Impact of Border Rejection Experience on Export Performance: Firm-level Evidence from China

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Introduction

- Despite progress in reducing tariffs, **Non-Tariff Measures (NTMs),** particularly technical measures (consumer safety, food safety, public health), are becoming more important.

- Exporters need to comply with each country's unique technical regulations and standards.
  - Even with the same policy objectives, specific requirements vary by country.

- **Border Rejection** occurs when shipments fail to meet regulations at the port of entry.

How do exporters react to border rejection?

Key Aspects: Dual Role of Compliance.

- Compliance with technical requirements can act as a **trade barrier** but also as a **catalyst** by forcing firms to improve capacity and quality.
  - Especially relevant for exporters from developing countries (Beghin et al., 2015).

Research Questions:

- Does a border rejection increase the likelihood of firms exiting the market?
- Does it encourage firms to adjust and continue exporting?

- Investigating market exit, entry, and impact on export performance (quantity, price, quality).

Methodology

Data Sources:

- US FDA Import Refusal Report (IRR), 2002-2013.
  - Manufacturers responsible for rejected shipments; rejected products details.
- Chinese Customs Trade Statistics (CCTS), 2000-2013.
- Annual Survey of Industrial Firms (ASIF), 2000-2013.

➔ Linked by firm name and address, products aggregated to HS 4-digit.

Empirical Method:

- Examine the impact of border rejection on **extensive margin** (exit, entry) and **intensive margin** (quantity, price, quality) of firm's exports.

Key Findings

Main Impact of Past Border Rejection:

- Firms face **increased likelihood of market exit**.
- (Re-)entry into the market is discouraged.
- Firms continuing to export despite a border rejection experience **increased export quantity** and **improved product quality**.

- Compliance with technical requirements act as **barriers** but also as **catalysts**, stimulating firms to adapt and upgrade capabilities.

Related Literature

- Trade effects of *de-facto* technical measures
  - Chen et al. (2006); Fontagné et al. (2015).
- Trade effects of border rejections
  - Origin x HS 2 or 4 level: Grundke and Moser (2019); Jaud et al. (2013).
  - Firm-level: Beestermöller, Disdier, and Fontagné (2018).
- Determinants of border rejections
  - Origin x HS 2 or 4 level: Baylis et al. (2009); Jouanjean et al. (2015).
- Catalyst role of Food Safety Standards
  - Conceptual and case studies: World Bank (2005); Henson and Jaffe (2008).
  - Country-level evidence: Anders and Caswell (2009); Maertens and Swinnen (2009).

Our Research:

- First study to identify manufacturers whose products were rejected and analyze the trade effects of rejection experience at the firm level.

Estimating Equation (Baseline)

$$y_{ipt} = \alpha + \beta_1 Rejection_{ip,t-1} + \beta_2 \ln Size_{i,t-1} + \mu_i + \psi_p + \phi_{HS2,t} + \varepsilon_{ipt}$$

Dependent Variable:

Exports of Chinese firm i to the US for HS 4-digit product p in year t.

Extensive Margin:

- **Exit Dummy**: $= 1$ if firm i stops exporting p to the US in t.
- **(Re-)Entry Dummy**: $= 1$ if firm (re-)starts exporting p to the US in t.

Intensive Margin:

- **Export Value**: $= \ln($value of continued exports in $t)$

Estimating Equation (Baseline)

$$y_{ipt} = \alpha + \beta_1 Rejection_{ip,t-1} + \beta_2 \ln Size_{i,t-1} + \mu_i + \psi_p + \phi_{HS2,t} + \varepsilon_{ipt}$$

Intensive Margin:

ln(export value) is decomposed into

- **Quantity**;
- **Deflated unit price**, using Chinese industry output deflators (Brandt et al., 2012);
- **Estimated effective quality**, as it enters consumer's utility (Khandelwal et al., 2013), using the US import elasticities of substitution (Broda and Weinstein, 2006).

Estimating Equation (Baseline)

$$y_{ipt} = \alpha + \beta_1 Rejection_{ip,t-1} + \beta_2 \ln Size_{i,t-1} + \mu_i + \psi_p + \phi_{HS2,t} + \varepsilon_{ipt}$$

Key Explanatory Variable:

- **Rejection Dummy**: $= 1$ if product p exported by firm i is rejected at the US border in $t-1$ (or $t-2$ for market entry).

Other Variables:

- Firm Size: ln(employees in $t-1$), to control for firm heterogeneity.
- Fixed Effects: Firm-, product-, and industry-year-specific attributes.

Basic Estimates (year(0~+2))

Dependent variable:	Exports to the US market in year t					
	Extensive margin		Intensive margin			
Regressor	Exit dummy	(Re-)entry dummy	ln(Value)	ln(Quantity)	ln(Price)	ln(Quality)
Rejection dummy in t-1 (t-2)	0.156***	-0.0709***	0.609***	0.536***	0.0377	1.442**
	(0.0193)	(0.0109)	(0.158)	(0.158)	(0.138)	(0.574)
ln(Firm size in t-1)	0.00190***	0.00334***	0.00278	-0.00454	0.0103	0.0295
	(0.000451)	(0.000397)	(0.00955)	(0.00973)	(0.00768)	(0.0371)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Product (HS4) FE	Yes	Yes	Yes	Yes	Yes	Yes
HS2-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,981,209	1,923,750	350,854	341,011	341,011	263,252
R-squared	0.182	0.070	0.448	0.590	0.613	0.250

Identification Issue

Key Issue: Treatment Selection Bias.

- Probability of being rejected depends on the **stringency of border controls** and on past violations of like shipments (Jouanjean et al., 2015; Grundke and Moser, 2019).

At the US port of entry

Hold

1st round of examinations
- Lab analysis
- Food label review
- Facility inspection
- Import alert

Detention

2nd round of examinations
- Reconditioning
- Challenge detention
- Import alert petition

+ pay fee

REFUSED

if admissible

IMPORT COMPLETE

if admissible

Identification Issue

Key Issue: Treatment Selection Bias.

Robustness Check:

- Focused on first rejection episodes for firm-product pairs.

IV Method:

- Instrument: **Dummy for peer firms' past rejection**
  - $= 1$ if product p exported by the other firm(s) than firm i is rejected in $t - 1$.
- Peers' rejection ➔ stringent border control against firm i ➔ higher prob. of firm i's rejection ➔ firm i's export strategy

IV Estimates (year(0~+2))

Dependent variable:	Exports to the US market in year t					
	Extensive margin		Intensive margin			
Regressor	Exit dummy	(Re-)entry dummy	ln(Value)	ln(Quantity)	ln(Price)	ln(Quality)
Rejection dummy in t-1	0.0478**	-0.0976***	1.140***	1.425***	-0.324	2.254***
	(0.0244)	(0.0160)	(0.216)	(0.321)	(0.243)	(0.698)
ln(Firm size in t-1)	0.00903***	0.000609	0.0851***	0.0178***	0.0905***	0.120***
	(0.000969)	(0.00125)	(0.00545)	(0.00616)	(0.00391)	(0.0198)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Product (HS4) FE	Yes	Yes	Yes	Yes	Yes	Yes
HS2-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Under-indentification test (p-value)	0.000	0.000	0.000	0.000	0.000	0.000
Weak indentification test (F-stat)	3.84	36.44	29.32	20.08	1.78	9.42
Weak instrument-robust inference test (p-value)	0.050	0.000	0.000	0.000	0.180	0.000
Observations	716,542	510,780	201,581	200,203	200,203	143,547
R-squared	0.000	0.000	0.002	0.000	0.000	0.001

Other Robustness Checks

Redefining the Rejection Variable:

- Capture **overall past rejection experiences**, not just recent ones.
- $= 1$ if product p exported by firm i has been rejected as of $t - 1$.

Background: Detention Process

- Shipments are detained if they appear to violate regulations; if no compliance evidence is provided, the shipment is rejected by the FDA.
- Higher risk of detention imposes **uncertainty costs** on exporting firms (Beestermöller et al., 2018), leading to **persistent effects** of rejection experience (Baylis et al., 2009).

Estimates with the Overall Rejection (year(0~+2))

Dependent variable:	Exports to the US market in year t					
	Extensive margin		Intensive margin			
Regressor	Exit dummy	(Re-)entry dummy	ln(Value)	ln(Quantity)	ln(Price)	ln(Quality)
Overall rejection	0.0654***	-0.0485***	0.965***	0.730***	0.175	1.426***
dummy **as of** t-1 (t-2)	(0.0140)	(0.00932)	(0.143)	(0.145)	(0.122)	(0.486)
ln(Firm size in t-1)	0.00191***	0.00334***	0.00280	-0.00453	0.0103	0.0294
	(0.000451)	(0.000397)	(0.00955)	(0.00973)	(0.00768)	(0.0371)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Product (HS4) FE	Yes	Yes	Yes	Yes	Yes	Yes
HS2-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,981,209	1,923,750	350,854	341,011	341,011	263,252
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Summary of Findings

Key Insights:

- Past border rejection **increases the likelihood of exit**.
- Rejected firms are less likely to (re-)enter the market.
- Surviving firms that continue exporting after rejection **increase their export quantity and quality**.
- Compliance costs act as **barriers** but also serve as **catalysts** for firms to adapt and improve capabilities.

Conclusion

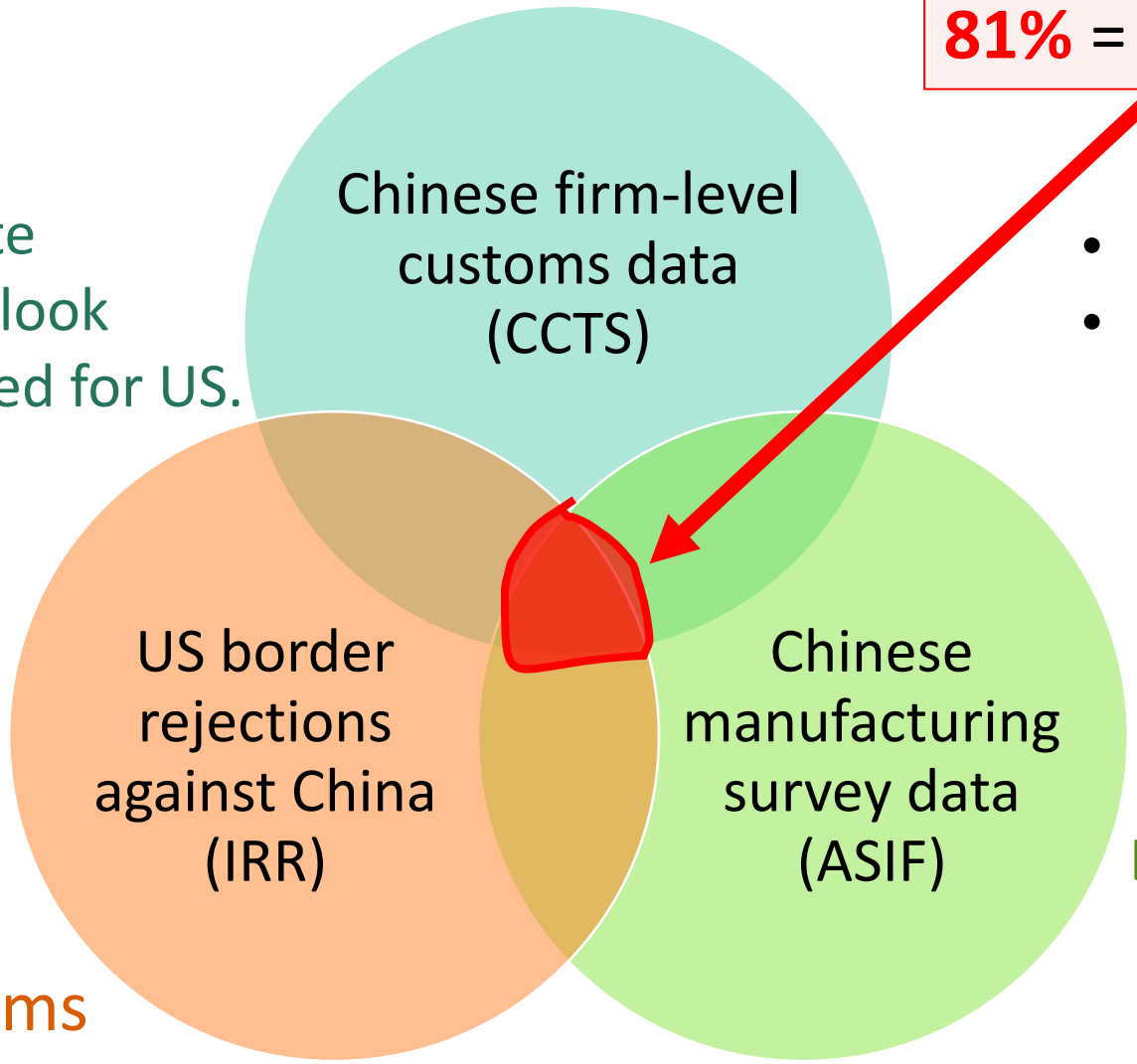
- This study provides empirical evidence on the impact of border rejection using a unique ASIF-CCTS-IRR dataset.
- First study to identify manufacturers whose products were rejected and analyze firm-level exports at the extensive and intensive margins.
- Our findings show that past rejection experiences have a dual impact.
- Supports the view that compliance with technical requirements can act as catalysts for improvement.

Appendix

Data Matching

Matching rate:
81% = **5,926**/7,316 firms

Records the immediate destination; may overlook entrepôt trade destined for US.

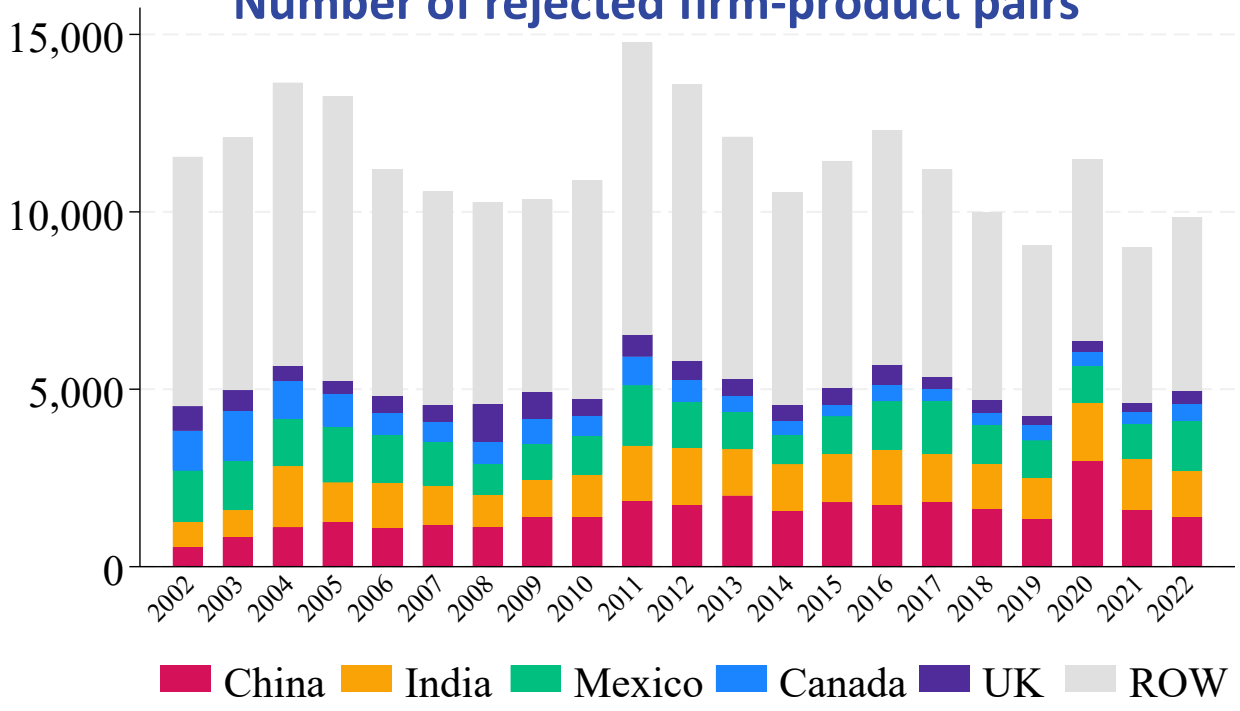


- Translation issue
- Intermediary companies

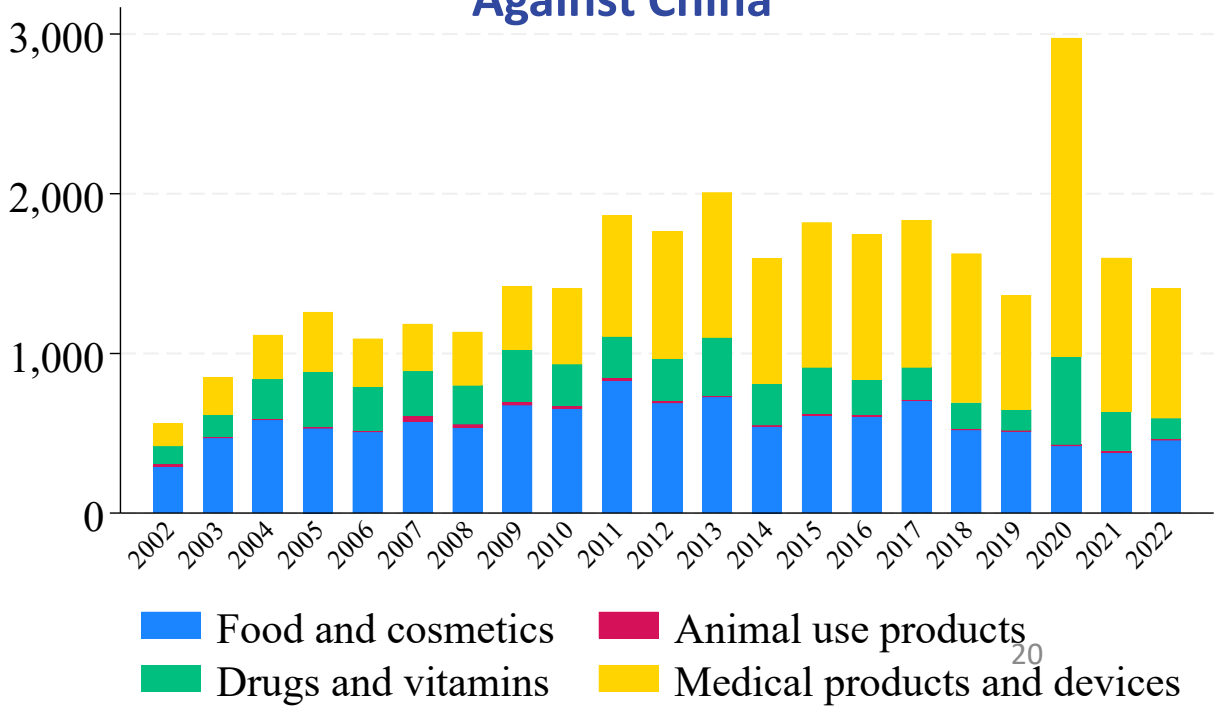
Large manufacturers only

7,316 firms
(originally, 13,691 firm-product-date rejection episodes in 2002-13)

Number of rejected firm-product pairs



Against China



The Way Forward

- Firm Heterogeneity:
  - Why do some firms survive and thrive while others exit after rejection?
- Impact on Smaller Firms:
  - Smaller firms may need institutional support to overcome compliance barriers.
- Consumer Benefits:
  - Do stricter compliance standards lead to long-term benefits for consumers in importing countries?