Corporate Income Tax Notch and Foreign Ownership Bunching

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Introduction

- Developing countries have carried out a series of policies to attract FDI, including an increased openness to FDI and liberalized ownership rules.

- The choice of firm ownership matters for production efficiency (Grossman-Hart, 1986; Antras Pol. 2003). Theoretical and empirical work has shown the gain in output from eliminating the restrictions on foreign ownership (Lin and Saggi, 2004; Eppinger and Ma, 2019).

- What if the foreign partner is encouraged to hold more share stakes? How do firms respond to it and how does it impact firms' performance? What is the cost of this policy?
Policy Background in China: FDI ownership threshold requirement for tax cuts.

Data pattern: how do firms respond to the policy?

Model: Antras model with tax notch.

Calibration and Counterfactuals.

Concluding remarks.

- Firms with foreign ownership shares that are no less than 25% are qualified for a corporate income tax cut from 33% to 15% or 24%.
- In 2008, this FDI-preferential tax break was eliminated in a tax reform.
Figure 1: Effective Income Tax Rate for Firms Before and After 2008

Notes. This figure plots the empirical distribution of the effective income tax rate for foreign and domestic firms. Observations come from the Annual Survey of Industrial Firms in China, from 1998 to 2007.
### Table 1: Summary Statistics

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Std</th>
<th>P25</th>
<th>P50</th>
<th>P75</th>
<th>Observations</th>
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<tbody>
<tr>
<td><strong>Domestic Firms</strong></td>
<td></td>
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<tr>
<td>Log of Industry Sales</td>
<td>9.759</td>
<td>1.337</td>
<td>8.975</td>
<td>9.657</td>
<td>10.506</td>
<td>849,600</td>
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<tr>
<td>Log of Pre Tax Profit</td>
<td>6.245</td>
<td>1.890</td>
<td>5.130</td>
<td>6.292</td>
<td>7.432</td>
<td>807,970</td>
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<tr>
<td>Log of TFP</td>
<td>0.935</td>
<td>0.261</td>
<td>0.790</td>
<td>0.951</td>
<td>1.105</td>
<td>893,665</td>
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<tr>
<td><strong>Firms with FDI share within range (0,25%)</strong></td>
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</tr>
<tr>
<td>Log of Pre Tax Profit</td>
<td>7.478</td>
<td>2.191</td>
<td>6.131</td>
<td>7.564</td>
<td>8.898</td>
<td>16,929</td>
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<tr>
<td>Log of TFP</td>
<td>1.122</td>
<td>0.243</td>
<td>0.975</td>
<td>1.138</td>
<td>1.286</td>
<td>19,368</td>
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<td><strong>Firms with FDI share within range [25%, 1)</strong></td>
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<td>Log of Pre Tax Profit</td>
<td>7.147</td>
<td>2.047</td>
<td>5.869</td>
<td>7.152</td>
<td>8.465</td>
<td>97,658</td>
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<tr>
<td>Log of TFP</td>
<td>1.033</td>
<td>0.235</td>
<td>0.897</td>
<td>1.051</td>
<td>1.191</td>
<td>115,763</td>
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<td><strong>Wholly-foreign-owned Firms</strong></td>
<td></td>
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<tr>
<td>Log of Pre Tax Profit</td>
<td>7.123</td>
<td>1.950</td>
<td>5.878</td>
<td>7.115</td>
<td>8.410</td>
<td>137,956</td>
</tr>
<tr>
<td>Log of TFP</td>
<td>1.056</td>
<td>0.247</td>
<td>0.913</td>
<td>1.075</td>
<td>1.223</td>
<td>175,555</td>
</tr>
</tbody>
</table>
Notes. This figure plots the empirical distribution of the FIE’s ownership structure. Observations come from the Annual Survey of Industrial Production in China, from 1998 to 2007.
Data Pattern: Bunching

Following the literature (Kleven, 2016; Diamond and Persson, 2016; Chen, Liu, Serrato and Xu, 2021):

\[ c_i = \sum_{k=0}^{p} \beta_k \cdot (b_i)^k + \sum_{j=b_L}^{b_U} \gamma_j \cdot 1[b_i = j] + \]
\[ \sum_{r\in 0.5, 0.1} \rho_r \cdot 1\left[\frac{b_j}{r} \in \mathbb{N}\right] + \rho_{0.5} \cdot 1[b = 0.5] + \epsilon_i \]

- \( c_i \): the probability of falling into a given bin.
- \( \beta_k \): fit polynomials of order \( k \) to the bin counts, excluding bins in the range \((b_L, b_U)\).
- \( \gamma_j \): a bin fixed effect for each bin in the excluded range, which gives a perfect fit in that range.
- \( \rho_r \): the fixed effect associated with round number multiple \( r \) (5 and 10, separately);
Data Pattern: Bunching

\[ c_i = \sum_{k=0}^{p} \beta_k \cdot (b_i)^k + \sum_{j=b_L}^{b_U} \gamma_j \cdot 1[b_i = j] + \]
\[ \sum_{r \in 0.5, 0.1} \rho_r \cdot 1 \left[ \frac{b_j}{r} \in \mathbb{N} \right] + \rho_{0.5} \cdot 1[b = 0.5] + \epsilon_i \]

- \( \rho_{0.5} \): give a perfect fit for the bin of 50%, ruling out the effect of absolute shareholdings.
- The counterfactual is estimated as polynomial terms plus round number effect and majority share holding effect for all bins.
- Use a cross-validation procedure approach to selecting the excluded region \((b_L, b_U)\), and the degree of the polynomial, \(p\).
Data Pattern: Bunching

Figure 3: Bunching at Different Thresholds of FDI Share

- \( f_0(D) \): Counterfactual Density
- \( f_1(D) \): Density With Notch

\[ \Delta d = 0.208(0.035)^{**} \]

P-value (M=B) = 0.9844

Frictions: \( a = 0.461(0.089)^{**} \)

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\[ \ln y_{ft} = \beta_0 + \sum_{j=1}^{J} \beta_j \cdot 1[d_i = j] + \alpha_{ct} + \epsilon_{ft} \]

**Figure 4: Firm Premium (5% Each Bin)**

Data Pattern: Firm Outcomes

![Graph showing various outcomes](image)

Size Premium of FDI/HMT Firms relative to Pure Domestic Firms

- Log number of workers
- Log fixed asset
- Log gross output
- Log profits in total
- Log industrial sale current
- Log TFP

Data: ASM 1998-2007. Point estimates and 95% CI intervals are reported. We control for SOE share, export share, city fixed effect and CIC-year fixed effect.
Data Pattern: Firm Outcomes

Figure 5: Firm Premium (1% Each Bin)

Size Premium of FDI/HMT Firms relative to Pure Domestic Firms

Data: ASM 1998-2007. Point estimates and 95% CI intervals are reported. We control for SOE share, export share, city-fixed effect and CIC-4-digit-year fixed effects.
We use similar settings as (Antras, 2014).

- There are two countries in the world: $H$ and $F$. In $H$ there is a representative consumer with the following CES preference:

$$U = \left[ \int_{\omega \in \Omega} q(\omega)^{\frac{\sigma-1}{\sigma}} d\omega \right]^{\frac{\sigma}{\sigma-1}}$$

- the demand function $q(\omega)$ is

$$q(\omega) = p(\omega)^{-\sigma} \cdot P^{\sigma-1} \cdot X$$

where the CES price index for final goods is

$$P = \left[ \int_{\omega \in \Omega} p(\omega)^{1-\sigma} d\omega \right]^{\frac{1}{1-\sigma}}$$

- We can then write sales $x(\omega) = p(\omega)q(\omega)$ as a function of $q(\omega)$:

$$x(\omega) = p(\omega) \cdot q(\omega) = q(\omega)^{\frac{\sigma-1}{\sigma}} P^{\frac{\sigma-1}{\sigma}} X^{\frac{1}{\sigma}}.$$
Let us see a firm’s motive to bunch its foreign equity share above the certain threshold beyond which a tax rate cut is granted:

- The “ideal” maximization is:

  \[
  \max_{h,m} (\varphi \cdot h^\eta \cdot m^{1-\eta}) \frac{\sigma-1}{\sigma} P \frac{\sigma-1}{\sigma} X \frac{1}{\sigma} \cdot (1 - \tau) - w_h \cdot h - w_m \cdot m \tag{1}
  \]

- The foreign investor chooses \(h\) to maximize the objective:

  \[
  \max_h \beta(\varphi \cdot h^\eta \cdot m^{1-\eta}) \frac{\sigma-1}{\sigma} P \frac{\sigma-1}{\sigma} X \frac{1}{\sigma} \cdot (1 - \tau) - w_h \cdot h \tag{2}
  \]

- The local partner chooses \(m\) to maximize the objective:

  \[
  \max_m (1 - \beta)(\varphi \cdot h^\eta \cdot m^{1-\eta}) \frac{\sigma-1}{\sigma} P \frac{\sigma-1}{\sigma} X \frac{1}{\sigma} \cdot (1 - \tau) - w_m \cdot m \tag{3}
  \]
Solve the problem and we get the solutions in the “ideal” case:

\[ p^*(\varphi) = \frac{\sigma}{\sigma - 1} \left( \frac{w_h}{\eta} \right)^\eta \left( \frac{w_m}{1 - \eta} \right)^{1-\eta} \frac{1}{\varphi} \]

\[ x^*(\varphi) = p^*(\varphi)^{1-\sigma} P^{\sigma-1} X(1 - \tau)^{\sigma} \]

\[ \pi^*(\varphi) = \frac{x^*(\varphi)}{\sigma} \]  \hspace{1cm} (4)

and the new solutions under incomplete contract:

\[ \tilde{p}(\varphi) = \frac{\sigma}{\sigma - 1} \left( \frac{w_h}{\beta \eta} \right)^\eta \left[ \frac{w_m}{(1 - \beta)(1 - \eta)} \right]^{1-\eta} \frac{1}{\varphi} \]

\[ \tilde{x}(\varphi) = \tilde{p}(\varphi)^{1-\sigma} P^{\sigma-1} X(1 - \tau)^{\sigma} \]

\[ \tilde{\pi}(\varphi) = [1 - \frac{\sigma - 1}{\sigma} (\beta \eta + (1 - \beta)(1 - \eta))] \tilde{x}(\eta) \]  \hspace{1cm} (5)
Model

- Combine (4) and (5), we have:

\[ \tilde{\pi}(\varphi) = \delta(\sigma, \eta, \beta)\pi^*(\varphi) \]  

(6)

where

\[ \delta(\sigma, \eta, \beta) = \left[ \sigma - (\sigma - 1)(\beta\eta + (1 - \beta)(1 - \eta)) \right] \left[ \left( \frac{1}{\beta} \right)^\eta \left( \frac{1}{1 - \beta} \right)^{1-\eta} \right]^{1-\sigma} < 1 \]  

(7)

- So the optimal ownership \( \beta^* \), under a flat tax rate scheme, is such that \( \delta(\sigma, \eta, \beta) \) is maximized:

\[ \frac{\beta^*}{1 - \beta^*} = \sqrt{\frac{\eta}{1 - \eta} \frac{1 - \frac{\sigma - 1}{\sigma}(1 - \eta)}{1 - \frac{\sigma - 1}{\sigma}\eta}} \]  

(8)

- The optimal scheme is to allocate a larger share to the foreign investor if its input is more important:

\[ \frac{d}{d\eta} \frac{d\beta^*}{d\eta} > 0 \]
Consider a tax scheme such that to create an incentive to raise foreign equity share:

\[
\tau = \begin{cases} 
\tau^L & \text{if } \beta \geq \beta^* \\
\tau^H & \text{if } \beta < \beta^* 
\end{cases}
\]

Let \( \beta^* \) denote the optimal foreign equity share under the flat tax scheme.

Consider the conditions under which deviating from \( \beta^* \) is optimal.
No Deviation Case 1:

If $\beta^* \geq \beta$, there is no incentive to deviate from $\beta^*$.

No Deviation Case 2:

If $\beta^* < \beta$, we compare the profits under deviation and notching to the cutoff $\beta$

Note that it does not make sense to bunch above $\beta$ because $\delta$ is decreasing in this region.

No deviation means the inefficiency of deviating from $\beta^*$ is larger than the tax benefit:

$$
\delta(\sigma, \eta, \beta^*) \frac{p^*(\varphi)^{1-\sigma} P^{\sigma-1} X(1-\tau^H)^\sigma}{\sigma} > (\delta(\sigma, \eta, \beta) - c) \frac{p^*(\varphi)^{1-\sigma} P^{\sigma-1} X(1-\tau^L)^\sigma}{\sigma}
$$

$$
\Rightarrow \frac{\delta(\sigma, \eta, \beta^*)}{\delta(\sigma, \eta, \beta) - c} > \left( \frac{1-\tau^L}{1-\tau^H} \right)^\sigma
$$

(9)
The firms who find it optimal to bunch satisfy:

\[
\frac{\delta(\sigma, \eta, \beta^*)}{\delta(\sigma, \eta, \beta)} - c < \left( \frac{1 - \tau_L}{1 - \tau_H} \right)^\sigma \tag{10}
\]

- the inefficiency of deviating from \( \beta^* \) is smaller than the tax benefit:
- so given \( \beta^* \), the larger \( \beta - \beta^* > 0 \), the more likely that the firms sticks to \( \beta^* \)
- From which we obtain the lower bound of bunching where the firm is indifferent between deviating or not.
Figure 6: Theoretical Bunching Predictions
Calibration

- $c$: assume it is uniformly distributed on $[0, \mu_c]$.
- $\varphi$: Pareto distribution with the scale parameter normalized to 1, and the shape parameter $k$.
- $c$ varies across firms: big firms have a higher cost to adjust their ownership structure. We allow $c$ and $\varphi$ to be correlated using the Plackett copula, and the parameter $\theta$ governs their correlation.
- Use SMM to calibrate $(\sigma, \mu_c, k, \theta)$, using data moments from the distribution of firm size and $(\Delta d, a)$ from the bunching estimation.
### Table 2: Estimation Results

<table>
<thead>
<tr>
<th>Parameters</th>
<th>$\sigma$</th>
<th>$\mu_c$</th>
<th>$k$</th>
<th>$\theta$</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>2.346</td>
<td>0.320</td>
<td>2.152</td>
<td>20.053</td>
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<tr>
<td></td>
<td>(0.087)</td>
<td>(0.047)</td>
<td>(0.324)</td>
<td>(0.211)</td>
</tr>
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<table>
<thead>
<tr>
<th>Moments</th>
<th>Simulated</th>
<th>Data</th>
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<tr>
<td><strong>TFP distribution</strong></td>
<td></td>
<td></td>
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<tr>
<td>25 quantile/50 quantile</td>
<td>0.833</td>
<td>0.830</td>
</tr>
<tr>
<td>75 quantile/50 quantile</td>
<td>1.162</td>
<td>1.160</td>
</tr>
<tr>
<td><strong>Profit discontinuity</strong></td>
<td></td>
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</tr>
<tr>
<td>Left Side of the Notch</td>
<td>0.296</td>
<td>0.223</td>
</tr>
<tr>
<td>Right Side of the Notch</td>
<td>0.042</td>
<td>0.065</td>
</tr>
<tr>
<td><strong>Bunching Moments</strong></td>
<td></td>
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<tr>
<td>Stayer Ratio</td>
<td>0.550</td>
<td>0.461</td>
</tr>
<tr>
<td>Increase in FDI share</td>
<td>0.221</td>
<td>0.208</td>
</tr>
</tbody>
</table>

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Figure 7: Model Simulation
We list the outcomes before and after bunching. After some algebra, we can decompose the change of firms’ outcome changes into the following:

- **Change in profits:**
  \[
  \ln \tilde{\pi}^B - \ln \tilde{\pi}^{NB} = \ln \left[ \frac{\delta(\sigma, \eta, \beta) - c}{\delta(\sigma, \eta, \tilde{\beta})} \right] + \ln \left[ \frac{\delta(\sigma, \eta, \beta)}{\delta(\sigma, \eta, \tilde{\beta})} \right] + \sigma \left[ \ln(1 - \tau_L) - \ln(1 - \tau_H) \right]
  \]

- **Change in sales:**
  \[
  \ln \tilde{x}^B - \ln \tilde{x}^{NB} = \ln \left( \frac{\Omega(\tilde{\beta})}{\Omega(\beta)} \right) + \sigma \left[ \ln(1 - \tau_L) - \ln(1 - \tau_H) \right]
  \]
  with
  \[
  \Omega(\beta) = \left( \frac{1}{\beta} \right)^{\eta} \left( \frac{1}{1 - \beta} \right)^{1 - \eta}^{(1 - \sigma)}
  \]

- **Change in foreign input:**
  \[
  \ln \tilde{h}^B - \ln \tilde{h}^{NB} = \ln \left( \frac{\beta}{\tilde{\beta}} \right) + \left[ \ln(\tilde{x}(\varphi, \beta, \tau_L)) - \ln(\tilde{x}(\varphi, \tilde{\beta}, \tau_H)) \right]
  \]

- **Change in domestic input:**
  \[
  \ln \tilde{m}^B - \ln \tilde{m}^{NB} = \ln \left( \frac{1 - \beta}{1 - \tilde{\beta}} \right) + \left[ \ln(\tilde{x}(\varphi, \beta, \tau_L)) - \ln(\tilde{x}(\varphi, \tilde{\beta}, \tau_H)) \right]
  \]
Table 3: Decomposition of Outcome Change

<table>
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<tr>
<th></th>
<th>Profits:</th>
<th></th>
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<th>Sales:</th>
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<th>Headquarter Service Inputs:</th>
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<th>Local Service Inputs:</th>
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<tr>
<td></td>
<td>Overall</td>
<td>Inefficiency</td>
<td>Adjustment Cost</td>
<td>Overall</td>
<td>Inefficiency</td>
<td>Tax Gain</td>
<td>Overall</td>
<td>Ownership Share</td>
<td>Total Sales</td>
<td>Overall</td>
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<tr>
<td></td>
<td>0.098</td>
<td>-0.025</td>
<td>-0.094</td>
<td>0.112</td>
<td>-0.105</td>
<td>0.217</td>
<td>0.607</td>
<td>0.495</td>
<td>0.112</td>
<td>0.006</td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
<td>(0.000)</td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.000)</td>
<td>(0.003)</td>
<td>(0.003)</td>
<td>(0.001)</td>
<td>(0.001)</td>
</tr>
</tbody>
</table>
Figure 8: Fiscal Cost of the Policy
Figure 9: Change in Bunching Behaviors
Figure 10: Characteristics of Staying and Bunching Firms
Figure 10: Characteristics of Staying and Bunching Firms

Average Size of Staying Firms

Average Size of Bunching Firms

Partial Equilibrium
General Equilibrium
Smaller firms respond to this tax program by bunching their FDI shares to the tax notch.

The government expends 19.38% of its annual corporate income tax revenue to facilitate a 20.8% increase in foreign investment shares.

Almost half of the tax benefit is used to cover the production loss and adjustment cost.

This research speaks to the importance of having the markets determine the ownership structure of the firms.
Thank You!