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The Differential Effects of Food Safety Regulations on Crustacean Product Trade

Introduction

- Non-tariff measures: major challenges & hot issues in international agri-food trade
- Ongoing debate: standards as barriers vs. standards as catalysts
  - Negative impact on bilateral trade
  - Help restructure supply chains & reposition countries in a better competitive position
- Dynamic/complex impact of standards on trade

Crustacean trade & Clorampheniсol

- Crustacean trade: very important; shrimp: the single most seafood product traded globally.
- Rising farmed production: strong economic, environmental & social concerns

Crustacean trade & Cloramphenicol

- Chemical contaminations: cloramphenicol & nitrofuran (as potential carcinogenics)
  - Banned in animal production in many countries; still found contaminated in farmed products
  - Stringent regulation & testing methods imposed by developed countries: EU (2001), follow by Canada, US and Japan

Crustacean trade & Clorampheniсol

- Chemical contaminations: Clorampheniсol & nitrofuran (as potential carcinogenics)
  - Harmonize standards as chasing zero tolerance/detection limit
  - Crisis: banned imports from China, found contaminated products from India, Thailand, Vietnam, Indonesia; increase testing and supervision on violated countries

Crustacean trade & Cloramphenicol

- Debaere (2005):
  - EU cloramphenicol regulation policy led to a disruption of shrimp trade flows from EU to US.
- Disdier and Marette (2010):
  - Increasing stringency of cloramphenicol regulation has a negative impact of crustacean trade lows (4 digit level)
- Tran, Wilson and Anders (2012)
  - Cloramphenicol regulations hurt poorer Asian countries than wealthier countries.

Objectives

- Explore the following questions:
  - Are different crustaceans products in trade affected differently?
  - What are the differential impacts of standards on different crustacean exports?
  - What is the impact of standards on crustacean exporters with regard to scale of export?

Empirical model specification

- $$ln(E_{ijt}) = \alpha_0 + \alpha_{ip} + \alpha_{jp} + \alpha_t + \alpha_1 lndist_{ij} + \alpha_2 contig_{ij} + \alpha_3 colony_{ij} + \alpha_4 comlang_{ij} + \alpha_5 EU15_{ij} + \alpha_6 NAFTA_{ij} + \alpha_7 CAP_{jt} + \alpha_8 tetracycline_{jt} + ln\varepsilon_{ij} \quad (2)$$

- E_{ijt}: bilateral crustacean imports of 7 products:
  - Frozen rock lobster & other sea crawfish (030611),
  - Frozen lobsters (030612); Frozen shrimps and prawns (030613); Frozen crabs (030614);
  - Non-frozen rock lobster & other sea crawfish (030621);
  - Non-frozen shrimps and prawns (030623);
  - Non-frozen crabs (030624).

Empirical model specification

- Heckman selection specification: MLE
  - Excluded variable: common language (Disdier and Marette 2010)
  - Model 1: Product together
  - Models 2-7: Each product
  - Model 8-13: Each product with CAP and Top30 interaction

Results

Estimates Total and by Product (1)

	All Products		HS 30611		HS 30612	
Variables	lnTrade	Selection	lnTrade	Selection	lnTrade	Selection
	(1)	(2)	(3)	(4)	(5)	(6)
ln(Distance)	-0.577***	-0.530***	-0.53***	-0.79***	-0.78***	-0.89***
	(0.109)	(0.037)	(0.16)	(0.042)	(0.22)	(0.052)
Cloramphenicol (CAP)	0.042***	0.014***	0.010	0.00016***	0.020*	0.017***
	(0.005)	(0.002)	(0.0068)	(0.0029)	(0.0012)	(0.0044)
Oxytetracycline	2.060***	0.642***	3.42***	1.065***	3.017***	1.20***
	(0.212)	(0.063)	(0.25)	(0.054)	(0.30)	(0.065)
Contingent	1.408***	0.628***	0.86***	0.27**	1.14***	0.71***
	(0.253)	(0.119)	(0.20)	(0.12)	(0.23)	(0.13)
Colony	0.553***	0.334***	-0.092	0.19**	-0.074	-0.074
	(0.208)	(0.076)	(0.19)	(0.083)	(0.25)	(0.11)
EU15	0.689**	0.830***	1.80**	1.16***	2.29***	1.46***
	(0.335)	(0.098)	(0.45)	(0.14)	(0.66)	(0.16)
NAFTA	1.603***	0.855**	-1.76***	-0.97***	-0.67	0.40
	(0.508)	(0.487)	(0.53)	(0.31)	(0.89)	(0.54)
Common Language		0.155***		0.19***		0.10
		(0.060)		(0.067)		(0.089)
rho	0.324		0.097		0.48	
lambda	0.698***		1.86		0.91***	
Number of observations	116,725		15,984		13,824	
Wald test	63.75***		66.25***		1146.85***	

Estimates Total and by Product (2)

	HS 30613		HS 30614		HS 30621	
Variables	lnTrade	Selection	lnTrade	Selection	lnTrade	Selection
	(7)	(8)	(9)	(10)	(11)	(12)
ln(Distance)	-0.93***	-0.82***	-0.65***	-0.91***	-1.16***	-0.85***
	(0.81)	(0.034)	(0.12)	(0.046)	(0.109)	(0.052)
Cloramphenicol (CAP)	0.010*	0.0094***	0.018**	0.0094***	-0.0078	0.0034
	(0.0054)	(0.0025)	(0.0071)	(0.0031)	(0.011)	(0.0043)
Oxytetracycline	3.00***	0.76***	3.96***	0.97***	1.98***	0.49***
	(0.10)	(0.041)	(0.16)	(0.053)	(0.24)	(0.066)
Contingent	0.80***	0.18***	1.31***	0.32***	0.98***	0.35***
	(0.16)	(0.12)	(0.19)	(0.12)	(0.23)	(0.13)
Colony	1.052***	0.39***	1.27***	0.31***	0.20	0.71***
	(0.12)	(0.066)	(0.16)	(0.080)	(0.29)	(0.096)
EU15	3.72***	1.43***	4.36***	1.55***	0.47	0.58***
	(0.25)	(0.11)	(0.41)	(0.13)	(0.55)	(0.17)
NAFTA	1.36***	5.062	2.15***	1.43**	-1.46**	-0.61**
	(0.43)		(0.54)	(0.57)	(0.55)	(0.31)
Common Language		0.17***		0.12*		-0.0075
		(0.54)		(0.067)		(0.083)
rho	0.17		0.63		0.45	
lambda	2.020**		1.28***		0.81*	
Number of observations	23,184		16,992		13,680	
Wald test	4276.81***		2317.60***		1035.16***	

Estimates Total and by Product (3)

Variables	HS 30623		HS 30624	
	lnTrade	Selection	lnTrade	Selection
	(13)	(14)	(15)	(16)
ln(Distance)	-1.26***	-0.91***	-0.69***	-0.56***
	(0.090)	(0.036)	(0.20)	(0.20)
Cloramphenicol (CAP)	0.0041	0.0048	0.017*	0.00018
	(0.0068)	(0.0033)	(0.010)	(0.0037)
Oxytetracycline	2.23***	0.45***	3.26***	0.49***
	(0.091)	(0.038)	(0.22)	(0.053)
Contingent	1.49***	0.85***	2.067***	0.62***
	(0.13)	(0.11)	(0.24)	(0.)
Colony	0.46***	0.23***	1.26***	0.34***
	(0.13)	(0.065)	(0.31)	(0.092)
EU15	2.41***	1.29***	6.47***	1.86***
	(0.30)	(0.11)	(0.71)	(0.16)
NAFTA	0.025***	6.20***	3.78***	5.42***
	(0.47)	(0.41)	(0.82)	(0.45)
Common Language		-0.152***		0.24***
		(0.057)		(0.078)
rho	0.16		0.69	
lambda	0.31**		1.59***	
Number of observations	19,957		13,104	
Wald test	3475.80***		1717.30***	

Marginal Effects of Standards

	Cloramphenicol			Oxytetracycline		
	On volume of trade			On volume of trade		
Products	Conditional (1)	Unconditional (2)	On probability of trade (3)	Conditional (4)	Unconditional (5)	On probability of trade (6)
30611	0.0099	0.0015	0.000021	3.26***	1.017***	0.14***
	(0.0068)	(0.0017)	(0.00037)	(0.25)	(0.043)	(0.0067)
30612	0.0096	0.0058***	0.0015***	2.092***	0.59***	0.11***
	(0.0012)	(0.0016)	(0.00040)	(0.30)	(0.032)	(0.0057)
30613	0.0080	0.0089***	0.0014***	2.81***	1.25 ***	0.11***
	(0.0054)	(0.0021)	(0.00037)	(0.10)	(0.036)	(0.0060)
30614	0.0079	0.056***	0.0011***	2.95***	0.94***	0.12***
	(0.0077)	(0.0015)	(0.000038)	(0.17)	(0.030)	(0.0062)
30621	-0.010	-0.000046	0.00031	1.64***	0.29***	0.045***
	(0.011)	(0.0014)	(0.00040)	(0.24)	(0.027)	(0.0060)
30623	0.0030	0.0025	0.00075	2.12***	0.70***	0.071***
	(0.0068)	(0.0020)	(0.00052)	(0.092)	(0.025)	(0.0059)
30624	0.017	0.017	0.000021	2.61***	0.397***	0.055***
	(0.0011)	(0.0011)	(0.00041)	(0.193)	(0.038)	(0.0059)

Marginal Effects by Scale

	Top 30			Not Top 30		
	On volume of trade		On probability of trade	On volume of trade		On probability of trade
Products	Conditional (1)	Unconditional (2)	(3)	Conditional (4)	Unconditional (5)	(6)
30611	0.015**	0.0061	0.00033	0.0039	0.000045	-0.000079
	(0.0076)	(0.0038)	(0.00072)	(0.0079)	(0.0013)	(0.00031)
30612	0.0023	0.011***	0.0029***	0.027*	0.0040***	0.00095**
	(0.013)	(0.0036)	(0.00077)	(0.015)	(0.0011)	(0.00031)
30613	0.020***	0.036***	0.0040***	-0.0037	0.0040**	0.00099***
	(0.0060)	(0.0056)	(0.00076)	(0.0059)	(0.0018)	(0.00035)
30614	0.024***	0.016***	0.0017**	-0.0092	0.0024**	0.00094***
	(0.0082)	(0.0035)	(0.00076)	(0.0086)	(0.0011)	(0.00032)
30621	-0.0048	0.0018	0.00087	-0.022	-0.0013	0.000029
	(0.012)	(0.0025)	(0.00065)	(0.014)	(0.0012)	(0.00036)
30623	0.012	0.011***	0.0016**	-0.013	-0.0015	0.00025
	(0.0073)	(0.0041)	(0.00077)	(0.0083)	(0.0016)	(0.00051)
30624	0.0069	0.0023	0.00021	0.037***	0.0024**	-0.000076
	(0.012)	(0.0029)	(0.00070)	(0.014)	(0.00098)	(0.00036)

Conclusions

- Modeling products shows the diversity of trade patterns within a product group.
- Enhancing stringency of chloramphenicol analytical standards has negative effects on international crustacean trade, decreasing value and probability of trade.

Conclusions

- However, Oxytetracline standards had larger overall effect than cloramphenicol.
- Complex impacts on different crustacean products: farmed products are sensitive to standard stringency; post-harvest handling and processing operations might lead to product contaminations.
- Top exporters are disciplined more than smaller exporters, with some exceptions.