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Effect of Trade Openness on Fertilizer use in the agricultural industry: Evidence from China’ s Trading Partners

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Motivation

Environmental policies sometimes give rise to unintended consequences with the presence of international trade. For example, Wyckoff and Roop (1994) pointed out that many greenhouse gas policies ignore the phenomenon called “carbon leakage,” which refers to the practice of keeping a country’s emission low by importing carbon intensive products from other countries. Therefore, the overall impact of these policies is quite limited. Similarly, Yu, Kim, and Cho (2010) studied the impact of trade liberalization between the United States and Mexico and suggest that the trade openness contributed to increases in greenhouse gas emissions in both countries after 1994.

Introduction

The Agricultural Department of China set the target of “zero growth” of fertilizers and pesticides by 2020. Meanwhile, there is the increasing trade openness between China and other countries and many new policies are introduced to liberalize the input markets in China. Take the fertilizer market for example, China abolished the discounts for electricity and gas use in its production, increased the railroad fare for its transportation, and restored the tax on its sale . Therefore, a pressing question to ask is whether the China’s “zero growth” policy combined with market and trade liberalization decrease its chemical use intensity by changing the structure of agricultural production in trading partners, and hence transfer the soil and water contamination problems to other countries by international trade.

Methodology

1. Hypothesis

- Since China's accession to WTO in 2001, the agrochemical market has being liberalizing and protection policies have been lifted. The prices of agrochemicals increase.
- The production of the chemical intensive product transfer to China’s trading partners. The trading partners’ chemical usage will be increasing.

2. Data

- we collected the national-level data through multiple databases, including Food and Agriculture Organization, United Nations Commodity Trade Statistics Database , World Bank WDI Database.
- 172 countries from 2002 to 2016, covering fifteen years since China's WTO accession.

3. Empirical analysis

- A panel data model is applied:

$$fertilizer_{it} = \alpha + \rho fertilizer_{it-1} + \beta_1 import_{it} + \beta_2 export_{it} + \beta_3 innovation_{it} + \beta_4 income_{it} + \beta_5 gdp_{it} + \beta_6 labor_{it} + \beta_7 inflation_{it} + \beta_8 soil_{it} + \beta_9 crop_index_{it} + u_i + v_t + \epsilon_{it}$$

where the subscript i denotes the country (i = 1,2,...,N) and t denotes the year (t = 1,2,...,T).

Results

1. Static analysis

	OLS	OLS	FE	FE	RE	RE
	Infertizer	Infertizer	Infertizer	Infertizer	Infertizer	Infertizer
Inimport	0.159*** (0.0265)	-0.00314 (0.0274)	0.0560*** (0.0106)	0.00863 (0.0171)	0.0598*** (0.0105)	-0.0169 (0.0137)
Inexport	-0.0963*** (0.0204)	-0.0702*** (0.0265)	-0.0795*** (0.0111)	-0.0355** (0.0163)	-0.0842*** (0.0108)	0.0144 (0.0148)
Ininnovation		0.102** (0.0456)		-0.00339 (0.0381)		0.0211 (0.0360)
Inincome		0.936*** (0.123)		0.419* (0.253)		0.575*** (0.160)
Ingdp		0.0486 (0.0730)		-0.0916 (0.258)		0.343 (0.110)
Inlabor		0.0972* (0.0561)		0.482** (0.234)		-0.0422 (0.0970)
Ininflation		0.0702 (0.0479)		-0.0249 (0.0219)		-0.0240 (0.0218)
Insoil		-0.690*** (0.0413)		-0.740*** (0.0994)		-0.708*** (0.0677)
Incrop_index		0.793*** (0.183)		0.302*** (0.0985)		0.218** (0.0929)
_cons	-1.050*** (0.320)	-10.60*** (1.181)	1.372*** (0.261)	-8.059* (4.811)	1.184*** (0.384)	-6.217*** (1.342)
N	2026	887	2026	887	2026	887

2. Dynamic analysis

	DIF-GMM	System- GMM
	Infertizer	Infertizer
L.Infertizer	0.136*** (0.00364)	0.306*** (0.00294)
Inimport	0.0898*** (0.00475)	0.0259*** (0.00386)
Inexport	-0.0151*** (0.00422)	-0.0264*** (0.00275)
Ininnovation	0.126*** (0.00861)	0.161*** (0.00864)
Inincome	0.788*** (0.0784)	0.305*** (0.0483)
Ingdp	0.144** (0.0726)	0.397*** (0.0439)
Inlabor	0.603*** (0.100)	0.0370 (0.0429)
Ininflation	0.000126 (0.00060)	-0.0155*** (0.00253)
Insoil	-0.631*** (0.0511)	-0.441*** (0.0328)
Incrop_index	-0.159*** (0.0128)	-0.0936*** (0.00849)
_cons	-15.21*** (1.319)	-9.623*** (0.556)
N	624	820

3. Heterogeneous analysis

	Free Trade Zone	The Belt and Road	BRICS	SCO	APEC
	Infertizer	Infertizer	Infertizer	Infertizer	Infertizer
L.Infertizer	0.303*** (0.00298)	0.275*** (0.00296)	0.206*** (0.00208)	0.300*** (0.00295)	0.312*** (0.00285)
Inimport	0.0282*** (0.00384)	0.0181*** (0.00360)	0.109*** (0.00314)	0.0295*** (0.00381)	0.0153*** (0.00396)
Inexport	-0.0266*** (0.00286)	-0.0444*** (0.00283)	0.00519 (0.00382)	-0.0306*** (0.00305)	-0.0208*** (0.00269)
Ininnovation	0.161*** (0.00866)	0.169*** (0.00758)	0.137*** (0.00653)	0.165*** (0.00860)	0.162*** (0.00850)
Inincome	0.311*** (0.0491)	0.743*** (0.0523)	-0.194*** (0.0368)	0.325*** (0.0490)	0.253*** (0.0469)
Ingdp	0.404*** (0.0462)	0.110** (0.0458)	0.980*** (0.0430)	0.400*** (0.0437)	0.330*** (0.0462)
Inlabor	0.0488 (0.0448)	0.241*** (0.0437)	-0.0265 (0.0473)	0.0317 (0.0423)	0.0350 (0.0451)
Ininflation	-0.0151*** (0.00257)	-0.00792*** (0.00273)	-0.00915*** (0.00223)	-0.0146*** (0.00259)	-0.0148*** (0.00253)
Insoil	-0.454*** (0.0236)	-0.393*** (0.0260)	-0.624*** (0.0242)	-0.439*** (0.0234)	-0.436*** (0.0237)
Incrop_index	-0.0865*** (0.00901)	-0.234*** (0.0113)	0.128*** (0.0110)	-0.0894*** (0.00870)	-0.113*** (0.00915)
fta	0.392 (0.520)				
obor		1.392*** (0.221)			
brics			-15.14*** (2.461)		
sco				0.0491 (0.352)	
apec					0.499 (0.361)
_cons	-10.05*** (0.563)	-9.176*** (0.705)	-17.74*** (0.780)	-9.637*** (0.560)	-7.733*** (0.558)
N	820	820	820	820	820

The main findings are that in general China’s export and import trade are positively correlated with trading partners’ fertilizer use, which corroborates our prediction. However, the international trade exerts heterogeneous effect on different countries.

Discussion

Attention should be raised to the issue that as the trade openness becomes deeper, we need to be cautious about the possible effect of export and import flows on the composition of agricultural production in trading partners, which could bring changes to their environmental conditions. The environmental problem becomes one of the most important factors in policy consideration for many world organizations. It is a consensus that the agricultural industry and international trade should not develop at the expense of increasing pollution. As the call for fair trade with China concentrates partly on the openness in agricultural markets, the unintended effect of possible pollution transferring should not be neglected.