Evaluating Policy Efficacy

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Step 1.

Collect all newspaper articles from 1995 through 2013 that relate to biofuel

6500

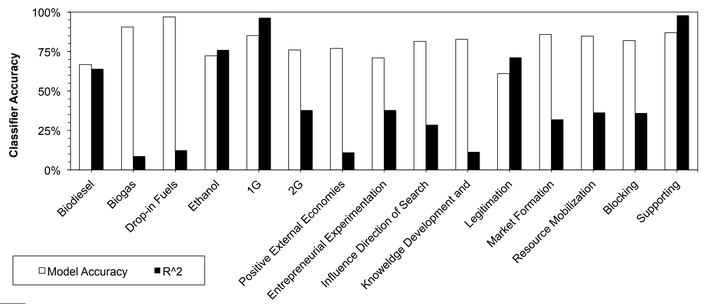
English-language news sources utilized

1 million

biofuel-related articles collected

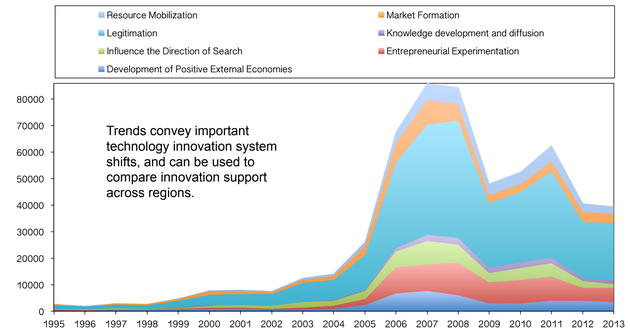
Step 2.

Machine learning-algorithms used to classify articles by innovation function, and technology type at fairly high accuracy



Step 3.

Map out the biofuel technology innovation system for the United States



Step 4.

Determine the marginal effects for state-level biofuel policies. This shows how enacted policy may influence the biofuel TIS article count for each state each year

Policies/Functions	F1	F2	F3	F4	F5	F6	F7
AFV Manufacturer Incentives							
Fuel Use Incentives							
Aftermarket Conversion						17	
Air Quality Emission Regulation	37	37	227	20	53		21
Alternative Fuel Dealer Incentives						28	
Alternative Fuel Producer Incentives							
Alternative Fuel Purchaser Incentives		-19	-72			-15	-10
Climate Change/Energy Initiatives	43	46	278	19	71		20
Idling Regulation	22	27	180	11	28	43	18
Exemption from Restrictions							
Fleet Purchaser/Manger Incentives						28	
Fuel Economy Requirements	13	22	108	7			18
Fuel Production/Quality Regulation	18	28	157	8	32	28	20
Alternative Fuel Tax Rates							
Alternative Fuel Station Incentives				6			13
Grants				-4			
Loans and Leases				6			
Rebates		-16				-18	
Registration or Licensing Regulation				4		22	
Renewable Fuel Standard/ Mandates	24	38	151	6	48		27
Tax Incentives							
Vehicle Owner/Driver Incentive	12	29	148	5	20	37	27

Note: only significant marginal effects are shown, and results consider only ethanol.

Step 5.

Assess which innovation functions are significantly correlated with deployment and adoption of biofuel technologies

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The Technology Innovation System

Innovation studies have determined that there are 7 key functions that support innovation

- Resource Mobilization (F1) — *Money and people*
- Market Formation (F2) — *Technology use and deployment*
- Legitimation (F3) — *Acceptance of technology*
- Knowledge development and diffusion (F4) — *Basic research and discovery*
- Influence the Direction of Search (F5) — *Drivers that promote interest or curiosity in pursuing the technology*
- Entrepreneurial Experimentation (F6) — *Business endeavors*
- Development of Positive External Economies (F7) — *New uses of the technology by external sectors or industries*
  e.g. photovoltaic cells and the semiconductor industry for consumer electronics

Marginal effects show how an increase in annual reporting for a given TIS function effects different biofuel deployment metrics at the state level

Functions/Deployment Metrics		FFV Count (No.Vehicles)	Ethanol Consumption (Thousand Barrels)	Ethanol Production (Thousand Barrels)	FFV Stations (No. Stations)
F1	Resource Mobilization		5.27	13.16	0.03
F2	Market Formation				
F3	Legitimation	-8.40	1.38		
F4	Knowledge Development and Diffusion			-32.68	-0.03
F5	Influence on the Direction of Search		-7.76		
F6	Entrepreneurial Experimentation	35.82	4.15	10.95	0.01
F7	Development of Positive External Economies			-19.67	-0.02

Note: only significant marginal effects are shown, and results consider only ethanol.

Conclusions

Innovation systems analysis suggests that Resource Mobilization and Entrepreneurial Experimentation are the two most influential functions for driving ethanol adoption.

Different policies are necessary to promote each function. Results suggest that some combination of emission regulations, idling regulations, and dealership incentives may be most effective at encouraging further adoption of ethanol and FFVs.

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