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Food Fraud and Import Refusals: Assessing China's Agri-Food Imports at the Firm Level

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Chaoping Xie^{ab}, Jason Grant^c, Xiaojuan Wang^d, Yanyu Long^e, and Yifang Liu^f

1. Motivation

- As the world's largest developing country, China's per capita arable land is only half of the global average and its per capita water availability is only a quarter of the world average (Huang and Yang 2017), yet it is feeding 18% of the world's population. The imbalance between scarce agricultural resources and growing agri-food demand drives the need for food imports.
- China has increasingly opened its markets to foreign agri-products ever since it joined the World Trade Organization (WTO) in December 2001. Its agricultural imports have increased from \$9.9 billion in 2001 to \$116.7 billion in 2017 with an average annual growth rate of 16.7%. Currently, China is the world's third largest agricultural importer.
- China's evolving food import regulations can have a significant impact on international markets. China enacted the *Agricultural Product Quality Safety Law* in 2006 to regulate agricultural products, and announced the *Food Safety Law* in 2015 to further ensure public health.
- Previous studies on agricultural trade mainly took China as an example of developing country and focused on impact of non-tariff barriers on its agricultural export (Beestermöller, Disdier and Fontagné 2018; Chen, Yang and Findlay 2008). However, the impact of China's SPS measures on its agricultural imports were not well examined.
- This paper employs a novel dataset: China's import refusal data maintained by Chinese customs. Compared to the notification-based data adopted by most studies on food safety regulations, import refusals data can reveal strictness of technical standards at the enforcement level and thus are a better proxy for regulatory stringency.
- This study is the first to systematically track China's import refusals on agricultural products and investigate their impacts on China's agricultural imports.

2. Objectives

- Provide a comprehensive overview of China's agricultural imports refusal database. Examine the distribution of violations across product categories, ports at which shipments are inspected, and exporting regions. Identify the principle reasons which cause China's import refusals.
- On exporting regions' level, investigate the impacts of import refusals on trade value and the probability of exporting agri-food to Chinese market to see if China's border inspections act as trade barriers; test whether import refusals' trade effects are heterogenous across exporters' income groups (upper middle-income countries and lower middle-income countries).
- On importing firms' level, examine the effects of import refusals on number of importing firms (extensive margin) and average import values per firm (intensive margin); see if these effects are heterogenous across exporters from different income groups.

3. Data

- China's import refusal data:
 - Source: General Administration of Customs, the People's Republic of China (GACC).
 - Period: March 2005 – Dec 2018
 - Key variables: For each refusal, we observe the importing firm, the origin country, the producing firm in the origin country, the product codes (HS 10-digit), the import quantity, the import month, the import refusal reason, and the entry port.
- Chinese firm-level import database:
 - Source: GACC
 - Period: 2000 - 2016
 - Key variables: The dataset records the importing firm, the origin country, the product codes (HS 8-digit), and the import value.

4. Overview of China's Import Refusal

- From 2006 to 2017, the total number of ag-food related refusals is 35,170.
 - Processed food (35%), beverages, spirits and tobacco (15%), and fruits and vegetables (14%) are the top three refused categories.
 - Ports in Guangdong (29%), Shanghai (24%), and Fujian (11%) are more likely to refuse ag-imports.
 - Shipments from Taiwan (13%), U.S. (9%), and Japan (7%) are more likely to be refused.
 - Ag-products are most likely to be refused due to micro-organisms(18%), labeling defective(17%) and food additives(14%).
- Figure 1 compares China's annual import value with the number of import refusal for major ag-product categories:
 - Oilseeds, fats and oils(Harmonized System (HS) chapter 12 and 15), fruits and vegetables (chapter 6, 7, 8, 13, 14, 20), and fishery products (mostly chapter 3) are the top three imported categories. They respectively accounted for 53%, 8% and 7% of China's agricultural import during 2006-2017, and represented 5%, 14% and 7% of China's total ag-import refusals.
 - Processed food (chapter 19 and 21), beverages, spirits and tobacco (chapter 22 and 24), and fruits and vegetables are the top three refused categories. They respectively accounted for 4%, 5% and 8% of China's ag-import value during 2006-2017, and represented 35%, 15% and 14% of ag-import refusals.

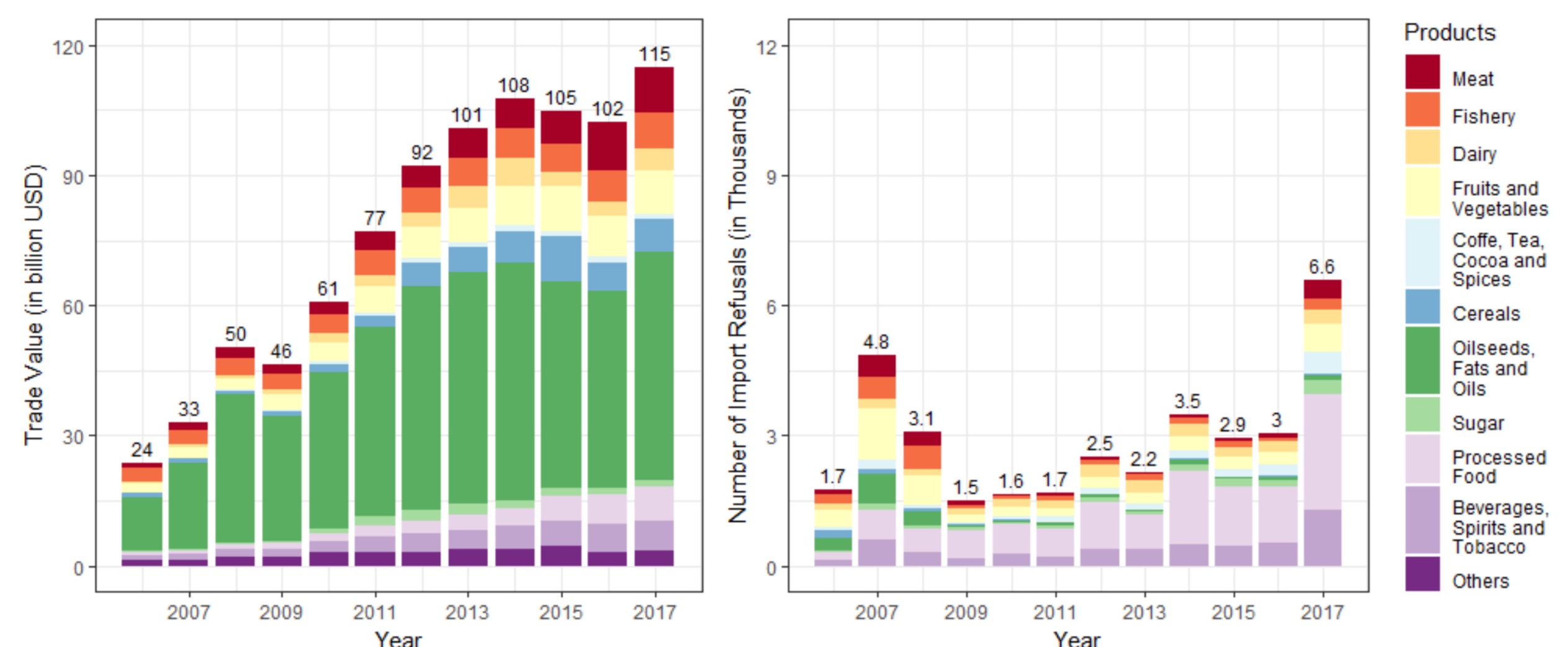


Figure 1. Chinese Annual Agricultural Import Value and Number of Import Refusals by Product Sectors, 2006-2017

Note: Trade data are from the World Integrated Trade Solutions (WITS) database.

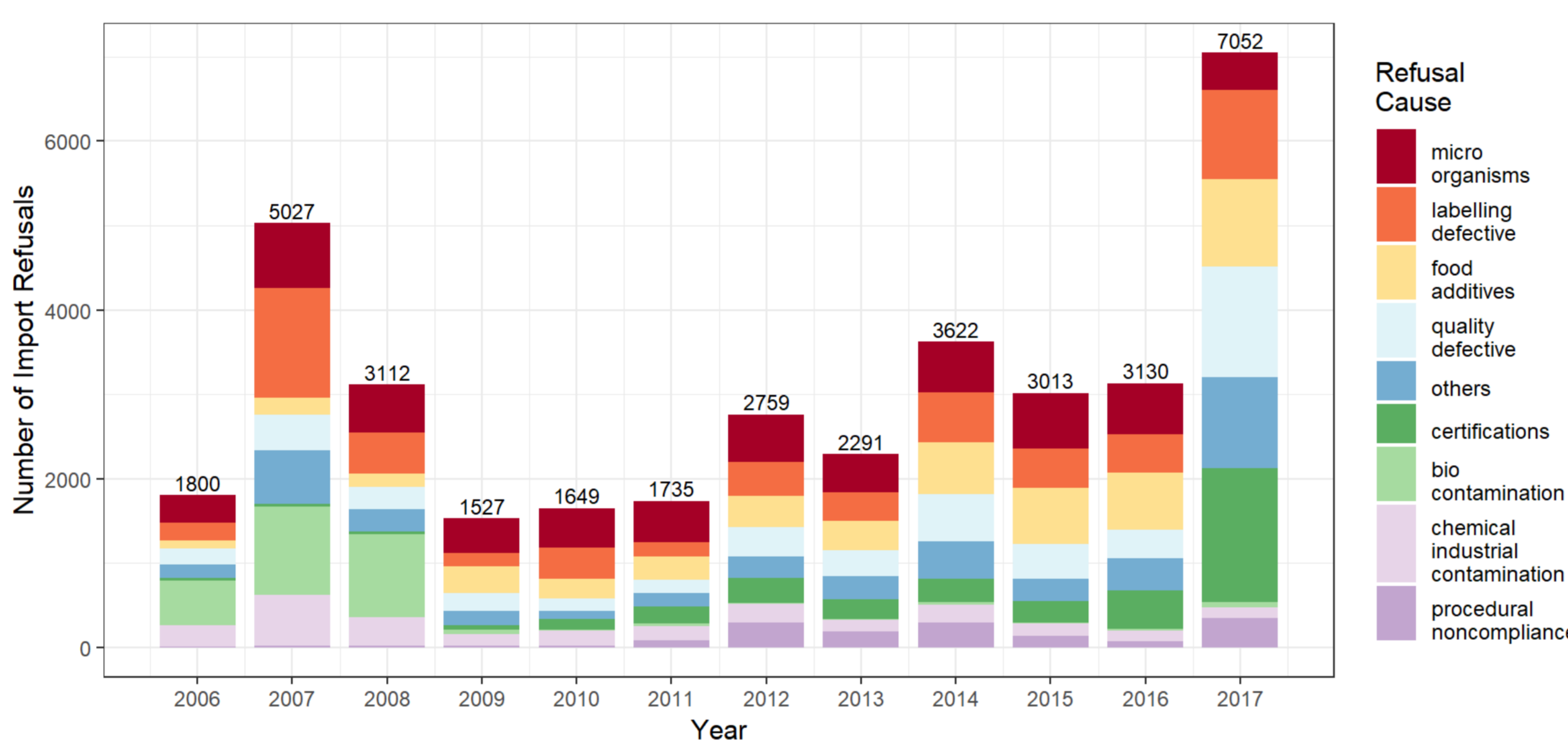


Figure 2. Import Refusals by Refusal Causes, 2006-2017

Note: (1) One refusal can be caused by multiple reasons, which is why total number of refusals in figure 2 exceeds that of figure 1. (2) We list only the top 8 refusal causes, and "others" represents the remaining 14 causes (composition, epidemic diseases, etc.).

- Figure 2 disaggregate import refusals by causes:
 - Import refusals are most often caused by micro-organisms(18%), labelling defective(17%) and food additives(14%).
 - Bio-contamination accounted for 27% of import refusals from 2006 to 2008, but only 1% of refusals during 2009-2017. Certifications accounted for only 7% of refusals during 2006-2016, but the share surged to 24% in 2017.

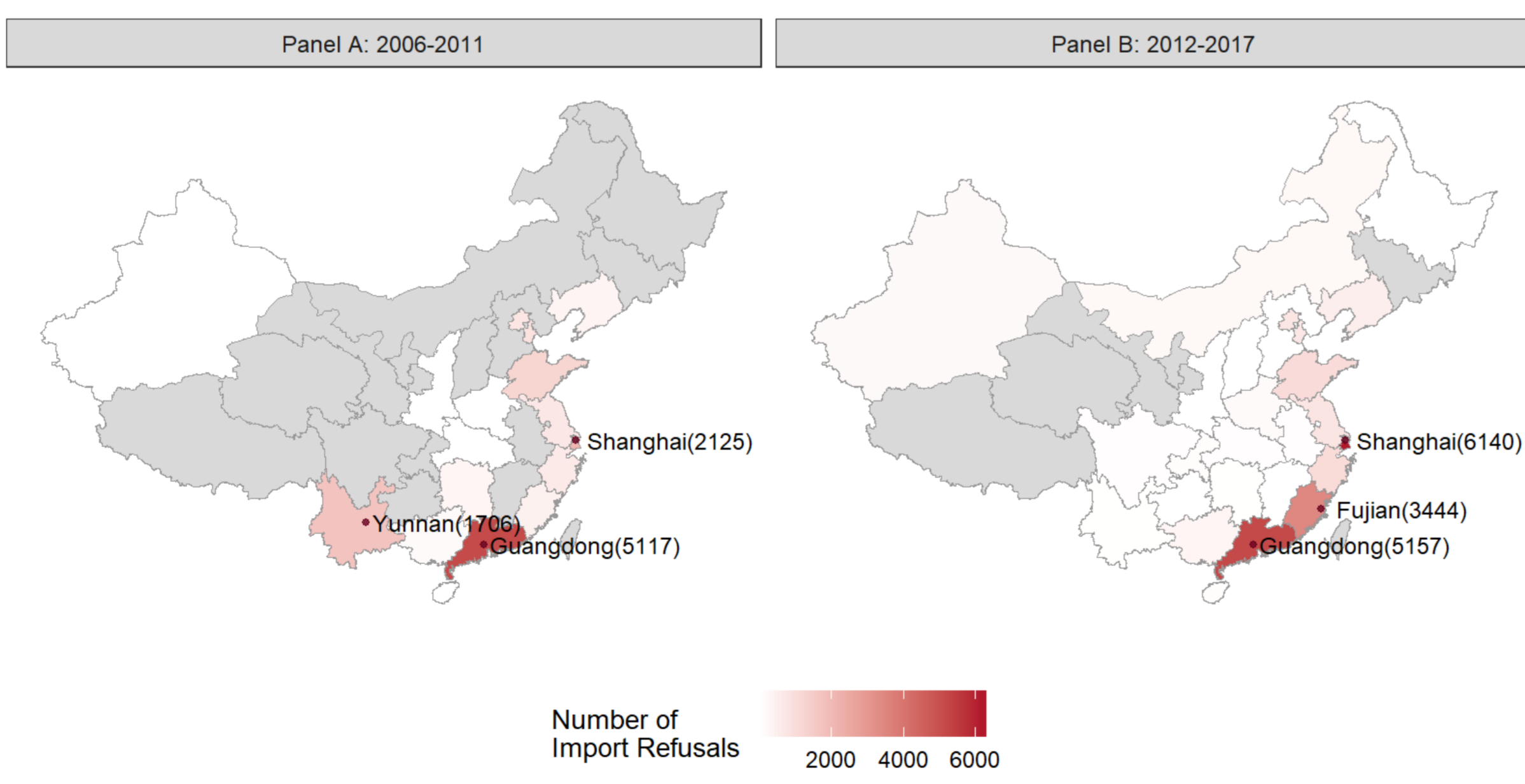


Figure 3: Import Refusals by Port (Aggregated at Province Level), 2006-2017

Note: (1) Areas in grey do not have any import refusals. (2) Numbers in the parentheses are cumulative count of rejections of the three provinces with most refusals during the time frame of each panel.

- Figure 3 presents the distribution of import refusals by provinces and the evolution of provinces with top import refusal cases:
 - In general, the number of import refusals are rising, with the exception of Beijing, Shandong, Tianjin, Hunan and Yunnan.
 - During 2006-2011, ports in Guangdong (5117), Shanghai (2125) and Yunnan (1706) refused most shipments, while during 2012-2017, the top three provinces became Shanghai (6140), Guangdong (5157) and Fujian (3444).
 - Inner Mongolia, Chongqing, Sichuan and another six provinces started to have non-zero import refusal records after the year 2012.

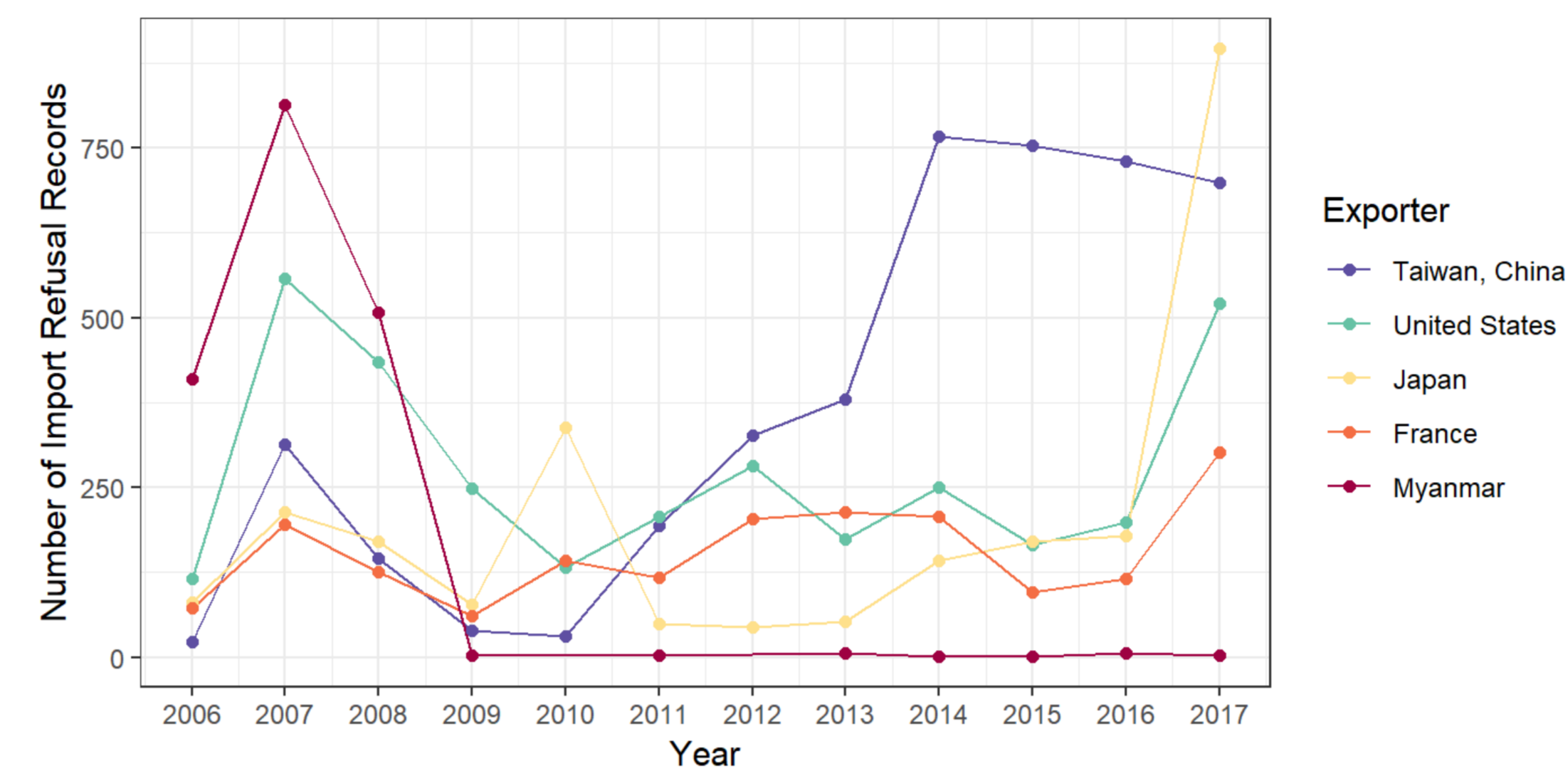


Figure 4: Top 5 Refused Exporting Regions, 2006-2017

- Figure 4 shows the number of rejected shipments from the top five mostly refused regions:

- Taiwan, the U.S., Japan, France, and Myanmar accounted for 39% of import refusals during 2006-2017. It is particularly noteworthy that Taiwan, a rather developed economy representing only 0.5% of China's agricultural import value during 2006-2017, should account for 13% of China's import refusals.
- Main refusal reasons for shipments from Taiwan were labelling defective and packaging defective in processed food (such as instant noodles, oatmeal, and pastries).
- The unusually high amount of U.S. refusals in 2007 was largely caused by ractopamine, furacilin, and Salmonella in frozen chicken and pork. The surge of U.S. refusals in 2017 was mostly due to mislabeling, excessive use of food additives or product expiration in processed foods and beverages.
- Most of Japan's refusals were gained in 2017 due to failure to provide certifications as required and product expiration in processed food such as instant noodles, cakes and cookies.
- Main refusal reasons for France products were labelling defective in wine, micro-organisms in cheese and curd, as well as product expiration in cheese, butter and buttermilk.
- Majority of Myanmar's refusals were gained during 2006-2008 due to bio-contaminants (such as beetles) in legume products.

5. Empirical Model

The empirical framework of this study aims to uncover the trade effects of Chinese import refusal measures on exporting country-level and importing firm-level. More specifically, our analysis address two policy questions:

- the impacts of existence and number of Chinese import refusals on exporter's trade value and the probability of exporting agri-food to Chinese market, and whether these impacts are heterogenous across exporters from different income groups (objective 2).
- the impacts of Chinese import refusal measures on the intensive and extensive margins of importing firms, and whether these impacts are heterogenous across exporters from different income groups (objective 3).

- Model**

$$y_{sjt} = \alpha + \beta_1 ISIR_{sjt} + \beta_2 CIR_{sjt} + \beta_3 \ln(value + 1)_{sjt-1} + \kappa_s + \delta_j + \eta_t + \varepsilon_{sjt}$$

where s , j , and t denote respectively HS 6-digit product category, exporting country/region, and year.

- Independent variables:**

- $ISIR_{sjt}$ represents the existence of an import refusal in product category s of country j at time t .
- CIR_{sjt} is the number of exporter j 's rejections for product s refused by China at time t (in logs).
- $\ln(value + 1)_{sjt-1}$ is the lagged trade value for each product-exporter pair.

- Dependent variables:**

- a dummy variable for positive trade flows from a certain product-exporter per year to capture the exporter's probability of exporting to China (objective 2);
- the export values (in logs) for each product-exporter per year as a measure of the exporter's intensive margin (objective 2);
- the number of Chinese importing firms (in logs) that import a certain product from an exporting country/region per year to measure firm's extensive margin (objective 3);
- the average import values (in logs) per firm for each product from a certain exporting country/region per year to calculate the firm's intensive margin (objective 3);

We estimate the above model using China's import refusal data and Chinese firm-level import data during 2006-2016. Our preliminary analysis is based on a simple fixed effect model. To control for commodity, country, year specific unobserved effects, we include three sets of fixed effects in the model: κ_s is the product (HS 6-digit level) specific characteristics that affect trade performance; δ_j represents the country specific factors such as multilateral trade resistance(Anderson and Wincoop, 2003); η_t represents the year fixed effects, such as business cycles.

6. Results and Discussion

- The existence of import refusal measure increases the exporting country's exports and probability of exporting to China by 1.07% and 0.09%, on average. And 1% increase in rejections increased exporting countries' exports by 0.01%.
- As for importing firms, existence of import refusal measure leads to 0.21% increase in firms' average imports, 0.88% increase in firms' extensive margin. If rejections increase by 1%, firm's intensive margin increase 0.01%, and there is no significant effect on extensive margin.
- Lower middle-income country benefits more than upper ones. For instance, the existence of import refusal measure increases the trade flow by 0.09% for upper middle-income country, but by 1.91% for lower middle-income country.

Table 1: Import refusal effect on exporting country level

	Ln (value)			Probability		
	ALL	Upper	Lower	ALL	Upper	Lower
ISIR	1.07*** (0.05)	0.90*** (0.06)	1.91*** (0.15)	0.09*** (0.01)	0.08*** (0.01)	0.15*** (0.01)
CIR	0.01* (0.01)	0.02** (0.01)	-0.00 (0.01)	-0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)
Ln (value) _{t-1}	0.49*** (0.00)	0.49*** (0.01)	0.49*** (0.01)	0.03*** (0.00)	0.03*** (0.00)	0.03*** (0.00)
Obs	36,916	30,888	6,028	36,916	30,888	6,028
R ²	0.765	0.768	0.748	0.637	0.637	0.629

*** p<0.01, ** p<0.05, * p<0.1. ALL represents the all countries (without Taiwan); Upper represents the upper middle-income countries; Lower represents the lower middle-income countries.

Table 2: Import refusal effect on importing firm level

	IM			EM		
	ALL	Upper	Lower	ALL	Upper	Lower
ISIR	0.21*** (0.01)	0.19*** (0.01)	0.31*** (0.02)	0.88*** (0.05)	0.73*** (0.05)	1.65*** (0.13)
CIR	0.01*** (0.00)	0.01*** (0.00)	0.00* (0.00)	0.00 (0.00)	0.00 (0.01)	-0.00 (0.01)
Ln (value) _{t-1}	0.09*** (0.00)	0.09*** (0.00)	0.08*** (0.00)	0.41*** (0.00)	0.40*** (0.00)	0.41*** (0.01)
Obs	36,916	30,888	6,028	36,916	30,888	6,028
R ²	0.829	0.832	0.800	0.719	0.721	0.713

*** p<0.01, ** p<0.05, * p<0.1. ALL represents the all countries (without Taiwan); Upper represents the upper middle-income countries; Lower represents the lower middle-income countries.

7. Conclusions

- This study uncovers the distribution of import refusals across product categories, refusal causes, ports and exporting regions, which would inform Chinese policymakers and consumers of safety concerns in imported foods, and help exporters in reducing the risk of non-compliance.
- Source countries of agri-food products export more to China if the products they export have been rejected, and the probability of exporting to China also increases. Border rejections boost the extensive and intensive margin of importing firms. And the macroeconomic impacts of import refusals are heterogeneous across exporters' income groups. The import refusal measures affect lower middle-income countries more than upper middle-income countries.
- Chinese import refusals act as trade catalysts rather than barriers, and lower middle-income countries benefit more. Therefore, for China, increasing management of food safety issues has a positive and significant impact on international and domestic markets; for trading partners, there is no need to be too concerned about Chinese border rejections.

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