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Regulatory Impacts on Corn Farming

A Comparison between the United States and European Union

via a cooperative agreement sponsored by The U.S. Department of Agriculture

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The GW Regulatory Studies Center

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Context

- A cooperative agreement between USDA and GWRSC
- Objective: Describe the regulatory tools and policy choices affecting the agricultural sectors in the US and EU
- Before this study:
  - Comparative statistics for the agricultural sectors
  - Agricultural productivity and regulation
  - Regulatory and policy approaches towards agriculture
  - Regulations on water pollution from agriculture
- This study examines the impact of environmental and food safety regulations on corn production in the US and EU.

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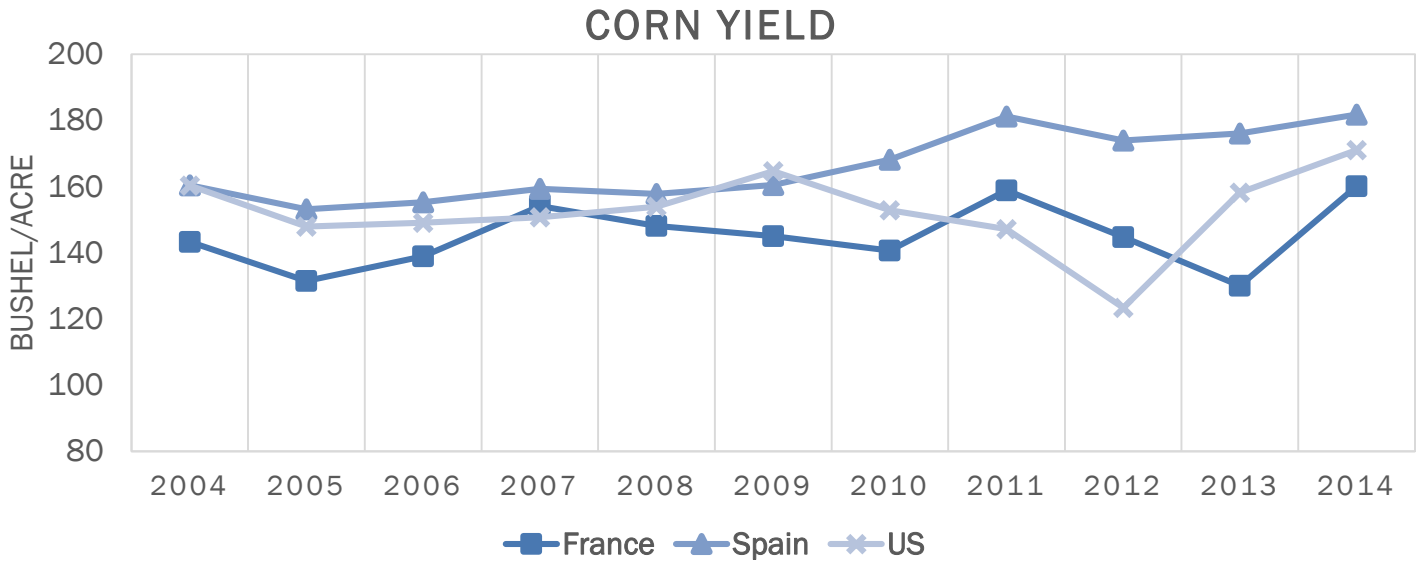
Background

France and Spain are selected as case studies for:

- High corn production in the EU
- Similar corn yields to the US
- Distinct biotechnology regulations and agri-environmental measures



Data source: FAOSTAT 2016

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Scope and Methodology

- Private regulatory costs and benefits
- Environmental and food safety regulation
  - Genetically modified crops, pesticides, and agri-environmental practices
- US federal and EU level regulations
- Timeframe: 2011-2013
- "Typical farm" cases
  - To reflect the most representative corn farming profile and farm-level regulatory impacts for the US, France and Spain

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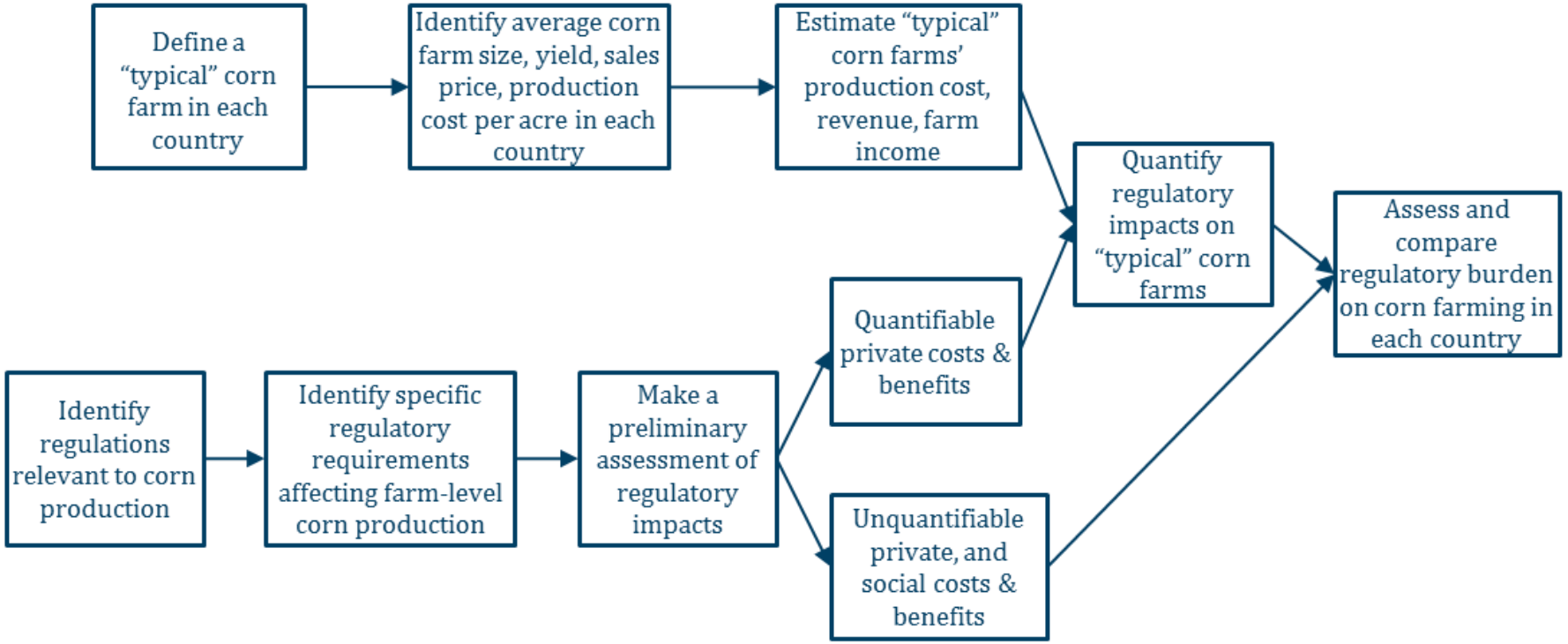
Study Approach



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Defining "A Typical Corn Farm"

Step 1: Determine the typical structural features of a corn farm in each country.

Typical corn farm profile (2011-2013 national averages)

	US	France	Spain
Corn acres planted	280.00	118.31	36.80
Yield per acre (bushel/acre)	140	161	175
Production (bushel)	39,200	18,975	6,430
Corn price at harvest ($/bushel)	5.71	6.26	6.80

Step 2: Estimate production costs and income per farm.

Annual corn production costs and income for a typical corn farm

	US	France	Spain
Production Costs ($/farm)	131,766	110,603	24,710
Revenue ($/farm)	223,832	118,784	43,724
Net Income ($/farm)	92,066	8,180	19,014

Data sources: USDA Economic Research Service, Commodity Costs and Returns, 2016; EU Cereal Farms Report, 2016

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Regulation: GM Crops

United States

- ○ Introduction of GMOs, APHIS, 7 CFR 340
- ○ Premarket approval of food additives, FDA, 21 CFR 170
- ✓ Insect resistance management (IRM) (non-*Bt* corn refuge), EPA, 40 CFR 152 & 174

France

- ○ Authorization of release of GMOs, Directive 2001/18/EC
- ✓ Prohibition of GM crop cultivation, Directive (EU) 2015/412, 2001/18/EC
- ○ Authorization of GMO for food and feed, Regulation (EC) 1829/2003
- ○ Traceability and labeling of GM products, Regulation (EC) 1830/2003

Spain

- ○ Authorization of release of GMOs, Directive 2001/18/EC
- ○ Prohibition of GM crop cultivation, Directive (EU) 2015/412, 2001/18/EC
- ○ Authorization of GMO for food and feed, Regulation (EC) 1829/2003
- ✓ Traceability and labeling of GM products, Regulation (EC) 1830/2003

✓: The regulation has an impact on corn farming.
○: The regulation does not apply to or is unlikely to affect a typical corn farm.

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Regulation: Pesticides

United States

- ○ Registration of pesticides (pesticide bans), EPA, 40 CFR 152
- ✓ Certification of pesticide applicators, EPA, 40 CFR 171
- ✓ Storage of pesticides, EPA, 40 CFR 156
- ✓ Disposal of pesticide containers, EPA, 40 CFR 165
- ✓ Agricultural Worker Protection Standard, EPA, 40 CFR 170
- ✓ Recordkeeping of pesticide application, AMS, 7 CFR 110
- ○ Pesticide tolerances, EPA, 40 CFR 180

France

- ✓ Authorization of pesticides (pesticide bans), Regulation (EC) No 1107/2009
- ✓ Training and certification of pesticide applicators, Directive 2009/128/EC
- ✓ Storage of pesticides, Directive 2009/128/EC
- ✓ Disposal of pesticide containers, Directive 2009/128/EC
- ✓ Recordkeeping of pesticide application, Regulation (EC) No 1107/2009
- ✓ Pesticide application equipment, Directive 2009/128/EC
- ○ Maximum residue levels, Regulation (EC) No 396/2005

Spain

- ✓ Authorization of pesticides (pesticide bans), Regulation (EC) No 1107/2009
- ✓ Training and certification of pesticide applicators, Directive 2009/128/EC
- ✓ Storage of pesticides, Directive 2009/128/EC
- ✓ Disposal of pesticide containers, Directive 2009/128/EC
- ✓ Recordkeeping of pesticide application, Regulation (EC) No 1107/2009
- ✓ Pesticide application equipment, Directive 2009/128/EC
- ○ Maximum residue levels, Regulation (EC) No 396/2005

✓: The regulation has an impact on corn farming.
O: The regulation does not apply to or is unlikely to affect a typical corn farm.

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Regulation: Agri-Environmental Practices

United States

- ○ NPDES Pesticide General Permit, EPA, 40 CFR
- ○ Endangered Species Protection Program, EPA/FWS, 50 CFR 402
- ✓ Conservation compliance: Highly Erodible Land Conservation and Wetland Conservation provisions, USDA, 7 CFR 12

France

- ✓ Cross-compliance for Good Agriculture and Environmental Conditions, Regulation (EU) No 1306/2013
  - Buffer zone for watercourse
  - Protection of groundwater against hazardous substance
  - Minimum land cover
  - Use of irrigation
  - Prevent soil erosion
  - No burning of crop residue
  - Maintaining the landscape features

Spain

- ✓ Cross-compliance for Good Agriculture and Environmental Conditions, Regulation (EU) No 1306/2013
  - Soil erosion control
  - Landscape features

✓: The regulation has an impact on corn farming.
○: The regulation does not apply to or is unlikely to affect a typical corn farm.

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Quantitative Impact Assessment

Estimating annual costs and benefits for a typical corn farm

- Key Assumptions:
  - Changes in farmers' production costs are not transferred to consumers; therefore farmers bear the full amount of the regulatory costs.
  - Corn farmers' annual production costs and income are not affected by changes in market supply or demand due to regulation.
- 12 quantifiable regulatory impacts
  - Estimates based on prior studies
  - Estimates based on market values
- Data Sources:
  - Existing ex-post analyses, regulatory impact analyses, economic analyses, peer-reviewed studies, publicly available surveys, etc.

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Example: Estimates based on Prior Studies

Insect Resistance Management (Refuge Requirement):

Hurley, Langrock and Ostlie, 2006:

$0.93 per acre (confidence interval: $0.13 ~ $1.74)

Base case: Annual cost = $0.93 * 280 acres = $259

Sensitivity analysis: $35 ~ $487

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Example: Estimates based on Market Values

Certification of Pesticide Applicators:

$$Annual\ Cost = (Fee + Wage * Time) * Number * Frequency$$

where

- Fee is the fee required for certification of a private pesticide applicator—national or ten-state average;
- Wage is the average wage rate for a private applicator—national mean hourly wage;
- Time is the training and testing time needed for certification for a year—national or ten-state average;
- Number is the number of pesticide applicators a typical corn farm needs for a year—assuming to be one;
- Frequency is the frequency at which a private applicator needs to be recertified—national or ten-state average.

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Base Case Estimates (2011 US$/year/farm)

	US		FRANCE		SPAIN	
	Costs	Benefits	Costs	Benefits	Costs	Benefits
GM crops						
GM corn prohibition	*n/a*	*n/a*	$3,243	$305	*n/a*	*n/a*
IRM	$259	*n.q.*	*n/a*	*n/a*	*n/a*	*n/a*
GMO labeling	*n/a*	*n/a*	*n/a*	*n/a*	$867	$0
Subtotal:	$259	n.q.	$3,243	$305	$867	$0
Pesticides						
Pesticide bans	*n/a*	*n/a*	$6,084	*n.q.*	$2,158	*n.q.*
Certification of pesticide applicators	$59	*n.q.*	$104	$44	$91	$45
Storage of pesticides	$88	*n.q.*	$53	*n.q.*	$53	*n.q.*
Recordkeeping of pesticides	$46	*n.q.*	$53	*n.q.*	$42	*n.q.*
WPS	$210	*n.q.*	*n/a*	*n/a*	*n/a*	*n/a*
Pesticide equipment	*n/a*	*n/a*	$20	$3	$20	$4
Pesticide disposal	$117	*n.q.*	$147	*n.q.*	$117	*n.q.*
Subtotal:	$519	*n.q.*	$6,460	$47+*n.q.*	$2,481	$49+*n.q.*
Agri-environmental practices						
Conservation compliance	$2,482	*n.q.*	*n/a*	*n/a*	*n/a*	*n/a*
GAECs	n/a	*n/a*	$1,095	*n.q.*	$245	*n.q.*
Subtotal:	$2,482	*n.q.*	$1,095	*n.q.*	$245	*n.q.*
TOTAL:	**$3,261**	***n.q.***	**$10,798**	**$352+*n.q.***	**$3,592**	**$49+*n.q.***

"n.q." refers to "not quantifiable" costs or benefits. "n/a" indicates that there are no relevant regulatory requirements. All estimates are rounded to the nearest dollar.

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A Comparison of Regulatory Costs

	US	France	Spain
Regulatory costs per farm ($)	3,261	10,798	3,592
Regulatory costs per acre ($)	12	91	98
Regulatory costs per bushel of corn produced ($)	0.08	0.57	0.56

What does it mean for a Typical Corn Farm?

Production (bushel)	39,200	18,975	6,430
Production Costs ($/farm)	131,766	110,603	24,710
Income ($/farm)	92,066	8,180	19,014
Regulatory costs as a share of production costs	2.47%	9.76%	14.54%
Regulatory impacts on farm income	-3.42%	-56.90%	-15.89%

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Sensitivity Analysis

	US	France	Spain
Upper-bound Estimate			
Regulatory costs per farm ($)	4,648	16,881	5,681
Regulatory costs per acre ($)	17	143	154
Regulatory costs per bushel of corn produced ($)	0.12	0.89	0.88
Regulatory impacts on farm income	-4.81%	-67.36%	-23.00%
Regulatory costs as a share of production costs	3.53%	15.26%	22.99%
Lower-bound Estimate			
Regulatory costs per farm ($)	432	5,184	849
Regulatory costs per acre ($)	2	44	23
Regulatory costs per bushel of corn produced ($)	0.01	0.27	0.13
Regulatory impacts on farm income	-0.47%	-38.79%	-4.27%
Regulatory costs as a share of production costs	0.33%	4.69%	3.44%

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Conclusion

- French and Spanish farmers face higher regulatory costs than the US by all measures.
- While a typical corn farm in France has the highest per-acre production costs, France does not exhibit the highest per-acre regulatory costs. It implies that EU-level regulations are not the primary source of significantly higher production costs in France.
- GM crop and pesticide regulations together contribute approximately 90% of the total regulatory costs in France and Spain, while the largest regulatory costs in the US come from agri-environmental regulations.

➢ Limitations:

- The estimates may not apply to corn farms with different features.
- The estimates do not reflect the whole picture of regulatory burden borne by corn farmers.
- Factors exogenous to regulations are likely to significantly affect outcomes for corn farmers.

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