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The Role of Intellectual Property Rights in Seed Technology Transfer through Trade – Evidence from U.S. Field Crop Seed Exports

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Introduction

▪ **Research question:**

How do country's IPRs affect U.S. (field crop) seed exports to this country?

▪ **Motivation:**

Access to improved seed varieties is essential for feeding an increasing global population in a sustainable fashion.

IPRs

facilitate seed innovation and technology transfer, most valuable asset of the seed industry

U.S.

global leader in seed production and exporting

Field crop seeds

account for over 1/3 of planting seed exported, include major GM crops

Top export destinations:

Mexico, Canada, Italy, France, Japan, Spain, Saudi Arabia, Greece, Austria, Netherlands.

Literature Review

Theoretical work

is ambiguous due to IPRs two countervailing effects on market access: market expansion vs. market power

Empirical work:

- Yang and Woo (2006): apply linear dynamic model and find no significant effect of IPRs on U.S. aggregate seed exports;

➤

Eaton (2009): uses quantile regression model but fails to detect significant effect of IPRs on U.S. and EU aggregate seed exports;

➤

Galushko (2012): employs Heckman selection model and finds the effect of IPRs varies across different types of crops using U.S. seed export data.

Data

▪ **Dataset:**

Data: coverage/range - 134 countries over 26 years (1985-2010), but about half of the export values are zeros

▪ **Relevant international IPR treaties:**

UPOV

International Convention for the Protection of New Varieties of Plants

TRIPs

(WTO's) Trade related aspects of intellectual property rights

▪ **Variables of interest:**

UPOV10

=1 if country has signed up to 1978 Act, but not 1991 Act yet

=0 otherwise

UPOV01

=1 if country has signed up to 1991 Act, but did not previously sign up to 1978 Act

=0 otherwise

UPOV11

=1 if country has signed up to 1991 Act, and previously signed up to 1978 Act

=0 otherwise

WTO_TRIPs

=1 if WTO member has implemented TRIPs

=0 otherwise

WTO_trans

=1 if WTO member is given TRIPs transition period

=0 otherwise

▪ **Control variables:**

logGDP

Represents economic size

logCropProd

Combined output of cereals, coarse grain, and oilseed crops; indicates market size

FTA

=1 if country has free trade agreement in force with U.S

=0 otherwise

growGM

=1 if country grows genetically modified crops

=0 otherwise

Methodology

Two-way fixed-effects models:

Linear model:

$\log (y_{i,t}) = \boldsymbol{x}_{i,t}'\boldsymbol{\beta} + \alpha_i + \gamma_t + \varepsilon_{i,t}$

Poisson model:

$y_{i,t} = \exp(\boldsymbol{x}_{i,t}'\boldsymbol{\beta} + \alpha_i + \gamma_t) + \varepsilon_{i,t}$

Results

VARIABLES	Linear Fixed Effects				Poisson Fixed Effects			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	logseedIMP	logseedIMP	logseedIMP	logseedIMP	seedIMP	seedIMP	seedIMP	seedIMP
logGDP	1.231** (0.548)	1.387** (0.538)	1.170** (0.549)	1.316** (0.539)	2.442*** (0.739)	2.796*** (0.709)	2.223*** (0.832)	2.600*** (0.819)
logCropProd	0.316 (0.291)	0.280 (0.290)	0.310 (0.284)	0.271 (0.280)	0.456 (0.596)	0.423 (0.585)	0.259 (0.491)	0.235 (0.483)
FTA	0.196 (0.329)	0.280 (0.300)	0.168 (0.335)	0.270 (0.303)	-0.149 (0.246)	-0.246 (0.197)	-0.100 (0.242)	-0.196 (0.202)
growGM	0.174 (0.260)	0.0916 (0.265)	0.125 (0.258)	0.0484 (0.261)	0.474 (0.323)	0.489 (0.310)	0.453 (0.313)	0.465 (0.302)
UPOV10		0.244 (0.233)		0.173 (0.234)		0.267 (0.288)		0.267 (0.314)
UPOV 01		-0.663** (0.286)		-0.759** (0.296)		-0.307 (0.328)		-0.203 (0.393)
UPOV11		0.369 (0.481)		0.241 (0.485)		0.982 (0.602)		0.934 (0.620)
WTO_TRIPs			0.881** (0.401)	0.924** (0.425)			1.203** (0.546)	1.078* (0.575)
WTO_trans			0.433 (0.404)	0.470 (0.412)			0.852 (0.602)	0.705 (0.623)
Observations	1,643	1,643	1,643	1,643	1,623	1,623	1,623	1,623
Countries	134	134	134	134	114	114	114	114

Notes: Cluster-robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Discussion

▪ **WTO_TRIPs**

is found to have significantly positive impact on seed exports in both types of models, with its magnitude larger in Poisson models.

▪

Membership dummies have drawbacks

▪

Results also complicated by firm's FDI and licensing efforts, as exports are not only way to sell products and technology.

▪

For future research, we would also consider estimating both linear and nonlinear dynamic models, and

▪

How IPRs influence the mode of serving foreign markets

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