PREFERENTIAL TREATMENTS OF STATE-OWNED ENTERPRISES IN CHINA

A Thesis

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ABSTRACT

Do state-owned enterprises (SOEs) enjoy preferential treatments in China? This thesis extends the political economy approach of Branstetter and Feenstra (2002)[2] by introducing domestic tax rates in addition to import tariffs, and derive a corresponding government objective function that can be estimated using data on domestic tax rates, both de jure and de facto, respectively determined at the level of the central government and provincial governments. We find that for both the central and provincial governments, the political weights on SOEs are greater than those on FIEs. However, the magnitude of this difference varies across regions and various groups of provinces. In addition, within-region/group, the political weights of the provincial governments on both SOEs and FIEs tend to be smaller than those of the central government, implying less governmental interference at the provincial governmental dimension.

BIOGRAPHICAL SKETCH

Pinyi Chen is working as a Research Analyst at the World Bank, Washington, D.C. She is expected to receive her Master of Science degree in Applied Economics and Management from Cornell University in August 2015, with a focus on Development Economics. In 2013, she got her Bachelor of Science degree in Agricultural Economics with a Minor in Mathematics from Purdue University.

She has conducted multiple research projects from field research on the Cooperative System in rural China to behavioral experiments on the obesity issue of the United States. In future, she plans to extend her researches on societal concerns, including but not limited to multidimensional inequality, poverty and early childhood intervention.

This thesis is dedicated to my beloved families.

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CHAPTER 1

THEORETICAL CHAPTER

1.1 Introduction

Initiated by Deng Xiaoping in 1978, a series of centrally mandated trade liberlaization policies have considerably opened China to the world and attracted foreign capital inflows. With the advance technology brought in by the foreign investors and the cheap labor cost, China has become the World Factory and witnessed stunning economic growth. Within China, foreign-invested enteprises (FIEs) exist side-by-side state-owned enterprises (SOEs). These two types of enterprises were subject to different tax treatments until 2008 when a uniform tax regime was finally introduced. (Van der Hoek, Kong, and Li, 2008)[21] Similarly, trade liberalization over time has also eroded the import tariff advantages that many FIEs enjoy.

With the onset of fiscal decentralization policies in 1994, provincial governments were given significant latitude in adopting policies to bolster local economic development. This has included tax policy advantages that may be granted to enterprises. Competition for foreign capital, buttressed by the cadre evaluation system, meant that de facto tax policies at the provincial level may not coincide with centrally determined tax mandates.

In this thesis, we collect data on centrally mandated de jure tax policies, and data on locally enforced de facto tax, to empirically estimate the relative weights the central and provincial governments attached to FIEs and SOEs. 1) The de jure tax, representing the attitudes of the central government, is summarized from a series of central tax laws and regulations since 1978 mentioned in Jiang (1998) [13]. 2) The de facto tax, resulted from the enforcements of the de jure tax by the provincial governments, is calculated as dividing the domestic tax charged on FIEs by the total output of them. To facilitate the analysis, a modified model based on Branstetter and Feenstra (2002)[2] is presented. The model is empirically applied to Chinese data over the period 1998-2011 for 30 provinces by changing the endogenous, domestic tax rate on FIEs to the exogenous fixed values using 1) and 2). The findings suggest that for both the central and provincial governments, the political weights on SOEs are found greater than those on FIEs. However, the magnitude of this difference varies across regions and various groups of provinces (see Section 2.2 for details). In addition, within-region/group, the political weights of the provincial governments on both SOEs and FIEs tend to be smaller than those of the central government, implying less governmental interference at the provincial governmental dimension.

The paper proceeds as follows. Section 1.2 presents a literature review and an elaboration of the gap in the existing papers. Section 1.3 explains the evolution of the tax policies for FIEs in China. Section 1.4 discusses the model of Branstetter and Feenstra (2002)[2] and the modifications of it. Section 2.1 discusses and introduces the data. Section 2.2 sets out the issues in estimation and displays the discussion of the results. Section 2.3 states the follow-up research plans.

1.2 Literature Review

The literature review is in three parts. The first discusses the Grossman and Helpman (1994)[11] "Protection for Sale" model. The second summarizes a series of empirical papers that employ this model in several democratic countries. The third part consists of papers testing this model in China.

The Protection for Sale model [11] investigates how government designs its trade policies in response to political incentives in a way that effectively maximize a weighted sum of total political contribution by lobbies and aggregate social welfare. In the model, special interest groups make political contributions in order to influence an incumbent governments choice of the trade policy (Hong, 2013) [12]. Grossman and Helpman (1996)[10] extend the model to study how the entry of FDI would affect the level of protection for the domestic industry.

There are several empirical papers applying the Protection for Sale model on democratic countries. Goldberg and Maggi(1999) [8] and Gawande and Bandyopadhyay (2000) [6] apply Grossman and Helpman (1994) [11] to the industry-level data of the United States, using non-tariff barrier (NTB) coverage ratio as a policy variable. In addition, they produce similar results that the U.S. government puts a 50 to 100 times higher weight on the social welfare than on the political contributions. Mitra, Thomakos, and Ulubasoglu (2002)[19] studied the case of Turkey. Single year and panel estimation methods are used and various factors including nominal protection rates, effective protection rates, and NTB coverage ratios are considered. It is found that over the period 1983-1990, politically organized industries receive higher protection and promotion than unorganized ones. McCalman (2003)[18] performed a similar analysis for the case of Australia between 1968-1969, and 1991- 1992. Grether, De Melo, and Olarrega (2002)[9] apply the protection for sale model to the case of Mexican tariffs, and finds that FDI played a significant role in determining Mexicos tariff structure.

However, there has been very little work that applies the Protection for Sale model to non-democratic China. Two exceptiions are Branstetter and Feenstra (2002)[2] and Hong (2013)[12]. Branstetter and Feenstra (2002)[2] analyze how China trades off the social benefits of increased FDI against the losses incurred by state-owned enterprises (SOEs) during trade liberalization. It is assumed that the Chinese central government extracts various extra rents from FIEs that are threats to SOEs in the view of the politicians; the extra rents are generalized as local tax levied on FIEs in China. The paper concludes that the political weight that the Chinese central government applies to SOEs is about 4 to 7 times higher than that applied to social welfare. Though the premium weight on SOEs is diminishing over time, SOEs are still favored as compared to the overall consumer welfare.

Different from Branstetter and Feenstra (2002) [2], Hong (2013) [12] uses the tariff rate rather than the FDI as a policy variable, and imposes a tariff constraint on the government objective function to emphasize the tariff reduction commitment to WTO. In addition, Hong (2013) [12] builds a model across industries while Branstetter and Feenstra (2002)[2] focuses on the provincial level. Hong (2013)[12] adopts two alternatives to analyze the elasticity of import demand. One alternative is applying a common elasticity value to all the industries under the constant elasticity of substitution (CES) assumption. The other alternative involves the estimates of the import demand elasticity from three existing empirical studies, Broda and Weinstein (2006)[3], Kee, Nicita, and Olearraga (2008)[14], and Chen and Ma (2012)[4]. By an OLS regression, Hong (2013)[12] shows that the weights of the central government for both SOEs and consumer welfare are declining over time, with the weight for SOEs always being greater. The result is consistent with that in Branstetter and Feenstra (2002)[2].

Nevertheless, there are still questions that remain unanswered in Branstetter and Feenstra (2002)[2] and Hong (2013)[12]. First, the analyses of these two papers are limited to the central governmental (de jure) level of China. Additionally, a consideration of possible governmental preferences for the positive spillover effects of FIEs on the economy of China is absent. Since trade liberalizaton, FIEs have brought creativity to domestic firms, and increased their productivity by spreading various advanced technologies and managerial methods (Cheung and Ping, 2004)[5]. These contributions of FIEs have been rewarded by extensive preferential tax policies established by the Chinese central government since the late 1970s (see details in Section 1.3). Moreover, FIEs, to some degree, are encouraged by tax concessions of the local governments since the 1994 tax decentralization. This paper is a modification of Branstetter and Feenstra (2002) to take these governmental rewards to FIEs into consideration (see details in Section 1.4).

1.3 Preferential tax treatments for foreign investment

1.3.1 Nationwide preferential tax treatments

In China, preferential tax treatments are confined to three major types of foreign direct investment, Chinese foreign equity joint ventures (EJVs), Chinese-foreign contractual joint ventures (CJVs), and wholly foreign-owned enterprises (WFOEs), referred as foreign investment enterprises (FIEs) [13]. These three types of FIEs do not enjoy the same centrally mandated preferential tax policies until the establishment of the Income Tax Law of the Peoples Republic of China

Concerning Foreign Investment (UTL) in 1991 [13] (See Appendix A for details). As a result, in addition to the special tax reductions for the early period of operations, FIEs nationwide were eligible for a 30% flat rate plus a 3% local rate in the normal operating year [13]. As a simplification, we assume that the de jure tax rate for FIEs is 30% for each provinces of China since 1991. The above special tax reductions and the extra local tax reductions that are too trivial to be generalized are excluded. This exclusion also applies to the tax policies at the regional level as summarized below.

1.3.2 Regional tax preferences

The first wave of regional preferences

Since 1978, China sought to open its door to the world and to foreign investment in particular as a way to bolster local economic growth. This gave rise to 1) the first wave of regional preferences. After experiencing the social instability in 1989, Chinese political leaders saw greater importance of promoting economic growth so as to realize the better living standard they had promised to the domestic people. Given the economic success in above experimental areas, China sped the liberalization process by introducing 2) new waves of regional preferences in the early 1990s. However, above lopsided preferential tax treatments for FIEs in the coastal areas enlarged the disparity between the coastal and non-coastal areas, thereby giving rise to unhealthy provincial competitions [13]. To overcome this disparity, the Chinese central government gradually redistributed sources in order to favor the inner provinces since 1992. 3) As of January 1, 2008, the unification of the two separate tax regimes for SOEs and FIEs is realized, as the New Enterprise Income Tax went to effect [21]. Since then, all enterprises, regardless of their ownerships, should pay enterprise income tax at a 25% rate generally speaking [13]. These three waves are summarized[1] in Table 1.1, and for more details please see Appendix A.

Table 1.1 Three waves of centrally mendated de jure tax policies for FIEs

Action	Time	Generalized de jure tax
1. The first wave of regional preferences		
Special Economic Zones (SEZs)	1979	15%
Coastal Open Cities (COCs)	1984	19.5%
Economic and Technological Development Areas (ETDA)	1984	15%
Old Urban District	1984	24%
Coastal Economic Open Regions (CEORs)	1985	15%
2. New waves of regional preferences in the early 1990s		
Pudong New District in Shanghai	1990	15%
Border Economic Cooperation Zones (BECZs)	1992	24%
Inlcuded large cites along Yangtze River as COCs	Early 1990s	19.5%
Expanded CEORs to include over 150 citeis and counties	Early 1990s	15%
3. The unification of the dual tax regimes for SOEs and FIEs	2008	25%

For the above discussion, only a major part of the tax treatments to FIEs were summarized from the tax laws and regulations mentioned in Jiang (1998) [13]. More detailed information can be found in Jiang (1998) [13] and the full-text versions of the aforementioned law and regulations. Also, in addition to the enterprise income tax, FIEs also pay business tax, value-added tax, consumption tax and etc. However, tax policies regarding these types of taxes are uniform to both SOEs and FIEs. Since this paper focus on how the Chinese government treat FIEs and SOEs differently, these kinds of taxes are ruled out and only the enterprise income tax is considered.

Based on Jiang (1998) [13], the distribution of the actions initiated during the three waves that are summarized in Table 1.1 is presented in Table 1.2:

[1]The generalized de jure tax are summarized from Jiang (1998) [13]

Table 1.2 Distribution of centrally mendated de jure tax policies for FIEs

Coastal province (15% overall)	**Border provinces (24% overall)**	**Inner province (30% overall)**
Guangdong	**Heilongjiang**	**Sichuan**
SEZ: Shenzhen Zhuhai Shantou 15%	BECZ: Suifenghe-24%	COC: Chengdu
COC: Guangzhou Zhanjiang -19.5%	ETDA: Harbin15%	**Chongqing**
CEOR–15%	**Jilin**	ETDA: Chongqing
Guangxi	BECZ: Hunchun	**Hunan**
COC: Beihai	ETDA: Changchun	COC: Yueyang, Changsha
BECZ: Pingxiang, Dongxing24%	**Inner Mongolia**	**Hubei**
Fujian	BECZ: Manzhouli, Erlianhaote	ETDA: Wuhan
SEZ: Xiamen15%	COC: Huhehaote15%	**Jiangxi**
COC: Fuzhou19.5%	**Yunnan**	COC: Jiujiang, Nanchang
CEOR15%	BECZ: Wanding, Ruili, Hekou	**Anhui**
Taiwan Investment Zones: Xiamen, Fuzhou15%		COC: Hefei
Tianjin		ETDA: Wuhu
COC15%		**Hebei**
Shanghai		COC: Qinhuangdao, Shijiazhuang
Pudong New District15%		**Shanxi**
Bonded ZonesWaigaoqiao15%		COC: Taiyuan
CEOR15%		**Henan**
Liaoning		COC: Zhengzhou
COC: Dalian		**Guizhou**
BECZ: Dandong24%		COC: Guiyang
ETDA: Shenyang		**Shaanxi**
CEOR15%		COC: Xian
Shandong		**Xinjiang**
COC: Qingdao, Yantai		**Ningxia**
CEOR		**Qinghai**
Jiangsu		**Gansu**
COC: Lianyungang Nantong		
CEOR		
Zhejiang		
COC: Ningbo Wenzhou		
ETDA: Hangzhou, Xiaoshan		
CEOR		
Hainan		
SEZ: Hainan		
Beijing		

As a generalization from Table 1.2, the centrally mendated de jure tax policies regarding FIEs are quantified as follows:

- 15% tax rate for coastal provinces before 2008
- 24% tax rate for border provinces before 2008

- 30% for rest of provinces before 2008
- 25% for all provinces since 2008

1.4 Model specification and modification of Branstetter and Feenstra (2002)[2]

In view of the above evidence, in this section, we extend the theoretical model of Branstetter and Feenstra (2002) [2] to incorporate differential tax policy treatments of FIEs and SOEs.

1.4.1 Main components

Regions: in this paper, each province in China is treated as distinct in that provinces within China have only limited trade [23]. Each province is characterized by heterogeneous products produced by state-owned enterprises (SOEs) and foreign-invested enterprises (FIEs), and by a labor force who serves both as input to and as consumers of these products.

Products: for each province, there is a numeraire good denoted by x_0, and a differentiated composite product x assumed to be a Constant Elasticity of Substitution (CES) aggregate of three varieties: the products of SOEs, the products of FIEs, and the imported goods. Within each province, n_h is the number of SOEs; n_f is the number of foreign firms, where m of n_f are FIEs, and $(n_f - m)$ are foreign firms exporting to China. In addition, n_h and n_f are exogenous variables while m is considered endogenous. The CES aggregate function is:

$$x = \left(n_h x_h^{\frac{\varepsilon-1}{\varepsilon}} + (n_f - m) x_f^{\frac{\varepsilon-1}{\varepsilon}} + m x_m^{\frac{\varepsilon-1}{\varepsilon}} \right)^{\frac{\varepsilon}{\varepsilon-1}}, \quad \varepsilon > 1 \tag{1.1}$$

The value x_j when $j = h$ (SOEs), f (imported), and m (FIEs) represents the consumption of the three differentiated varieties of products from each SOE, FIE, and foreign firm exporting to China respectively. $\varepsilon > 1$ is the own-price elasticity of demand for each variety.

Consumers: given above three varieties of products, the utility function of consumers is assumed to be quasi-linear:

$$U = x_0 + \frac{\theta}{(\theta - 1)} x^{\frac{(\theta-1)}{\theta}}, \quad \theta > 0 \quad and \quad \theta \neq 1 \tag{1.2}$$

$\theta > 0$ is the elasticity of demand for the CES aggregate x. We impose the standard restriction that $\varepsilon > \theta$, which implies that the cross-price elasticity (the responsiveness of the demand for one variety to a change in the price of another) for each variety is positive.

Let p_j denote the prices of each type of goods $j = h, f, m$, the budget constraint of maximization problem is $x_0 + n_h p_h x_h + (n_f - m) p_f x_f + m p_m x_m = I$ where I is the total labor income. Meanwhile, the demand for each variety of goods for each corresponding firm derived by maximizing the untility equation (2) is given by:

$$x_j = p_j^{-\varepsilon} q^{\varepsilon - \theta}, j = h, f, m, \quad and \quad x = q^{-\theta} \tag{1.3}$$

where q is a price index.

$$q = \left(n_h p_h^{1-\varepsilon} + (n_f - m) p_f^{1-\varepsilon} + m p_m^{1-\varepsilon}\right)^{\frac{1}{1-\varepsilon}} \tag{1.4}$$

This paper defines the marginal cost for locally produced products as c_j, $j = h, m$, while the marginal cost for the imported products is c_f plus a specific tariff τ that add up to a total marginal cost, $c_f + \tau$. Given the two different costs, the profits to be maximized also differ as follows:

$$\pi_j = (p_j - c_j)x_j,\ j = h, m \tag{1.5a}$$

$$\pi_f = \left(p_f - (c_f + \tau)\right) x_h \tag{1.5b}$$

With the consumption equation (3), maximizing the profits in (5a) and (5b) in terms of price p_j generates the following equations:

$$p_j = \frac{\varepsilon}{(\varepsilon - 1)} c_j,\ j = h, m \tag{1.6a}$$

$$p_f = \frac{\varepsilon}{(\varepsilon - 1)} (c_f + \tau) \tag{1.6b}$$

Substituting (6a) into (5a) and (6b) into (5b), we obtain the maximized profit of each type of enterprise:

$$\pi_j = \frac{p_j x_j}{\varepsilon},\ j = h, f, m \tag{1.7}$$

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Factor inputs: this paper, following Branstetter and Feenstra (2002) [2], assumes that one unit of the numeraire is produced with one unit of labor, with unit wages. In addition, the unit wages are earned by workers of SOEs producing the differentiated products, while those working at FIEs are paid a wage premium, $(w - 1) > 0$. The wage premium paid by FIEs is supported by the interview results of Branstetter and Feenstra (2002)[2] and the wage premium in FIEs found by Malchow-Meller et al., (2013) [17] by testing the theories of heterogeneous worker, heterogeneous learning, and heterogeneous firms. Moreover, in the dataset of this paper, FIEs wages are higher than the SOEs wages for almost all observations. Insofar as labor is the only input of production, only labor costs are considered for the marginal costs of the production of local SOEs and FIEs. In addition, it is supposed that supplying the domestic demand by producing locally is always cheaper than producing outside the country. Otherwise foreign firms would not have interests to enter the local market of the importing country. Thus, it is assumed that:

$$c_m < c_f + \tau \tag{1.8}$$

Policy toward FIEs: foreign firms that have launched local plants face a fixed cost of $F > 0$. In addition, the local government also charges them a domestic tax of $\lambda > 0$ on their profits. Taking F and λ into consideration, the profits earned locally are $(1 - \lambda)\pi_m - F$. The entry will occur only if $(1 - \lambda)\pi_m - F > \pi_f$, which contributes to the following condition:

$$(1 - \lambda)\frac{p_m x_m}{\varepsilon} - F \geq \frac{p_f x_f}{\varepsilon} \tag{1.9}$$

Given equations (3), (4), (6a), and (6b), this equation (9) can be rewrite as:

$$F <= \frac{1}{\varepsilon^{\varepsilon}(\varepsilon-1)^{1-\varepsilon}} q^{\varepsilon-\theta} \left((1-\lambda)c_m^{1-\varepsilon} - (c_f+\tau)^{1-\varepsilon}\right) \quad (1.10)$$

It is assumed that when $m = \lambda = 0$, the equation (10) holds as a strict inequality.

1.4.2 Government objective function

The governmental objective function is a weighted sum of social welfare and the contribution of each dimension of governmental interest. The social welfare is represented by consumer utility from products consumption, which is assigned a weight of α in the objective function. Using (2), (3) and (4), the utility function for consumers is as follows:

$$U = I + q^{1-\frac{\theta}{\theta-1}} \quad (1.11)$$

I is the total labor income. Supposing there are a_m workers used per unit of output in local FIEs (assuming total consumption equals total production), the total wage premium received by workers of local FIEs per province is:

$$(w-1)ma_m x_m \quad (1.12)$$

Since only the labor cost is considered, the marginal cost of the production of local FIEs is wa_m. Using (7), the price of the products of FIEs is as follows:

$$p_m = wa_m \frac{\varepsilon}{\varepsilon-1} \quad (1.13)$$

Then the above total wage premium received by workers of local FIEs per province can re-written in the following form:

$$\left(\frac{(\varepsilon-1)(w-1)}{w\varepsilon}\right)mp_m x_m \tag{1.14}$$

Making I (total labor income) equal to the sum of L (labor endowment that is one unit wage per unit labor) and $\left(\frac{(\varepsilon-1)(w-1)}{w\varepsilon}\right)mp_m x_m$ (total wage premium per province), and given (3) and (4), the utility (not maximized) equation can be re-written as:

$$\begin{aligned} U &= L + \left(\frac{\varepsilon-1}{\varepsilon}\right)\left(\frac{w-1}{w}\right)mp_m x_m + \frac{1}{(\theta-1)}q^{1-\theta} \\ &= L + \left(\frac{\varepsilon-1}{\varepsilon}\right)\left(\frac{w-1}{w}\right)mp_m x_m + \frac{1}{(\theta-1)}\left(n_h p_h x_h + (n_f-m)p_f x_f + mp_m x_m\right) \end{aligned} \tag{1.15}$$

Please referring to Appendix B for the derivation of the second expression.

As for the categories of governmental interests according to the objective function, the first is the consumer utility, U, with a weight α. The second is the profit of SOEs, $n_h\pi_h$, with a weight β. The third, $m_\lambda\pi_m$, is the extra rents extracted from the profit of FIEs, while the fourth, $\tau(n_f-m)x_f$, is the tariff revenue. These two latter dimensions of interests are both given a unit weight in the objective function. Thus the government objective function is as follows:

$$\begin{aligned} G(m,\lambda,\tau) &= \alpha U + \beta n_h\pi_h + m\lambda\pi_m + \tau(n_f-m)x_f \\ &= \alpha L + \left(\frac{\alpha}{\theta-1}+\frac{\beta}{\varepsilon}\right)n_h p_h x_h + \\ &\left(\frac{\alpha}{\theta-1}+\frac{\tau}{p_f}\right)(n_f-m)p_f x_f + \left(\frac{\alpha}{\theta-1}+\frac{\alpha(\varepsilon-1)(w-1)}{\epsilon w}+\frac{\lambda}{\varepsilon}\right)mp_m x_m \end{aligned} \tag{1.16}$$

1.4.3 Optimal tax policies based on Branstetter and Feenstra (2002)

Branstetter and Feenstra (2002) suppose that the Chinese government indrectly controls the entry of FIEs through policy instruments, for example, tax rate λ on FIEs. Mathematically, the government objective function is increasing in the number of FIEs, m ($\frac{\partial G}{\partial m} > 0$) which is a decreasing function of the domestic tax rate on FIEs, λ ($\frac{dm}{d\lambda} < 0$). This assumption, however, does not hold in this modified model of Branstetter and Feenstra (2002) (please see details in Section 1.4.4). In Branstetter and Feenstra (2002), to understand how each region chooses optimal λ to maximize the objective function through its effect on m, the estimable equation is calculated by deriving the first order condition (FOC) of the government objective function with respect to λ and then setting the FOC to be zero:

$$
\begin{aligned}
s_{mit} = {} & -\beta s_{hit} + \eta \frac{w_{it} - 1}{w_{it}} + \alpha(\varepsilon - 1)\frac{w_{it} - 1}{w_{it}}(s_{hit} + s_{fit}) - \varepsilon \frac{\tau_{it}}{p_{ft}} s_{fit} + \frac{m_{it}}{n_f - m_{it}} s_{fit} \\
& + \frac{\alpha\varepsilon}{\varepsilon - \theta} + \left(\frac{(\varepsilon - 1)\lambda_{it}\pi_{mit}}{(\varepsilon - \theta)(F_{it} + \lambda_{it}\pi_{mit})} + \left(\frac{\alpha(\varepsilon - 1)^2}{\varepsilon - \theta}\frac{w_{it} - 1}{w_{it}} - \varepsilon \frac{\tau_{it}}{p_{ft}} \right) \frac{\pi_{fit}}{(F_{it} + \lambda_{it}\pi_{mit})} \right)
\end{aligned}
\tag{1.17}
$$

The dependent variable, s_{mit}, is the share of the provincial consumption of the products from FIEs with respect to the total provincial domestic consumption. On the right-hand side, the first term, with a coefficient β, is the share of the consumption of SOEs products, s_{hit}. The second term of this equation is the wage premium, $\frac{w_{it}-1}{w_{it}}$, with a coefficient $\eta = \alpha(\varepsilon - 1)(\theta - 1)/(\varepsilon - \theta)$. The next term is the wage premium, $\frac{w_{it}-1}{w_{it}}$, multiplying the sum of the shares of the spending on the products of SOEs and the imported goods, $(s_{hit} + s_{fit})$, with a coefficient $\alpha(\varepsilon - 1)$. The fourth term is the ad valorem tariff rate, $\frac{\tau_{it}}{p_{ft}}$, timing the share of the spending on imports, s_{fit} , with a coefficient $-\varepsilon$. The final term of is the product of the share of the number of FIEs in foreign firms (exporting to China), $\frac{m_{it}}{n_f - m_{it}}$, and the share of the spending on the imports, s_{fit}. Besides, the terms in the second line are the fixed cost and profits variables, interacted with the wage premium and tariffs, for which the data are not fully available to estimate. However, the interacted items change across provinces and years and are thus treated as provincial and year fixed effects for simplicity.

1.4.4 Modification of Branstetter and Feenstra (2002) [2]

In our data, the centrally mandated tax policies were not variable frequently. In addition, it may also be argued that since local authorities were given the responsibility of tax collection, the ultimate determination of the effective tax rates rest on them. Thus, we will take λ to be given by the observed tax policies that were collected for the purpose of this thesis. We use two sources, respectively they include 1) the de jure tax rates summarized from the central tax policies or 2) the de facto tax rates of FIEs, resulting from the enforcement of the de jure ones by the provincial governments. Thus, while 1) demonstrates the political attitudes to FIEs of the central government, 2) illustrates those of the provincial governments. Taking λ as given, we examine the government's optimal policy in terms of the number of foreign firms m. The resultant estimating function is as follows (please see detailed derivation in Appendix B):

$$s_{mit} = -\beta\frac{s_{hit}}{\boldsymbol{\lambda_{it}}} + \frac{\eta}{\boldsymbol{\lambda_{it}}}\frac{w_{it}-1}{w_{it}} + \alpha(\varepsilon-1)\frac{w_{it}-1}{w_{it}}(s_{hit}+s_{fit})\frac{1}{\boldsymbol{\lambda_{it}}} - \varepsilon\frac{\tau_{it}}{p_{ft}}\frac{s_{fit}}{\boldsymbol{\lambda_{it}}} + \frac{\alpha\varepsilon}{\varepsilon-1}\frac{1}{\boldsymbol{\lambda_{it}}}$$
$$+ \frac{\theta-1}{\varepsilon-1} + 1 + \frac{1}{\boldsymbol{\lambda_{it}}}\frac{\pi_{fit}}{F_{it}+\lambda_{it}\pi_{mit}}\left(\frac{\alpha(\varepsilon-1)^2(w_{it}-1)}{\varepsilon-\theta}\frac{w_{it}-1}{w_{it}} + \left(\frac{\lambda_{it}(\varepsilon-1)}{\epsilon-\theta}\right) - \left(\frac{\epsilon-1}{\epsilon-\theta}\right)\frac{\tau_{it}}{p_{ft}}\right) \tag{1.18}$$

The dependent variable in (18) is the same as that in (17), though the independent variables differ in these two equations. First, the first four terms in the first line are the same for (17) and (18), except that in (18) they are all divided by λ. With λ incorporated in the objective equation (18), we are able to examine whether the Chinese government gives preference to the positive spillover effects of FIEs at both the de jure and de facto levels using the de jure and de facto λ as policy instruments, which Branstetter and Feenstra (2002) fail to do. Throughout, λ is restricted to be positive. Second, the fifth term of (17) is replaced by the inverse of λ and its coefficient. In addition, there are some changes of the terms in the second line from (17) to (18). Despite the changes, those items in the second line of (18), similar to those in (17), are still the fixed cost and profit variables, interacted with the wage premium and tariff, and thereby are samely treated as provincial and year fixed effects for simplicity.

As for the coefficients, β and α are critical to our analyses. According to the objective equation (16), β is the weight on the profits of SOEs and α [2] is the weight on consumer utility (the same as on the benefits of FIEs in that it is assumed that consumer utility positively functions on the contribution of FIEs in terms of output, technology, and etc. within a given country)[3] . By assuming that the governments (central and provincial) positively value the profits of SOEs and

[2] Can be obtained using the estimates of α (ε -1) and ε.

[3] For the rest of this paper, we describe α as the weight on the benefits of FIEs rather on the consumer utility. Because the main purpose of this paper is to analyze how the government (central and provincial) treat FIEs and SOEs differently.

benefits of FIEs, β and α are expected to be positive. Moreover, according to the data description in Section 2.1, de jure and de facto λ slightly correlate (correlation=0.1942), which implies that the central and provincial governments do not behave closely in terms of taxing the profits of FIEs. Hence, we expect that the estimates for β and α to be different at the de jure and de facto level. Furthermore, we have learned at Section 2.1 that the de facto tax does not vary much with the output and output shares (of total output) of FIEs and SOEs. This can either imply that the provincial governments, when taxing the profits of FIEs, do not have particular preferences to FIEs or SOEs, or imply that there are other "players" in the market at the de facto level that obscures the preferences of the provincial governments on the profits of SOEs or benefits of FIEs if there are. Thus, if the absolute value of β - α is indeed small at the de facto level, then it indicates a lack of clear preference of the provincial governments to the benefits of FIEs/SOEs, and/or the existence of other "players" at the de facto level. In contrast, the de jure tax from the central government is clearly negatively (positively) associated with shares of FIEs (SOEs) output and the number of FIEs, which indicate a clear preference of the central government to the benefits of FIEs. Hence, we suppose that the absolute value of β - α at the de jure level be larger than that at the de facto level. Moreover, the probable existence of other players lowers our expectation for the significance level of the estimates of the de facto model.

CHAPTER 2

EMPIRICAL CHAPTER

2.1 Data

The provincial panel dataset used by this paper covers the period of 1998-2011, which is summarized in the Table 2.1. (SOEs are State-owned enterprises and FIEs are foreign-invested enterprises.)

Table 2.1 Provincial dataset

	Source	**Unit**
Provincial output data		
Total output value [1]	*Chinese Statistical Yearbook*	100 million Yuan
Output value of FIEs[2]	*Chinese Statistical Yearbook*	100 million Yuan
Output value of SOEs[3]	*Chinese Statistical Yearbook*	100 million Yuan
Provicial Trade data[4]		
Total export value	*the Chinese Custom*	yuan
Export value of FIEs	*the Chinese Custom*	yuan
Export value of SOEs	*the Chinese Custom*	yuan
Ordinary import	*the Chinese Custom*	yuan
Weighted provincial tariff data[5]		
Tariff rate of each type of commodities	*Import and Export Tariff of the Peoples Republic of China (IET)*	Harmonized System
Provincial import of each type of commodities	*Provincial Statistical Yearbooks*	yuan
Provincial tax data		
De jure tax rates	*Centrally mendated tax laws and tax regulations of FIEs since 1978 (details in Section 1.3)*	
De facto tax rates[6]	*Chinese Taxation Yearbooks* *Chinese Statistical Yearbook*	
Provincial wage data		
Average wage of urban collectives	*Provincial Statistical Yearbook*	yuan
Average wage of other firms[7]	*Provincial Statistical Yearbook*	yuan
Data for econometric use		
Provincial population[8]	*Chinese statistical yearbook*	10000 persons
Provincial GDP	*Provincial Statistical Yearbook*	100 million Yuan
Provincial electricity production	*Chinese Energy Statistical Yearbook*	100 million kWh
Provincial average rural income	*Chinese Rural Statistical Yearbook*	Yuan
Provincial average urban income[9]	*Chinese Price and Urban Household Income and Expenditure Survey Statistical Yearbook* *Chinese City (Town) Life and Price Yearbook*	Yuan

The wage premium is constructed as the differences between the wages paid by FIEs and urban collectives (wages of FIEs minus wages of urban collectives) divided by the wages paid by FIEs. In addition, the share of consumption on outputs of each type of enterprise was calculated as follows:

$$S_{jit} = \frac{\text{Output}_{jit} - \text{Exports}_{jit}}{\text{TotalOutput}_{it} - \text{Exports}_{it} + \text{OrdinaryImports}_{it}} \quad \text{for j=h,m}$$

$$S_{jit} = \frac{\text{Ordinary Imports}_{jit}}{\text{Total Output}_{it} - \text{Exports}_{it} + \text{Ordinary Imports}_{it}} \quad \text{for j=f}$$

The output_{jit} refers to the consumption of products from firm-type j in province i and in year t, with $j = h$ meaning SOEs and $j = m$ meaning FIEs. In addition, $j = f$ indicates foreign firms that export to China, and we use $\text{OrdinaryImport}_{jit}$ rather than Output_{jit}. Similarly, the export_{jit} denotes the exports of firm-type j in province j and in year t. The denominator, Total Output - Exports + Ordinary Imports, reflects domestic consumption. In that theoretically only the products (added value) that participate in the domestic market competition should be

[1]The provincial output values are from all SOEs and non-SOEs at or above the designated size (5 million Yuan of annual production value).

[2]FIEs include firms invested by either foreigners or Chinese overseas from Hong Kong, Macau, and Taiwan.

[3]SOEs include both the state-owned and state-holding enterprises.

[4]For this group of data, I greatly appreciate the generous help of the Chinese Custom. In addition, I also obtained a set of trade data from the Provincial Statistical Yearbook, the values of which on average are quite lower than those from Chinese Customs. We judge the trade data from the Chinese Customs to be more reliable.

[5]This data was computed as a weighted average of tariff rates assessed on different types of commodities for each province; the weight is the share of provincial import of each type of commodities. However, Jiangsu, Tianjin, Shanghai, Anhui and Fujian didnt adopt the Harmonized System, and Hubei, Hebei, Ningxia, Liaoning, and Xizang provinces did not have import values categorized by types of commodities. Therefore, the weighted average tariff rates were unable to be computed for these provinces.

[6]The de facto tax rates are calculated as dividing the total tax revenues turned over by FIEs by the total output values of them.

[7]Other firms indicate all firms that exclude SOEs and urban collectives. The wage of other firms was used as a measure of the wage for workers in FIEs.

[8]The population of Hong Kong, Macau, and Taiwan were excluded.

[9]Rural and urban income both include wages and salaries, net business income, income from properties, and income from transfer.

considered, exports were netted out from the total output, otherwise the actual value added in the domestic market will be exaggerated. For example, processing exports means that intermediate materials are imported and then exported after some value added; the value added in this process is not a part of the domestic market. For the same reason, ordinary imports, rather than nominal imports, were used to avoid overstating the domestic consumption of imports.

2.1.1 Basic data description

All variables in the following three figures are the simple averages of themselves respectively for each province over the period 1998-2011. The average de jure tax takes three values: 0.18, 0.24, and 0.29.

Figure 2.1 Provinces with the lowest de jure tax (0.18) have higher (lower) share of FIEs (SOEs) output than the rest of provinces

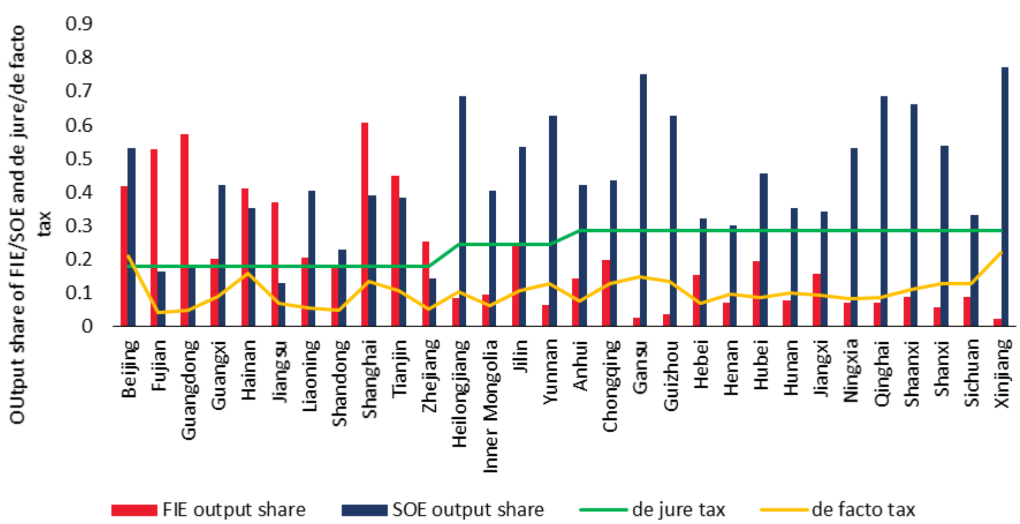


Figure 2.2 Provinces with the lowest de jure tax (0.18) have both higher output shares of FIEs and SOEs than the rest of provinces

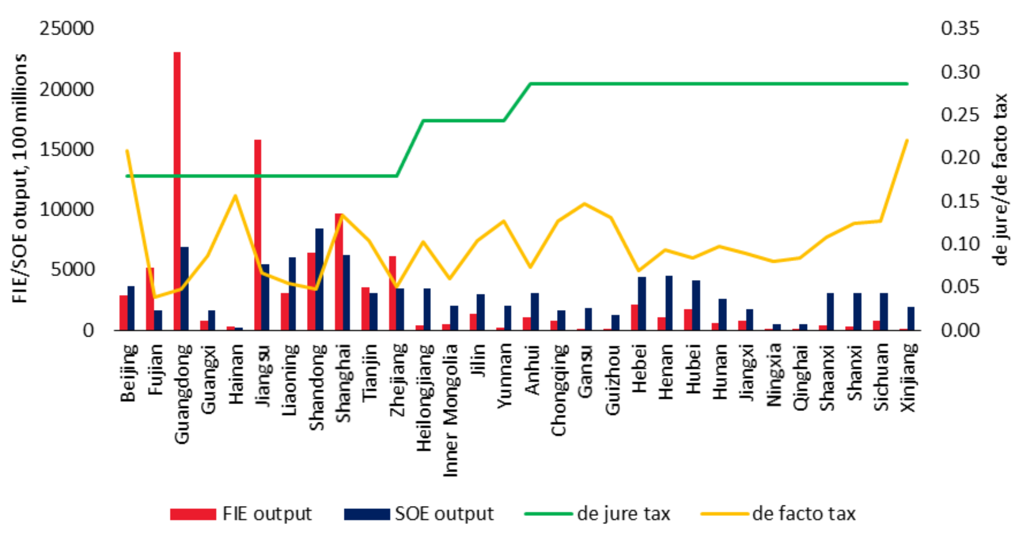
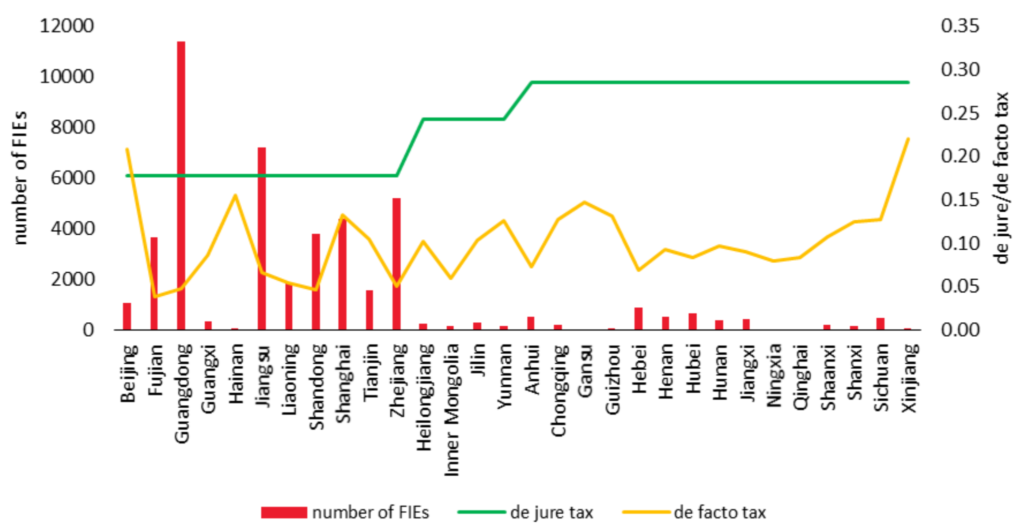


Figure 2.3 Provinces with the lowest de jure tax (0.18) have much greater number of FIEs than the rest of provinces



National level

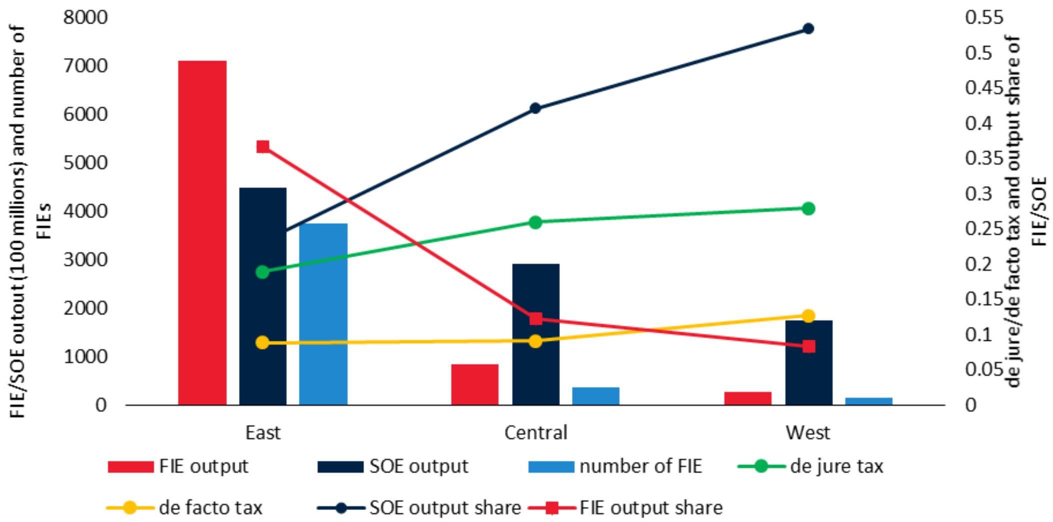
According to Figure 2.1, the provinces that have the lowest de jure tax (0.18) have higher (lower) share of FIEs (SOEs) output than the rest of provinces.

When we look at Figure 2.2, the provinces that have the lowest de jure tax tend to have both higher FIEs and SOEs output than the rest of provinces. Therefore, the FIE and SOE output values cannot clearly tell the relative importance of FIEs and SOEs in a given province. However, turning to Figure 2.3, we find that the provinces with the lowest de jure tax (0.18) have much greater number of FIEs while the number FIEs stays at a roughly stable low level as the de jure tax changes across the rest of provinces. In sum, these three charts show that, in general, de jure tax is negatively (positively) associated with shares of FIEs (SOEs) output and the number of FIEs. Nevertheless, this association does not obviously hold for the de facto tax. We saw from the above three charts that the de facto tax fluctuates up and down (with a trend line to be flat) regardless the distribution of de jure tax, share of FIEs output, and etc[10]. In this regard, we expect that it is either because the provincial governments at the de facto level have different mindset from that of the central government in terms of treating SOEs and FIEs using tax, or there are other ”players” in the market at the de facto level that complicated the de facto tax. No matter what the specific reason is, we expect that the model predictions of the government attitudes (regarding the profits of SOEs and consumer utility) at the de jure and de facto levels respectively will differ from each other.

[10] There is no correlation analysis for how the de jure tax correlates to the share of FIEs output, FIEs output, and the number of FIEs. Because the de jure tax only takes three values for all the provinces so that it lacks variation. Hence, there is also no correlation analysis for the de facto tax since it does not have a counterpart (analysis for de jure tax) to compare.

Regional level

Figure 2.4 A regional pattern of the distrubution of the de jure tax, de facto tax, and variables related to FIEs



In view of the Figure 2.4, first we notice that the east region has the highest nominal FIEs output, the highest share of FIEs output, highest number of FIEs firms, lowest de jure tax, and slightly lowest de facto tax, while the opposite for the west region. As for the central region, it ranks second for all of the variables in Figure 2.4 among the three regions. Given this regional pattern in terms of FIEs output, FIEs output shares, and number of FIEs firms[11], we suppose that provinces in the same region receive similar de jure and de facto treatments from the central and provincial governments.

[11]Based on the above analysis at the national levelWe suppose that the (central and provincial) governmental attitudes (instrumented by the de jure tax) that each province receive depends on the share of FIEs output, nominal FIEs output, and the number of FIEs to some degree.

Correlation between de jure and de facto tax

One feature captured from figures 2.1-2.3 is that while there is a clear pattern among de jure tax and other variables related FIEs and SOEs, that pattern is absent or unclear for de facto tax. This motivates us to examine the correlation between de jure and de facto tax at both the national and regional level, which is presented in Table 2.2 below.

Table 2.2 Correlation between de jure and de facto tax for FIEs

	National	East	Central	West
Correlation	0.19*	0.09	0.12	-0.11

(* means significant at the 5% level)

The above correlation results deliver several essential messages. First, the relationship between the de jure tax rates and the de facto tax rates is only statistically significant at the national level. Moreover, the absolute values of the correlations in Table 2.2 for the east, the central, and the west are much smaller than that for the nationwide.

Second, the correlation for the west region is negative, which means the de facto tax appeared to be set in opposition to that dictated by the central government.

Third, the correlation for the east part is the smallest in absolute value. Its interesting to see that the de facto tax rates of the east region, that enjoyed the most preferential de jure tax rates, are affected relatively less by those de jure rates. It is conceivable that the east region is well-developed and has good environment for foreign direct investment (FDI), so that it does not rely heavily on the preferential de jure tax rates to attract FDI. Even more, they can charge higher local tax rates on the FIEs without the fear of the outflow of FDI. Or there are other kinds of tax incentives which dwarf the impact of the preferential de jure tax rates on the de facto ones.

Fourth, the central region has the highest correlation compared to the east and west region. This could be due to the high density of the heavy industry of which there has historically strong interference from the central governmental. Under this interference, the officials of the provincial governments are more likely to obey the de jure tax policy.

Overall, all the above findings are motivations for an analysis of the central and provincial government attitudes. We expect to find differences in government's attitudes regarding profits/benefits of SOEs and FIEs at the de jure and de facto level, both within and across regions.

2.1.2 Robustness check for the validity of this provincial panel data set

We begin first with a validation exercise. Using the above new panel dataset (1998-2011), we test the original model of Branstetter and Feenstra (2002) [2] using the same estimation techniques as they do.[12] The results of this replication, shown in Table 2.3, are consistent with those of BF (2002) that Chinese government weight more on the profits of SOEs than on the benefits of FIEs [2]. This justifies the validity of this new dataset. (Numbers in bold are significant at the 5% level.)

[12] Please refer to Branstetter and Feenstra (BF) (2002) [2] for details. Chongqing, though included in the provincial dataset of this paper, is absent in the dataset of BF (2002) [2] in that it did not exist until 1997. In addition, the de jure and de facto models illustrated in this paper do not apply to the BF (2002) [2] model.

Table 2.3 Test BF (2002) [2] model using the dataset of this paper

	β	$\alpha(\varepsilon-1)$	ε	α	$\beta-\alpha$
OLS	**0.38**	0.28	2.61	0.18	0.20
TSLS	**0.64**	0.58	5.03	0.14	0.50
Weighted TSLS	**1.16**	0.72	2.55	0.46	0.70

We then test the model using the dataset (1984-1996) used by Branstetter and Feenstra (2002) [2], but with de jure tax as well in the specification[13] on the model of this paper (modified from the BF (2002) [2] model) to generate baseline results as shown in Table 2.4 (Numbers in bold are significant at the 5% level.):

Table 2.4 Test BF (2002) [2] data on the model of this paper

de jure model	β	$\alpha(\varepsilon-1)$	ε	α	$\beta-\alpha$
OLS	**0.05**	0.08	**-0.81**	-0.04	0.10
TSLS	**0.29**	**0.63**	1.80	0.79	-0.49
Weighted TSLS	**0.37**	**0.77**	2.76	0.44	-0.07

Different from the predictions of Branstetter and Feenstra (2002) [2], the Chinese central government prefers the benefits of FIEs to the profits of SOEs using the TSLS and weighted TSLS techniques on the model of this paper. However, these possible preferences are not significant due to the insignificant values of β-α.

[13] The dataset of Branstetter and Feenstra (2002) [2] covers the period 1984-1996. However, there is only de facto tax data since 1993. Thus we can only use the Branstetter and Feenstra (2002) [2] dataset together with de jure tax to test our revised model. Each province has the same de jure tax for the period of 1984 -1996 as they have for the period of 1998-2008. Since the tax unification in 2008, each province has the same 24% de jure tax.

2.2 Estimation issues

For all the empirical estimation[14] scenarios below, each estimation equation is estimated at both the de jure and de facto tax levels. It is called de jure model when λ (the tax rate assessed on the profits of FIEs) takes the de jure tax summarized from the central tax policies, and called de facto model when λ takes the values of the de facto tax, keeping other data used the same. The de facto tax results from the enforcements of the de jure tax by the provincial governments. Thus, while the de jure tax represents the preferences regarding SOEs and FIEs of the central government, the de facto tax reflects the same preferences of the provincial governments. In other words, the de jure and de facto model test the mindsets of the central and provincial governments respectively.

2.2.1 OLS and Fixed Effects

Our baseline estimation is an OLS model with fixed effects (using least squares dummy variable) and robust standard error[15]. The corresponding actual estimation equation is:

[14] Hainan and Tibet are dropped due to its outlying values of FIEs output, number of FIEs, de facto tax, and etc.

[15] As mentioned in Section 1.4, the items in the second line of equation (18) are treated as province and year fixed effects. Those items, though cannot be estimated due to the limitation of data, vary across provinces and years, so that they are treated as provincial and time fixed effects. In terms of whether to choose the Fixed Effects or Random Effects econometric tool to estimate, the Hausman test shows that the former is preferred to the latter at the 5% significant level. In addition, the modified Wald test for group wise heteroskedasticity in fixed effect regression model indicates the presence of heteroskedasticity. Therefore, the robust standard errors are used for estimation.

$$s_{mit} = -\beta\frac{s_{hit}}{\boldsymbol{\lambda_{it}}} + \frac{\eta}{\boldsymbol{\lambda_{it}}}\frac{w_{it}-1}{w_{it}} + \alpha(\varepsilon-1)\frac{w_{it}-1}{w_{it}}(s_{hit}+s_{fit})\frac{1}{\boldsymbol{\lambda_{it}}} - \epsilon\left(\frac{\tau_{it}}{p_{ft}}\right)\frac{s_{fit}}{\boldsymbol{\lambda_{it}}} + \frac{\alpha\varepsilon}{\varepsilon-1}\frac{1}{\boldsymbol{\lambda_{it}}}$$
$$+ \text{Control Variable} + \text{Year Dummies} + \text{Province Dummies}$$
$$\text{with Robust Standard Error} \tag{2.1}$$

The control variable is the nominal consumption of all domestic products. The year dummies are created for each year from 1999-2011 (1998 as the base year), and the province dummies are created for each of the 30 provinces (Beijing as the base province). As for the description of variables in the first line, please refer to Section 1.4. Another important issue is about the endogeneity due to the simultaneity of independent and dependent variables. On the left side of the estimable equation (19) is the dependent variable, s_{mit}, which is the output of FIEs as share of total provincial output, while the SOEs and import shares are on the right. These three kinds of shares are assumed to sum to unity, causing an endogeneity between the FIEs share on the left side and the state-owned and import shares on the right side. To correct for this, the nominal provincial spending on the products of FIEs, SOEs, and imports, rather than the shares, are used. (This approach is also used by Branstetter and Feenstra (2002) [2].)

The actual estimates of equation (19) is summarized in Table 2.5 (those numbers in bold are significant at the 5% level):

Table 2.5 OLS+Fixed effects+Robust standard error

de jure model	β	$\alpha(\varepsilon-1)$	ε	α	$\beta-\alpha$
OLS	**0.271**	**0.686**	0.200	-0.858	1.129
de facto model	β	$\alpha(\varepsilon-1)$	ε	α	$\beta-\alpha$
OLS	**0.050**	**0.118**	**-4.561**	**-0.021**	**0.071**

Overall, the estimates of the de facto model are more significant than those of the de jure model. For example, the estimates of λ, α, and β-α are insignificant at the 5% level of the de jure model. Moreover, the estimates of α are negative in both the de jure and de facto model and ε is negative in the de facto level, running counter to the parameter restrictions of $\alpha > 0$ and $\lambda > 0$ respectively. As a way to improve the results, we turn to Instrument Variable (IV)[16].

2.2.2 Fixed Effects and IVs

For the de facto λ, an endogeneity problem arises because the dependent variable s_m is estimated using the provincial nominal output value of FIEs (minus provincial exports and plus provincial ordinary imports[17]), one of the source for calculating the de facto tax rates[18]. Thus, there is a potential simultaneous problem between S_m and de facto λ. This simultaneity also holds for the de jure λ. For example, provinces with higher output of FIEs tend to receive lower de jure λ according to Figure 2.2 in Section 2.1. For the details of how to deal with the endogeneity issue of λ, please refer to Appendix C. (All the potential IVs discussed below are also used by Branstetter and Feenstra (2002) [2].)

The output of SOEs (s_{hit}) may be endogenous to the output of FIEs because they affect each other by competing in the same domestic market. The endogeneity of the wage premium ($w_{it} - 1/w_{it}$) arises from the fact that it is possible for wage to affect the productivity of workers according to Ge and Yang (2012) [7]. Moreover, the import (s_{fit}) (measured using ordinary imports only[19]) is also en-

[16] According to the Wooldridges score test, the explanatory variables in (19) are endogenous at the 5% significance level.

[17] Only consider FIEs products that participate in the domestic market.

[18] De facto tax is calculated as the tax on the profits of FIEs divided by the output of FIEs at the provincial level.

[19] Only consider imports that participate in the domestic market.

dogenous in that it participates in the domestic market as FIEs output does. For the same reasons, the product of the wage premium and spending on the products of SOEs and imported goods ($w_{it} - 1/w_{it}$) *(s_{hit}+s_{fit})) is also endogenous. In addition, as illustrated in equation (8) of Section 1.4, foreign investors trade off between launching a factory in a foreign country (related to FIEs output) and exporting to that country, by considering factors including the ad valor-em tariff rate. Hence, the fourth variable, product of ad valor-em tariff rate and spending on imports ($\frac{\tau_{it}}{p_{ft}} * s_{fit}$), is endogenous. As for the inverse of λ and the control variable (nominal consumption of all domestic products including FIEs output), their endogeneity is self-evident given above analysis.

For the provincial output of SOEs, provincial electricity production is a potential IV. Because, first of all, it is highly related to the output of SOEs due to SOEs monopolization of electricity production in China. According to Lam (2005) [15], the electric power industry in China has basically been under state ownership and control. Admittedly, electricity production to some extent is also related to FIEs output since electricity is an input for most FIEs production. But at the provincial level, the electricity used by FIEs is not a big portion of the total electricity production in China.

As for instrumenting the control variable (nominal total consumption), we use IVs including provincial GDP, population, average rural and urban income which are key drivers of the domestic consumption but unnecessarily affect the FIEs output. For instance, higher rural income may only considerably drive the consumption of non-FIEs output in that there is essentially no FIEs output at the rural region. Moreover, though we observe that FIEs output is more dense in provinces (in the east coast) with relatively higher GDP, population, and household income in Section 2.1, these variables are still not considered as significant determinants of FIEs output. Rather, it is the tax levied on FIEs, the location of a province which facilitate transportation, and other trade-liberalization policies (which aimed to open the door of China starting from the east coast) that considerably determine the high density of FIEs and thus high level of FIEs output in the east coastal provinces. Vice versa, we also do not have sufficient evidence to support a strong simultaneous effect of FIEs output on GDP, population, rural and urban income.

Turning to ordinary imports, we instrument it using processing imports. At first, processing import is exogenous to the independent variable, FIEs output, because it does not participate in the domestic market that the FIEs output is in. It is true that in China, a large portion of processing import is conducted by FIEs according to Ma, Wang, and Zhu (2015) [16], which relates processing import to the FIEs output. However, at the provincial level, this weak exogeneity of processing import is not too problematic, as mentioned before in the case of the control variable. Turing to the relevance between ordinary and processing import, we claim that provinces that have extensive processing import tend to have richer connections with other trading partners in the world and more convenient facilities which would have positive spillover to ordinary import.

Moreover, all of the explanatory variables except for the dummies are related to each other. For example, wage premium can affect the output of SOEs in that wage is a key input of production. Also, the third and fourth variables in (19) are compositions of above mentioned endogenous variables respectively. This implies that the IV for one variable can also be valid for others. Thus, all of the variables (except for the dummies) in (19) are instrumented[20] by all of the in-

[20] All of the variables in (19) and IVs are at the provincial level.

strumental variables (IVs) including: provincial electricity production, provincial GDP, provincial population, average provincial rural and urban, provincial processing imports, and various interactions of these interactions. Statistical check for the relevance and validity of these IVs for all of the estimation scenarios presented in this paper is attached in Appendix D. IVs tests. The estimation equation with IVs is as follows:

$$s_{mit} = -\beta \frac{s_{hit}}{\boldsymbol{\lambda_{it}}} + \frac{\eta}{\boldsymbol{\lambda_{it}}} \frac{w_{it} - 1}{w_{it}} + \alpha(\varepsilon - 1) \frac{w_{it} - 1}{w_{it}} (s_{hit} + s_{fit}) \frac{1}{\boldsymbol{\lambda_{it}}} - \epsilon \left(\frac{\tau_{it}}{p_{ft}} \right) \frac{s_{fit}}{\boldsymbol{\lambda_{it}}} + \frac{\alpha\varepsilon}{\varepsilon - 1} \frac{1}{\boldsymbol{\lambda_{it}}}$$
$$+ \text{Control Variable} + \text{Year Dummies} + \text{Province Dummies}$$
$$\text{with IVs and Robust Standard Error} \tag{2.2}$$

The estimates of equation (20), using TSLS and Weighted[21] TSLS, is summarized in Table 2.6 (those numbers in bold are significant at the 5% level):

Table 2.6 TSLS+Fixed Effects+Robust standard error

de jure model	β	$\alpha(\varepsilon - 1)$	ε	α	$\beta - \alpha$
TSLS	**0.366**	**1.483**	5.415	0.336	0.030
Weighted TSLS	0.220	**1.916**	10.880	0.194	0.026
de facto model	β	$\alpha(\varepsilon - 1)$	ε	α	$\beta - \alpha$
TSLS	**0.062**	**0.134**	**-4.637**	-0.024	**0.086**
Weighted TSLS	**0.0425**	**0.108**	**-3.377**	-0.025	**0.067**

Similar to the results of the OLS model with Fixed Effects but no IVs, the estimates, are insignificant and do not satisfy the parameter restrictions ($\alpha > 0$, $\beta > 0$, and $\varepsilon > 0$). For example, α and ε is not positive as assumed in the de facto

[21] All explanatory variables are weighted by provincial GDP respectively.

model, and β-α is not statistically different from zero at the 5% significance level in the de jure model. Given this unsatisfied results of using provincial dummies, we now discuss a number of ways to reconcile these results.

2.2.3 IVs and Fixed Effects of various groups of provinces

For the above analysis, we remove the time-invariant fixed effects for each province, which costs us too much variation of the data. Hence, we turn to clustering provinces using three criteria suggested by the results of Section 2.1. According to Section 2.1, the governmental attitudes instrumented by the de jure and de facto tax toward the profits/benefits of SOEs and FIEs largely depend on the share of FIEs output and the number of FIEs. Also, there is a clear regional pattern of the distribution of de jure and de facto tax on FIEs across the east, central and west regions of China. Thus, we suppose that provinces with similar 1) number of FIE firms, 2) share of FIEs output (as total output), and/or in the same 3) region (east, central, and west) should share considerable time-invariant fixed effects so as to receive similar de jure and de facto tax policies from the government. In view of this, we use these three aspects as criteria for clustering provinces (keeping the time-variant fixed effects unchanged) and apply the Fixed Effects technique across the clustered groups rather than the individual provinces[22].

Clustering provinces

Method 1: Number of multinational firms as a clustering criterion

[22]For the the three methods below, the observations of provinces in bold are dropped in the actual estimation due to the lack of the weighted tariff data as mentioned in Section 2.1.

Assuming that having similar number of FIEs indicates sharing a great deal of time-invariant fixed effects, we firstly try to clustering provinces together by the number of FIEs. The provincial average numbers of FIEs for the period of 1998-2011 are sorted in a decreasing order in Table 2.7:

Table 2.7 Average number of FIEs of the period 1998-2011

Group 1	Guangdong	11399
	Jiangsu	7211
	Zhejiang	5227
	Shanghai	4407
	Shandong	3799
	Fujian	3682
	Liaoning	1906
	Tianjin	1562
	Beijing	1088
	Hebei	904
Group 2	**Hubei**	653
	Anhui	538
	Henan	524
	Sichuan	494
	Jiangxi	436
	Hunan	407
Group 3	Guangxi	358
	Jilin	319
	Heilongjiang	232
	Chongqing	221
	Shaanxi	191
	Yunnan	171
	Inner Mongolia	158
	Shanxi	146
Group 4 (Base)	Guizhou	90
	Xinjiang	59
	Gansu	47
	Ningxia	35
	Qinghai	24

The provinces are divided into four groups based on the sorting results (the cut-off lines were drawn wherever there is a distinct gap between the adjacent numbers). The resultant estimable equation is as follows:

$$
\begin{aligned}
s_{mit} = -\beta\frac{s_{hit}}{\boldsymbol{\lambda_{it}}} + \frac{\eta}{\boldsymbol{\lambda_{it}}}\frac{w_{it}-1}{w_{it}} + \alpha(\varepsilon-1)\frac{w_{it}-1}{w_{it}}(s_{hit}+s_{fit})\frac{1}{\boldsymbol{\lambda_{it}}} - \epsilon\left(\frac{\tau_{it}}{p_{ft}}\right)\frac{s_{fit}}{\boldsymbol{\lambda_{it}}} + \frac{\alpha\varepsilon}{\varepsilon-1}\frac{1}{\boldsymbol{\lambda_{it}}} \\
+ \text{Control Variable} + \text{Year Dummies} + \text{Dummies for Group1-Group3} \\
\text{with IVs and Robust Standard Error}
\end{aligned}
\tag{2.3}
$$

Method 2: Share of multinationals output to total output

Assuming that the provinces with similar shares of FIEs output have many common time-invariant features, we group the provinces by their shares of average FIEs output[23] for the period of 1998-2011. As in Table 2.8, we sorted those shares in a decreasing order, and assorted the provinces into six groups with the last one as a base[24]. (The cut-off lines are drawn wherever there is an obvious gap between the adjacent numbers.)

[23] Calculated as the average of FIEs output for the period 1998-2011 divided by the average of total output for the same period for each province.

[24] We also tried putting the group4, group5, and base group together as a base group. But the estimates from the de facto model becomes less significant overall.

Table 2.8 Average shares of FIEs' output of the period 1998-2011

Group 1	**Shanghai**	0.606
	Guangdong	0.572
	Fujian	0.527
	Tianjin	0.449
	Beijing	0.418
	Jiangsu	0.371
Group 2	Zhejiang	0.252
	Jilin	0.247
	Liaoning	0.203
	Guangxi	0.201
Group 3	Chongqing	0.198
	Hubei	0.193
	Shandong	0.174
	Jiangxi	0.154
	Hebei	0.153
	Anhui	0.140
Group 4	Inner Mongolia	0.094
	Shaanxi	0.087
	Sichuan	0.085
	Heilongjiang	0.084
	Hunan	0.076
Group 5	Qinghai	0.071
	Henan	0.068
	Ningxia	0.068
Group 6 (Base)	Yunnan	0.061
	Shanxi	0.056
	Guizhou	0.035
	Gansu	0.024
	Xinjiang	0.020

The resultant estimable equation is as follows:

$$s_{mit} = -\beta\frac{s_{hit}}{\boldsymbol{\lambda_{it}}} + \frac{\eta}{\boldsymbol{\lambda_{it}}}\frac{w_{it}-1}{w_{it}} + \alpha(\varepsilon-1)\frac{w_{it}-1}{w_{it}}(s_{hit}+s_{fit})\frac{1}{\boldsymbol{\lambda_{it}}} - \epsilon\left(\frac{\tau_{it}}{p_{ft}}\right)\frac{s_{fit}}{\boldsymbol{\lambda_{it}}} + \frac{\alpha\varepsilon}{\varepsilon-1}\frac{1}{\boldsymbol{\lambda_{it}}}$$
$$+ \text{Control Variable} + \text{Year Dummies} + \text{Dummies for Group1-Group5}$$
$$\text{with IVs and Robust Standard Error} \qquad (2.4)$$

Method 3: Geographic grouping

In addition to the number of FIEs and the share of FIEs output, the geographic location of provinces can be an effective indicator of the time-invariant characteristics shared by each geographical group of provinces, such as the accessibility to the foreign market and the transportation facilities. The geographical categorization that we follow is the east-central-west division as follows:

Group 1 consists of the eastern provinces:

Beijing, **Tianjin**, **Hebei**, **Liaoning**, **Shanghai**, **Jiangsu**, Zhejiang, **Fujian**, Shandong, Guangdong

Group2 consists of the central provinces:

Shanxi, Jilin, Heilongjiang, Anhui, Jiangxi, Henan,**Hubei**, Hunan

Group 3 (base group) consists of the western provinces:

Sichuan, Chongqing, Guizhou, Yunan, Xizang, Shanxi, Gansu, Qinghai, **Ningxia**, Xinjiang, Guangxi, Neimenggu

The equation that we will estimate is:

$$s_{mit} = -\beta\frac{s_{hit}}{\boldsymbol{\lambda_{it}}} + \frac{\eta}{\boldsymbol{\lambda_{it}}}\frac{w_{it}-1}{w_{it}} + \alpha(\varepsilon-1)\frac{w_{it}-1}{w_{it}}(s_{hit}+s_{fit})\frac{1}{\boldsymbol{\lambda_{it}}} - \epsilon\left(\frac{\tau_{it}}{p_{ft}}\right)\frac{s_{fit}}{\boldsymbol{\lambda_{it}}} + \frac{\alpha\varepsilon}{\varepsilon-1}\frac{1}{\boldsymbol{\lambda_{it}}}$$
$$+ \text{Control Variable} + \text{Year Dummies} + \text{Dummies for East and Central Regions}$$
$$\text{with IVs and Robust Standard Error} \tag{2.5}$$

Results of the above three clustering methods

The estimation methods used are OLS, TSLS, and TSLS with each variable weighted by provincial GDP at both de jure and de facto levels. (Numbers in bold are significant at the 5% level and in italic forms are robust standard errors.[25])

[25] Please refer to Appendix D. Regression Tables for more detailed regression tables.The robust standard errors for α and β-α which are not contained in the regression table are calculated separately and put as italic right below the corresponding values of α and β-α.

Table 2.9. Results of the three clustering methods

Method 1					
de jure model	β	$\alpha(\varepsilon-1)$	ε	α	$\beta-\alpha$
OLS	**0.460**	**0.907**	**5.128**	**0.220**	0.240
				0.106	*0.146*
TSLS	**1.112**	**2.043**	**24.960**	**0.085**	**1.027**
				0.021	*0.208*
W TSLS	**1.204**	**2.102**	**26.710**	**0.082**	**1.122**
				0.024	*0.209*
de facto model	β	$\alpha(\varepsilon-1)$	ε	α	$\beta-\alpha$
OLS	**0.058**	**0.125**	**-6.595**	**-0.016**	**0.074**
				0.008	*0.024*
TSLS	0.158	0.030	**-11.410**	-0.002	0.160
				0.005	*0.029*
Weighted TSLS	**0.074**	0.008	**-9.553**	-0.001	**0.074**
				0.004	*0.022*
Method 2					
de jure model	β	$\alpha(\varepsilon-1)$	ε	α	$\beta-\alpha$
OLS	**0.352**	**0.646**	**8.293**	**0.089**	**0.263**
				0.016	*0.063*
TSLS	**0.547**	**1.985**	**31.220**	**0.066**	0.481
				0.004	*0.234*
Weighted TSLS	**0.667**	**1.699**	**25.110**	**0.070**	**0.597**
				0.014	*0.236*
de facto model	β	$\alpha(\varepsilon-1)$	ε	α	$\beta-\alpha$
OLS	**0.060**	**0.132**	**-6.016**	**-0.019**	**0.079**
				0.009	*0.023*
TSLS	**0.067**	0.076	**-8.956**	-0.008	**0.075**
				0.070	*0.030*
Weighted TSLS	**0.094**	0.059	**-6.869**	-0.007	**0.102**
				0.080	*0.036*
Method 3					
de jure model	β	$\alpha(\varepsilon-1)$	ε	α	$\beta-\alpha$
OLS	**0.470**	**0.864**	**5.250**	**0.203**	**0.267**
				0.088	*0.129*
TSLS	**1.114**	**2.124**	**27.600**	**0.080**	**1.034**
				0.020	*0.204*
W TSLS	**1.303**	**2.543**	**34.680**	**0.076**	**1.227**
				0.018	*0.243*
de facto model	β	$\alpha(\varepsilon-1)$	ε	α	$\beta-\alpha$
OLS	**0.050**	**0.114**	**-7.136**	**-0.014**	**0.064**
				0.007	*0.022*
TSLS	**0.047**	0.093	**-9.424**	-0.009	**0.056**
				0.005	*0.019*
Weighted TSLS	**0.080**	0.042	**-9.127**	-0.004	**0.084**

Overall, the above three methods produce very similar results in terms of the actual values, significance, and reasonability ($\alpha >= 0, \beta >= 0$, and $\varepsilon > 0$ according to the parametric restrictions in Section 1.4), playing the role of robustness check for each other.

For the de jure model, all of the three methods produce reasonable and significant results for α (weight on the benefits of FIEs/consumer utility), β (weight on the profits of SOEs), ε (the own price elasticity of the demand for each variety), and β-α at the 5% significance level using the OLS, TSLS and Weighted TSLS techniques, except for the result of β-α using OLS in method 1 and using TSLS in method 2. The positive and significant results of β-α indicate that the central government have weighed more on the profits/benifits of SOEs than on those of FIEs.

For the de facto model, while the absolute values of α, β, and β-α are smaller than in the de jure model, the positive values of β-α still point us to a conclusion consistent with that for the central government that the provincial governments also have favored more on the profits/benifits of SOEs than on those of FIEs. Nevertheless, the three methods only produce significant results for all of the α, β, ε, and β-α using the OLS techniques. Using TSLS and Weighted TSLS, the three methods does not generate significant results for α and $\alpha(\varepsilon - 1)$. This implies that the IVs are less effective on predicating those coefficients at the de facto level, and this less effectiveness is especially reflected in the insignificant estimates related to α (weight on the benefits of FIEs). Moreover, the estimates of ε (though significant at the 5% level) and α, become unreasonable for all of the three methods at the de facto level.

In sum, regardless of some insignificant and/or unreasonable estimates, the above three methods all predict that 1). The Chinese central government and provincial governments have putted more political weights on the profits of SOEs than on the benefits of FIEs/consumer utility. 2). In addition, the absolute magnitudes of estimates for α and β respectively are smaller in the de facto model than those in the de jure model for all the three econometric methods (OLS, TSLS, and Weighted TSLS). This implies a less governmental interference at the provincial level than at the central level. 3). Also, the absolute value of the difference, β-α, is smaller in the de facto model than that in the de jure model. This implies that while SOEs are preferred to FIEs by the government at both the de jure and de facto levels, the provincial governments put more attention to FIEs than does the central government. This greater attention could have driven the provincial competition for foreign capital. As a result, various policy incentives for FIEs, in addition to tax concessions, are given by provincial governments. Moreover, those incentives could be a part of the ”noises” that make it harder for the de facto model to produce theory-consistent results, especially the results related to FIEs.

Theory-inconsistent estimates of the above three clustering methods

First, regarding the estimations for α, β, ε, and β-α, the de facto model produces much less significant estimates in total, and the insignificant estimates are mainly related to α. For example, in the de facto model, the estimates for α and $\alpha(\varepsilon-1)$ are insignificant using TSLS and Weighted TSLS, and the estimates for α and ε are unreasonable using all of the econometric techniques, while all of these estimates are both significant and reasonable in the de jure model. However, instead of claiming these insignificant and unreasonable estimates as weaknesses of the model, we value the signals they have delivered that the provincial governments treat FIEs (using tax) in a much more complicated way than does the central government, making the attitudes of the provincial governments harder for the model to predict in a theory-consistent way.

Second, according to the regression tables in Appendix E, the coefficients of each group dummy fail to satisfy their expected positive values. The base groups consist of provinces that have the least number of FIEs, the lower share of FIE output, and belong to the west region respectively for the above three methods. According to Section 2.1, these base provinces are supposed to have the lowest levels of the output of FIEs (the dependent variable). Thus, the non-base-group dummies are expected to have positive coefficients. However, the actual coefficients are mostly negative and are only positive in some cases of the de jure model for the above three methods. Not only does this explains why the de jure model tends to have more significant and reasonable estimations, but also imply that the cut-off lines for clustering the provinces using the above three methods need improvement. As a trial for the improvement, we attempted to cluster the provinces into less or more groups than what we currently have in the above estimations. However, the resulting model predictions become even less theory-consistent in terms of significance and reasonability (See Appendix E for more details). It could be that dividing provinces into fewer groups lacks precision, so that provinces that do not share many time-invariant features are considered as one group, while in contrast the more-group division may be too specific so that too much common information for each group is removed from the data when using the province (time-invariant) fixed effects during the empirical test.

2.2.4 Regional level

In addition, while the three clustering methods in 7.3 are at the national level, we also analyze the governmental preferences concerning SOEs and FIEs (consumer welfare) for the east, central and west region separately. We do so by constructing dummy variables for the east and central region (the west region as a base) and for each year (except for 2011 as a base year). In addition, I added into (24) the interactions between the east and central dummies and the first variable (-β as the coefficient), the third variable ($\alpha(\varepsilon - 1)$ as the coefficient), and the fourth variable (-ε as the coefficient) of (24) respectively[26]. The estimating equation is as follows:

$$
\begin{aligned}
s_{mit} = {} & -\beta\frac{s_{hit}}{\boldsymbol{\lambda_{it}}} + \frac{\eta}{\boldsymbol{\lambda_{it}}}\frac{w_{it}-1}{w_{it}} + \alpha(\varepsilon-1)\frac{w_{it}-1}{w_{it}}(s_{hit}+s_{fit})\frac{1}{\boldsymbol{\lambda_{it}}} - \epsilon\left(\frac{\tau_{it}}{p_{ft}}\right)\frac{s_{fit}}{\boldsymbol{\lambda_{it}}} + \frac{\alpha\varepsilon}{\varepsilon-1}\frac{1}{\boldsymbol{\lambda_{it}}} \\
& + \text{Control Variable} + \text{Year Dummies} \\
& + \text{Interactions among Region Dummies and Variables} \\
& \quad \text{with IVs and Robust Standard Error}
\end{aligned}
\tag{2.6}
$$

Given the preferential de jure tax described in Section 1.3, we expect that the benefits of FIEs are preferred to the profits of SOEs in the east region by the central government in the de jure model. Moreover, given the low correlation between de jure and de facto tax for all the regions, the estimates for the attitudes of the central and provincial governments in each region should be quite different.

[26]Instead of using these interactions of dummies, I can also run separate regression for each region. However, in that case, the number of observations for each regression would not be large enough.

For both the de jure and de facto models, only the OLS method generates mostly statistically significant estimations. Thus we just summarize the estimates of OLS for the two models respectively in Table 2.10: (see Appendix E. Regression tables for detailed results.)

Table 2.10. Results at the regional level

De jure model(OLS)	East	Central	West
β	0.46	**0.70**	0.42
$\alpha(\varepsilon - 1)$	1.17	0.77	0.69
ε	11.05	-57.98	67.72
α	**0.12**	-0.01	0.01
$\beta - \alpha$	0.34	**0.71**	0.40
De facto model(OLS)	East	Central	West
β	**0.08**	0.14	0.14
$\alpha(\varepsilon - 1)$	0.19	0.10	0.21
ε	-2.64	-15.17	-0.84
α	-0.05	-0.01	**-0.11**
$\beta - \alpha$	**0.13**	0.14	0.25

For the de jure model, the estimate for β (the weight on the welfare of SOEs) is the highest for the central part with a value of 0.70, compared to the values of 0.42 and 0.46 for the west and east regions respectively. In other words, the Chinese central government interfered with the SOEs in the central region much heavier than it did in the west and east regions. This finding is reasonable given that the central region has the highest density of the heavy industry that has historically been critical to the stability of the Chinese economy. In addition, the prediction of α (the weight on consumer utility/benefits of FIEs) has a largest value, 0.12, for the east region, while those for the west and the central are 0.01 and -0.01 respectively. That is, the Chinese central government gives greater attention to the FIEs in the east region than to those in the west and central regions. This result can be buttressed by the generous preferential tax treatments to FIEs in the east part established by the central government (see details in Section 1.3).

According to the de facto model, the estimate of β for the central region does not differ much from the corresponding estimates for the other two regions as it does in the de jure model. As for the estimations of α, it is interesting to see that the prediction for the east region is not the highest anymore with a negative value of -0.05. In other words, while the central government puts the greatest attention to the FIEs in the east part, the provincial governments in the east region impose less interference, letting them oriented by the market.

Generally, in both the de jure model and de facto models, the differences of β-α are positive across all three regions. This implies that the Chinese governments preferred the profits of SOEs to the benefits of FIEs at both the de jure and de facto levels. Moreover, the estimates of β and α are smaller in the de facto model, meaning that there was less governmental interference for SOEs at the provincial governmental level than at the central governmental level. However, the existence of the negative predictions of ε and α in both de jure and de facto models weakens the credibility of above results. Moreover, the estimates at the regional levels are much less significant than the above-mentioned estimates at the national level. This, together with the fact in Section 2.1 that the correlation between the de jure and de facto tax is only significant at the national level, direct us to a possibility that there are more unknown factors affecting how the Chinese governments treat(tax) FIEs at the de facto level than at the de jure level.

2.3 Follow-up research plans

Testing the new panel dataset on the modified Protection for Sale model, the political weights of both the Chinese central and provincial governments on SOEs were found greater than those on FIEs. But the magnitudes of above differences between the weights on SOEs and FIEs varied across regions (the three regions used are the east, the central and the west). Moreover, the political weights of the provincial governments on both SOEs and FIEs were smaller than those of the central government, which implied that there was less governmental interference at the local governmental dimension. Given these findings, the immediate step is to conduct thorough literature research for empirical findings that can support and better explain for them.

In addition, it was found that the preferential tax policies for FIEs established by the central government were translated onto different versions of the effective tax rates when enforced by the provincial governments. This heterogeneous translation was further found to be correlated with the heavy industry density, FIE density, and output level. To deepen the understanding of this correlation, we will consider the relationship between the central preferential tax rates and the provincial effective tax rates as a measure of the provincial heterogeneity. Through effective regression of the ratio of central/provincial tax rate on practical variables including the provincial heavy industry densities, the FIEs densities, and the output values, a fundamental understanding of their correlations could be founded.

Moreover, we will examine how the provincial governments with heterogeneous behaviors compete with each other dynamically for foreign capital, with a ripple effect on the foreign capital mobility in China. To answer this question, we expect to explore how the effective tax rates (i.e., measures of provincial governmental behaviors) and the distribution of foreign capital result from the provincial competition given the mutual responses of the provincial governments and FIEs. These mutual responses will be analyzed along multiple regulative dimensions, such as environmental regulations, provincial tariffs, and tax regulations. Though there are empirical papers studying the provincial competition for foreign capital in China, none of them has focused on the mutual responses and the multiple regulative dimensions.

APPENDIX A

SUMMARY OF DE JURE TAX LAWS AND REGULATIONS TOWARD FIES

A.1 Preferential tax treatments for foreign investment

A.1.1 Nationwide preferential tax treatments

In China, preferential tax treatments are confined to three major types of foreign direct investment, Chinese foreign equity joint ventures (EJVs), Chinese-foreign contractual joint ventures (CJVs), and wholly foreign-owned enterprises (WFOEs), referred as foreign investment enterprises (FIEs) [13]. These three types of FIEs do not enjoy the same centrally mandated preferential tax policies until the establishment of the Income Tax Law of the Peoples Republic of China Concerning Foreign Investment (UTL) in 1991 [13] (See Appendix A for details). As a result, in addition to the special tax reductions for the early period of operations, FIEs nationwide were eligible for a 30% flat rate plus a 3% local rate in the normal operating year [13]. As a simplification, we assume that the de jure tax rate for FIEs is 30% for each provinces of China since 1991. The above special tax reductions and the extra local tax reductions that are too trivial to be generalized are excluded. This exclusion also applies to the tax policies at the regional level as summarized below.

A.1.2 Regional tax preferences

The first wave of regional preferences

Since 1978, China sought to open its door to the world and put efforts in attracting foreign investment as a way to boost the domestic economy:

- The first step is the creation of Special Economic Zones (SEZs), including Shenzhen, Zhuhai and Shantou of Guangdong province, and Xiamen of Fujian province in 1979. All foreign investment projects in SEZs were eligible for a reduced 15% enterprise income tax rate, and the local governments had autonomy to reduce or waive local income tax [13].
- The second step is the establishment of the 14 Coastal Open Cities (COCs) in 1984. Within COCs, there were two tiers. One was the Economic and Technological Development Areas (ETDA) which were given a 15% enterprise income tax rate; the other was named Old Urban District. According to Jiang (1998), enterprises that conduct activities related to energy, transport or port construction received a 15% enterprise income tax rate, while those fall within sectors such as machinery and agriculture enjoyed a 24% one [13].
- The third step is the setup of Coastal Economic Open Regions (CEORs) in 1985, including cities and counties in the Yangtze and Pearl River Deltas, and the South Fujian (Xiamen-Zhangzhou-Quanzhou) area. FIEs operating in these areas generally enjoyed a 15% enterprise income tax [13].

New waves of regional preferences in the early 1990s

After experiencing the social instability in 1989, Chinese political leaders saw greater importance of promoting the economic growth so as to realize the better living standard they had promised to the domestic people. Given the economic success in the above experimental areas, China speeded up its opening progress:

- In 1990, China selected Pudong New District in Shanghai, the largest and most industrialized city of China, as a pioneer to attract a next wave of foreign direct investment. Shanghai was given a 15% enterprise income tax, and was exempt from local enterprise income surcharge until the year 2000 [13].
- 1992, China launched Border Economic Cooperation Zones (BECZs), including cities bordering Russia and Mongolia, such as Heihe and Suifenghe of Heilongjiang, Hunchun of Jilin, Manzhouli of Inner Mongolia. These cities received a 24% enterprise income tax. Following these cities, additional border cities and towns were selected to enjoy similar policies [13].
- In early 1990s, large cities alongside the Yangtze River and in interior provinces were accorded a status similar to that of COCs, with permissions to set up their own ETDAs [13].
- In addition, the sphere of initial setup of CEOR in 1985 was expanded to include over 150 cities and counties that cover 8 provinces (including Hong Kong and Macau) [13].
- In addition, various newly designated priority zones mushroomed:

1. Bonded zones was assigned to Waigaoqiao district of Shanghai which received a 15% enterprise income tax [13];
2. High and new technology industrial development areas were established across China that enjoyed a 15% enterprise income tax [13];
3. Two Taiwan investment zones were setup, one in Fujian and the other in Fuzhou. Policies applied to ETDA were adopted here, which was a 15% enterprise income tax in general [13];
4. State tourist and resort areas were built across the country, given a 24% enterprise income tax [13].

The unification of the two separate tax regimes for SOEs and FIEs

Above lopsided preferential tax treatments for FIEs in the coastal areas enlarged the disparity between the coastal and non-coastal areas, thereby giving rise to unhealthy provincial competitions, according to (Jiang, 1998)[13]. To overcome this disparity, the Chinese central government gradually re-distributed sources in order to favor inner provinces since 1992. In 2007, the New Enterprise Income Tax law was established [21], and went to effect as of January 1, 2008, since when all enterprises, regardless of their ownerships, should pay enterprise income tax at a 25% rate generally speaking.

For the above discussion, only a major part of the tax treatments to FIEs were summarized from the tax laws and regulations. More detailed information can be found in the full-text versions of aforementioned laws and regulations. Besides, in addition to the enterprise income tax, multinationals also pay business tax, value-added tax, consumption tax and etc. However, tax policies regarding these types of taxes are uniform to both SOEs and FIEs. Since this paper focus on how the Chinese government treat FIEs and SOEs differently, these kinds of taxes were ruled out and only the enterprise income tax was considered currently. Moreover, local tax charges were excluded in that the degrees of autonomy for each province are too ambiguous to be captured and quantified.

The pattern of the generalized and quantified tax treatments toward FIEs across China and time is visualized in table A.1:

Table A.1 Distribution of centrally mendated de jure tax policies for FIEs

Coastal province (15% overall)	Border provinces (24% overall)	Inner province (30% overall)
Guangdong	**Heilongjiang**	**Sichuan**
SEZ: Shenzhen Zhuhai Shantou 15%	BECZ: Suifenghe-24%	COC: Chengdu
COC: Guangzhou Zhanjiang -19.5%	ETDA: Harbin15%	**Chongqing**
CEOR–15%	**Jilin**	ETDA: Chongqing
Guangxi	BECZ: Hunchun	**Hunan**
COC: Beihai	ETDA: Changchun	COC: Yueyang, Changsha
BECZ: Pingxiang, Dongxing24%	**Inner Mongolia**	**Hubei**
Fujian	BECZ: Manzhouli, Erlianhaote	ETDA: Wuhan
SEZ: Xiamen15%	COC: Huhehaote15%	**Jiangxi**
COC: Fuzhou19.5%	**Yunnan**	COC: Jiujiang, Nanchang
CEOR15%	BECZ: Wanding, Ruili, Hekou	**Anhui**
Taiwan Investment Zones: Xiamen, Fuzhou15%		COC: Hefei
Tianjin		ETDA: Wuhu
COC15%		**Hebei**
Shanghai		COC: Qinhuangdao, Shijiazhuang
Pudong New District15%		**Shanxi**
Bonded ZonesWaigaoqiao15%		COC: Taiyuan
CEOR15%		**Henan**
Liaoning		COC: Zhengzhou
COC: Dalian		**Guizhou**
BECZ: Dandong24%		COC: Guiyang
ETDA: Shenyang		**Shaanxi**
CEOR15%		COC: Xian
Shandong		**Xinjiang**
COC: Qingdao, Yantai		**Ningxia**
CEOR		**Qinghai**
Jiangsu		**Gansu**
COC: Lianyungang Nantong		
CEOR		
Zhejiang		
COC: Ningbo Wenzhou		
ETDA: Hangzhou, Xiaoshan		
CEOR		
Hainan		
SEZ: Hainan		
Beijing		

With a simplification, above-enumerated tax treatments regarding FIEs and SOEs are quantified as follows:

- 15% tax rate for coastal provinces before 2008;
- 24% tax rate for border provinces before 2008;

- 30% for rest of provinces before 2008;
- 25% for all provinces since 2008.

APPENDIX B

THEORETICAL DERIVATION

B.1 Derivation of equation (1.15)

The derivation combines equations (1.3) and (1.4):

$$x_j = p_j^{-\varepsilon} q^{\varepsilon-\theta}, = h, f, m, \quad and \quad x = q^{-\theta}$$
$$q = \left(n_h p_h^{1-\varepsilon} + (n_f - m) p_f^{1-\varepsilon} + m p_m^{1-\varepsilon}\right)^{\frac{1}{1-\varepsilon}}$$

$$p_j^{-\varepsilon} = \frac{x_j}{q^{\varepsilon-\theta}} \tag{B.1a}$$
$$n_j p_j^{1-\varepsilon} = \frac{n_j x_j p_j}{q^{\varepsilon-\theta}} \tag{B.1b}$$
$$q = \left(\frac{n_h p_h x_h + (n_f - m) p_f x_f + m p_m x_m}{q^{\varepsilon-\theta}}\right)^{\frac{1}{1-\varepsilon}} \tag{B.1c}$$
$$q^{\frac{1-\theta}{1-\varepsilon}} = (n_h p_h x_h + (n_f - m) p_f x_f + m p_m x_m)^{\frac{1}{1-\varepsilon}} \tag{B.1d}$$

$$q^{1-\theta} = n_h p_h x_h + (n_f - m) p_f x_f + m p_m x_m \tag{B.2}$$

B.2 Derivation of the estimating equation (1.18)

$$(n_h)^* = n_h$$
$$(n_f)^* = n_f - m$$
$$(n_m)^* = m$$

$$
\begin{aligned}
S_j &= \frac{n_j^* p_j x_j}{n_h p_h x_h + \left(n_f - m\right) + m p_m x_m} = \frac{n_j^* p_j^{1-\varepsilon}}{n_h p_h^{1-\varepsilon} + \left(n_f - m\right) p_f^{1-\varepsilon} + m p_m^{1-\varepsilon}} \\
&= \frac{n_j^* p_h^{1-\varepsilon} q^{\varepsilon-\theta}}{q^{\varepsilon-\theta}\left(n_h p_h^{1-\varepsilon} + \left(n_f - m\right) p_f^{1-\varepsilon} + m p_m^{1-\varepsilon}\right)} \\
&= \frac{n_j^* p_j x_j}{q^{1-\theta}}
\end{aligned}
\tag{B.3}
$$

$$
p_j x_j = \frac{s_j}{n_j^*}\left(n_h p_h^{1-\varepsilon} + \left(n_f - m\right) p_f^{1-\varepsilon} + m p_m^{1-\varepsilon}\right)^{\frac{1-\theta}{1-\varepsilon}} \tag{B.4}
$$

$$
\begin{aligned}
\frac{d p_j x_j}{d_m} &= \frac{d s_j}{d_m} \frac{\left(n_h p_h^{1-\varepsilon} + \left(n_f - m\right) p_f^{1-\varepsilon} + m p_m^{1-\varepsilon}\right)^{\frac{1-\theta}{1-\varepsilon}}}{n_j^*} + \frac{s_j}{n_j^*} \frac{d\left(n_h p_h^{1-\varepsilon} + \left(n_f - m\right) p_f^{1-\varepsilon} + m p_m^{1-\varepsilon}\right)^{\frac{1-\theta}{1-\varepsilon}}}{dm} \\
&= -(p_m x_m - p_f x_f)\frac{s_j}{n_j^*} + \frac{1-\theta}{1-\varepsilon}(p_m x_m - p_f x_f)\frac{s_j}{n_j^*} \\
&= -\frac{\varepsilon-\theta}{\varepsilon-1}(p_m x_m - p_f x_f)\frac{s_j}{n_j^*}
\end{aligned}
\tag{B.5}
$$

Given the objective equation (1.16) as below:

$$
\begin{aligned}
G(m, \lambda, \tau) &= \alpha U + \beta n_h \pi_h + m \lambda \pi_m + \tau(n_f - m) x_f \\
&= \alpha L + \left(\frac{\alpha}{\theta-1} + \frac{\beta}{\varepsilon}\right) n_h p_h x_h + \\
&\left(\frac{\alpha}{\theta-1} + \frac{\tau}{p_f}\right)(n_f - m) p_f x_f + \left(\frac{\alpha}{\theta-1} + \frac{\alpha(\varepsilon-1)(w-1)}{\epsilon w} + \frac{\lambda}{\varepsilon}\right) m p_m x_m
\end{aligned}
$$

$$
\begin{aligned}
\frac{\partial G}{\partial m} &= \left(\frac{\alpha}{\theta-1} + \frac{\beta}{\varepsilon}\right) n_k \frac{d p_k x_k}{d_m} + \left(\frac{\alpha}{\theta-1} + \frac{\tau}{p_f}\right)(n_f - m)\frac{d p_f x_f}{d_m} - \left(\frac{\alpha}{\theta-1} + \frac{\tau}{p_f}\right) p_f x_f \\
&+ \left(\frac{\alpha}{\theta-1} + \frac{\alpha(\varepsilon-1)(w-1)}{w\varepsilon} + \frac{\lambda}{\varepsilon}\right) p_m x_m + \left(\frac{\alpha}{\theta-1} + \frac{\alpha(\varepsilon-1)(w-1)}{w\varepsilon} + \frac{\lambda}{\varepsilon}\right) m \frac{d p_m x_m}{dm}
\end{aligned}
\tag{B.6}
$$

Given (A.5), $\frac{dp_m x_m}{d_m} = -\frac{\varepsilon-\theta}{\varepsilon-1}(p_m x_m - p_f x_f)\frac{s_m}{n_m^*}$, and subsitituding it into (A.6) we get the following equation:

$$\frac{\partial G}{\partial m} = \left(\frac{\alpha}{\theta-1} + \frac{\beta}{\varepsilon}\right) n_k \frac{\varepsilon-\theta}{\varepsilon-1}(p_m x_m - p_f x_f)\frac{s_m}{n_m^*} + \left(\frac{\alpha}{\theta-1} + \frac{\tau}{p_f}\right)(n_f - m) - \frac{\varepsilon-\theta}{\varepsilon-1}(p_m x_m - p_f x_f)\frac{s_m}{n_m^*}$$
$$- \left(\frac{\alpha}{\theta-1} + \frac{\tau}{p_f}\right) p_f x_f + \left(\frac{\alpha}{\theta-1} + \frac{\alpha(\varepsilon-1)(w-1)}{w\varepsilon} + \frac{\lambda}{\varepsilon}\right) p_m x_m$$
$$+ \left(\frac{\alpha}{\theta-1} + \frac{\alpha(\varepsilon-1)(w-1)}{w\varepsilon} + \frac{\lambda}{\varepsilon}\right) m - \frac{\varepsilon-\theta}{\varepsilon-1}(p_m x_m - p_f x_f)\frac{s_m}{n_m^*} \tag{B.7}$$

Re-arrange (A.7) to get the simplified equation as below:

$$\frac{\partial G}{\partial m} = -\frac{\tau}{p_f}\left(\frac{\varepsilon-\theta}{\varepsilon-1}(p_m x_m - p_f x_f) sf + p_f x_f\right) + \left(\frac{\alpha(\varepsilon-1)(w-1)}{w\varepsilon} + \frac{\lambda}{\varepsilon}\right)\left(p_m x_m - s_m \frac{\varepsilon-\theta}{\varepsilon-1}(p_m x_m - p_f x_f)\right)$$
$$+ \frac{p_m x_m - p_f x_f}{\varepsilon-1}\left(\alpha - s_h \frac{\beta(\varepsilon-\theta)}{\varepsilon}\right) \tag{B.8}$$

Substitute $s_m + s_f + s_h = 1$ into (A.8) and re-arrange as follows:

$$\frac{\partial G}{\partial m} = p_f x_f \left(\frac{\alpha(\varepsilon-1)(w-1)}{w\varepsilon} + \frac{\lambda}{\varepsilon} - \frac{\tau}{p_f}\right) + \frac{\theta-1}{\varepsilon-1}(p_m x_m - p_f x_f)\left(\frac{\alpha(\varepsilon-1)(w-1)}{w\varepsilon} + \frac{\lambda}{\varepsilon} - \frac{\alpha}{\theta-1}\right)$$
$$\frac{\varepsilon-\theta}{\varepsilon-1}(p_m x_m - p_f x_f)\left(s_h\left(\frac{\alpha(\varepsilon-1)(w-1)}{w\varepsilon} + \frac{\lambda}{\varepsilon} - \frac{\beta}{\varepsilon}\right) + s_f\left(\frac{\alpha(\varepsilon-1)(w-1)}{w\varepsilon} + \frac{\lambda}{\varepsilon} - \frac{\tau}{p_f}\right)\right) \tag{B.9}$$

Set (A.9) to be zero and given $(1-\lambda)\frac{p_m x_m}{\varepsilon} - F = \frac{p_f x_f}{\varepsilon}$, we get the estimating equation (1.18) as follows:

$$s_{mit} = -\beta\frac{s_{hit}}{\boldsymbol{\lambda_{it}}} + \frac{\eta}{\boldsymbol{\lambda_{it}}}\frac{w_{it}-1}{w_{it}} + \alpha(\varepsilon-1)\frac{w_{it}-1}{w_{it}}(s_{hit} + s_{fit})\frac{1}{\boldsymbol{\lambda_{it}}} - \varepsilon\frac{\tau_{it}}{p_{ft}}\frac{s_{fit}}{\boldsymbol{\lambda_{it}}} + \frac{\alpha\varepsilon}{\varepsilon-1}\frac{1}{\boldsymbol{\lambda_{it}}}$$
$$+ \frac{\theta-1}{\varepsilon-1} + 1 + \frac{1}{\boldsymbol{\lambda_{it}}}\frac{\pi_{fit}}{F_{it} + \lambda_{it}\pi_{mit}}\left(\frac{\alpha(\varepsilon-1)^2(w_{it}-1)}{\varepsilon-\theta}\frac{w_{it}-1}{w_{it}} + \left(\frac{\lambda_{it}(\varepsilon-1)}{\epsilon-\theta}\right) - \left(\frac{\epsilon-1}{\epsilon-\theta}\right)\frac{\tau_{it}}{p_{ft}}\right)$$

APPENDIX C

ENDOGENEITY OF DOMESTIC TAX ON THE PROFITS OF FIES IN CHINA

To deal with the endogeneity of ε, one possible instrument variable is the effective tax rates of FIEs in Hong Kong (HK), Taiwan, and Japan. In China, FIEs sometimes transfer profits to tax haven areas to which they have connections to avoid the relatively higher tax. Mostly, FIEs in the inner land of China are mainly from Hong Kong, Taiwan, and Japan (Branstetter and Feenstra, 2002) [2]. Thus, the effective tax rates in those places can affect the shift of the profits of FIEs located in China, which further influence the effective tax rates on FIEs in China (relevance). In addition, the effective tax rates in HK, Taiwan, and Japan are exogenous to the provincial output of FIEs in the inner land of China (validity). However, one shortcoming is that those effective tax rates do not vary for each province of China while other variables in the estimation equation (18) are measured at the provincial level. Therefore, I consider multiplying the effective tax rates in HK, Taiwan, and Japan with something that varies across provinces.

The first consideration is multiplying the effective tax rates of HK, Taiwan, and Japan by the fiscal budget lagged one year of each provincial government in China. This could be valid due to the following reasons. Firstly, the fiscal budget lagged one year can affect whether a local government will manipulate the tax on FIEs to collect more revenue or not in the next year; the manipulation can impact the effective tax rates. Secondly, if there is no serial correlation, fiscal budget lagged one year does not have obvious influence on the dependent variable, the output value of FIEs of last year. Nevertheless, if there are serial correlations, the fiscal budget lagged one year can be correlated with the dependent variable. For example, it is possible that provinces with tight fiscal budget in previous years tend to be less developed and have low concentrations of FIEs (implying low FIEs output levels). Thus, fiscal budget of each provincial government is a valid consideration only if it has no serial consideration. Additionally, another way is to multiply the effective tax rates of HK, Taiwan, and Japan respectively by the de jure tax rates on FIEs generalized from the tax laws and regulations for each province. However, this also imposes an endogenous concern that those provinces with higher FIEs output levels usually, though not necessarily, receive more preferential tax policies, like Shanghai. However, though imperfection, the considerations of the provincial fiscal budget lagged one year and provincial preferential tax rates are still worthwhile to try out. For this moment, due to the unavailability of data, these considerations can only be left for future studies.

APPENDIX D

IVS TESTS

Table D.1. Tests for under and over identification

IVs and Fixed Effects for individual province		TSLS	Weighted TSLS
De jure model	Kleibergen-Paap rk LM statistic (Underidentification)	P-val = 0.0064	P-val = 0.0389
	Hansen J statistic (overidentification)	P-val = 0.0012	P-val = 0.0059
De facto model	Kleibergen-Paap rk LM statistic (Underidentification)	P-val =0.005	P-val = 0.0001
	Hansen J statistic (overidentification)	P-val = 0.0044	P-val = 0.0006

Table D.2. Tests for weak identification

De jure model			
TSLS	Shea's Partial R-sq	Shea's Adj. Partial R-sq	Robust F (12, 177)
$\frac{s_{hit}}{\lambda_{it}}$	0.38	0.18	26.2
$\frac{w_{it}-1}{w_{it}}(s_{hit}+s_{fit})\frac{1}{\lambda_{it}}$	0.32	0.11	17.37
$(\frac{\tau_{it}}{p_{ft}})\frac{s_{fit}}{\lambda_{it}}$	0.16	-0.1	37.24
$\frac{w_{it}-1}{w_{it}}$	0.23	-0.02	12.38
$\frac{1}{\lambda_{it}}$	0.11	-0.17	30.59
Control Variable	0.18	-0.08	586.19
Weighted TSLS	Shea's Partial R-sq	Shea's Adj. Partial R-sq	Robust F (12, 177)
$\frac{s_{hit}}{\lambda_{it}}$	0.46	0.29	15.62
$\frac{w_{it}-1}{w_{it}}(s_{hit}+s_{fit})\frac{1}{\lambda_{it}}$	0.29	0.06	15.12
$(\frac{\tau_{it}}{p_{ft}})\frac{s_{fit}}{\lambda_{it}}$	0.2	-0.05	51.97
$\frac{w_{it}-1}{w_{it}}$	0.36	0.17	16.13
$\frac{1}{\lambda_{it}}$	0.16	-0.11	20.94
Control Variable	0.23	-0.01	672.28
De facto model			
TSLS	Shea's Partial R-sq	Shea's Adj. Partial R-sq	Robust F (12, 177)
$\frac{s_{hit}}{\lambda_{it}}$	0.32	0.11	105.53
$\frac{w_{it}-1}{w_{it}}(s_{hit}+s_{fit})\frac{1}{\lambda_{it}}$	0.46	0.29	66.11
$(\frac{\tau_{it}}{p_{ft}})\frac{s_{fit}}{\lambda_{it}}$	0.33	0.12	208.58
$\frac{w_{it}-1}{w_{it}}$	0.15	-0.12	6.62
$\frac{1}{\lambda_{it}}$	0.14	-0.13	8.8
Control Variable	0.25	0.02	596.19
Weighted TSLS	Shea's Partial R-sq	Shea's Adj. Partial R-sq	Robust F (12, 177)
$\frac{s_{hit}}{\lambda_{it}}$	0.33	0.12	126.35
$\frac{w_{it}-1}{w_{it}}(s_{hit}+s_{fit})\frac{1}{\lambda_{it}}$	0.71	0.62	149.48
$(\frac{\tau_{it}}{p_{ft}})\frac{s_{fit}}{\lambda_{it}}$	0.36	0.16	327.84
$\frac{w_{it}-1}{w_{it}}$	0.25	0.01	7.46
$\frac{1}{\lambda_{it}}$	0.15	-0.11	12.15
Control Variable	0.32	0.1	672.28

According to Table D.1, the rejections of the Hansen J statistic and Kleibergen-Paap LM statistic indicate that the model is not over-identified and under-identified respectively. Since Stock and Yogo (2005) [20] do not offer critical values when there are more than three endogenous variables, we use F-statistics and partial R-square as tests for weak identification. Based on Table D.2, though the values of the F-statistic are high, the relative low values of the partial R-square alert us to be cautious when interpretation the results predicted by the model.

APPENDIX E

REGRESSION TABLES

E.1 National level

E.1.1 Method 1

de jure model using method 1

	(1) OLS	(2) TSLS	(3) Weighted_T~S
-ß	-0.460***	-1.112***	-1.204***
	(0.0636)	(0.205)	(0.202)
a(e-1)	0.907***	2.043***	2.102***
	(0.194)	(0.515)	(0.563)
-e	-5.128*	-24.96**	-26.71*
	(2.507)	(8.645)	(12.02)
group1	-864.3	1378.7	3904.8
	(1337.6)	(3753.4)	(7160.0)
group2	-2205.0***	-1648.2**	-3500.1**
	(434.7)	(615.5)	(1224.2)
group3	-921.0*	-1261.9	-1403.4
	(378.3)	(1032.7)	(1402.3)
Observations	222	222	222
R-squared	0.883	0.718	0.863
Adjusted R-squared	0.870	0.686	0.848
rmse	2263.6	3519.6	4720.0

Standard errors in parentheses
* p<0.05, ** p<0.01, *** p<0.001

de facto model using method 1

	(1) OLS	(2) TSLS	(3) Weighted_T~S
-ß	-0.0580***	-0.0158	-0.0735***
	(0.0171)	(0.0259)	(0.0189)
a(e-1)	0.125***	0.0295	0.00774
	(0.0359)	(0.0643)	(0.0466)
-e	6.595***	11.41***	9.553***
	(1.791)	(1.957)	(1.980)
group1	-1189.0	-2996.6	-6913.7***
	(817.6)	(1575.0)	(1620.0)
group2	-1122.9**	-113.1	-3936.1***
	(382.7)	(662.9)	(974.9)
group3	-254.2	-496.0	-3557.6***
	(248.2)	(653.2)	(832.9)
Observations	222	222	222
R-squared	0.948	0.875	0.952
Adjusted R-squared	0.942	0.861	0.947
rmse	1515.9	2339.5	2795.6

Standard errors in parentheses
* p<0.05, ** p<0.01, *** p<0.001

E.1.2 Method 2

de jure model using method 2

	(1)	(2)	(3)
	OLS	TSLS	Weighted_T~S
-ß	-0.352***	-0.547*	-0.667**
	(0.0708)	(0.236)	(0.225)
a(e-1)	0.646***	1.985***	1.699***
	(0.175)	(0.435)	(0.365)
-e	-8.293***	-31.22***	-25.11***
	(1.746)	(8.177)	(5.118)
sharegroup1	7575.3***	18810.5**	17095.4***
	(1710.9)	(5903.2)	(4151.3)
sharegroup2	11.73	6203.3	521.1
	(631.4)	(4092.5)	(3153.0)
sharegroup3	-237.4	2377.9*	2444.6*
	(292.2)	(1169.7)	(1235.3)
sharegroup4	-438.7	550.0	-61.77
	(235.5)	(659.6)	(708.0)
sharegroup5	-2122.7**	-2400.7*	-5758.8***
	(693.6)	(1041.7)	(1644.2)
Observations	222	222	222
R-squared	0.911	0.696	0.917
Adjusted R-squared	0.900	0.659	0.907
rmse	1991.2	3670.9	3691.5

Standard errors in parentheses
* p<0.05, ** p<0.01, *** p<0.001

de facto model using method 2

	(1) OLS	(2) TSLS	(3) Weighted_T~S
-ß	-0.0601***	-0.0672*	-0.0943**
	(0.0152)	(0.0283)	(0.0295)
a(e-1)	0.132***	0.0763	0.0586
	(0.0358)	(0.0618)	(0.0507)
-e	6.016***	8.956***	6.869*
	(1.722)	(2.025)	(2.755)
sharegroup1	46.50	-4323.2	-4961.7*
	(1296.4)	(2569.9)	(2040.2)
sharegroup2	-191.0	-1643.5**	-2599.4**
	(266.5)	(564.5)	(994.7)
sharegroup3	-641.5*	-1852.4**	-3793.4**
	(318.0)	(654.6)	(1149.7)
sharegroup4	-596.8**	-1310.2**	-2142.1***
	(220.5)	(454.6)	(577.9)
sharegroup5	-1869.5**	-3833.3***	-5716.8***
	(637.4)	(1134.6)	(1603.4)
Observations	222	222	222
R-squared	0.949	0.900	0.967
Adjusted R-squared	0.943	0.888	0.963
rmse	1496.7	2100.4	2334.9

Standard errors in parentheses
* p<0.05, ** p<0.01, *** p<0.001

E.1.3 Method 3

de jure model using method 3

	(1)	(2)	(3)
	OLS	TSLS	W_TSLS
-ß	-0.470***	-1.114***	-1.303***
	(0.0641)	(0.199)	(0.237)
a(e-1)	0.864***	2.124***	2.543***
	(0.196)	(0.496)	(0.659)
-e	-5.250*	-27.60**	-34.68*
	(2.419)	(10.08)	(13.66)
east	-375.6	3734.9	8244.3
	(1235.5)	(6100.9)	(7653.8)
central	-1426.2***	-1651.2	-3059.5*
	(314.3)	(1007.2)	(1223.7)
Observations	222	222	222
R-squared	0.879	0.725	0.838
Adjusted R-squared	0.867	0.696	0.821
rmse	2293.5	3463.6	5123.6

Standard errors in parentheses
* p<0.05, ** p<0.01, *** p<0.001

de facto model using method 3

	(1) OLS	(2) TSLS	(3) W_TSLS
-ß	-0.0502**	-0.0474**	-0.0800***
	(0.0163)	(0.0163)	(0.0146)
a(e-1)	0.114**	0.0934	0.0422
	(0.0347)	(0.0549)	(0.0451)
-e	7.136***	9.424***	9.127***
	(1.694)	(1.641)	(1.562)
east	-984.6	-3021.7*	-5394.7***
	(784.1)	(1494.2)	(1461.3)
central	-560.9*	-966.0*	-3198.4***
	(227.9)	(461.0)	(609.7)
Observations	222	222	222
R-squared	0.946	0.902	0.959
Adjusted R-squared	0.940	0.891	0.955
rmse	1537.2	2070.7	2572.2

Standard errors in parentheses
* $p<0.05$, ** $p<0.01$, *** $p<0.001$

E.2 Regional level

de jure model at the regional level

	(1)	(2)	(3)
	OLS	TSLS	W_TSLS
-ß	-0.415***	-1.949	-13.53
	(0.0740)	(5.465)	(21.15)
a(e-1)	0.693***	5.618	22.65
	(0.196)	(9.522)	(37.49)
-e	-67.72	-683.2	5377.7
	(41.06)	(2650.0)	(9600.6)
-ß*Dummy for the E~t	-0.0411	0.342	11.53
	(0.0725)	(4.906)	(19.86)
-ß*Dummy for the C~l	-0.285**	2.593	13.45
	(0.0915)	(6.291)	(22.63)
a(e-1)*Dummy for t~t	0.479***	-3.534	-16.85
	(0.140)	(7.738)	(31.27)
a(e-1)*Dummy for t~l	0.0768	-7.560	-20.74
	(0.201)	(12.14)	(36.87)
-e*Dummy for the E~t	56.67	689.5	-5481.5
	(41.21)	(2688.5)	(9725.7)
-e*Dummy for the C~l	125.7**	486.3	-6797.3
	(43.06)	(3246.5)	(11941.5)
Observations	222	222	222
R-squared	0.922	.	.
Adjusted R-squared	0.911	.	.
rmse	1871.9	11874.9	27779.4

Standard errors in parentheses
* p<0.05, ** p<0.01, *** p<0.001

de facto model at the regional level

	(1) OLS	(2) TSLS	(3) W_TSLS
-ß	-0.135**	-4.567	1.082
	(0.0421)	(26.02)	(3.608)
a(e-1)	0.206**	5.906	-1.246
	(0.0630)	(32.77)	(5.222)
-e	0.842	2817.6	-1041.5
	(18.06)	(18451.5)	(2144.9)
-ß*Dummy for the E~t	0.0510	4.421	-1.333
	(0.0361)	(27.26)	(3.598)
-ß*Dummy for the C~l	-0.000310	4.779	-1.388
	(0.0362)	(30.36)	(3.676)
a(e-1)*Dummy for t~t	-0.0141	-5.373	1.359
	(0.0525)	(32.03)	(4.933)
a(e-1)*Dummy for t~l	-0.107	-6.034	0.556
	(0.0597)	(30.21)	(4.831)
-e*Dummy for the E~t	1.802	-2809.2	1030.9
	(17.66)	(18271.6)	(2143.9)
-e*Dummy for the C~l	14.33	-3399.1	1221.3
	(18.33)	(22296.9)	(2511.6)
Observations	222	222	222
R-squared	0.961	.	0.626
Adjusted R-squared	0.956	.	0.574
rmse	1323.5	21795.6	7906.4

Standard errors in parentheses
* p<0.05, ** p<0.01, *** p<0.001

APPENDIX F

CLUSTERING TRIALS

For the method 2, I also attempted other sets of cut-off lines to partition the provinces into different number of groups, such as 3, 5, and 7. However, using the six-group dummies as shown above generates relatively better (overall more significant and reasonable) results in both the de jure and de facto models. As for the reason, it could be that dividing provinces only into 3 groups may be too general so that provinces that dont share many time-invariant features are considered as one group, while in contrast the 7-group division may be too specific so that too much common information for each group is removed from the data when using the province (time-invariant) fixed effects during the empirical test.

For the method 3, to categorize the provinces by geographic locations, I tried three ways. The first way is to group the provinces into 2 parts, namely, one part consists of coastal provinces that contain at least one SEZ (Special Economic Zones) or COCs (Coastal Open Cities), and the other part includes the rest of the provinces. The second way is to divide the provinces into the east, central and west parts according to the Chinese official geographic division standard. The third way is separating those provinces into 7 sub-regions by a more specific Chinese official geographic division standard. Among these three ways of division, the east-central-west division generates more reasonable results. The explanation to this is similar to that in the method 2 that the 2-group division is too general so that provinces that dont have many common time-invariant features are considered as one group, while in contrast the 7-group division may be too specific so that too much common information is removed from the data.

However, what the underlying factors are that determine whether a division is neither too general nor too specific are waited to be found out.

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