The impact of EU border inspections on Chinese agri-food exports: Firm-level evidence

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Summary:

Does the threat of border rejections prohibit exports from developing economies?

- Address microeconomic impact of rejection risk from sanitary regulations at EU border for Chinese agri-food exporters.
- Combine EU Rapid Alert System for Food and Feed (RASFF) with firm level exports from China.

Preview Findings: EU border rejections ...

- Increase firms' turnover at the extensive margin.
- Increase concentration at the intensive margin.
- Unevenly affect different-sized exporters.

Context (1/2): Trade liberalization?

Tariff liberalization:

- Decrease in tariffs.
- EU average applied tariff on Chinese agri-food exports. in 2007: 13%

BUT, market access often difficult:

- Exporters must meet regulatory standards, face procedural obstacles and enforcement.
- Uncertainty related to possible border rejection of shipments not complying with regulations.
- Costs and uncertainty created by non-tariff measures (NTMs) act as substantial barriers in exporting decision.

Context (2/2): Border rejections: *de facto* trade barrier

- Increase cost of exporting and *introduce uncertainty*: Good *may* be rejected if it does not comply with standards.
- Border rejection: risk faced by the exporter & shaped by:
  - Quality of exported products (can be reduced by investments in quality or controls prior shipment).
  - Intensity of controls at EU border.
  - Reputation.

Controls' intensity is endogenous to past rejections:

- Externalities among exporters of same country/region - products.
  - Regulatory agencies only conduct spot checks.
  - But not random: Certain producers or products may be under special focus.
  - Part of cost of being rejected are more future inspections/rejections.
  - Spell of rejections may lead to ban of all goods from destination.

Contributions

1. **RASFF dataset (rarely used): all EU border rejections:**
   - System of information exchange on emergency sanitary measures among EU countries.
   - Restrictiveness of *de jure* NTMs generally hard to measure (not all NTMs are barriers).
   - Border rejections: cases where regulations are actually enforced, raising an obstacle to trade.
2. **Firm-level data:**
   - Add to a growing empirical literature examining the impact of restrictive NTMs at the firm-level.
     - e.g. Fontagné et al. (2015): WTO concerns and French exporters.
   - Allows studying participation (EM) and adjustments (IM), heterogeneity.
3. **Developing economy: China**
   - Large and diversified developing economy.
   - Frequent scandals and anecdotes document the problems of Chinese exporters to meet sanitary standards.

Data:

RASFF: Universe of EU border rejections

- Sample period 1995-2012.
- Focus on agri-food products (HS01-HS24).
- Information on products in verbal form: match with HS4 codes manually.
- Treat the RASFF border as the relevant location of observing notifications.

Universe of exports from Chinese customs authorities:

- Sample period: 2000-2011.
- Drop wholesalers.

Combine datasets:

- Chinese data: Aggregate firm level data to HS4.
- Both datasets: Aggregate all destinations: RASFF market.
- Drawback: Can not directly identify the firms and shipments rejected.

Empirical strategy:

$$
\begin{aligned}
y_{i,s,j,t} = \alpha &+ \beta_1 \text{rejection}_{s,j,t-1} \\
&+ \beta_2 ln(\text{size})_{i,t-1} + \beta_3 \text{rejection}_{s,j,t-1} \times ln(\text{size})_{i,t-1} \\
+ \beta_4 ln(\text{visibility})_{i,HS2,j,t-1} &+ \beta_5 \text{rejection}_{s,j,t-1} \times ln(\text{visib.})_{i,HS2,j,t-1} \\
&+ \mu_i + \phi_{HS2,j,t} + \epsilon_{i,s,j,t}
\end{aligned}
$$

- i: firm, s: HS4-product, j: destination, t: year
- Aggregate RASFF to single export destination
- LPM/OLS: avoid incidental parameter problem from FE

Empirical strategy:

$$y_{i,s,j,t} = \alpha + \beta_1 \text{rejection}_{s,j,t-1} + \beta_2 ln(\text{size})_{i,t-1} + \beta_3 \text{rejection}_{s,j,t-1} \times ln(\text{size})_{i,t-1} + \beta_4 ln(\text{visib.})_{i,HS2,j,t-1} + \beta_5 \text{rejection}_{s,j,t-1} \times ln(\text{visib.})_{i,HS2,j,t-1} + \mu_i + \phi_{HS2,j,t} + \epsilon_{i,s,j,t}$$

Dependent variable:

- Extensive margin:
  - Exit: If firm exported HS4 in $t-1$ but not in t to RASFF market
  - Entry: If firm exports in t but not in $t-1$ to RASFF market
- Intensive margin: ln(value). Focus on surviving firms

Empirical strategy:

$$y_{i,s,j,t} = \alpha + \beta_1 \text{rejection}_{s,j,t-1}$$

$$+ \beta_2 ln(\text{size})_{i,t-1} + \beta_3 \text{rejection}_{s,j,t-1} \times ln(\text{size})_{i,t-1}$$
$$+ \beta_4 ln(\text{visib.})_{i,HS2,j,t-1} + \beta_5 \text{rejection}_{s,j,t-1} \times ln(\text{visib.})_{i,HS2,j,t-1}$$
$$+ \mu_i + \phi_{HS2,j,t} + \epsilon_{i,s,j,t}$$

rejection$_{s,j,t-1}$:

- If at least one shipment of that HS4 was rejected in $t-1$
- Cumulative number of past Chinese rejections

Empirical strategy:

$$y_{i,s,j,t} = \alpha + \beta_1 \text{rejection}_{s,j,t-1}$$

$$+ \boxed{\beta_2 ln(\text{size})_{i,t-1} + \beta_3 \text{rejection}_{s,j,t-1} \times ln(\text{size})_{i,t-1}}$$

$$+ \beta_4 ln(\text{visib.})_{i,HS2,j,t-1} + \beta_5 \text{rejection}_{s,j,t-1} \times ln(\text{visib.})_{i,HS2,j,t-1}$$

$$+ \mu_i + \phi_{HS2,j,t} + \epsilon_{i,s,j,t}$$

$ln(\textbf{size})_{i,t-1}$:

- Total agricultural exports of the firm in $t-1$
- Centered around median size of all firms in that year
- Proxy for firm-specific characteristic (productivity, etc.)
- Lag: Firms' past performance affect current export decisions
- Interaction term: Heterogeneous effects of rejections on firms

Empirical strategy:

$$y_{i,s,j,t} = \alpha + \beta_1 \text{rejection}_{s,j,t-1} + \beta_2 ln(\text{size})_{i,t-1} + \beta_3 \text{rejection}_{s,j,t-1} \times ln(\text{size})_{i,t-1}$$

$$+ \beta_4 ln(\text{visib.})_{i,HS2,j,t-1} + \beta_5 \text{rejection}_{s,j,t-1} \times ln(\text{visib.})_{i,HS2,j,t-1}$$

$$+ \mu_i + \phi_{HS2,j,t} + \epsilon_{i,s,j,t}$$

$ln(\textbf{visibility})_{i,HS2,j,t-1}$:

- Large and more visible firms may be targeted by inspections (if yes, then endogeneity bias for IT btw. rejections and firm size)
- Visibility of a firm: Log(1+ firm's export share in RASFF market and HS2 sector over total Chinese exports in RASFF mkt and same HS2)
- Normalized by the HS2-Destination-Year specific median
- Interaction term (if not significant, no endogeneity bias)

Empirical strategy:

$$y_{i,s,j,t} = \alpha + \beta_1 \text{rejection}_{s,j,t-1} + \beta_2 ln(\text{size})_{i,t-1} + \beta_3 \text{rejection}_{s,j,t-1} \times ln(\text{size})_{i,t-1}$$

$$+ \beta_4 ln(\text{visib.})_{i,HS2,j,t-1} + \beta_5 \text{rejection}_{s,j,t-1} \times ln(\text{visib.})_{i,HS2,j,t-1} + \boxed{\mu_i + \phi_{HS2,j,t}} + \epsilon_{i,s,j,t}$$

Firm and HS2-destination-year fixed effects $\mu_i + \phi_{HS2,j,t}$:

- Firm-specific (time-invariant) characteristics
  - Average firm size
  - Productivity
- HS2-destination-time varying factors
  - business cycles
  - import-demand shocks
- Follow: Fontagné et al. 2015 *JIE*

Exit from RASFF market - Chinese Rejections

	Exit from RASFF market in year t			
	(1)	(2)	(3)	(4)
Dummy = 1 if at least one rejection in $t-1$	-0.024[a]	0.127[a]		
	(0.007)	(0.031)		
Dummy for rejection$_{t-1}$ X Firm size		-0.012[a]		
		(0.002)		
Cumulated nb. of past rejections until $t-1$			0.049[a]	0.048[a]
			(0.012)	(0.013)
Cum. nb. past rejections X Firm size			-0.005[a]	-0.005[a]
			(0.001)	(0.001)
Firm size		-0.043[a]	-0.041[a]	-0.036[a]
		(0.002)	(0.002)	(0.002)
Cum. nb. past rejections X Firm visibility				-0.236
				(0.190)
Firm visibility				-2.450[a]
				(0.244)
Observations	49220	49220	49220	49220
R^2	0.383	0.391	0.392	0.394

Note: Fixed effects for firms and HS2-year in all estimations (not reported).

Standard errors in parentheses. [a]: p<0.01.

Entry on RASFF market - Chinese Rejections

	Entry on RASFF market in t			
	(1)	(2)	(3)	(4)
Dummy = 1 if at least one rejection in $t-1$	0.004	0.011[a]		
	(0.003)	(0.003)		
Dummy for rejection$_{t-1}$ X Firm size		-0.002[a]		
		(0.000)		
Cumulated nb. of past rejections until $t-1$			0.008[a]	0.008[a]
			(0.001)	(0.001)
Cum. nb. past rejections X Firm size			-0.001[a]	-0.001[a]
			(0.000)	(0.000)
Firm size		0.013[a]	0.014[a]	0.014[a]
		(0.000)	(0.000)	(0.000)
Cum. nb. past rejections X Firm visibility				-0.213
				(0.274)
Firm visibility				0.209
				(0.277)
Observations	178951	178951	178951	178951
R^2	0.062	0.081	0.082	0.082

Note: Fixed effects for firms and HS2-year in all estimations (not reported).

Standard errors in parentheses. [a]: p<0.01.

Intensive margin - RASFF market - Chinese Rejections

	Ln exports to RASFF markets in t			
	(1)	(2)	(3)	(4)
Dummy = 1 if at least one rejection in $t-1$	0.264[a]	-0.187		
	(0.031)	(0.165)		
Dummy for rejection$_{t-1}$ X Firm size		0.034[a]		
		(0.012)		
Cumulated nb. of past rejections until $t-1$			-0.012	0.095
			(0.067)	(0.070)
Cum. nb. past rejections X Firm size			0.014[a]	0.003
			(0.005)	(0.005)
Firm size		0.152[a]	0.149[a]	0.092[a]
		(0.011)	(0.012)	(0.012)
Cum. nb. past rejections X Firm visibility				5.201[a]
				(0.798)
Firm visibility				20.930[a]
				(1.070)
Observations	30999	30999	30999	30999
R^2	0.619	0.623	0.625	0.635

Note: Fixed effects for firms and HS2-year in all estimations (not reported).

Standard errors in parentheses. [a]: p<0.01.

Conclusion:

- We study the effect of EU border rejections on Chinese agri-food exports
- Main results:
  - EM: Firms exporting products affected by rejections are more likely to exit. But at the same time, entry of new firms
  - Heterogeneity: Larger firms are less affected by rejections (less exit, but also less entry).
  - IM: Conditional on survival, concentration on some big exporters (but effect disappears once we control for firm's visibility)

$\Rightarrow$ Provide more nuanced understanding of NTMs impact that fits into large literature on firm heterogeneity and trade