province's regional tax rate, where the weight is the inverse of the distance between the given province and the other provinces, that is, $\sum_j w_{ij} r_j$. Then we use the 2SLS to estimate the tax rate effects.

Table 4 presents the Instrumental Variable results. The results here indicate that there is a significant negative correlation between local tax incentives polices and employment. Considering the province-specific unobservable time-varying heterogeneity, the results

are still significantly negative, seen from columns (2), (3), (5), (6). After controlling for the year dummy and firm's ownership status, the negative effect is still statistically significant. The results show that if the local governments use more corporate income tax preferential policies, the tax rate can be reduced and then the number of employees is increased.

Table 4: Regional Tax Policy (R2) and Employment within Instrumental Variable (2SLS)

Lnemp	(1)	(2)	(3)	(4)	(5)	(6)
R2	-0.067***	-0.061**	-0.055*	-0.066***	-0.061**	-0.055*
	(0.023)	(0.027)	(0.029)	(0.023)	(0.027)	(0.029)
Lnasset	0.614***	0.608***	0.607***	0.613***	0.607***	0.607***
	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
Lngdp	-0.042	-0.294**	0.051	-0.037	-0.289**	0.054
	(0.106)	(0.131)	(0.170)	(0.105)	(0.131)	(0.170)
Lnexp	-0.145	-0.124	-0.064	-0.149	-0.112	-0.065
	(0.091)	(0.095)	(0.138)	(0.092)	(0.099)	(0.138)
Market	0.018***	0.012*	0.007	0.018	0.006	0.015
	(0.006)	(0.007)	(0.007)	(0.012)	(0.013)	(0.016)
Age	0.026**	0.069***	0.033	0.027**	0.070***	0.030
	(0.013)	(0.016)	(0.021)	(0.013)	(0.016)	(0.022)
Age^2	-0.000**	-0.001**	-0.001***	-0.000**	-0.001**	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Debt	0.004***	0.003***	0.003***	0.004***	0.003***	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
D^{2008}				-0.000	-0.021	0.025
				(0.036)	(0.041)	(0.047)
$D^{central}$				0.115***	0.127***	0.123***
				(0.041)	(0.041)	(0.041)
D^{local}				0.062*	0.047	0.048
				(0.035)	(0.035)	(0.034)
Province dummy× time trend	No	Yes	Yes	No	Yes	Yes
Province dummy× (time trend)^2	No	No	Yes	No	No	Yes
Province Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes

(Continued)

Table 4: (Continued)

Lnemp	(1)	(2)	(3)	(4)	(5)	(6)
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	14,198	14,198	14,198	14,198	14,198	14,198
R-squared	0.330	0.347	0.357	0.331	0.348	0.357
Number of Firms	1,291	1,291	1,291	1,291	1,291	1,291

Notes. Effective Tax Rate 2 (R2) is calculated by dividing current tax expense minus deferred income tax expenses by pre-tax income. Robust standard errors are reported in parenthesesclustered at firm level. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Table 5 reports the first stage regression results for models (1)-(6) from table 4. In the first stage regressions, we take the province effective tax rate as the dependent variable, and take the instrumental variable used as independent variable. We show the value of first stage F-statistics test when excluding the instrumental variable, which is greater than the critical value 10 suggested by Stock and Yogo (2002). It rejects the hypothesis that the sum of weighted tax rate is a weak instrumental variable. Thus, it can be assumed that the instrumental variable we used in this article is valid.

Table 5: First Stage Regression Results for Effective Tax Rate 2 (R2)

R2	(1)	(2)	(3)	(4)	(5)	(6)
IV2	-0.578***	-0.486***	-0.460***	-0.587***	-0.486***	-0.460***
	(0.082)	(0.055)	(0.052)	(0.084)	(0.055)	(0.052)
Lnasset	0.051*	-0.013	-0.003	0.044	-0.015	-0.004
	(0.028)	(0.025)	(0.025)	(0.027)	(0.025)	(0.025)
Lngdp	3.461***	0.820***	2.647***	3.463***	0.832***	2.627***
	(0.574)	(0.224)	(0.340)	(0.574)	(0.237)	(0.340)
Lnexp	-2.539***	-1.578***	-2.573***	-2.345***	-1.548***	-2.568***
	(0.357)	(0.242)	(0.298)	(0.303)	(0.223)	(0.297)
Market	-0.068***	-0.071***	-0.098***	-0.171***	-0.082**	-0.045
	(0.010)	(0.010)	(0.011)	(0.040)	(0.038)	(0.038)
Age	0.120***	0.192***	0.202***	0.137***	0.192***	0.179***
	(0.027)	(0.035)	(0.043)	(0.029)	(0.035)	(0.040)
Age^2	-0.002***	0.000	0.000	-0.002***	0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)

(Continued)

Table 5: (Continued)

R2	(1)	(2)	(3)	(4)	(5)	(6)
Debt	-0.000	-0.002	-0.002	-0.000	-0.002	-0.002
	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)
D^{2008}				-0.402***	-0.042	0.185
				(0.152)	(0.135)	(0.126)
$D^{central}$				0.072	-0.006	-0.030
				(0.093)	(0.094)	(0.101)
D^{local}				0.088*	0.053	0.067
				(0.046)	(0.049)	(0.057)
Province dummy× time trend	No	Yes	Yes	No	Yes	Yes
Province dummy× (time trend)^2	No	No	Yes	No	No	Yes
Province Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
F-statistic	49.79	77.29	79.64	48.82	76.68	79.44
Observations	14198	14198	14198	14198	14198	14198
Number of Firms	1,291	1,291	1,291	1,291	1,291	1,291

Notes. Effective Tax Rate 2 (R2) is calculated by dividing current tax expense minus deferred income tax expenses by pre-tax income. Robust standard errors are reported in parenthesesclustered at firm level. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

5 Robustness Checks

As mentioned above, large-scale firms can possibly affect the local corporate income tax policies. Because the large assets scale listed firms have their political importance, the causal relationship does not exist between local tax policy and firm's employees. Thus we exclude the upper 25% firms sorting by assets scale, leaving the other 75% in the sample to examine the conjecture. Table 6 reports the 2SLS regression results of the remaining 75% firms sorting by assets scale with missing value deleted.

Shown by the regression results, the negative effects of local corporate income tax policies on the number of employee are most significant at 10% level. The empirical

results give evidence that local corporate income tax preferential policies will encourage the firms of assets scale under 75% to hire more employees.

Table 6: Regional Tax Policy (R2) and Employment within Instrumental Variable (2SLS)

Lnemp	(1)	(2)	(3)	(4)	(5)	(6)
R2	-0.069**	-0.063*	-0.058*	-0.069**	-0.062*	-0.056*
	(0.028)	(0.032)	(0.034)	(0.028)	(0.032)	(0.034)
Lnasset	0.615***	0.606***	0.607***	0.615***	0.606***	0.607***
	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)
Lngdp	0.183	-0.085	0.174	0.193	-0.095	0.170
	(0.119)	(0.147)	(0.186)	(0.119)	(0.147)	(0.185)
Lnexp	-0.149	-0.146	-0.125	-0.165	-0.167	-0.127
	(0.102)	(0.104)	(0.151)	(0.103)	(0.109)	(0.151)
Market	0.020***	0.013*	0.010	0.025**	0.021	0.031*
	(0.006)	(0.007)	(0.007)	(0.012)	(0.014)	(0.016)
Age	-0.007	0.030	0.007	-0.008	0.030	-0.001
	(0.015)	(0.019)	(0.024)	(0.015)	(0.019)	(0.024)
Age^2	-0.001**	-0.000*	-0.001**	-0.001**	-0.000	-0.001**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Debt	0.004***	0.004***	0.004***	0.004***	0.004***	0.004***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
D^{2008}				0.018	0.029	0.069
				(0.039)	(0.044)	(0.049)
$D^{central}$				0.152***	0.158***	0.158***
				(0.045)	(0.045)	(0.046)
D^{local}				0.079**	0.051	0.054
				(0.036)	(0.036)	(0.036)
Province dummy× time trend	No	Yes	Yes	No	Yes	Yes
Province dummy× (time trend)^2	No	No	Yes	No	No	Yes
Province Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes

(Continued)

Table 6: (Continued)

Lnemp	(1)	(2)	(3)	(4)	(5)	(6)
Observations	10,631	10,631	10,631	10,631	10,631	10,631
R-squared	0.242	0.265	0.277	0.244	0.267	0.279
Number of Firms	1,167	1,167	1,167	1,167	1,167	1,167

Notes. Effective Tax Rate 2 (R2) is calculated by dividing current tax expense minus deferred income tax expenses by pre-tax income. Robust standard errors are reported in parenthesesclustered at firm level. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

In addition, the measurement error in the local corporate income tax rate variable can also be a possible reason for the biased estimate. In the following, two types of measurement error will be discussed: the sample with a pre-tax profit above 0 and an alternative calculating method of province effective income tax rate. Note that firms do not need to pay income tax rate when pre-tax profit is negative.

Table 7 reports the regression result of samples with a pre-tax profit above 0 which shows a statistically significant negative effect of local corporate income tax rate on the number of employees in firms and still is statistically significant after controlling for tax reform and international shocks. It is worth noticing that, after controlling for regional-specific unobservable time-varying effects, local corporate tax rate is estimated to have a negative effect on the number of employees under linear time trends. However, the effect of tax policies is still negative, but not significant under quadratic time trends.

Table 7: Regional Tax Policy (R2) and Employment within Instrumental Variable (2SLS)

Lnemp	(1)	(2)	(3)	(4)	(5)	(6)
R2	-0.062**	-0.057**	-0.048	-0.060**	-0.056*	-0.048
	(0.025)	(0.029)	(0.031)	(0.024)	(0.029)	(0.031)
Lnasset	0.627***	0.622***	0.621***	0.625***	0.621***	0.620***
	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
Lngdp	0.011	-0.326**	-0.001	0.007	-0.309**	0.004
	(0.115)	(0.137)	(0.178)	(0.114)	(0.137)	(0.178)
Lnexp	-0.203**	-0.150	-0.028	-0.175*	-0.098	-0.028
	(0.099)	(0.103)	(0.150)	(0.099)	(0.105)	(0.150)
Market	0.017***	0.011	0.009	0.005	-0.011	-0.002
	(0.006)	(0.007)	(0.008)	(0.012)	(0.014)	(0.017)
Age	0.031**	0.072***	0.028	0.034**	0.074***	0.033

(Continued)

Table 7: (Continued)

Lnemp	(1)	(2)	(3)	(4)	(5)	(6)
	(0.013)	(0.017)	(0.022)	(0.013)	(0.017)	(0.023)
Age^2	-0.000*	-0.000**	-0.001***	-0.000*	-0.000**	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Debt	0.017***	0.017***	0.017***	0.017***	0.017***	0.017***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
D^{2008}				-0.049	-0.083*	-0.039
				(0.038)	(0.042)	(0.048)
$D^{central}$				0.095*	0.104**	0.099*
				(0.051)	(0.051)	(0.051)
D^{local}				0.066	0.046	0.044
				(0.042)	(0.042)	(0.042)
Province dummy× time trend	No	Yes	Yes	No	Yes	Yes
Province dummy× $(\text{time trend})^2$	No	No	Yes	No	No	Yes
Province Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	12,538	12,538	12,538	12,538	12,538	12,538
R-squared	0.353	0.368	0.379	0.355	0.369	0.379
Number of Firms	1,289	1,289	1,289	1,289	1,289	1,289

Notes. Effective Tax Rate 2 (R2) is calculated by dividing current tax expense minus deferred income tax expenses by pre-tax income. Robust standard errors are reported in parenthesesclustered at firm level. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

The alternative method of effective tax rate is calculated as firms' current income tax expense divided by their pre-tax income (Porcano, 1986; Li and Song, 2011; Jaafar and Thornton, 2015). We denote the effective tax rate using this method as R1. Table 8 reports the regression result using this method, which is consistent with the former results.

Table 8: Regional Tax Policy (R1) and Employment within Instrumental Variable (2SLS)

Lnemp	(1)	(2)	(3)	(4)	(5)	(6)
R1	-1.421**	-1.262**	-1.025*	-1.947**	-1.846**	-1.702
	(0.560)	(0.543)	(0.545)	(0.937)	(0.933)	(1.100)
Lnasset	0.603***	0.605***	0.608***	0.592***	0.598***	0.605***
	(0.017)	(0.016)	(0.016)	(0.020)	(0.018)	(0.017)
Lngdp	-0.128	-0.842***	-0.795*	-0.091	-0.951***	-1.227
	(0.144)	(0.256)	(0.417)	(0.189)	(0.335)	(0.762)
Lnexp	-0.378**	0.033	0.318	-0.290*	0.386	0.486
	(0.175)	(0.114)	(0.201)	(0.171)	(0.259)	(0.328)
Market	0.058***	0.067***	0.062**	-0.050	-0.043	-0.069
	(0.017)	(0.024)	(0.028)	(0.042)	(0.036)	(0.061)
Age	0.070***	0.089***	0.040*	0.109***	0.109***	0.122*
	(0.022)	(0.021)	(0.023)	(0.041)	(0.031)	(0.068)
Age^2	-0.000	-0.001***	-0.001***	-0.000	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Debt	0.004***	0.004***	0.004***	0.003***	0.004**	0.004**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
D^{2008}				-0.472*	-0.501*	-0.575
				(0.262)	(0.271)	(0.399)
$D^{central}$				0.105*	0.174***	0.156***
				(0.054)	(0.059)	(0.055)
D^{local}				0.071	0.075	0.057
				(0.044)	(0.047)	(0.042)
Province dummy× time trend	No	Yes	Yes	No	Yes	Yes
Province dummy× (time trend)^2	No	No	Yes	No	No	Yes
Province Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	14,198	14,198	14,198	14,198	14,198	14,198
R-squared	-0.223	-0.046	0.124	-0.725	-0.511	-0.309

(Continued)

Table 8: (Continued)

Lnemp	(1)	(2)	(3)	(4)	(5)	(6)
Number of Firms	1,291	1,291	1,291	1,291	1,291	1,291

Notes. Effective Tax Rate 1 (R1) is calculated as firms' current income tax expense divided by their pre-tax income.Robust standard errors are reported in parenthesesclustered at firm level. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

6 Conclusion

This paper studies the effect of China's local corporate income tax policy on firm employee numbers. On one hand, local taxation policies will impact on firms' production and relocation decisions. The decision-making on labor input of local firms is in accordance with the policy environment. On the other hand, province unobservable time-varying heterogeneity is an important factor that affects the firms' decision making as well. Therefore, this paper studies the impact of China's local government corporate income tax policy on the number of employees by considering the unobservable time-varying heterogeneity of the province.

To achieve this objective, this paper employs the identification strategy adopted by Wolfers (2006), and Islam and Lopez (2014) to approximate the unobservable time-varying heterogeneity of the province by a quadratic function of time, which controls for the unobservable time-varying heterogeneity to reduce potential reverse causality. The pooled OLS and fixed effect model show that there is a positive correlation between regional tax rate and employment. We employ an instrumental variable and find that the correlation between the number of employees of firms and the province effective corporate income tax rate is significantly negative. And after controlling for the province time-varying unobservable heterogeneity, the results are still negative and the majority of them are statistically significant.

The semi-elasticity of regional corporate income tax rate on firms' employment is negative, significant and robust. The reduction of corporate income tax by local governments via various preferential tax treatments will promote the employment of firms. With more tax concessions, the effective corporate income tax rate decreases and hence the firms' disposable profit is increased, and firms may keep the current size. When the profit is high enough, firms may choose to enlarge their production to achieve more profit. The analysis above based on empirical results can be considered as an important reason for the negative relationship between the number of employees in firms and the effective corporate income tax rate.

China's current tax cuts policy for firms is an effective way to resist the downward pressure on the economy. However, the results of this paper show that the estimated

impact of the local government's corporate income tax preferential policies on firm employment declines after controlling for the unobservable time-varying heterogeneity.

One possible reason is that the Chinese central government has given the local government too much tax concession authority, which results in the excessive use of tax incentive policies for the local governments, and hence distortion and inefficient tax competition between local governments. Therefore, the central government should strengthen the supervision and management of regional tax preferential policies, and further clean up the existing inappropriate tax policies.

Our main contributions include evaluating the impact of regional tax policy on firms' employees, considering the unobservable time-varying heterogeneity by adding a province-specific quadratic function of time into the model. Moreover, we construct an instrumental variable for regional corporate income tax rate to fix the endogeneity problem. The study of this paper also shows that that there may be endogeneity problems in local tax policies, or more broadly, in fiscal decentralization assessments, and that the diverse local economic and social characteristics affect the consistency of estimates.

Another insight from this work is that although the corporate income tax is essentially a kind of tax levied on capital, it becomes an indirect tax for which it is easy to transfer the firm tax burden to employees, because of imperfect market conditions and the irregular enterprise management system (Wang and Dai, 2015). Therefore, China's corporate income tax reform should be designed and implemented based on market conditions and the status of firms' management systems.

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