INTRODUCTION
Trade standards exist to protect safety and environment. The importance of food safety and its quality has been emphasized. Stylized facts: (1) Hidden causes and consequences of international trade at country-level can be interpreted with firm heterogeneity (2) Differences in productivity among firms causes changes in trade participation

Related studies:
Trade Liberalization and quality sorting: Amiti and Khandelwal (2013), Fan et al. (2014)

RESEARCH QUESTION
Illustrate heterogeneous firm trade model with endogenous quality choice
Estimate model with agricultural and food trade data: (1) Evaluate determinants of bilateral trade (2) Analyze effect of non-tariff measures (NTM) as a fixed trade cost
Introduce the impact of selection into exporting with consideration of product quality in agricultural and food trade and use advanced NTM data

THEORETICAL BACKGROUND

PRODUCTION
Firms are heterogeneous in (1) productivity, (2) product quality, q
- j countries, i firms under monopolistic competition
- Marginal cost of production: c, a
- Firms choose optimal domestic price (p) and export price(\(p_f\))
\[ p = \frac{a - c}{1 - \alpha} \]
\[ p_f = \frac{a - c}{1 - \alpha} \]

PRODUCTIVITY AND QUALITY
\[ q = \frac{a - c}{1 - \alpha} \text{ where } \theta > 1 > 0 \]
\( \Theta \) is “quality elasticity” or “scope for quality differentiation”

THEORETICAL BACKGROUND (CONT.)
Profit and zero-profit condition
\[ \pi_i(a) = \frac{1}{(1 - \gamma)} - \frac{a - c}{1 - \gamma} + \gamma \left( \frac{a - c}{1 - \gamma} \right) \]
Trade volume
\[ V_i = \left( \frac{a - c}{1 - \gamma} \right) \text{ for } a_i > a \]
Then trade volume
\[ M_i = \frac{1}{(1 - \gamma)} \left[ \frac{a_i - c}{1 - \gamma} - \frac{a - c}{1 - \gamma} \right] \]

EMPIRICAL ESTIMATION
TWO-STAGE ESTIMATION (Heise et al., 2008)
First stage: Selection equation
\[ p_i = P(T_{ij} = 1) = \theta(e_i - \epsilon_i) + \delta_i + \nu_i + \nu_i \text{ in DIST} \]
\[ \nu_i \text{ ADJ} + \nu_i \text{ LANG} + \nu_i \text{ RTA} + \kappa \text{ GOV} + \nu_i \text{ NTM} \]
Second stage: Trade equation
\[ \ln m_{ij} = \psi_i - \psi_j + \psi_i \ln \text{DIST} + \psi_i \ln \text{ADJ} + \psi_i \ln \text{LANG} + \psi_i \ln \text{RTA} + \kappa \text{ GOV} + \nu_i \text{ NTM} \]
\[ \text{Bias Decomposition} \]

RESULTS
Trade determinants (distance, adjacency, language) follow theoretical expectation.
Good governance facilitates trade but NTM negatively influence trade participation.
Introducing non-linear coefficient \( w \) and inverse Mills ratio makes coefficient of trade determinants consistent.
Inverse Mills ratio: control sample selection error \( w \) : control unobservable firm heterogeneity
According to bias decomposition result, most of the bias driven by unobserved heterogeneity (proportion of exporting firms). Accordingly, ignoring firm heterogeneity in standard gravity model induces significant bias.

DATA
Panel data from 2010 to 2013
Food and agricultural product trade value and quantity from FAO, trade cost data from CEPIL, standards data from World Bank: WTO
Exclusion restrictions should determine the probability of exporting but not influence trade value. Government efficiency (World Bank) and Freedom to Trade (Fraser Inst) Non-tariff measures data (WITTS-I-TIP)

INCOME & PRODUCTIVITY THRESHOLD
Effect of trade frictions on bilateral trade flow towards OECD importers becomes stronger when we consider proportion of exporting firms, since productivity threshold is relatively higher than in other markets.
Effect of trade frictions towards non-OECD member countries becomes weaker after consideration of extensive margin, because exporting firms are able to enter market relatively easily thanks to lower export threshold
Importers who require import high-quality products have relatively higher productivity threshold restrict exporting firms, whereas importers with relatively lower productivity threshold allow more firms to enter export market.

CONCLUSIONS
Selection into exporting should be considered in evaluation of effect of trade frictions in food and agricultural trade
Our new approach is to use freedom to trade, governance indicators, and non-tariff measures as proxies for fixed trade costs in food and agricultural trade
Estimation results confirm that controlling extensive margins, alternative model specification, is better fitted to the data and produces unbiased and consistent estimates.

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