Fake Growth, Real Distortions: GDP Manipulation, Export Rebate Delays, and Welfare Losses

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Roadmap

1. Introduction & Motivation
2. Background
3. Model
4. Empirical Strategy & Data
5. Baseline Results
6. Mechanisms
7. Calibration & Welfare
8. Policy Counterfactuals
9. Conclusion

The Big Question

When local officials inflate GDP,

who bears the cost?

- Large literature on GDP manipulation *detection*
  - Nightlight-GDP gap (Henderson et al. 2012; Martinez 2022)
  - Discontinuity in growth distributions (Lyu 2018; Gong 2025)

- **This paper:** Moves past detection to *real consequences*
  - Fake growth $\Rightarrow$ real distortions in international trade
  - Which firms export reflects *politics*, not productivity

What We Do

1. **Exploit** an officially confirmed case of GDP falsification in Weihai, China (2012–2017)
2. **Develop** a heterogeneous-firm trade model (Melitz + Bai et al.)
   - Formalizes the "corrupt bargain" between officials and large firms
   - Delivers a *sufficient statistics* welfare formula
3. **Test** six model predictions using firm-level tax survey data
4. **Quantify** the welfare cost of manipulation

Preview of Main Results

Empirical Findings

- GDP manipulation $\Rightarrow$ **-2.4 pp** export probability for small firms in rebate-exposed industries
- Operates through *delayed rebate processing*, not reduced rebate amounts
- No effect on large firms (complicit in data falsification)

Quantitative Results

- Implied tariff equivalent: **6.2%** ad valorem on affected firms
- Baseline welfare loss: **-2.22%** (robust across $\theta \in [3, 5]$)
- 92.3% of welfare loss from fiscal externality (misallocation), not trade volume

Why This Matters

- China = world's **second-largest economy + largest goods trader**
  - Key trade ties with 150+ countries
- The 6.2% implicit tariff from *domestic governance failure* rivals:
  - Formal MFN tariffs (5–10%)
  - Barriers that decades of WTO negotiations aimed to reduce
- GDP manipulation is widespread:
  - Liaoning: officially acknowledged $\sim$20% overstatement
  - Inner Mongolia: industrial output revised down 40%
  - Martinez (2022): $\sim$30% of autocratic countries manipulate GDP

Contributions

1. **GDP manipulation literature:** From detection to real consequences
   - First to use an *officially verified* case (not nightlight proxies)
   - Show misallocation across firms of different sizes

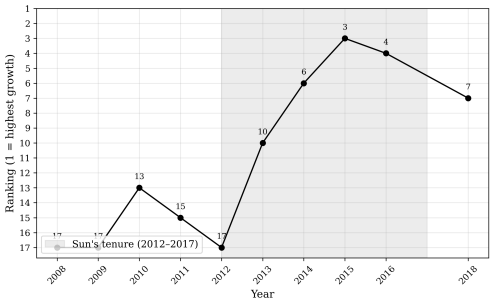
2. **Resource misallocation in trade:** New channel
   - Government-firm collusion $\Rightarrow$ rebate misallocation
   - Export wedge from corruption, not traditional trade frictions

3. **Welfare quantification:** Sufficient statistics approach
   - Extends Bai, Jin & Lu (2024) to GDP manipulation context
   - Transparent: welfare verifiable with pencil and paper

4. **Anti-corruption campaign:** Specific form of misconduct $\rightarrow$ trade distortion

The Weihai Case

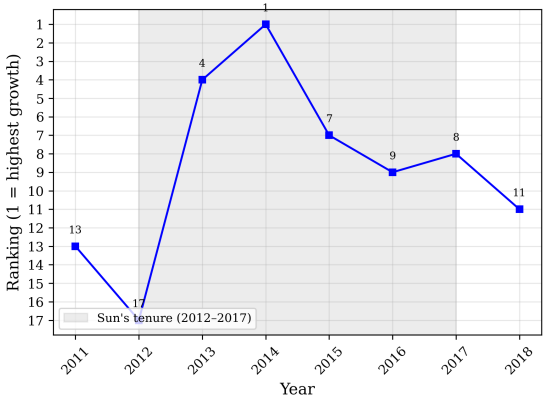
- **Sun Shutao**: Party Secretary of Weihai, 2012–2017
- Directed statistical authorities to *falsify GDP data*
- Established "red–black list" ranking system
  - Quarterly meetings comparing districts
  - Publicly criticized low-ranking officials
- Revealed by CCTV documentary *Anti-Corruption for the People* (2025)
- CCDI investigation began 2023



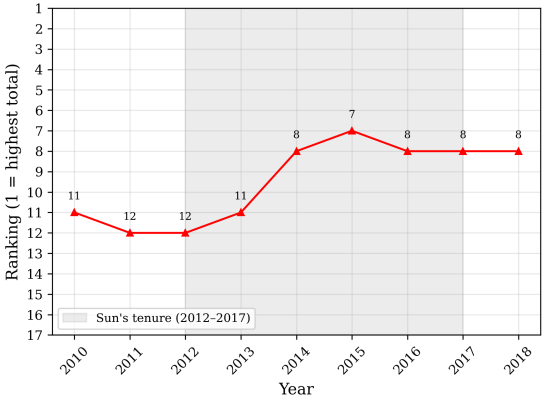
GDP growth ranking within Shandong

(shaded = Sun's tenure)

Evidence: GDP vs. Tax Revenue



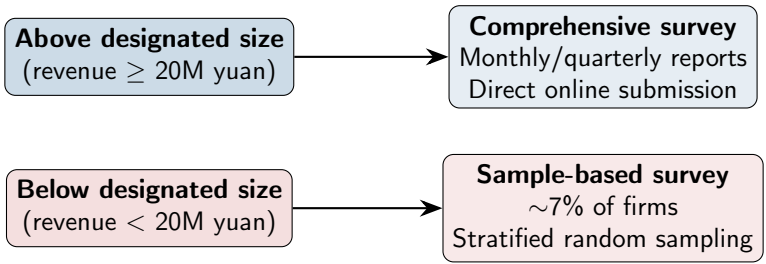
(A) Tax revenue growth rate ranking



(B) Total tax revenue ranking

- Tax data collected by independent tax authorities ("Golden Tax System")
- During Sun's tenure: GDP ranking surged but *tax ranking unchanged*

China's Statistical Survey System



- **Key implication:** Large firms fully involved in GDP manipulation (direct data submission); small firms far less likely to participate
- ⇒ Asymmetric government–firm collusion by size

Export VAT Rebates: The Channel

What are export VAT rebates?

Partial or full refund of taxes paid on exported goods, to eliminate double taxation and ensure fair international trade (WTO guidelines).

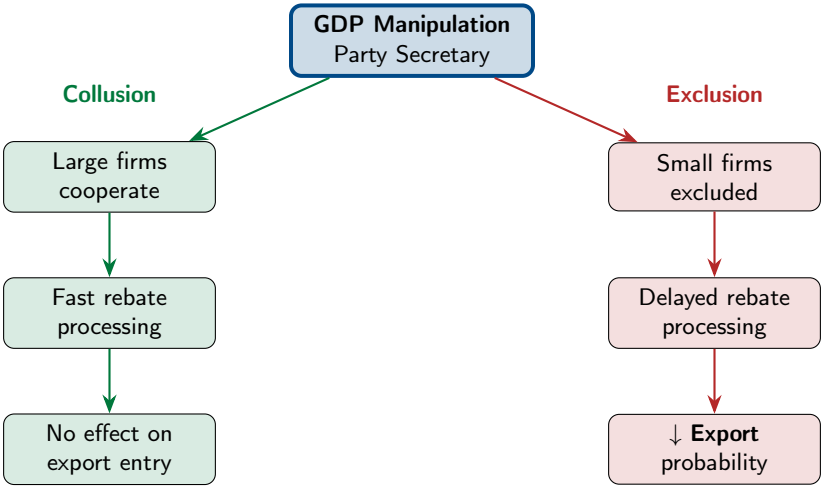
Key institutional features:

- Rebate *amounts* set by central government $\Rightarrow$ local governments have limited influence
- Rebate *processing* managed by local tax authorities $\Rightarrow$ subject to local discretion
- Three-stage procedure: preparation $\rightarrow$ application $\rightarrow$ approval (15 working days)
- **Delays at any stage** $\Rightarrow$ cash flow burden on firms

The corrupt bargain:

- Large firms cooperate in data falsification $\Rightarrow$ get *fast rebate processing*
- Small firms excluded $\Rightarrow$ *delayed rebates* $\Rightarrow$ higher cost of exporting

Mechanism: A Visual Summary



Model Overview

- **Framework:** Melitz (2003) + firm-specific distortions (Bai et al. 2024)
- **Three purposes:**
  1. Generate testable predictions (6 propositions)
  2. Deliver a *sufficient statistics* welfare formula
  3. Provide a tariff-equivalent metric for policymakers
- **Key adaptation:** Distortion arises from the corrupt bargain
  - Firms cooperating in GDP inflation get $\tau = 1$
  - Non-participating small firms face $\tau > 1$
- **Small open economy** (Weihai = 0.3% of China's GDP)

Model Setup: Demand & Supply

Demand: CES preferences, elasticity $\sigma > 1$

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

Supply:

- Sunk entry cost f_e, then draw productivity $z \sim$ Pareto:

$$G(z) = 1 - \left(\frac{z_{\min}}{z}\right)^{\theta}, \quad z \geq z_{\min}$$

- Fixed costs: domestic f_d, export $f_x > f_d$; iceberg trade cost κ
- Constant-markup pricing: $p_d(z) = \frac{\sigma}{\sigma-1} \cdot \frac{w}{z}$

Key parameters:

σ	CES elasticity of substitution
$\theta > \sigma - 1$	Pareto shape (trade elasticity)

The Export Wedge

Firm-specific distortion

$$\tau_{ij} = 1 + \delta \cdot b_j \cdot (1 - S_i) \cdot M_c$$

$\delta > 0$	Intensity of rebate delay penalty
$b_j \in [0, 1]$	Industry j's rebate exposure (share of costs recoverable)
$S_i \in \{0, 1\}$	$= 1$ if firm above designated size
$M_c \in \{0, 1\}$	$= 1$ if city has GDP manipulation

	Rebate-exposed ($b_j > 0$)	**Non-rebate** ($b_j = 0$)
Large ($S_i = 1$)	$\tau = 1$	$\tau = 1$
accentred!10 Small ($S_i = 0$)	$\tau = 1 + \delta b_j > 1$	$\tau = 1$

Micro-Founding the Wedge

- Firm has export revenue r_x and statutory rebate rate b_j
- **Normal processing:** receives rebate promptly $\Rightarrow$ effective revenue $= r_x$
- **Under manipulation:** rebate delayed by d periods at interest rate ρ

$$\text{Effective revenue} = r_x \left[1 - b_j \left(1 - \frac{1}{(1+\rho)^d}\right)\right] = \frac{r_x}{\tau_{ij}}$$

where $\delta \equiv (1+\rho)^d - 1$ is the gross interest cost of the delay.

Calibrated magnitude

- Average rebate rate: $\bar{b} = 0.065$
- Estimated $\hat{\delta} = 0.96$
- Average wedge: $\bar{\tau} = 1 + 0.96 \times 0.065 = 1.062$
- $\Rightarrow$ **6.2% ad valorem tax** on small firms' exports

Export Entry Decision

Export profit:

$$\pi_x(z, \tau_{ij}) = \frac{1}{\tau_{ij}} \cdot \frac{r_x^0(z)}{\sigma} - wf_x$$

Export cutoff:

$$z_x^*(\tau_{ij}) = z_x^0 \cdot \tau_{ij}^{\frac{1}{\sigma-1}}$$

Since $\tau_{ij} \geq 1$: cutoff $\uparrow \Rightarrow$ fewer firms export

Export probability (Pareto distribution):

$$\Pr(\text{export} \mid \tau_{ij}) = \left(\frac{z_{\min}}{z_x^0}\right)^{\theta} \cdot \tau_{ij}^{-\frac{\theta}{\sigma-1}}$$

Change due to manipulation:

$$\Delta \Pr_j = \underbrace{\Pr_0}_{\text{baseline}} \times \left[1 - (1 + \delta b_j)^{-\frac{\theta}{\sigma-1}}\right] > 0$$

Welfare with Misallocation

Standard ACR result (no distortions):

$$\ln\left(\frac{W}{W_{\text{aut}}}\right) = -\frac{1}{\theta}\ln\lambda_R$$

With firm-specific distortions (Bai et al. 2024):

Sufficient Statistics Welfare Formula

$$\boxed{d\ln W = \frac{1}{\theta}\left[d\ln\lambda_L - d\ln\lambda_R\right]}$$

- λ_R = domestic *revenue* share
- λ_L = domestic *labor* share
- Gap $d\ln\lambda_L - d\ln\lambda_R$ = **fiscal externality**
- Revenue overstates productive contribution of subsidized exporters

All structural parameters $(f_d, f_x, f_e, \kappa, z_{\min})$ *are integrated out!*

Welfare in DID Framework

Using control cities as counterfactual:

$$\Delta \ln W = \frac{1}{\theta} \left\{ \underbrace{\left[\Delta \ln \lambda_L^{\text{Weihai}} - \Delta \ln \lambda_L^{\text{control}} \right]}_{\text{DID of labor share}} - \underbrace{\left[\Delta \ln \lambda_R^{\text{Weihai}} - \Delta \ln \lambda_R^{\text{control}} \right]}_{\text{DID of revenue share}} \right\}$$

Intuition:

- Without distortions: labor and revenue shares move in lockstep
- Manipulation channels revenue toward *favored* (large) firms
- But labor follows *productivity*, not political connections
- $\Rightarrow$ Shares diverge $\Rightarrow$ welfare loss

Transparency: Welfare verifiable with 4 numbers from data + pencil & paper!

Six Model Predictions

P1. **Small firms:** Export probability *falls* in rebate industries ✓

P2. **Large firms:** No effect (regardless of industry) ✓

P3. **Non-rebate industries:** No effect on small firms ✓

P4. **Heterogeneous effects:** Increasing in b_j and δ ✓

→ Concentrated in delayed-rebate industries

P5. **Welfare:** Falls under manipulation (fiscal externality) ✓

P6. **Intensive margin:** Theoretically ambiguous, zero under Pareto

→ Selection effect (↑) exactly offsets revenue reduction (↓)

⇒ All six predictions are tested in the empirical analysis

Difference-in-Differences Design

Specification

$$Entry_{fct} = \alpha \underbrace{(Manipulation_c \times Post12_t)}_{\text{DID}} + X'_{ft}\lambda + \delta_f + \delta_t + \varepsilon_{fct}$$

$Entry_{fct}$	$= 1$ if firm f exports in year t
$Manipulation_c$	$= 1$ if city is Weihai
$Post12_t$	$= 1$ for years ≥ 2012
X'_{ft}	Capital-labor ratio, employment, fixed assets, ROA
δ_f, δ_t	Firm and year fixed effects

Identification: Within-firm variation; sample split by firm size (above/below designated size)

Data: National Tax Survey

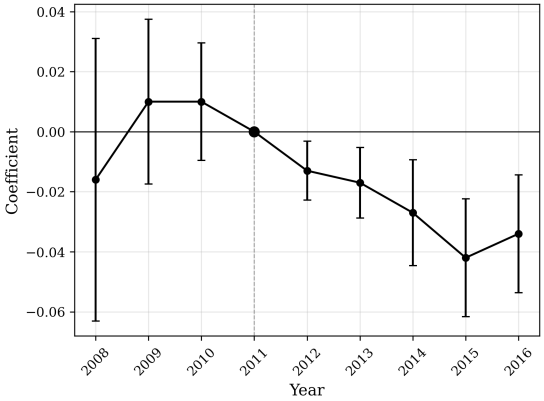
- **Source:** National Tax Survey Database, 2008–2016
  - Compiled by State Taxation Administration + Ministry of Finance
  - *Not* from local statistical departments (reduces manipulation concern)
- **Coverage:** 258,354 firm-year observations in Shandong Province
  - 16 prefecture-level cities
  - Weihai: 6.8% of observations (treatment)
- **Key variables:**
  - Export status, export values
  - Tax payments, VAT rebates (declared vs. received)
  - Firm characteristics (assets, employment, profits)
- **Advantage over ASIF:** Detailed tax/rebate data + large sample of small firms

Baseline Results (Table 2)

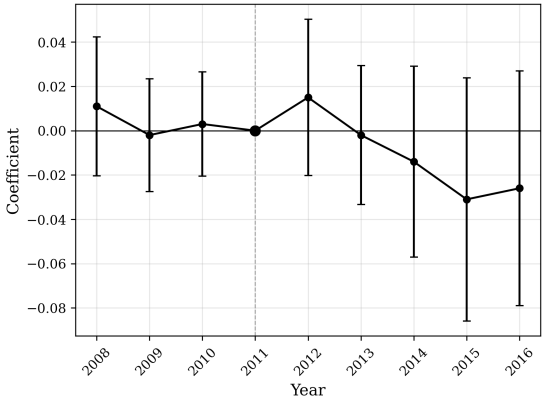
	$Entry_{ft}$			
	Panel A: Below size		Panel B: Above size	
	(1)	(2)	(3)	(4)
$Manipulation_c \times Post12_t$	-0.022^{***}	$\mathbf{-0.022}^{***}$	-0.010	-0.007
	(0.005)	(0.005)	(0.016)	(0.016)
Controls	No	Yes	No	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
N	177,690	177,690	80,664	80,664
Adj. R^2	0.883	0.885	0.898	0.899

- **Small firms:** GDP manipulation reduces export probability by **2.2 pp**
- **Large firms:** No significant effect $\Rightarrow$ consistent with P1 and P2

Validity: Dynamic Treatment Effects



(A) Below designated size



(B) Above designated size

- **Pre-2012:** Coefficients insignificant ⇒ no pre-trends
- **Post-2012:** Negative, significant, and growing for small firms

Validity: Placebo Tests

	Below size			Above size		
	(1) Dynamic	(2) Random	(3) Post10	(4) Dynamic	(5) Random	(6) Post10
Random DID		0.000			0.000	
		(0.000)			(0.000)	
Placebo (2010)			−0.010			0.001
			(0.012)			(0.006)
N	177,690	—	177,690	80,664	—	80,664

- **Random reassignment (500 reps):** Mean coefficient ≈ 0 and insignificant
- **False timing (2010):** Insignificant and small
- Both placebo tests support causal interpretation

Inference with Few Clusters

Challenge: Treatment varies at city level (1 treated city among 16)

Clustering scheme	SE	p-value	Significant?
Firm level (baseline)	0.005	< 0.001	✓
City level (16 clusters)	0.004	< 0.001	✓
City $\times$ Year (144 clusters)	0.006	< 0.001	✓
Permutation test	—	0.062	✓(10% level)

- Permutation: Weihai has the most negative coefficient among all 16 cities
- $p = 1/16 = 0.062$ is the *minimum attainable* p-value $\Rightarrow$ strongest possible rejection
- Wild cluster bootstrap uninformative with 1 treated cluster (MacKinnon et al. 2018)

Robustness (Table 4)

	(1) Logit	(2) Alt. size threshold	(3) Yantai control	(4) Drop sub-provincial	(5) Tax control	(6) Subsidy control	(7) TFP control
				Panel A: Below designated size			
DID	−0.669***	−0.018***	−0.016**	−0.023***	−0.022***	−0.039***	−0.029***
				Panel B: Above designated size			
DID	0.714	0.000	0.004	−0.015	−0.006	−0.016	−0.015

- Results robust to: logit specification, alternative size cutoffs, Yantai-only control, excluding sub-provincial cities, controlling for taxes/subsidies/TFP
- Large firms: always insignificant

Mechanism I: Export VAT Rebates (Table 5)

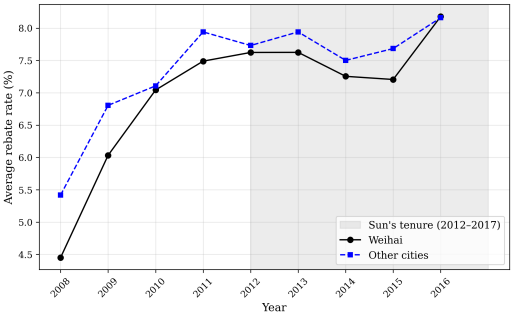
Test P3: Split sample by rebate eligibility

	Below size		Above size	
	Rebate (1)	Non-rebate (2)	Rebate (3)	Non-rebate (4)
$Manipulation_c \times Post12_t$	-0.024^{***}	0.002	−0.011	−0.000
	(0.006)	(0.002)	(0.019)	(0.000)
N	94,624	21,188	48,752	8,875

- **−2.4 pp** for small firms in rebate-exposed industries
- Zero for small firms in non-rebate industries ⇒ isolates the VAT rebate channel
- Zero for large firms regardless ⇒ confirms P2–P3

Mechanism II: Rebate Amount vs. Efficiency

Rebate amount:



Rebate rates: Weihai vs. other cities

No divergence around 2012

⇒ Local governments *cannot* influence amounts

Rebate efficiency (Table 6):

Split by delay status (industry×year level):

	Delayed	Non-delayed
	Below size	
DID	**−0.027*****	0.000
	(0.006)	(0.000)
N	82,620	25,590
	Above size	
DID	−0.018	0.002
	(0.021)	(0.002)

⇒ Effect operates through *delay channel*

Mechanism III: Rebate Delays at Industry Level (Table 7)

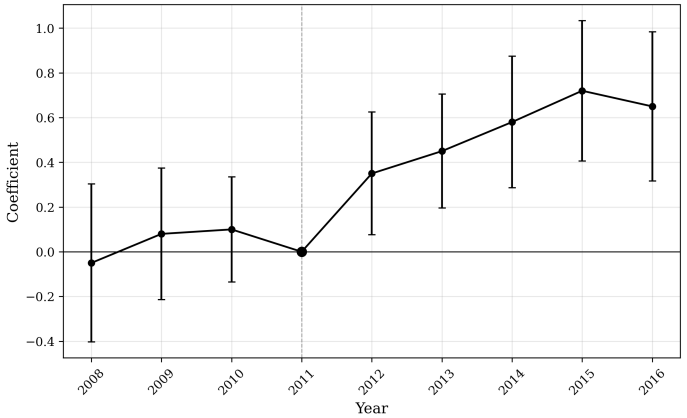
Triple-difference: Does manipulation increase delays for small firms?

$$Number_{cjst} = \beta(Manipulation_c \times Post12_t \times Below_{cjst}) + X'_{cjst}\lambda + \{FE\} + \varepsilon$$

	(1)	(2)
$Manipulation_c \times Post12_t \times Below_{cjst}$	0.587^{***}	$\mathbf{0.611}^{***}$
	(0.116)	(0.114)
City-Year, Ind-Year, City-Ind FE	Yes	
City-Industry-Year FE		Yes
N	5,108	3,474

GDP manipulation raises the number of below-threshold firms with rebate delays by **61%**

Dynamic Effects on Rebate Delays



- Pre-2011 coefficients largely insignificant $\Rightarrow$ no pre-trends
- Post-2012: positive, significant, and growing
- Supports identifying assumption of triple-DID design

Alternative Explanations (Table 8)

	(1) Financing constraints	(2) Tax evasion	(3) Resource allocation	(4) Industry-year FE
	Below designated size			
DID	-0.024^{***}	-0.022^{***}	-0.020^{***}	-0.017^{***}
	(0.005)	(0.005)	(0.005)	(0.005)
	Above designated size			
DID	-0.007	-0.007	-0.008	0.003
	(0.017)	(0.016)	(0.016)	(0.016)

Results robust to controlling for:

- Credit constraints (accounts payable ratio)
- Effective tax burden (income tax / profits)
- TFP dispersion (resource allocation efficiency)
- Industry×year fixed effects (production structure)

Intensive Margin (Table 10) & Domestic Substitution (Table 9)

Intensive margin (P6):

	Below	Above
DID	0.047	−0.014
	(0.032)	(0.105)
N	40,371	20,921

- ✓ No significant effect on export *values*
- Consistent with Pareto selection offset (P6)
- Welfare channel operates through *extensive* margin

Domestic market substitution:

	Exporters	Non-exp.
DID	0.266***	0.073
	(0.057)	(0.122)
N	32,376	24,805

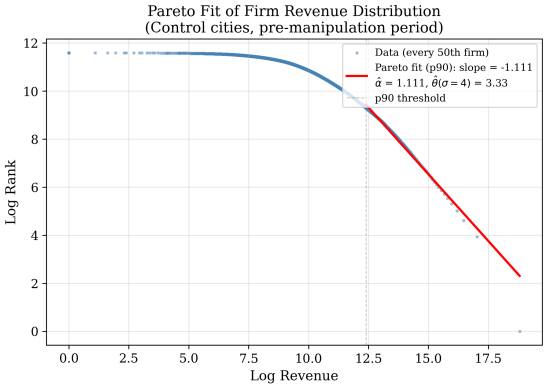
- ✓ Small *exporting* firms redirect to domestic market
- Non-exporters unaffected (natural placebo)
- Consistent with model: when τ rises, domestic return increases

Calibration Strategy

Parameter	Method	Source	In welfare formula?
θ (trade elasticity)	Estimate from data	Pareto fit	**Yes**
σ (CES elasticity)	External calibration	Literature ($= 4$)	No
δ (distortion intensity)	Back out from DID	Table 5 Col. 1	No
b_j (rebate exposure)	Construct from data	Rebate/VAT rate	No
λ_R (revenue share)	Compute from data	City-level	**Yes**
λ_L (labor share)	Compute from data	City-level	**Yes**
$f_d, f_x, f_e, \kappa, z_{\min}$	**Not needed**	Integrated out	No

Key advantage: Only 3 objects enter the welfare formula $(\theta, \lambda_R, \lambda_L)$
All other structural parameters are *sufficient-statistics'd* away!

Estimating θ: Pareto Tail



Log rank vs. log revenue

Control cities, pre-period

Hill estimator at p90 threshold:

- $N = 108,060$ firms with positive revenue
- p90 threshold: 243,501 RMB
- $N_{\text{tail}} = 10,806$

$$\hat{\alpha} = 0.976 \;\Rightarrow\; \hat{\theta} = 2.93$$

- Bootstrap SE: 0.02
- 95% CI: [2.88, 2.98]

Baseline: $\theta = 4$ (Bai et al. 2024)

- Conservative relative to data estimate
- Standard range: $\theta \in [3, 5]$

Calibrating δ

From the model, the extensive margin DID coefficient satisfies:

$$\underbrace{0.024}_{\text{Data}} = \underbrace{0.309}_{\text{Pr}_0} \times \left[1 - \left(1 + \delta \times \underbrace{0.065}_{\bar{b}}\right)^{-\theta/(\sigma-1)}\right]$$

Solving numerically:

θ	σ	$\hat{\delta}$	$\hat{\delta} \times \bar{b}$
3	4	1.30	0.084
mainblue!10 4 (baseline)	4	**0.96**	**0.063**
5	4	0.77	0.050

- **Interpretation:** $\hat{\delta} = 0.96 \Rightarrow$ average wedge of 6.2%
- Equivalent to: rebate delay imposes a present-value cost equal to 96% of the rebate value

Model Validation: 5 Moments

Moment	Data	Model	Targeted?	Source
Panel A: Extensive margin				
Small, rebate	$-\mathbf{0.024}^{***}$	-0.024	Yes	Table 5 Col. 1
Small, non-rebate	0.002	0.000	No	Table 5 Col. 2
Large, rebate	-0.011	0.000	No	Table 5 Col. 3
Large, non-rebate	-0.000	0.000	No	Table 5 Col. 4
Panel B: Intensive margin				
Small, delayed	0.047	≈ 0	No	Table 10 Col. 1

- **1 targeted + 4 untargeted** moments $\Rightarrow$ all matched
- RMSE across 4 untargeted moments: 0.024 (small vs. $\text{Pr}_0 = 0.309$)
- None of the untargeted moments is statistically different from the model prediction

Welfare Inputs: Lambda Values

	Weihai		Control cities	
	Pre	Post	Pre	Post
λ_R (revenue share)	0.683	0.687	0.894	0.893
λ_L (labor share)	0.353	0.290	0.609	0.543

Back-of-envelope welfare calculation:

$$d\ln\lambda_R = [\ln(0.687) - \ln(0.683)] - [\ln(0.893) - \ln(0.894)] = \mathbf{+0.007}$$

$$d\ln\lambda_L = [\ln(0.290) - \ln(0.353)] - [\ln(0.543) - \ln(0.609)] = \mathbf{-0.082}$$

$$\text{Fiscal ext.} = d\ln\lambda_L - d\ln\lambda_R = -0.082 - 0.007 = \mathbf{-0.089}$$

$$\Delta \ln W = \frac{1}{4} \times (-0.089) = \mathbf{-2.22\%}$$

Welfare Results

	All SD controls	Yantai only	Leave-one-out
$\theta = 3$	-2.96%	-1.79%	$[-3.28\%, -2.02\%]$
mainblue!10 $\theta = 4$ (baseline)	-2.22%	-1.34%	$[-2.46\%, -1.51\%]$
$\theta = 5$	-1.77%	-1.07%	$[-1.97\%, -1.21\%]$
Fiscal externality	-0.089	-0.054	$[-0.098, -0.061]$

- **Baseline:** -2.22% welfare loss (robust across $\theta \in [3, 5]$)
- **Leave-one-city-out:** No single city drives the result
- Largest cost when Jining dropped (-2.46%); smallest when Qingdao dropped (-1.51%)

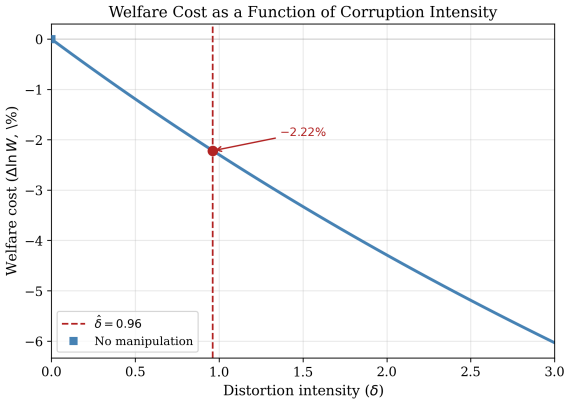
Welfare Decomposition

Component	All SD controls	Yantai only
Revenue reallocation $-(1/\theta)d \ln \lambda_R$	-0.17%	$+0.09\%$
accentred!10 Labor reallocation (fiscal externality)	-2.05%	-1.44%
Total welfare loss	-2.22%	-1.34%

Key Finding

- Revenue reallocation: only **7.7%** of total loss
- Fiscal externality: **92.3%** of total loss
- Aggregate trade volume barely changed (λ_R: 0.683 $\rightarrow$ 0.687)
- Welfare loss from *who* exports, not *how much* is exported
- $\Rightarrow$ Selection distortion, not trade volume effect

Welfare Gradient



Welfare cost as a function of δ

Dashed line = estimated $\hat{\delta} = 0.96$

- $\delta = 0$: no cost
- $\delta = 0.48$ (half): -1.15%
- $\delta = 0.96$ (est.): $\mathbf{-2.22\%}$
- $\delta = 1.93$ (double): -4.15%

Shape: Slightly concave

- Marginal welfare cost is *decreasing*
- First unit of corruption most harmful
- Most vulnerable marginal exporters blocked first

Tariff Equivalent of Manipulation

For affected firms

$$\bar{\tau} = 1 + \hat{\delta} \times \bar{b} = 1 + 0.96 \times 0.065 = 1.062 \;\Rightarrow\; \textbf{6.2\% ad valorem tariff}$$

Aggregate tariff equivalent:

- Affected firms' share: 59.9% of employment, 38.5% of revenue
- Employment-weighted: 3.7%
- Revenue-weighted: 2.4%

Context:

- China's MFN tariffs on manufactures: 5–10%
- This implicit tax generated entirely by *domestic governance failure*
- Rivals barriers that decades of WTO negotiations aimed to reduce

Scaling Up: National Implications

Share of export cities	0.25× Weihai	0.5× Weihai	1× Weihai
10%	−0.06%	−0.11%	−0.22%
25%	−0.15%	−0.29%	−0.55%
50%	−0.29%	−0.57%	−1.11%

- Even conservative assumptions (10% of cities, 25% intensity) $\Rightarrow -0.06\%$
- Martinez (2022): $\sim$30% of autocratic countries manipulate GDP
- If 25% of cities at 50% intensity: -0.29% national welfare cost
  - Comparable to gains from a moderate trade liberalization

Industry Concentration

- Among 49 rebate-exposed 3-digit industries in Weihai:

- **Top 10 industries:** 60.5% of total welfare cost
- **Top 17 industries:** 80% of total welfare cost

- Most affected: industries combining
  - Moderate-to-high rebate intensity (b_j)
  - Large employment presence

- **Policy implication:** Targeted audits of rebate processing in a small number of high-exposure sectors could mitigate the bulk of welfare costs

External Validity

Why the mechanism generalizes beyond Weihai:

1. **Institutional generality:** Three ingredients operate nationally
   - Size-based statistical surveys
   - Locally administered export rebates
   - Promotion-linked GDP incentives

2. **Conservative benchmark:** Weihai's overstatement was moderate
   - Liaoning: $\sim$20% overstatement (roughly 2$\times$ Weihai)
   - Inner Mongolia: 40% industrial output revision

3. **Nightlight evidence:** Panel regression within Shandong
   - Nightlight-GDP gap $\Rightarrow$ lower small-firm export rate ($\beta = -0.099$, $p = 0.15$)
   - Correct sign but insignificant (only 16 prefectures)

Summary of Findings

1. **GDP manipulation creates real distortions**
   - Reshapes which firms export: politics, not productivity
   - Small firms: -2.4 pp export probability (rebate industries)
   - Large firms (complicit): unaffected

2. **Channel: Rebate efficiency, not amount**
   - Small firms face delayed rebate processing
   - Effect concentrated in industries with existing delays

3. **Welfare cost: -2.22%**
   - 92.3% from fiscal externality (misallocation)
   - 6.2% implicit tariff on affected firms
   - Robust across θ, control groups, leave-one-out

Broader Implications

1. **Detection → Consequences:** GDP manipulation is not just a statistical problem
2. **Domestic corruption → Trade distortion:** Implicit tariffs from governance failures rival formal trade barriers
3. **Allocative efficiency:** Informal government-firm hierarchies undermine the gains from trade
4. **For trading partners:** Mix of Chinese suppliers shaped by politics of local governance, not just comparative advantage
5. **Policy:** Targeted audits of rebate processing in high-exposure sectors could mitigate welfare costs efficiently

Thank You

Questions & Comments?

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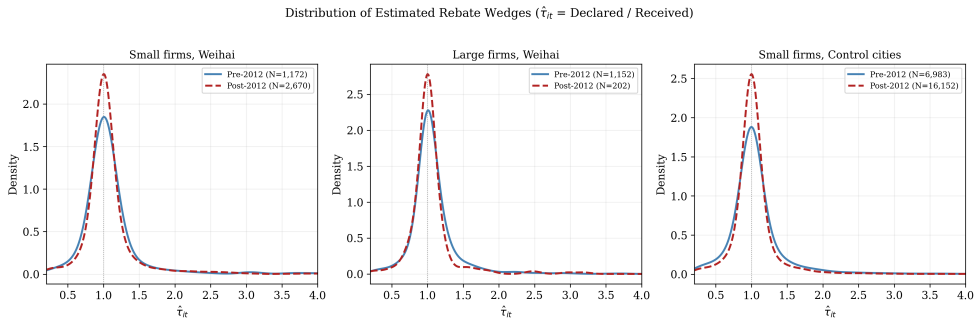
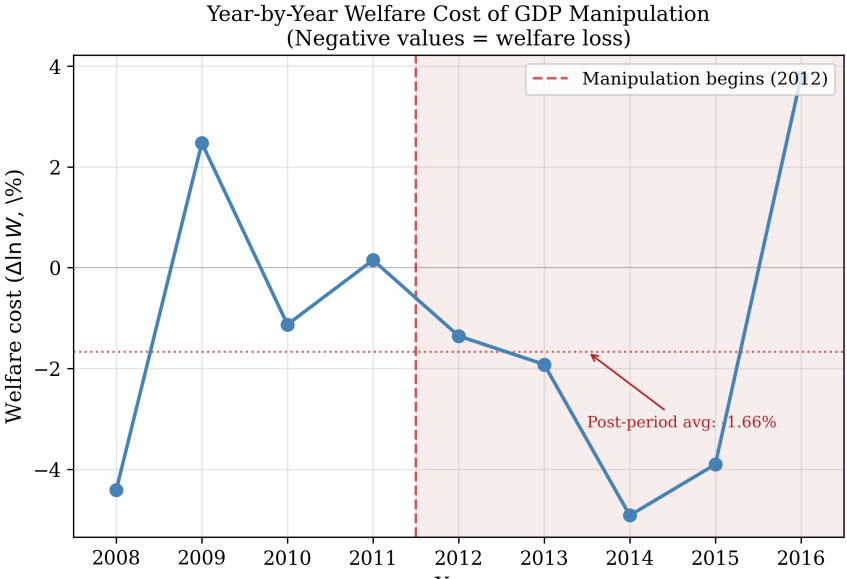
Appendix

Wedge Distribution



Distribution of $\hat{\tau}_{it}$ = Declared/Received rebate. Vertical line: $\tau = 1$. Small firms in Weihai shift rightward post-2012.

Welfare Trajectory



σ Sensitivity

σ	3	4 (baseline)	5	6
Implied $\hat{\theta} = \hat{\alpha}(\sigma - 1)$	1.95	2.93	3.91	4.88
$\Delta \ln W$ (data $\hat{\theta}$)	-4.54%	-3.03%	-2.27%	-1.82%
$\Delta \ln W$ ($\theta = 4$)	-2.22%	-2.22%	-2.22%	-2.22%

- σ affects welfare *only* through θ
- With externally calibrated $\theta = 4$: welfare invariant to σ
- Data-based $\hat{\theta}$: welfare ranges from -1.82% to -4.54%

Inference Comparison (Appendix Table A1)

		City (16)		City×Year (144)		Perm.
Specification	Coeff.	SE	p	SE	p	p
Baseline (below)	−0.022	0.004	<0.001	0.006	<0.001	0.062
Rebate (below)	−0.024	0.005	<0.001	0.006	<0.001	0.062
Non-rebate (below)	0.002	0.000†	<0.001†	0.002	0.334	—
Ind-yr FE (below)	−0.017	0.004	0.001	0.006	0.004	—
Domestic sales	0.276	0.034	<0.001	0.040	<0.001	—
Intensive (ln)	0.055	0.037	0.157	0.047	0.237	—

†City-level SE collapses for non-rebate (minimal within-city variation); city×year benchmark: $p = 0.334$.

Summary Statistics (Table 1)

Variable	Obs	Mean	Std. dev.	Definition
$Entry_{ft}$	258,354	0.303	0.460	Export status
$Manipulation_{c}$	258,354	0.068	0.252	Weihai dummy
$Post12_{t}$	258,354	0.544	0.498	Post-2012 dummy
K/L_{ft}	258,354	3.515	1.933	ln(capital-labor ratio)
$Employment_{ft}$	258,354	3.760	1.589	ln(employees)
Fix_{ft}	258,354	0.203	0.228	Fixed assets / total assets
ROA_{ft}	258,354	-0.028	0.192	Return on assets
$Number_{cjst}$	5,108	1.210	1.017	ln(firms with delays)
$Export_{ft}$	75,361	9.053	2.116	ln(export value)