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Abstract

We analyze how profit reporting and investment behavior of foreign enterprises respond to local tax incentives in China, a large developing country. Using firm-level data between 2000 and 2013 from China's industrial enterprise survey, we first provide strong evidence for tax competition among Chinese cities (especially cities within the same province) over the average effective income tax rate. We then find that, despite stringent capital controls, both reported pre-tax profits and investment of foreign firms respond strongly to local tax incentives, suggesting that subnational tax competition in China is oriented towards both mobile profits and real resources.

Key words: tax competition, FDI, investment, profit shifting

1. Introduction

One distinctive aspect of the Organization for Economic Cooperation and Development's (OECD) Base Erosion and Profit Shifting (BEPS) project, especially compared to the OECD's previous initiatives in international taxation, is its attempt to build an "inclusive framework" that addresses the needs and concerns of developing countries.[4] It is claimed that developing countries are particularly vulnerable to profit shifting of multinational enterprises (MNEs) because they rely to a greater extent on corporate income tax revenue than developed economies, and because they lack expertise in dealing with tax planning and tax avoidance (IMF 2014; Crivelli et al 2016). The participation of developing countries thus has a potential both to shape and to legitimize the BEPS project. However, while existing studies find that profits allocation by MNEs can be highly sensitive to tax incentives in the host country, almost all studies focus on developed countries; much less is known about the extent of profit shifting in less developed countries.

The need to empirically investigate the extent of BEPS phenomena in the developing world is urgent for at least two reasons. First, developing countries' policies towards cross-border trade and investment often substantially deviate from those of developed countries. To implement industrial policy, to shield themselves

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[4] The political sponsorship of the BEPS project by the G20, which includes the BRICS countries as

from financial instability originating in global financial markets, and for other reasons, developing countries often retain capital control (IMF 2012; Ghosh and Qureshi 2016; Fernández et al 2015). At the same time, many developing countries also offer tax incentives to attract foreign investment (Klemm and van Parys 2012)—of the types that they deem desirable. This combination (noted in Desai et al 2006) of the use of tax measures to attract, but the use of capital control to select and monitor, foreign investment, is rarely observed in developed countries. And it has complex implications for MNE tax planning: prima facie, it simultaneously curtails the means of tax-motivated profit shifting and reduces the scope for such shifting. Second, the severity of BEPS phenomena even in developed countries has been challenged in recent empirical research: improved data and methodologies have tended to show that MNEs' propensity for tax-motivated profit shifting may be much weaker than claimed by earlier studies and by popular and policy discourses. A recent survey of this debate (Dharmapala 2014) concludes that more research should be carried out to investigate the specific channels of MNE profit shifting, and to study legal and other frictions that may cause MNEs to "under-exploit" tax avoidance opportunities. Caution about the gap between the rhetoric and reality of BEPS seems even more relevant in developing countries, given the abundance of institutional obstacles to foreign investment in the latter.

In this study, we investigate MNE profit reporting and investment behavior in response to tax incentives in China, a large developing country. China has been one of the largest recipient countries of foreign direct investment (FDI) in the world since the 1980s. Until a decade ago, it offered very generous tax incentives to attract FDI, and even today, China's corporate income tax (CIT) regime boasts of a relatively low statutory tax rate as well as competitive effective average and marginal tax rates, in addition to an especially attractive low rate for companies with intangibles (Devereux et al., 2016). Yet at the same time, despite decades of reform in many aspects of the economy, China had retained one of the strictest capital control regimes in the world. The country thus exemplifies the interventionist policies towards foreign investment that MNEs face in many other developing countries. Interestingly, as a G20 country, China has been one of the most active non-OECD participants in the BEPS project. This fascinating policy configuration raises questions about how to interpret China's policy stance, and more importantly, what the reality of BEPS is for MNEs investing in China.

Our study identifies MNE profit reporting and investment responses to tax incentives in China through variations in effective income tax rates at the prefectural city level.[5] Using accounting information from a large Chinese enterprise survey dataset covering 2000-2013, we examine whether reported pre-tax profits are sensitive to city-level tax incentives. As a supplement, we collect a smaller sample of

well as several other non-OECD countries, is partly responsible for this approach.

[5] Unless otherwise indicated, all references to Chinese cities below refer to prefectural cities—which are jurisdictions subordinate to provinces but superior to (and encompassing) counties.

foreign firms from the database Oriana, which provides information on the home countries of foreign firms operating in China. We find significant effects of city-level tax incentives on MNE reported profits and investments. Further, we find that despite strict capital controls, reported profits of the Chinese subsidiaries of these MNEs are highly sensitive to the tax rate difference between their host cities and the parent country.

Studying MNE profit shifting and investment responses in China using city-level variations holds several attractions. First, under the assumption that capital control policies are implemented much more uniformly across Chinese cities than tax policies, we are able to separate MNE behavior motivated by the goal of circumventing capital controls from tax minimization behavior. Second, because of China's capital control regime, any cross-border profit shifting that can be observed arguably are achieved only through a narrow range of techniques—mostly current account transactions involving transfer pricing and service payments. Therefore, to a greater extent than many previous studies, our research design allows profit shifting to be matched to specific mechanisms. And third, by comparing the magnitude of profit shifting to similar studies carried out in other countries without capital controls, one can obtain a quantitative indication of the significance of institutional frictions on tax planning.

Just as importantly as these observations about the mechanisms of profit shifting and about the effectiveness of tax incentives under capital control, our study, by estimating spatial reaction functions, uncovers robust evidence for fierce tax competition over effective income tax rates among Chinese cities. This sheds important light on the politics of BEPS implementation: even if China's national policymakers favor pursuing anti-tax-avoidance policies, support for such policies may be weak in other parts of the Chinese government, especially among subnational politicians competing for investment-driven growth.[6] Moreover, we find evidence that MNEs do respond to Chinese cities' tax incentives by investing more, which would be consistent with a conception of tax competition as being over real resources and not just mobile profits.

In addition to the literature analyzing the extent of MNE profit shifting and the policy discourse surrounding BEPS,[7] our study contributes to two other strands of research. The first is a literature using rigorous spatial-econometric techniques to identify patterns of sub-national tax competition in China. In contrast to a few recent studies, we argue that subnational tax competition in China is more plausibly analyzed at the city rather than at the provincial level: such an approach is more consistent with both rapidly developing political science research on subnational

[6] It has been observed that the BEPS project may be in conflict with many OECD countries' intent to engage in tax competition, and may merely narrow the forms of such competition (see, e.g. Collier and Maffini 2015 on the U.K.). Our study, by examining subnational income tax competition to attract foreign capital, empirically portrays an analogous reality in China.

[7] BEPS Action 11 specifically calls for empirical research "measuring and monitoring BEPS", yet little such research has emerged in the last few years.

politics in China and with anecdotal and legal documentation of the locus of tax competition. Moreover, our use of firm-level data, our focus on effective income tax rates, and our estimation strategies are in greater conformity with trends in research on corporate tax competition (Devereux and Loretz, 2013).

The second additional research strand to which our study contributes is the study of investment responses to tax incentives. Previous studies find that tax incentives are important for the location choice of FDI (Devereux and Griffth, 1998, 2003). Our study suggests that conditional on the location choice, the intensive margin of foreign investment is strongly affected by local tax incentives, which is consistent with evidences regarding domestic firms.

The rest of the paper proceeds as follows. In Section 2, we provide a brief review of China's corporate tax system and recent policy changes, and lay out our views about the relationship between capital control and tax avoidance, the locus and mechanisms of subnational tax competition, and the extent of MNE profit shifting in China, all in relation to relevant recent scholarship. Section 3 describes the data and the sample. We provide evidence for interjurisdictional tax competition at the city level in Section 4. In Section 5, we present results regarding the sensitivity of reported profits and investment of foreign firms with respect to city-level tax incentives. Section 6 concludes.

2. Capital control, subnational tax competition, and international profit shifting

The current Chinese CIT system is the product of a major reform and statutory change in 2007. Before 2008, two separate regime of corporate income taxation applied to domestically-owned firms (DOEs) and foreign-invested enterprises (FIEs, which category includes both firms wholly-owned by foreign entities and joint ventures). The regime pertaining to FIEs offered extensive tax preference to foreign investors, including (i) lower statutory tax rates (15% or 24%, as compared to the general statutory rate of 33% applicable to DOEs) for FIEs set up in China's many "special economic zones", "economic development zones", "open economic zones", etc.; (ii) tax holidays with complete or partial tax exemptions; (iii) zero withholding tax on dividends and tax rebates for re-invested earnings, and (iv) narrower statutory tax bases as compared with the regime for DOEs (Li 2007). The dual regimes were replaced by a single CIT regime under the Enterprise Income Tax Law, effective in 2008, which unified the taxation of DOEs and FIEs, eliminated all domestic tax preferences targeted at FIEs, and introduced a general statutory rate of 25%. DOEs thus enjoyed substantial reductions in both their tax rate and tax base after 2008, while FIEs experienced a substantial rate increase.[8]

[8] China is thus among the few countries that raised the statutory tax rate on foreign investment in the last two decades.

Since around 2009, China's tax authorities began to pursue several policy initiatives to combat tax avoidance by MNEs, such that China has come to be portrayed in recent years as an exemplary developing country that actively defends its tax base against profit shifting (Li 2015, 2016). However, the objective extent of MNE tax avoidance in China is still unknown. A close look at tax policy implementation and MNE behavior in China also reveals a complex reality. Two issues that deserve particular emphasis are the relationship between capital control and tax policy instruments in influencing the decisions of MNEs, and the effect of subnational tax competition on China's national anti-avoidance initiatives.

2.1 Capital control and tax planning

China maintains a strict capital control regime (Fernández et al 2015; Bayoumi and Ohnsorge 2013). There are many ways in which a capital control system may limit tax planning opportunities and otherwise increase tax paid by MNEs.

Most importantly, capital control can simply render many tax planning techniques irrelevant. For example, a general policy against cross-border debt flows—such that capital account transactions are largely limited to investments of equity capital—would seriously dampen earnings stripping through the payment of interest to shareholders, as well as disguised dividends that transfer funds to shareholders through outbound loans. China has maintained a strict debt-to-equity ratio for FIEs for capital control purposes ever since the 1980s, and its restrictions on outbound loans (especially for non-financial institutions) were near absolute until very recently. Cross-border loans all require government approval, and their terms (including the interest rates charged) are closely scrutinized during the approval process and must generally fall within the comfort zones of (non-tax) regulators. Similarly, the equity structures of any FIE and transactions among shareholders are also governed by a highly inflexible regulatory regime.[9] The licensing of intellectual property must also be registered with bureaus of industry and commerce, and contracts for royalty payments—including royalty rates—must be reviewed by government agencies before they can take effect. The idea that multinationals can shift profits by contractually allocating risk through mere legal artifices—which animates much of the OECD's BEPS project—is far from Chinese reality.

As a result of arcane and inflexible rules applicable to capital account transactions, techniques for tax avoidance—and for mitigating the effect of capital control—mainly involve current account transactions.[10] In fact, manipulating transfer pricing and arranging service payments that lack economic reality are attractive ways

[9] Derivative contracts are generally not available to non-financial institutions. No financial instruments permitted by the capital control system give rise to any ambiguity as to debt v. equity characterization.

[10] It is thus not accidental that China's most active engagement with the BEPS project is in the area of transfer pricing—the pricing of intra-group sales of goods and services (Li 2016), which generally go through current accounts.

for FIEs to simultaneously circumvent Chinese taxation and capital control.[11] However, the goals of circumventing capital control and lowering tax liability do not always align. If circumventing capital control is sufficiently important, for example, "intra-group trade deficits" might be observed even if China is the jurisdiction with the lower tax rate. As another example, the difficulty of bringing capital into China implies that keeping retained earnings within China may often be a good idea, even if there is a lower taxed jurisdiction to which the earnings can be repatriated.[12]

Overall, therefore, one should expect that MNEs engage in less tax-motivated profit shifting with respect to their investments in China than they would in countries with no or less stringent capital control. Moreover, where MNEs are in fact observed to engage in profit shifting (e.g. arranging inappropriate transfer pricing or service payments), the question can be raised as to whether they are motivated by tax as opposed to other reasons. For example, Chan and Chow (1997) report transfer pricing audits conducted in China in the early 1990s resulting in adjustments even for FIEs that face very low tax rates.[13] A key challenge to studying tax-motivated profit shifting in China is thus separating the effects of capital control and tax policy.

We approach this challenge on the basis of the following reflections. Several Chinese bureaucratic systems that play roles in approving and monitoring capital account transactions can be influenced by subnational governments by virtue of funding and appointment.[14] At least in theory, they could adjust their efforts in the enforcement of capital control policies to aid local governments in the competition for foreign investment. Yet there have been few reports of "race to the bottom" in these regulatory areas. Why is this? We believe the answer lies in the fact that the routine monitoring of both capital and current account transactions is carried out by China's national banks under the supervision of the State Administration of Foreign Exchange (SAFE). SAFE itself forms a part of the regulatory system of the People's Bank of China and is considered among the most centralized of all of China's regulatory

[11] Clausing 2001, 2004 show that multinationals' subsidiaries in high tax countries are more likely to run "intra-group trade deficits": the value of imports from related parties may be over-stated and the value of exports to related parties may be under-stated. In any country with capital control as well, intra-group trade deficits would also serve the purpose of circumventing capital control.

[12] It should also be recognized that tax administration in China with respect to foreign investors is aided tremendously by the capital control regime. Among the documents that need to be presented to banks and regulators for the approval of outbound payments are "tax completion certificates," which certify not only that withholding tax has been properly deducted and paid to the tax bureaus but that the paying entities themselves have complied with their tax obligations.

[13] We are not aware of previous scholarship that considers the impact of capital control on MNE's tax-motivated profit shifting. Desai et al 2006 show that capital control policies may have similar effects as source-country taxation in reducing investment, and the MNEs may adopt tactics to circumvent capital control that are similar to tax avoidance tactics. Devereux et al 2008 argue that countries would engage in tax competition to attract mobile capital only after they lift capital control. Because the appropriate measurement of the extent of capital control is still debated (IMF 2016), studies on the effect of capital control on MNE behavior based on cross-country data arguably should be complemented by within-country studies that identify changes in capital control more precisely.

[14] These include, for example, subsidiary agencies of the National Development and Reform Commission (NDRC), the Ministry of Commerce (MOFCOM), and the Administration of Industry and Commerce (AIC),

agencies. While both SAFE and the major banks have branches across China, their connections with subnational governments are weak, and are themselves unlikely to systematically implement city government policies for purposes of attracting capital.[15] Other agencies that do have incentives to aid local government would still have to gain the cooperation of SAFE and the banks to adjust capital control policy, which may be difficult.

This suggests that city-level variations in firm profit shifting behavior should not reflect variations in capital control policy. In choosing to study profiting shifting at the city level, the goal of separating the effect of capital control and tax policy also dovetails with our conception of the locus and mechanism of subnational tax competition in China, as we discuss in the next section.

2.2 Subnational tax competition

Even in a country where the national sovereign has imposed capital control, subnational governments may engage in tax competition among themselves for foreign capital. Where the effect of tax policy ultimately depends on subnational enforcement, national policy may be eroded by sub-national competition (Cai and Treisman 2004). We present evidence suggesting that MNEs shift profit in response to city-level variances in tax rates, which implies that subnational policy implementation is an important aspect of Chinese international taxation.

i. The locus of tax competition

Analyzing Chinese domestic tax competition and its effect on foreign companies' profit shifting behavior requires one to articulate assumptions about the locus and mechanisms of tax competition. In terms of locus, we study inter-jurisdictional interactions at the city level, motivated by our view that the primary locus of tax competition in China is at the sub-provincial levels. Many considerations support this view. First, the now-large literature on political tournaments in China shows that political competition based on nurturing local GDP growth can be empirically observed at the county- and city-levels (Lü and Landry 2014; Yu et al 2016). In fact, performance-based political competition is more intense at these sub-national levels, where political turnover is faster and there is greater upward mobility, than at the provincial levels (Lü et al 2016). If one conceives of tax competition in China as resulting from GDP-focused political competition, then one would expect to observe the former at the sub-provincial levels, where jurisdictions compete with one another rather than being coordinated by a provincial principal.

[15] This is not to claim that the SAFE and bank branches are very uniform in the implementation of SAFE policy; it is instead only to suggest that local variations are random rather than systematic.

Second, the structure of the Chinese state is such that most governance tasks are performed by country and city level governments. Provincial governments act as policy and fiscal intermediaries between the central and sub-provincial governments for the most part, but do very little directly to implement policy. Provincial tax bureaus, for example, are generally thinly staffed, while most tax collectors are employed at the county and lower levels (Cui 2015). Thus insofar as government actors affect firms' effective tax rates through mechanisms such as altering the strictness of enforcement and providing rebates after taxes are collected, these actions would almost certainly take place at the sub-provincial rather than provincial levels.[16]

It is worth noting that one recent study of subnational tax competition in China (Liu and Martinez-Vazquez 2014) which we later refer to is based on the assumption that provincial governments are the main agents in such competition.[17] For the reasons given above, this is a questionable depiction of reality in China, and our empirical evidence of income tax competition at the city level is also inconsistent with it.[18]

ii. The mechanisms of tax competition

China's public finance system has gone through substantial transformations over the past 35 years. Subnational tax competition assumed different forms and dynamics during different periods; empirical analyses using data drawn from different periods must accordingly be tailored to the relevant forms of tax competition.

It has been widely observed that after the major tax reform of 1994, the power to set tax policy in China became highly centralized: nominally, roughly the same law applies across the country. Against this background, a first mechanism for sub-national governments to offer tax incentives—especially in the CIT sphere—is the creation of economic development zones (EDZs). By national statute, EDZs

[16] Legal research on large bodies of policy documents issued since the 1980s relating to illicit subnational tax preferences also indicates that most of such preferences are issued by sub-national governments. The Chinese central government has been cracking down on what it perceives as impermissible tax policy discretion at sub-national levels ever since the early 1980s (Cui 2013). Provincial governments were often put in the role of agents of the central government in monitoring and cracking down on tax preferences that contravene national policy. They may play this role with greater or lesser zeal (i.e. doing more or less to hide impermissible sub-provincial tax preferences or to protect sub-provincial jurisdictions from the political consequences of illicit policies), but they themselves—who are most easily monitored by the central government—act as direct sponsors of preferential tax policies less frequently.

[17] They "refer to the provincial government as a single entity that represents and captures all the competing behaviors of subnational governments in that particular province," arguing that "horizontal competition among sub-provincial governments should not be an issue, since they act as agents of provincial governments at the local level, and so their behaviors, at most, are only the reflections of provincial governments' policies."

[18] Note also Yang and Xu (2011), using provincial data of aggregate income tax paid and gross profit of foreign invested enterprises, finds no evidence of strategic interactions among provinces (and thus no direct evidence of tax competition). 杨晓丽、许垒（2011）,《中国式分权下地方政府 FDI 税收竞争的策略性及其经济增长效应》,《经济评论》第 3 期.

provide preferential tax rates. However, the implementation of the Enterprise Income Tax Law beginning in 2008 reversed many of the income tax preferences tied to EDZ status. Moreover, we are not aware of any statutory (or other formal) tax preferences other than under the CIT that are tied to EDZ status. Therefore preferences under other taxes (e.g. VAT, the sales tax on services, personal income tax, property and other taxes) should be no more likely to be granted in EDZs than in other jurisdictions. Consequently, EDZ creation cannot be thought of as the primary mechanism for tax competition in recent years.

A second, arguably more prevalent practice in domestic tax competition is refund-after-collection (RACs). An RAC policy involves a sub-national government at the city or county level refunding a portion of the taxes paid by a firm—typically capped by that government's share in the revenue collected under China's tax sharing system.[19] While extremely prevalent (by anecdotal accounts), RACs are empirically challenging to study for several reasons. First, because of the conflicting views towards RACs taken by Chinese central and local governments, RACs tend to be individually negotiated and not published. Second, because a refund need not nominally reduce the tax paid by a firm to the official treasury, "well-designed" RACs (i.e. policies fashioned to be in accordance with the letters, if not the spirit, of the law) do not change accounting reports of income and other taxes paid, and would at best show up on financial statements as government subsidies. Therefore they would not affect accounting measures of ETR.[20] Third, the economic impact of different forms of RACs on a firm's profitability is complex. While a refund of income tax paid is similar to a tax rate reduction, a refund of VAT paid by the firm, for instance (which may simply reflect VAT collected from customers), would be equivalent to a cash subsidy, the quantity of which may depend on the type of input employed rather than profitability.[21] The refund of other taxes (e.g. the personal income tax) other than the CIT could similarly have complex effects on investment and profit reporting decisions.

Yet a third way for local (especially city- or lower-level) governments to engage in tax competition is to deviate from national law and control the level of enforcement

[19] RACs were first adopted around the time of the 1994 tax reform, as sub-national governments sought, against the centralization of tax policy making power, to preserve very extensive tax preferences granted during the 1980s. The central government initially accepted RACs as transitional measures, but beginning in 1997 argued that they were illegal tax preferences in disguise. However, local governments can rely on the legal position that RAC refunds—which can be appropriated from the general budget and need not reduce the amounts of tax actually paid by any firm to the official treasury—represent spending decisions and therefore not constrained by the centralization of tax law and policy making. RAC policies thus persisted in the 21st century and are as relevant today as it had ever been.

[20] Wu and Li (2007) find that local tax refund policies nominally prohibited by the central government reduced the effective tax rates of listed companies 吴联生、李辰:《"先征后返"、公司税负与税收政策的有效性》,《中国社会科学》2007(4): 61-73. However, their data relates to an earlier period when RAC policies are less well-disguised.

[21] The higher is the proportion of non-taxable inputs (including labor), the larger is the refund.

in tax collection.[22] Discretionary tax collection—or simply negotiated tax payments—could render a firm's tax payment substantially different from what would be required under the law. This form of tax competition, unlike RAC subsidies, should be reflected in ETR measures.

2.3 The extent of BEPS in China

Chinese subsidiaries of MNEs currently face a general income tax rate of 25%, while the withholding tax on passive income earned by foreign investors (e.g. dividends, interest, royalties, and capital gains) is capped under domestic law at 10% and may be further reduced under tax treaties. While these rates represent an increase from the tax regime for FDI that prevailed until 2007, they are not unattractive when compared internationally. How strong the tax reasons are to shift profits out of China is thus an open question. Further, if the government is able effectively to limit the means of international tax avoidance through capital control, the need to take strong tax policy stances on avoidance seems attenuated.

Systematic evidence for MNE profit shifting out of China is scant. Several recent studies (An 2012a, b; An and Tan 2014), using the 2008 EIT reform as a policy experiment, purport to present evidence of tax avoidance behavior among FIEs in China. These studies argue that because the CIT rates on FIEs increased in 2008, evidence that FIEs are more likely to report lower profits, increase debt ratios, or decrease investments relative to domestically-owned enterprises captures their avoidance behavior. However, the design of these studies faces an important objection: they all rely on a difference-in-difference approach by treating domestically-owned firms as control groups in the 2008 policy experiment. However, domestically-owned firms cannot be appropriately regarded as control groups in the 2008 policy change, because the statutory rates they face were substantially lowered (from 33% to 25%) as a result of the same reform. Consequently, domestically-owned firms can be expected to increase investments and reported profits and/or decrease debt ratios.[23] Even if FIEs did not respond to the policy treatment, different trends between domestic- and foreign-owned firms could emerge post-2008.

3. Data and sample constructions

We use several data sources to construct our sample and variables. The main source is the Chinese enterprise survey data provided by the National Bureau of

[22] Although offices in the Local Tax Bureau system are considered to be especially cooperative in this sphere of discretionary enforcement, we believe State Tax Bureau offices are also likely to coordinate with local governments.

[23] On the capital structure response of domestic firms to the decrease in tax rates in 2008, see 王跃堂、王亮亮、彭洋，《产权性质、债务税盾与资本结构》，《经济研究》，2010 年第 9 期， pp 122-36.

Statistics (NBS). The NBS data is similar to the Longitudinal Research Database (LRD) maintained by the U.S. Bureau of the Census, and collects annual accounting and ownership information for "all state-owned and all above-scale non-state owned industrial enterprise". The "above-scale" criterion excludes industrial enterprises with annual sales below 5 million RMB. To reflect firm growth over time, the inclusion threshold increased from 5 million to 20 million RMB in 2011. The NBS database has been widely used in academic research on China due to its comprehensive coverage (see Brandt et al. (2014) for detailed information). The NBS data we obtain starts from 1998 and the most recently available year is 2013. We focus on the period 2000-2013, for which we have information for the essential control variables at the city level. We exclude 2010 from our sample since we do not have reliable NBS survey data for that year.

We focus on tax competition at the city level for reasons discussed in Section 2. To measure local tax incentives resulting from both policies and enforcement, we use the average effective tax rate (AETR) as a proxy. More specifically, we first calculate firm-level average effective tax rate as CIT paid divided by pre-tax profits. We then calculate the average level of AETR across all firms located in the same city in a given year. As there is no meaningful measure for the AETR for loss-making or zero profit firms, we exclude these firms from our calculation. Our approach of measuring local tax incentives is similar to that used by Desai et al. (2006).

As detailed in Section 4, we include a set of city-level characteristics as control variables in our analysis about tax competition across cities. To construct these control variables, we rely on official city level statistical yearbooks. Definitions of these variables are provided in Section 4 and Table 1.

We focus on foreign firms located in 113 cities that belong to 8 Chinese provinces (Jiangsu, Zhejiang, Fujian, Guangdong, Shandong, Liaoning, Hebei, and Henan), the majority of which are located in the coastal area. There are two reasons for focusing on this subset of provinces. Firstly, for consistent estimations of the extent of interjurisdictional tax competition, we require each city in each province to have non-missing AETR. Nevertheless, as FDI in China tends to be geographically concentrated, we do not have sufficient coverage of foreign firms (especially profitable ones) in many cities. Secondly, data on city-level characteristics is incomplete for many cities throughout our sample period 2000-2013. For the cities located in the 8 provinces we focus on, we have the full set of necessary information. It is worth noting that these 8 provinces attract a large fraction of the universe of foreign firms in the NBS data: the total number of foreign firms in our sample amounts to nearly 70% of the full database. Since FDI traditionally favors coastal areas than inland areas, our sample should also be representative.

To investigate foreign firms' profit shifting and investment behavior, we collect other essential firm-level information from the NBS data, including fixed assets, the

number of employees, annual sales, and reported pre-tax profits. We take the natural logarithm of all these variables to be consistent with existing empirical studies.[24] For our regression analysis, we exclude observations with extreme values. (i.e. those in the top or bottom 1 percent of the distributions regarding the key variables for each analysis). We also require each firm in the sample to have at least 3 years' observations.

Table 2 provides summary statistics of both city-level and firm-level variables. The AETR for foreign firms in our sample has a mean of 0.12 during the period 2000-2013. The effect of the 2007 Enterprise Income Tax (EIT) reform is reflected in the AETR, the mean of which is around 0.1 before 2008 but increases to around 0.15 during the post-reform sample period. It is worth noting the AETR is, on average, substantially lower than the statutory CIT rate for foreign firms both before and after the EIT reform. Although the statutory income tax rate for foreign firms was raised to 25% after 2007, there was a 5-year phasing-out period, which partly explains the lower AETR after 2008. But as discussed in Section 2, this deviation from the statutory rate should also reflect tax policies and approaches to enforcement adopted by city governments.

4. Interjurisdictional tax competition

In this section, we document the existence and extent of tax competition at the city level. Exiting studies on cross-region fiscal interdependence in the Chinese context have focused on political tournaments analogous to the type of yardstick competition highlighted by Besley and Case (1995). For example, Caldeira (2012) and Yu et al. (2016) find evidence for yardstick competition regarding public spending policies. There are fewer studies specifically about tax competition in China, despite various anecdotes. One exception is Liu and Martinez-Vazquez (2014), who document significant tax competition for FDI across Chinese provinces during 1993-2007, using the measure of all tax revenue (i.e. not just income tax) paid by FIEs to FDI capital stock. As discussed in Section 2, however, the tax competition phenomenon should be much stronger within provinces rather than across provinces.

Empirically, we adopt the spatial panel data model to investigate strategic interactions in tax policy among cities in China. More specifically, we consider three model specifications:

(1) The spatial panel data model with the spatial fixed effects:

$$Y_{nt} = \lambda W_n Y_{nt} + X_{nt}\beta + \mu_n + \mathbf{u}_{nt} \quad (1)$$

[24] We use reported pre-tax profits in logs as the dependent variable in our analysis about the profit shifting behavior of foreign firms. This excludes loss-making firm-year observations. We will discuss this issue in more details in Section 5.1.

(2) The spatial panel data model with both spatial and time fixed effects:

$$Y_{nt} = \lambda W_n Y_{nt} + X_n t\beta + \mu_n + c_t l_n + \mathbf{u}_{nt} \ (2)$$

(3) And the spatial dynamic panel data model with both spatial and time fixed effects:

$$Y_{nt} = \lambda W_n Y_{nt} + \gamma Y_{n,t-1} + \rho W_n Y_{n,t-1} + X_{nt}\beta + \mu_n + c_t l_n + \mathbf{u_{nt}} \ (3),$$

where $Y_{nt} = \begin{pmatrix} y_{1t} \\ y_{2t} \\ \vdots \\ y_{nt} \end{pmatrix}, X_{nt} = \begin{pmatrix} x'_{1t} \\ x'_{2t} \\ \vdots \\ x'_{nt} \end{pmatrix}, \mu_n = \begin{pmatrix} \mu_1 \\ \mu_2 \\ \vdots \\ \mu_n \end{pmatrix}, \mathbf{u}_{nt} = \begin{pmatrix} u_{1t} \\ u_{2t} \\ \vdots \\ u_{nt} \end{pmatrix}$

with y_{it} and x_{it} representing the dependent variable (outcome) and independent variables (characteristics) of the spatial unit i at time t, μ_i being the spatial fixed effect of unit i, c_t being the time fixed effect of t, l_n being an n-dimensional vector of ones, and u_{it} being the i.i.d. error term. W_n is an n-dimensional spatial weight matrix and its (i,j) th entry w_{ij} measures the relationship between spatial unit i and j. For example, to investigate interdependence between geographically neighboring cities, we can set $w_{ij} = 1$ if i and j are contiguous neighbors and 0 otherwise. To investigate within-province tax competition, we can instead set $w_{ij} = 1$ for cities located within the same province, and 0 otherwise. Then $W_n Y_{nt}$ is an n-dimensional vector representing the neighbor's outcome at time t, $W_n Y_{n,t-1}$ is the neighbor's outcome from the previous period, t-1. We refer to $W_n Y_{nt}$ as the spatial lag term, $Y_{n,t-1}$ as the time lag, and $W_n Y_{n,t-1}$ as the spatial-time lag. Hence, in the spatial dynamic panel data model, y_{it}, the outcome of spatial unit i at time t is affected by its own characteristics x_{it}, the time lag $y_{i,t-1}$, and the neighbors' outcomes at current and previous periods, namely, the spatial lag and the spatial-time lag. The spatial correlation is captured by the coefficients associated with the spatial and spatial-time lags.

In our model, the dependent variable y_{it} is the average effective tax rate for profit-making firms located in city *i* in year *t*. The parameter of interest is λ, which captures the interdependence of the average effective tax rate across cities.

x_{it} includes important city-level characteristics that might affect local tax incentive provisions. Our choice of the control variables is mainly based on factors that may affect FDI decisions and the fiscal conditions of the local government. The logic is that these factors in turn should be reflected by the local government's choice of tax incentives.

Industrial composition and the wealth of local population could influence the investment decision of foreign firms. For example, foreign firms may prefer to operate in more industrialized cities than in a more rural environment. To take into account the effect of the composition of the local economy, we control for the ratio of

the primary industry (agriculture, forestry, fishing and mining) to GDP and the ratio of the secondary industry (manufacturing) to GDP. The omitted group is mainly the service industry. Foreign firms may also prefer to carry out business in wealthier cities where the potential consumer market are likely to be larger. Thus, we include two variables to proxy for the wealth of the local population: the natural logarithm of real output per capita and the natural logarithm of average wage.

Koh et al. (2013) find that economic agglomerations exert a positive impact on the jurisdictional tax rate choice. Agglomeration effect is likely to influence investment decision of foreign firms. Therefore, we follow the method used by Koh et al. (2013) to construct an urbanization measure $U_{i,t} = \sum_{j=1}^{J} \left(\frac{EMP_{i.t} - EMP_{j.t}}{DIST_{i,j}} \right)$, where $EMP_{i.t}$ is the number of employees in city *i* in year *t* and $DIST_{i,j}$ is the geographic distance between the two cities *i* and *j*. In our empirical analysis, we construct several urbanization measures using employment, the industrial output, the share of industrial output, or the domestic industrial output. Regression results are very robust regarding to these different measures of urbanization, so we only report estimates using employment and the number of firms.

Other factors that may affect FDI decisions include a city's infrastructures and human capital. In the Chinese context, Head and Rice (1994) find that cities with good infrastructures and an established industrial base are more attractive to FDI. We thus include growth rate of road transportation, the number of hospitals (in logs), and the ratio of college students in total population.

We use the total government expenditures as a ratio to total output to proxy for the local governments' demand for tax revenue. To control for city-level business environment in general, we include output growth, total fixed asset investment as a ratio to total output and the percentage of loss-making firms in total number of foreign firms in each city.

The three spatial panel data models are estimated using MLE (maximum likelihood estimation). For model (3), estimators from the direct MLE approach has the asymptotic bias. Thus, we use estimators after bias correction from Lee and Yu (2010).

We report estimates from two specifications of the spatial weight matrices: the contiguity matrix where w_{ij} is 1 if the two cities are contiguous; and the province matrix where w_{ij} is 1 if the two cities belong to the same province. In both cases, we further row-normalize the weight matrix. Then $W_n Y_{nt}$ is the weighted average of the neighboring cities.

Table 3 reports our estimation results based on the full sample 2000-2013. In Columns 1-3, we estimate Models 1-3 by setting $w_{ij} = 1$ if *i* and *j* are contiguous

and 0 otherwise. The estimated coefficient on the spatial lag is between 0.17 and 0.30 in different columns, and it is significantly different from zero. These results indicate that city i's AETR will increase 0.17-0.30 percentage point when the mean of the AETR of neighboring cities increases 1 percentage point, all else equal. The estimated coefficients on the time lag and the spatial-time lag are both positive and significant in Column 3, suggesting possible bias in the estimated coefficient on the spatial lag in Model 1 and Model 2. Column 3 also indicates that the tax incentive of city *i* is affected by not only the level of tax incentives of its neighboring cities in the same year, but also by tax incentives of its neighbors in the previous year.

In Columns 4-6, we instead set $w_{ij} = 1$ for cities located within the same province, and 0 otherwise. We observe much stronger interdependence between cities within the same province regarding their tax incentives offered to foreign firms—the estimated coefficient on the spatial lag is more than doubled in corresponding columns. This result is consistent with our discussion in Section 2 that tax competition for foreign firms should be fiercer within provinces. Again, we find in Column 6 that both the time lag and the spatial-time lag are significant, which suggests possible bias in Model 1 and Model 2.

Next, we investigate whether there is any difference in the pattern of tax competition before and after 2008, for two reasons. First, if, prior to 2008, a main way to attract FDI is to create economic development zones (as Liu and Martinez-Vazquez 2014 argue), income tax competition over AETR could be weaker. We can test this hypothesis by conducting sub-sample analysis. Second, existing studies on tax competition often focus on the period before 2008 due to lack of more recent data. By splitting the sample, we can more directly compare our estimates with those in previous studies.

The sub-sample analysis results are reported in Table 4A and Table 4B. Results based on the two sub-samples are broadly similar to those in Table 3. While we find strong evidence of competition over AETR both before and after 2008, the competition appears to be more intense in the latter period.

5. Tax incentives and behavior of multinationals under capital controls

In the previous section, we find strong evidence of tax competition at the city level in China. In this section, we use the variation in the tax incentives across cities to identify the extent of tax motivated profits shifting among foreign firms, and to analyze whether such tax competition also affects foreign firms' investment behavior.

5.1 Reported profits of foreign enterprises

We first investigate whether reported pre-tax profits of foreign firms are sensitive to local tax incentives, by conducting the following two exercises. First, we estimate the responsiveness of the reported pre-tax profits of foreign firms with respect to the city-level AETR. We use both cross-sectional and time-series variation in the city-level AETR in different cities for identification. As discussed in Section 2, since there is little variation across cities regarding the strictness of capital controls, our approach can identify the extent of tax-motivated profit shifting.

Second, as a more refined test of profit shifting, we collect a smaller sample of foreign firms for which we know the location of the parent company. The NBS database does not provide information on the location of the parent company. Thus, we match the database Oriana (provided by Bureau van Dijk) with the NBS database by a firm's business identification number. Since the coverage of Oriana is less comprehensive than the NBS, we only manage to match 5 percent of the NBS sample with Oriana. Next, we match the corporate income tax rate data provided by the Oxford University Centre for Business Taxation with this smaller sample, based on the parent companies' location. This gives us both cross-sectional and time-series variation in the CIT rate faced by the foreign firms' parent companies. We then calculate the difference between the CIT rate in the parent country and the AETR in the host Chinese city, labeling this variable as $\text{DIFF\_RATE}_{i,t}$ for a foreign firm *i* in year *t*. As presented in Table 2, on average, foreign firms in our sample faced a much lower tax rate in China than in their home countries both before and after the EIT reform in 2008, although the reform substantially narrowed such gap.

Empirically, we follow the approach by Hines and Rice (1994) and estimate Equation 4:

$$(4)\quad ln\pi_{i,t} = \alpha + \beta_1\tau_{i,t} + \beta_2 lnK_{i,t} + \beta_3 lnL_{i,t} + \mu_i + \delta_t + \varepsilon_{i,t}$$

where $\tau_{i,t}$ captures the tax incentives for reporting profits. We use either the city-level average AETR or $\text{DIFF\_RATE}_{i,t}$ in separate exercises. $lnK_{i,t}$ is the natural logarithm of net fixed assets and $lnL_{i,t}$ is the natural logarithm of the number of total employees. In all estimations, we control for common and province-level business cycle effects by including year dummies and province-year dummies. By including year dummies, we also control for any variation in the strictness of capital controls over time.

Table 5 reports our estimation results based on Equation 4 for the first exercise. Columns 1-3 report the OLS regression results. In the OLS regressions, we also control for province and industry fixed effects.[25] In different specifications, we find

[25] The industrial classification system changed in both 2003 and 2013 in the NBS database. We match the old and new industry codes and consequently, we have consistent industry classifications for our

that the city-level AETR is strongly and negatively correlated with the reported pre-tax profits of foreign firms. In Columns 4-6, we control for firm-level fixed effects. One caveat is that firm-level fixed effects are likely to absorb much of the cross-sectional tax rate variation. Nonetheless, we continue to find similar patterns in these columns. The results imply that all else equal, foreign firms not only tend to report higher pre-tax profits in cities with a lower AETR, they also tend to report higher pre-tax profits when a city lowers its AETR, and vice versa. The magnitude of this coefficient appears to be larger for the sample period 2008-2013. Regarding fixed assets and employee numbers, the estimated coefficients on these two variables are rather stable in different columns.

We only consider cross-sectional and time-series variation in the city-level AETR in the first exercise. To directly test for the existence and extent of tax-motivated profit shifting, we then regress firms' pre-tax profits on DIFF_RATE based on the matched NBS-Oriana sample as described above. The results are reported in Table 6. We find that DIFF_RATE is negatively associated with foreign firms' reported pre-tax profits in all columns in Table 6, and the estimated coefficient on DIFF_RATE is significant in all columns except Column 5. It is worth noting that there is much less time-series variation in DIFF_RATE during 2000-2007. This might explain why the estimated semi-elasticity of pre-tax profits with respect to DIFF_RATE is insignificant in Column 5, when we control for firm-level fixed effects. Nevertheless, the overall pattern in Table 6 is rather consistent with that in Table 5, which again suggests substantial sensitivity of the reported pre-tax profits to local tax incentives.

Overall, we find that the reported pre-tax profits of foreign firms operating in China are rather sensitive to local tax incentives and to the differential tax rate between China and their parent countries, despite the country's stringent capital controls. One implication of our analysis is that all else equal, foreign firms should have strong incentives to report smaller profits following the EIT reform in 2008, which substantially increased the statutory income tax rate and AETR they face.

Our estimate of the semi-elasticity of pre-tax profits with respect to changes in the tax incentives for profit-shifting appears to be within the range of previous estimates. For example, Heckemeyer and Overesch (2013) conduct a meta-analysis on this issue. For the 22 studies they focus on, the mean of the estimated semi-elasticities is 1.78 and the median effect is 0.97. Accounting for all potential misspecification biases, Heckemeyer and Overesch (2013) predict that this semi-elasticity is around 0.8. Admittedly, our analysis is different from existing studies in many dimensions (such as the measure for the tax incentives, and the fact we are analyzing a developing country). Nonetheless, the evidence suggests that the extent of tax-motivated profit-shifting in the Chinese context is not substantially different from that found in more developed countries.

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sample.

Some studies on tax-motivated profit shifting use earnings before interest and tax (EBIT) as the dependent variable instead of pre-tax profits, since the responsiveness of EBIT to tax incentives excludes profit shifting using financial instruments. We conduct a similar analysis and, in Table 7, compare the semi-elasticity of EBIT with respect to DIFF_RATE with the semi-elasticity of pre-tax profits, thus decomposing the semi-elasticity of pre-tax profits due to non-financial and financial shifting techniques. We define EBIT as pre-tax profits plus interest expenses. To make the comparison, we use a sample where both EBIT and pre-tax profits are observed. Missing observations regarding interest expenses render the sample used in Table 7 slightly different from that used in Table 6. Following Heckemeyer and Overesch (2013), we first estimate the semi-elasticity of EBIT with respect to DIFF_RATE, and label this semi-elasticity as γ_{EBIT}. Then, we calculate the semi-elasticity of pre-tax profits due to non-financial instruments as:

$$\gamma_{NF} = \gamma_{EBIT} \times \frac{\text{EBIT}}{\text{Pre} - \text{tax profits}}$$

One caveat is that the ratio of EBIT to total pre-tax profits has a rather skewed distribution. Thus, we exclude the top 2.5% observations regarding this ratio. After excluding the outliers, the sample mean of EBIT/Pre-tax profits is 1.230. We obtain a semi-elasticity around 0.284 for EBIT in the OLS regressions based on Equation 4, and a semi-elasticity around 0.444 for pre-tax profits using the same sample. Hence, the implied semi-elasticity of pre-tax profits due to non-financial shifting technique equals 0.284*1.230=0.349, and that due to financial shifting instruments equals the residual. In the last columns of Table 7, we calculate the percentage of shifting through non-financial and financial techniques based on the previous column. We find that non-financial shifting techniques explain around 79% of total profit-shifting.

As a robustness check, in Panel B of Table 7 we exclude the top 5% observations in the distribution of EBIT/Pre-tax profits, and re-do the exercise as in Panel A. The results are similar, although the mean of EBIT/Pre-tax profits decreases to 1.165. In the last column, we find that non-financial shifting techniques explain around 82% of total profit shifting.

Overall, results in Table 7 indicate that financial instruments (i.e., interest payment) are not the predominant methods for tax-motivated profit shifting for foreign firms operating in China. Heckemeyer and Overesch (2013), based on their meta-analysis of profit shifting in developed countries, find that non-financial techniques could explain around 72% of total tax-motivated profit shifting. Our estimate is higher, although not by a large degree. This result is consistent with our hypothesis that profit-shifting via current account is most relevant in the Chinese context due to strict controls of the capital account.

5.2 Investment behavior of foreign enterprises

One remaining issue is that whether local governments compete just over more mobile profits or real investment. We analyze this issue in this section. Our empirical specification is based on the neoclassical investment theory (Jorgenson, 1963; Hall and Jorgenson, 1967). The theory suggests that in equilibrium, the optimal level of a firm's capital stock should be positively associated with the level of its output, and inversely associated with the tax-adjusted user cost of capital.[26] In the special case where a firm has the Cobb-Douglas production technology and constant returns to scale, the elasticity of capital stock with respect to changes in output should be 1 while that with respect to changes in the user cost of capital should be -1. Bond and Xing (2015) find that such theoretical predictions are likely to hold for investment in equipment and machinery for manufacturing sectors from 14 OECD countries during 1982-2007, although there remains much controversy about the magnitude of the user cost elasticity in this literature.

It is not an easy task to calculate precisely the tax-adjusted user cost of capital UC because one needs to know not only the marginal tax rate but also the (inflation-adjusted) tax base. To calculate tax base precisely, one needs to know the detailed depreciation scheme for different types of assets for tax, rather than accounting, purposes. In addition, one needs information such as the real interest rate and the physical depreciation rate of assets. In the absence of such information, we use two variables as proxies for the tax-adjusted user cost of capital: first, the city level average AETR; and second, the natural logarithm of 1/[1-AETR]. We use both proxies as we do not know which functional form is more suitable *a priori*. We expect the estimated coefficients on the two proxies to be negative and significant, as both should be highly correlated with the tax-adjusted user cost of capital. Moreover, we expect the estimated coefficients on the tax incentives to be similar to the estimated coefficient on output which is also predicted by the neoclassical investment theory. However, if capital controls seriously dampens the effectiveness of tax incentives, the estimated coefficients on the two proxies for tax-adjusted user cost of capital are likely to be small or even insignificant.

Our empirical specification is as follows:

$$(5)\quad lnK = \alpha + \beta_1 lnQ_{i,t} + \beta_2 \tau_{i,t} + \mu_i + \delta_t + \varepsilon_{i,t}$$

where $\tau_{i,t}$ is the tax-adjusted user cost of capital in logs, as proxied by the two variables mentioned above ($\tau_{i,t}$, the city-level $AETR_{j,t}$ and $\ln(1 - \mathrm{AETR}_{j,t})^{-1}$ if firm i located in city j.) We report OLS estimation results with province dummies,

[26] Bond and Xing (2015) provide a detailed derivation of the first-order condition for a profit maximization firm, which implies a log-linear relationship between capital, output and the tax adjusted user cost of capital.

year dummies, and province-year dummies. We also report within-group estimation results when controlling for city level fixed effects.

Table 8 reports the within-groups estimation results based on Equation 5. In Columns 1-3, we use the city-level AETR to capture the tax effects on capital accumulation. In Columns 4-6, we instead use $\ln(1-\text{AETR})^{-1}$. The pattern, nonetheless, is similar regardless which variable we use. For the whole sample period 2000-2013, we find that the level of fixed assets of foreign firms was strongly sensitive to the local tax incentives, and the negative sign of the estimated coefficients on tax incentives is consistent with the neoclassical investment model. Besides, the absolute value of the estimated β_2 is close to that of the estimated β_1. This pattern of our results is similar to that reported by Bond and Xing (2015) for OECD countries. Splitting the sample into the pre-2008 and post-2008 subsamples, we find that investment appears to respond to local tax incentives more strongly since 2008.

Conclusions

The preliminary results of our study offer two novel sets of findings. First, Chinese subsidiaries of foreign MNEs seem clearly to respond to city-level variations in average effective tax rates in their profit-reporting and investment behavior. Moreover, profit reporting behavior is also sensitive to changes in the differential between the AETR that a host Chinese city is able to offer and the statutory tax rate in the home country of the Chinese subsidiary's parent company. Insofar as such sensitivity reflects cross-border profit shifting, it is plausible to view such shifting as motivated by tax and not the goals of circumventing capital control, since capital control regimes are uniform across cities. Moreover, MNE profit shifting seems to have intensified after 2008, as China's reform of its corporate income tax increased the statutory and effective tax rates on foreign investments. The sensitivity of MNE investment decisions to varying AETR across regions also seems to have increased after 2008.

Second, we produce evidence for tax competition over AETR offered to foreign investment across the Chinese cities that host a predominant portion of the country's FDI. The evidence is novel in our use of firm-level data and our direct estimation of spatial reaction functions. It appears that subnational tax competition is especially intense among cities within the same province, and is able to attract real investment. Given that such competition intensified after the tax rate for foreign investment was raised in 2008 and several years into the Chinese national tax administration's anti-tax-avoidance campaigns, China's international tax policy seems to be characterized by strong internal tensions.

Further work remains to be done to refine and interpret these preliminary results. With respect to MNE profit shifting in China, for example, our estimated semi-elasticity of pre-tax profits to AETR is similar to such semi-elasticity with

respect to statutory tax rates found for developed countries. This is somewhat surprising, as one may have expected greater frictions for profit shifting in China. Perhaps relatedly, our analysis at the present does not completely preclude the possibility that the profit reporting sensitivity to AETR is the result of domestic instead of cross border profit shifting. Such possibility deserves further exploration.

With respect to our second set of findings on subnational tax competition, we believe that the significant spatial interactions over city-level AETR for FDI cannot be adequately explained by "spill-over" phenomena distinct from competition over real resources. For example, because tax revenue from FDI is not a substantial portion of city governments' source of income, it is unlikely that the interactions we observe are the product of expenditure competitions. Nonetheless, more work may be required to rule out such alternative explanations. Moreover, there are reasons to believe that Chinese local governments' tools for tax competition—especially through rebates, rewards, and subsidies tied to tax payments—are increasingly unlikely to be reflected in firms' effective income tax rates. The evidence of growing competition over AETR thus also requires further examination.

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Tables and Figures

Table 1: Variable definitions and data sources

AETR	Average effective tax rate measured at the city level (NBS)
LnK	The natural logarithm of net fixed assets (NBS)
LnQ	The natural logarithm of sales (NBS)
Lnπ	The natural logarithm of pre-tax profits (NBS)
DIFF_RATE	The difference between the AETR in the host city and the corporate income tax rate in the foreign firm's home country (NBS, Oriana, Oxford CBT corporate tax rate database)
% Agriculture	the ratio of primary industry to GDP (city statistical yearbooks)
% Manufacturing	the ratio of secondary industry to GDP (city statistical yearbooks)
Population density	Population per square kilometer (city statistical yearbooks)
Population growth	Yearly population growth rate (city statistical yearbooks)
GDP per capita	GDP per capita in real terms (unit: 10, 000 yuan, city statistical yearbooks)
Ln(Wage)	The natural logarithm of average wage (unit: yuan, city statistical yearbooks)
Urbanization	Urbanization index constructed from Koh et al. (2013) (city statistical yearbooks, own calculation)
Road Growth	growth rate of road transportation (unit: 10,000 ton, city statistical yearbooks)
Ln(Hospital)	The natural logarithm of the number of hospitals (city statistical yearbooks)
% College student	ratio of college students in total population (city statistical yearbooks)
EXP/GDP	the ratio of expenditures to GDP (city statistical yearbooks)
Output growth	growth rate of real GDP (city statistical yearbooks)
Investment/GDP	the ratio of investment to GDP (city statistical yearbooks)
% loss-making firms	percentage of loss-making foreign firms in total foreign firms (NBS)

Table 2: Summary statistics

A. City characteristics: 113 cities 2000-2013

Variable	No. of observations	Mean	Standard deviation
AETR:00-13	1,469	0.121	0.052
AETR:00-07	904	0.104	0.046
AETR:07-13	565	0.147	0.051
% Agriculture	1,469	13.737	8.506
% Manufacturing	1,469	50.777	8.577
Population density	1,469	0.581	0.437
Population growth	1,469	0.008	0.013
GDP per capita	1,469	2.529	3.034
Ln(Wage)	1,469	9.871	0.586
Urbanization	1,469	6.513	0.447
Road Growth	1,469	0.168	1.309
Ln(Hospital)	1,469	5.120	0.600
% College student	1,465	0.013	0.018
EXP/GDP	1,469	0.099	0.041
Output growth	1,469	0.143	0.444
Investment/GDP	1,469	0.450	0.202
% loss-making firms	1,469	0.224	0.119

B. Firm-level characteristics

Variable	No. of observations	Mean	Standard deviation
A. Profit-shifting sample			
LnK	300,096	8.881	1.542
Ln π	300,096	5.308	1.081
LnL	300,096	7.316	1.822
DIFF_RATE: 00-13	18,001	-0.146	0.144
DIFF_RATE: 00-07	9,909	-0.176	0.140
DIFF_RATE: 08-13	8,092	-0.108	0.140
B. Investment sample			
LnK	443,917	8.885	1.553
LnQ	443,917	10.566	1.205

Table 3. Tax competition at the city level: Full sample 2000-2013

Dependent variable:	**Using contiguity matrix**			**Using the province matrix**		
$AETR_{i,t}$	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Spatial lag	0.296***	0.228***	0.168***	0.544***	0.463***	0.401***
	(0.031)	(0.032)	(0.035)	(0.031)	(0.036)	(0.045)
Time lag			0.372***			0.342***
			(0.029)			(0.029)
Spatial-time lag			0.148***			0.124*
			(0.050)			(0.071)
% Agriculture	-0.074	-0.111**	-0.066	-0.086*	-0.113**	-0.072
	(0.049)	(0.049)	(0.056)	(0.047)	(0.048)	(0.054)
% Manufacturing	-0.161***	-0.142***	-0.098**	-0.136***	-0.132***	-0.088**
	(0.037)	(0.038)	(0.041)	(0.036)	(0.037)	(0.040)
Population density	0.570*	0.573**	0.545*	0.531*	0.536*	0.546*
	(0.301)	(0.297)	(0.300)	(0.288)	(0.289)	(0.293)
Population growth	-11.066	-2.910	-1.106	-9.392	-4.658	-2.548
	(8.645)	(8.698)	(9.186)	(8.278)	(8.445)	(8.986)
GDP per capita	-0.113	-0.204	-0.148	-0.058	-0.078	-0.032
	(0.106)	(0.118)	(0.130)	(0.101)	(0.115)	(0.128)
Ln(Wage)	16.337	34.502***	29.576**	22.606*	34.330**	31.340**
	(13.425)	(13.685)	(15.303)	(12.855)	(13.287)	(14.970)
Urbanization	0.935	0.587	0.325	0.820**	0.585	0.327
	(0.370)	(0.368)	(0.382)	(0.354)	(0.358)	(0.374)
Road Growth	4.545***	5.566***	3.640***	2.806***	4.623***	2.793**
	(0.637)	(1.278)	(1.378)	(0.613)	(1.242)	(1.352)
Ln(Hospital)	0.037	0.042	0.031	0.037	0.039	0.003
	(0.072)	(0.071)	(0.095)	(0.069)	(0.069)	(0.093)
% College student	0.106	0.186	-0.067	0.221	0.212	0.009
	(0.347)	(0.346)	(0.359)	(0.317)	(0.335)	(0.351)
EXP/GDP	6.633	-7.071	-9.152	5.220	-0.717	-2.054
	(7.941)	(8.579)	(9.002)	(7.601)	(8.332)	(8.829)
Output growth	-0.126	-0.165	2.284	-0.153	-0.173	0.902
	(0.214)	(0.213)	(1.997)	(0.205)	(0.207)	(1.952)
Investment/GDP	-3.891***	-3.633***	-1.841*	-3.140***	-3.315***	-1.759
	(0.934)	(1.050)	(1.117)	(0.942)	(1.020)	(1.091)
% loss-making firms	-0.598	-0.580	0.644	-0.936	-1.028	0.070
	(1.214)	(1.230)	(1.330)	(1.162)	(1.195)	(1.306)
Direct effect	1.0242	1.0138		1.0476	1.0295	direct
Total effect	1.4205	1.2953		2.193	1.8622	total
Indirect effect	0.3962	0.2815		1.1454	0.8327	indirect
Spatial FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	No	Yes	Yes	No	Yes	Yes

Log likelihood	-3921.794	-3885.749	-3492.851	-3863.747	-3848.193	-3465.755
No. observations	1,469	1,469	1,356	1469	1469	1,356

Notes: We use XX as the weight matrix in Columns 1-3, and YY as the weight matrix in Columns 4-6. Robust and clustered standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 4A. Tax competition at the city level: Subsample 2000-2007

Dependent variable:	**Using contiguity matrix**			**Using the province matrix**		
$AETR_{i,t}$	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Spatial lag	0.105**	0.079*	0.106**	0.318***	0.279***	0.356***
	(0.043)	(0.044)	(0.047)	(0.058)	(0.061)	(0.063)
Time lag			0.241***			0.249***
			(0.037)			(0.037)
Spatial-time lag			0.057			-0.070
			(0.066)			(0.097)
% Agriculture	-0.044	-0.028	-0.038	-0.059	-0.046	-0.054
	(0.069)	(0.070)	(0.085)	(0.068)	(0.070)	(0.084)
% Manufacturing	-0.072	-0.063	-0.065	-0.070	-0.063	-0.059
	(0.055)	(0.055)	(0.065)	(0.054)	(0.055)	(0.064)
Population density	0.425	0.486*	0.465	0.444	0.491*	0.498*
	(0.285)	(0.285)	(0.305)	(0.281)	(0.282)	(0.301)
Population growth	-3.593	-0.388	3.206	-3.124	-0.777	2.905
	(10.311)	(10.465)	(12.060)	(10.167)	(10.365)	(11.887)
GDP per capita	-0.346**	-0.384**	-0.396*	-0.312*	-0.343*	-0.365
	(0.188)	(0.196)	(0.232)	(0.186)	(0.193)	(0.228)
Ln(Wage)	9.098	1.464	12.698	10.836	5.038	14.567
	(19.709)	(20.172)	(24.407)	(19.433)	(19.957)	(24.070)
Urbanization	0.434	0.352	0.345	0.478	0.409	0.390
	(0.380)	(0.380)	(0.417)	(0.375)	(0.376)	(0.412)
Road Growth	5.738***	3.819*	3.319	4.714***	3.409*	2.671
	(0.956)	(1.936)	(2.367)	(0.953)	(1.916)	(2.335)
Ln(Hospital)	0.076	0.080	0.060	0.071	0.074	0.039
	(0.067)	(0.067)	(0.096)	(0.066)	(0.066)	(0.095)
% College student	-0.986*	-1.071**	-1.236**	-0.908*	-0.980**	-1.108**
	(0.491)	(0.490)	(0.557)	(0.485)	(0.485)	(0.549)
EXP/GDP	-46.516***	-46.247***	-61.395***	-41.547***	-41.562***	-55.552***
	(12.530)	(13.382)	(15.472)	(12.357)	(13.239)	(15.254)
Output growth	-0.182	-0.127	-0.105	-0.155	-0.116	-1.096
	(0.198)	(0.200)	(2.497)	(0.195)	(0.198)	(2.475)
Investment/GDP	-3.600**	-4.515***	-2.074	-3.239**	-4.007**	-1.663
	(1.450)	(1.587)	(1.867)	(1.432)	(1.571)	(1.839)
% loss-making firms	0.240	0.326	1.781	0.149	0.242	1.801
	(1.418)	(1.455)	(1.707)	(1.398)	(1.439)	(1.687)

Direct effect	1.0028	1.0016		1.0111	1.0081	direct
Total effect	1.1173	1.0858		1.4663	1.387	total
Indirect effect	0.1145	0.0842		0.4552	0.3789	indirect
Spatial FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	No	Yes	Yes	No	Yes	Yes
Log likelihood	-2303.756	-2297.768	-1979.294	-2293.893	-2290.429	-1969.486
No. observations	904	904	791	904	904	791

Notes: We use XX as the weight matrix in Columns 1-3, and YY as the weight matrix in Columns 4-6. Robust and clustered standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 4B. Tax competition at the city level: Subsample 2008-2013

Dependent variable:	**Using contiguity matrix**			**Using the province matrix**		
$AETR_{i,t}$	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Spatial lag	0.293***	0.262***	0.163***	0.509***	0.467***	0.243**
	(0.049)	(0.051)	(0.061)	(0.053)	(0.058)	(0.097)
Time lag			0.329***			0.265***
			(0.053)			(0.062)
Spatial-time lag			0.232**			0.396***
			(0.102)			(0.141)
% Agriculture	0.328*	0.198	0.103	0.310*	0.207	0.128
	(0.176)	(0.181)	(0.293)	(0.172)	(0.177)	(0.289)
% Manufacturing	-0.100	-0.149*	-0.212*	-0.091	-0.134	-0.231*
	(0.072)	(0.076)	(0.110)	(0.070)	(0.075)	(0.122)
Population density	1.962	1.719	1.362	1.955	1.756	1.236
	(1.304)	(1.298)	(1.595)	(1.273)	(1.274)	(1.570)
Population growth	-13.693	-11.736	-7.779	-13.189	-11.549	-8.016
	(12.055)	(12.200)	(14.447)	(11.767)	(11.965)	(14.210)
GDP per capita	-0.224	-0.541*	-0.280	-0.162	-0.376	-0.122
	(0.248)	(0.288)	(0.398)	(0.242)	(0.283)	(0.394)
Ln(Wage)	31.021	42.826	11.426	32.682	42.607	16.513
	(49.514)	(49.596)	(66.956)	(48.340)	(48.643)	(65.847)
Urbanization	0.035	-0.029	-0.076	0.024	-0.031	-0.055
	(0.400)	(0.398)	(0.460)	(0.390)	(0.390)	(0.452)
Road Growth	6.967***	1.879	-2.832	4.185***	1.005	-3.231
	(1.488)	(2.642)	(3.457)	(1.455)	(2.592)	(3.407)
Ln(Hospital)	-0.445	-0.380	0.156	-0.322	-0.268	0.141
	(0.379)	(0.380)	(0.498)	(0.370)	(0.372)	(0.490)
% College student	0.041	0.247	0.648	0.206	0.328	0.878
	(0.574)	(0.578)	(0.785)	(0.561)	(0.566)	(0.774)
EXP/GDP	42.306***	37.679*	34.167	40.042**	38.465**	29.949
	(14.816)	(15.819)	(23.075)	(14.525)	(15.528)	(22.727)

Output growth	4.885	4.900	-3.113	3.873	3.995	-3.834
	(3.951)	(3.971)	(5.489)	(3.857)	(3.895)	(5.404)
Investment/GDP	-0.410	1.095	1.786	-0.540	0.672	1.354
	(1.623)	(1.841)	(2.669)	(1.585)	(1.806)	(2.630)
% loss-making firms	-3.782	-3.300	-2.575	-3.254	-3.172	-3.197
	(2.386)	(2.518)	(3.531)	(2.329)	(2.470)	(3.482)
Direct effect	1.0237	1.0186		1.0388	1.0302	
Total effect	1.4144	1.335		2.0367	1.8762	
Indirect effect	0.3907	0.3364		0.9979	0.846	
Spatial FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	No	Yes	Yes	No	Yes	Yes
Log likelihood	-1382.987	-1377.007	-1086.542	-1370.717	-1366.907	-1078.304
No. observations	565	565	452	565	565	452

Notes: We use XX as the weight matrix in Columns 1-3, and YY as the weight matrix in Columns 4-6. Robust and clustered standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 5: Reported profits and AETR

		OLS			Within-groups	
Dep. Variable: lnπ	(1)00-13	(2)00-07	(3)08-13	(4)00-13	(5)00-07	(6)08-13
AETR	-2.302***	-1.379***	-4.600***	-3.352***	-0.727***	-2.818***
	(0.149)	(0.165)	(0.259)	(0.161)	(0.198)	(0.291)
lnK	0.475***	0.466***	0.489***	0.300***	0.226***	0.283***
	(0.004)	(0.005)	(0.005)	(0.005)	(0.007)	(0.008)
lnL	0.318***	0.328***	0.303***	0.340***	0.418***	0.200***
	(0.005)	(0.006)	(0.007)	(0.007)	(0.011)	(0.009)
Province FE	Yes	Yes	Yes			
Industry FE	Yes	Yes	Yes			
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Province-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	No	No	Yes	Yes	Yes
Number of groups	60,243	49,467	42,369	60,243	49,467	42,369
Observations	300,096	185,456	114,640	300,096	185,456	114,640
R-squared	0.353	0.344	0.329	0.101	0.078	0.065

Notes: Robust and clustered standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 6: Reported profits and differential tax rate between the host and parent countries

	OLS			Within-groups		
Dep. Variable: lnprofit	(1)00-13	(2)00-07	(3)08-13	(4)00-13	(5)00-07	(6)08-13
DIFF_RATE	-0.623***	-0.692***	-0.524***	-1.173**	-0.234	-2.452***
	(0.165)	(0.204)	(0.189)	(0.496)	(0.734)	(0.782)
lnK	0.448***	0.430***	0.466***	0.341***	0.263***	0.307***
	(0.016)	(0.021)	(0.019)	(0.024)	(0.037)	(0.038)
lnL	0.232***	0.253***	0.206***	0.271***	0.368***	0.167***
	(0.021)	(0.028)	(0.024)	(0.025)	(0.051)	(0.030)
Province FE	Yes	Yes	Yes			
Industry FE	Yes	Yes	Yes			
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Province-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	No	No	Yes	Yes	Yes
Number of groups	3,137	2,471	2,847	3,137	2,471	2,847
Observations	18,001	9,909	8,092	18,001	9,909	8,092
R-squared	0.292	0.293	0.293	0.103	0.110	0.060

Notes: Robust and clustered standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 7: Responses of EBIT and pre-tax profits to tax incentives

Shifting techniques	Semi-elasticity of		% of underlying techniques in total responses
	EBIT	Pre-tax profits	
A. Excluding top 2.5% of EBIT/Pre-tax profits (Mean EBIT/Pre-tax profits=1.230)			
All		0.444	100%
Non-financial	0.284	0.349	79%
Financial		0.09	21%
B. Excluding top 5% of EBIT/Pre-tax profits (Mean EBIT/Pre-tax profits=1.165)			
All		0.407	100%
Non-financial	0.289	0.337	83%
Financial		0.07	17%

Notes: This table reports the estimated semi-elasticity of EBIT and pre-tax profits with respect to DIFF_RATE, based on the matched Oriana-NBS sample. The estimates are obtained from OLS regressions based on Equation 4. We control for industry, province, common year and province-year fixed effects in the regressions.

Table 8: Capital accumulation and local tax incentives, within-groups estimations

Dep. Variable: lnK	(1) 00-13	(2) 00-07	(3) 08-13	(4) 00-13	(5) 00-07	(6) 08-13
AETR	-0.472***	0.100	-0.480***			
	(0.082)	(0.090)	(0.130)			
$\ln(1-\text{AETR})^{-1}$				-0.402***	0.085	-0.426***
				(0.070)	(0.077)	(0.110)
lnQ	0.362***	0.298***	0.332***	0.362***	0.298***	0.332***
	(0.003)	(0.004)	(0.005)	(0.003)	(0.004)	(0.005)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Province-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Number of groups	72,578	60,573	50,628	72,578	60,573	50,628
Observations	443,917	256,307	187,610	443,917	256,307	187,610

Notes: Robust and clustered standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1