

Who Bears the Burden of Energy Taxes?

The Role of Local Pass-Through

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MIT and Michigan

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The basic question

What are the distributional impacts of energy taxation?

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Why do we care?

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- Energy taxes are:
 - An important type of environmental policy

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 - Quite common throughout the world

The basic question

What are the distributional impacts of energy taxation?

Why do we care?

- Energy taxes are:
 - An important type of environmental policy
 - Quite common throughout the world
 - Frequently criticized for disproportionately burdening the poor

This paper

What I do:

- Study the distributional equity of energy taxes in one particular context:

This paper

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 - Degree of competition
 - Wealth of local consumers

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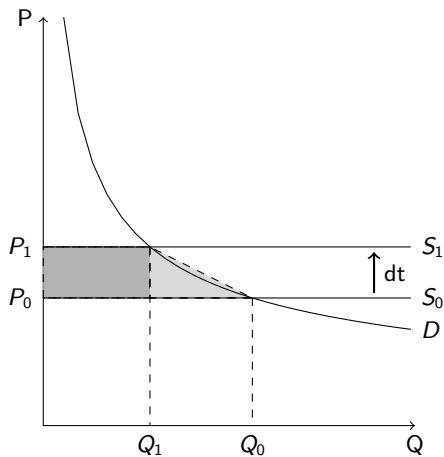
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- Link price impacts to welfare impacts, by wealth bracket

Pass-through and consumer surplus




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Province
(Seleccione Provincia)

Municipality





Type of fuel
Gasolina 95 (G Protec)


Title

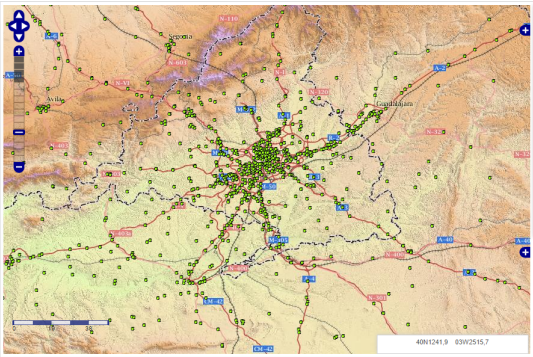
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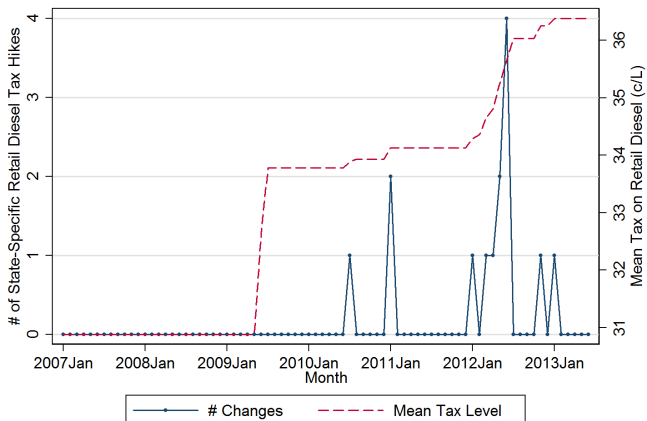




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► Other data details

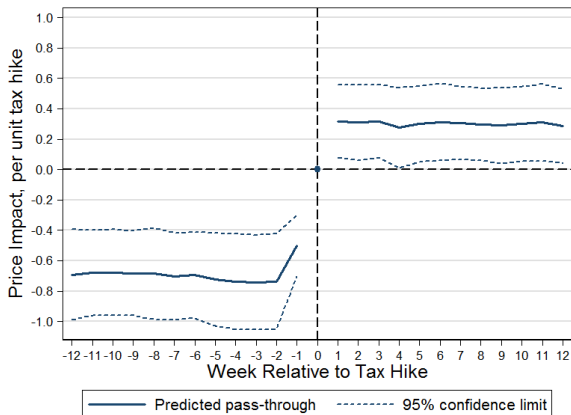
Assessing price trends around tax hikes

Event study model

$$P_{it} = \alpha + \sum_{j=a}^b \pi^j D_{st}^j + \mathbf{X}'_{it} \delta + \lambda_i + \sigma_t + \varepsilon_{it}$$

- Index j denotes a time period relative to the event of interest - a tax hike
 - D_{st}^j is a binary variable equaling one if time t is j periods (where $j \in [a, b]$) after a tax hike in state s
 - $[a, b] = [-12, 12]$; observation window is thus 6 months wide

Price impacts of tax hikes are mean shifts



► Event study by degree of competition

Empirical model of tax pass-through

Main fixed effects specification

$$P_{it} = \alpha + \beta Tax_{st} + \mathbf{X}'_{it}\delta + \lambda_i + \sigma_t + \varepsilon_{it}$$

Adding interactions between the tax variable and local market characteristics:

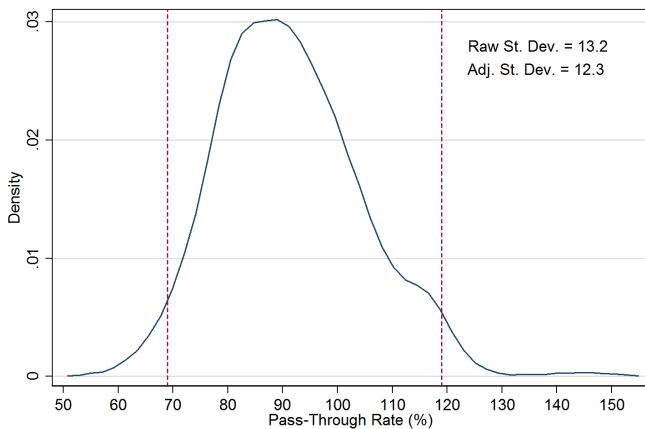
$$P_{it} = \alpha + \beta Tax_{st} + \mathbf{X}'_{it}\delta + \sum_{k=1}^K \left(\gamma_k Tax_{st} * X_{it}^k \right) + \lambda_i + \sigma_t + \varepsilon_{it}$$

Estimates of average and local pass-through

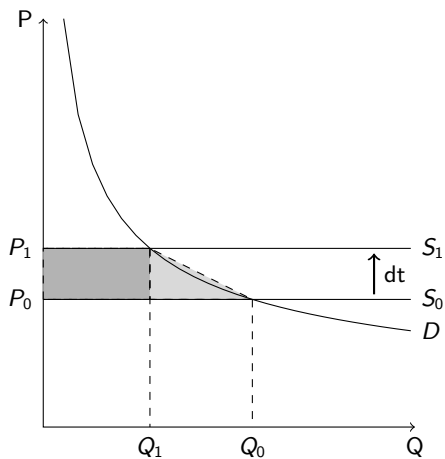
	(1)	(2)	(3)	(4)	(5)	(6)
Mean Tax Level (c/L)	0.952*** (0.036)	0.845*** (0.046)	0.943*** (0.036)	0.868*** (0.036)	0.598*** (0.076)	0.231 (0.203)
Mean Tax Level X 1[Refiner brand]		0.138*** (0.029)				0.095*** (0.023)
Mean Tax Level X # of stations w/in 5 min			-0.117*** (0.035)			-0.090*** (0.017)
Mean Tax Level X Ownership concentration				0.173*** (0.045)		0.090** (0.038)
Mean Tax Level X Avg. House Price					0.220*** (0.037)	0.195*** (0.042)
N	730,146	730,146	730,146	730,146	730,146	730,146

▶ Robustness checks

Empirical distribution of pass-through rates



Distributional welfare analysis, graphically



Heterogeneous pass-through and regressivity

Goal: estimate tax burdens on households in different wealth brackets, as a proportion of overall wealth

- Following Poterba (1991), Fullerton and West (2003), and Treasury OTA

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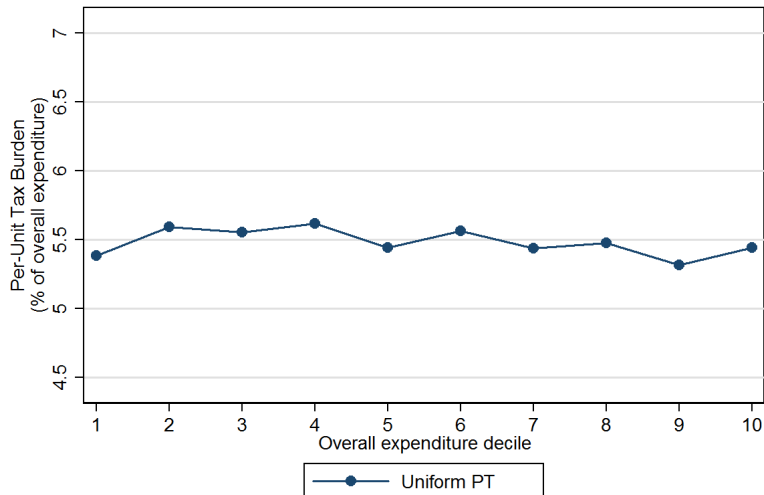
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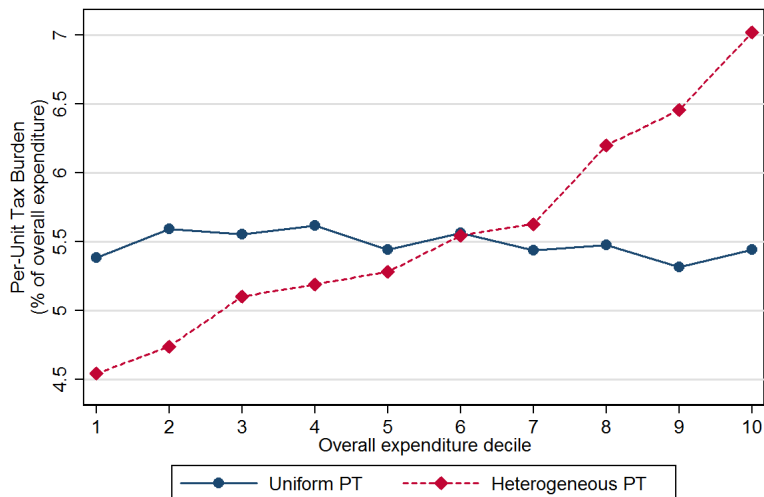
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 - Assumes house-price decile equals expenditure decile

Is the Spanish diesel tax regressive?



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Policy takeaways

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Much of the world is considering some form of policy to mitigate climate change

- Nearly any such policy will raise the price of energy
- Optimal policy depends on an accurate picture of distributional implications

Thank you for your time!

sstolper@mit.edu

The use of pass-through in energy tax research

Existing analyses assume uniform – and usually, full – pass-through

- Gasoline: West (2003); West and Williams (2004); Bento et al (2005, 2009)
- Carbon: Metcalf (2009); Grainger and Kolstad (2010); Metcalf, Mathur, and Hasset (2011); Mathur and Morris (2012)

Why might pass-through be non-uniform?

- Variation in supply conditions (Marion and Muehlegger 2011)
- Variation in the makeup of the demand side: preferences, budget constraints

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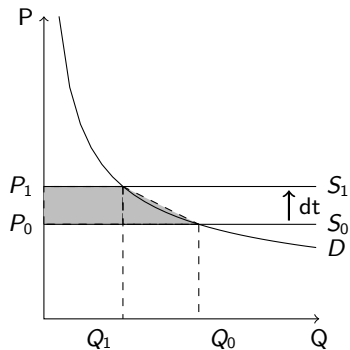
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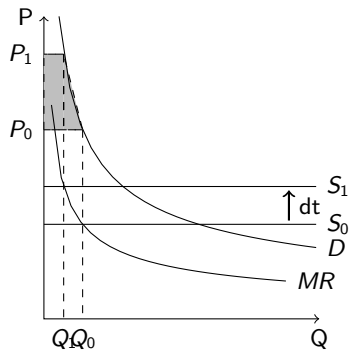
- Variation in supply conditions (Marion and Muehlegger 2011)
- Variation in the makeup of the demand side: preferences, budget constraints
- Variation in competition (Doyle and Samphantharak 2008)

The possibility of $> 100\%$ pass-through

A. Perfect Competition



B. Monopoly



▶ Back

Other data details

Demand-side variables

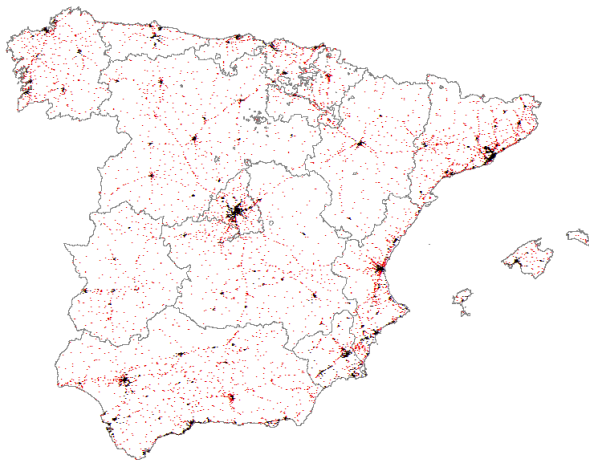
- Population density: municipal-year
- Education levels: cross-sectional, 1x1-km grid with incomplete coverage
- House prices per unit area: municipal-quarter (only if $\geq 25,000$ residents)

In main analysis, I use only the stations with demand-side data

- Cuts sample from 9,457 to 2,553
- I show results with the national sample as well, for comparison

[▶ Station map](#)[▶ Summary stats](#)[▶ Price variation](#)[▶ Back](#)

Geography of selected stations

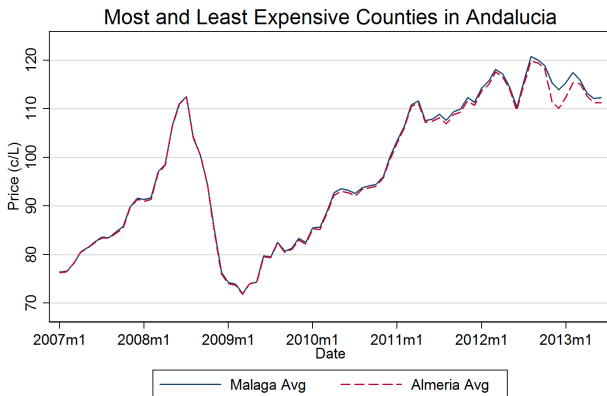
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Characteristics of stations and their surroundings

	Mean	St. Dev.	Min	Max
<i>Panel A. Characteristics of stations</i>				
Retail price (c/L)	98.59	4.84	73.54	117.64
1[Refiner branded]	0.58	0.49	0	1
<i>Panel B. Characteristics of stations' surroundings</i>				
# of rival stations, weighted by inverse travel time	0.47	0.14	0	2.13
Own-firm proportion	0.40	0.26	0.07	1
Municipal mean house price (1000s of /m ²)	1.99	0.64	0.83	3.86
N	2,553			

▶ Back

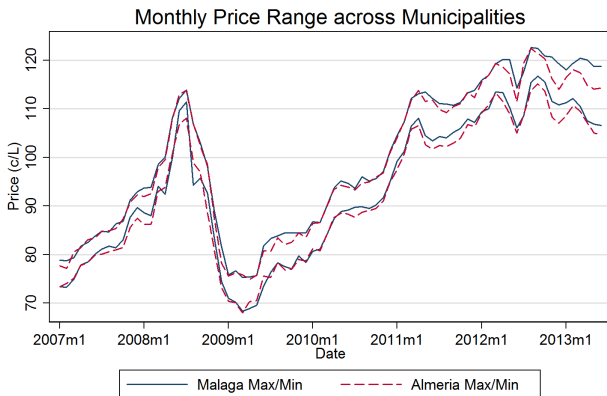
County-level price differences are negligible



► Within County

► Back

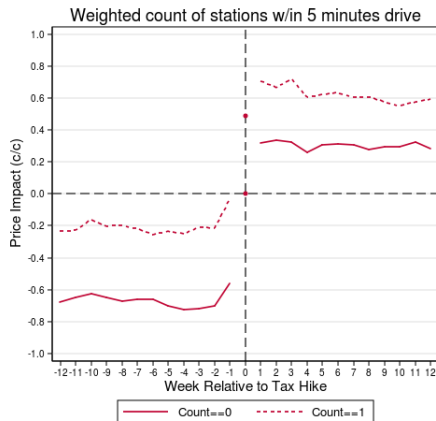
Municipality-level differences are *not* negligible



► Cross County

► Back

Is pass-through heterogeneous?



Checks on robustness of estimates

	(1) County clusters	(2) State-year FE	(3) Post-2010	(4) Full sample
Mean Tax Level	0.231* (0.136)	0.532*** (0.144)	0.826*** (0.054)	0.766*** (0.054)
Mean Tax Level X 1[Refiner brand]	0.095*** (0.023)	0.100*** (0.021)	0.134*** (0.029)	0.109*** (0.015)
Mean Tax Level X # of stations w/in 5 min	-0.090*** (0.030)	-0.054*** (0.019)	-0.098*** (0.030)	-0.039* (0.019)
Mean Tax Level X Own-firm proportion	0.090*** (0.033)	0.085*** (0.028)	0.094** (0.040)	0.058* (0.03)
Mean Tax Level X Avg. House Price	0.195*** (0.035)	0.124*** (0.036)	0.124*** (0.036)	
Demand-side interactions	X	X	X	
N	730,146	730,146	730,146	2,599,966

▶ Back