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

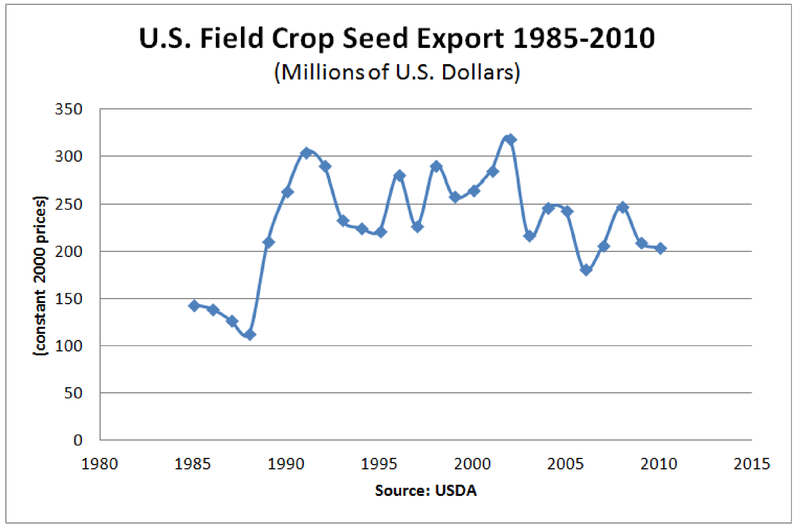
- **Research question:** How do country's IPRs affect U.S. (field crop) seed exports to this country?

- **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:

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

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

Results

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