

Research question

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- What if the cost change is firm-specific?
- What if it is an industry-wide cost change?
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These are useful questions to answer.

- Pass-through is central to wide range of analyses
- Theory predictions on pass-through are ambiguous
- Large empirical literature on pass-through...
but little that accounts for oligopoly interactions

Summary of regression results

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Main regression results

- 1 Industry pass-through is complete, regardless of competitive conditions
- 2 Own pass-through is incomplete and decreases with competition
- 3 Cross pass-through effects – how firms adjust prices with competitors' costs – account for this divergence

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Similar to theoretical predictions of Cournot model with convex demand curve (ten Kate and Niels 2005)

Why portland cement?

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- 1 Amendments to the NESHAP regulations on (local) air pollutants take effect September 2015
- 2 Cement accounts for 5% of global CO₂ emissions. How would cap-and-trade affect firms and consumers?
- 3 Merger of Holcim and Lafarge proposed in April 2014. Number 1 and 3 in United States. Price effect?

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Motivation for the empirical model

Objective: Obtain estimates of how each plant adjust prices with its costs and the costs of its competitors

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Obstacle: Plant-level prices are not observed

Plant pricing in equilibrium

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Linear approximation of equilibrium price of plant j in period t

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Plant pricing

Linear approximation to equilibrium price of plant j in period t

$$p_{jt} = \beta_{jt} C_{jt} + \sum_{k \neq j} \beta_{jkt} C_{kt} + X_{jt}^0 + \epsilon_{jt}$$

Plant pricing

Linear approximation to equilibrium price of plant j in period t

$$p_{jt} = \beta_{jtt} C_{jt} + \sum_{k \neq j} \beta_{jkt} C_{kt} + X_{jt}^0 + \alpha_j + \alpha_t + \alpha_{jt}$$

- ① Model is general: prices based on equilibrium strategies, given a demand schedule and some competitive game
- ② Cannot be estimated due to curse of dimensionality ($J \times J \times T$ pass-through parameters)

Restrictions on pass-through

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 - Analogous to strategic complementarity decreasing in distance (e.g., Pinske, Slade and Brett 2002)
- 2 Own pass-through linearly affected by number, proximity of competitors

Linearity facilitates aggregation

Pass-through can be estimated with regional price data and properly aggregated plant-level fuel costs data

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- 2 All regressors constructed by aggregating plant-level variables to region level
- 3 Plants affect prices outside their region via cross pass-through

Stylized facts about cement production

Data span United States, 1974-2010

Empirical variation in fuel costs:

- 1 Observable heterogeneity in kiln fuel efficiency
- 2 Time-series variation in fossil fuel prices
- 3 Heterogeneity in choice of fossil fuel

Empirical variation in competitive conditions:

- 1 Entry and exit
- 2 Changes in gasoline prices

Table : Regression Results with the Baseline Specification

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		OLS		FGLS		Bayesian	
		(i)	(ii)	(iii)	(iv)	(v)	(vi)
Fuel Costs		0.99 (0.23)	1.01 (0.23)	1.02 (0.15)	1.16 (0.24)	1.1 (0.17)	1.31 (0.16)
Fuel Costs	Inverse Rival Distance	-5.49 (1.71)	-4.14 (1.70)	-6.95 (0.67)	-5.09 (0.97)	-3.1 (0.95)	-3.75 (1.01)
Rival Fuel Costs	Inverse Rival Distance	5.07 (2.07)	3.52 (2.18)	6.93 (0.77)	4.55 (1.15)	3.1 (1.03)	3.62 (1.09)
Distance Metric		Miles Gas	Miles	Miles Gas	Miles	Miles Gas	Miles

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Application to merger analysis

Holcim and Lafarge are first and third largest cement firms

How to analyze the likely price effects?

- 1 Cournot competition with local markets

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- 2 Structural modeling (Miller-Osborne 2014 RAND)
- 3 **First order approximation** (Jaffe-Weyl 2013, MRRS 2014)

Unilateral pricing effects of mergers

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- 2 Low pricing of one partner forgoes profit from other partner
- 3 Magnitude of opportunity cost is “upward pricing pressure”
- 4 Calculate first order effects of mergers based on (i) magnitude of opportunity costs and (ii) observed pass-through behavior

Table : Price Effects of a Holcim/Lafarge Merger

City	State	Pre-Divestiture Price Effect	Post-Divestiture Price Effect
<i>Holcim Plants</i>			
Bloomsdale	MO	6.6%	4.70%
Holly Hill	SC	6.3%	
Theodore	AL	8.2%	
Catskill	NY	8.1%	
Hagerstown	MD	4.5%	4.2%
<i>Lafarge Plants</i>			
Ravena	NY	7.4%	2.5%
Calera	AL	3.7%	
Grand Chain	IL	3.1%	3.0%
Sugar Creek	MO	4.0%	
Tulsa	OK	4.9%	

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- Producer surplus loss of **\$17MM** per dollar of carbon tax
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- Consumer surplus loss of \$66MM per dollar of carbon tax
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- Broad disbursement of revenues is justifiable

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In conclusion

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Thank you