

# Demand for Gasoline is More Price-Inelastic than Commonly Thought

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- 1 Introduction  
Price Elasticity of Gasoline Demand  
Meta-Analysis
- 2 Our Contribution  
Visual Analysis  
Numerical Results

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# Why We Need to Estimate the Elasticity

## The price elasticity of gasoline demand

It measures the % increase in gasoline demand after a 1% increase in price.

- A key parameter for computing the optimal gasoline tax.
- Very low elasticity → taxes will not reduce emissions.
- Many estimates of the elasticity, but **very different results**.

# How to Make Sense of All These Papers?



# Outline

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# Meta-Analysis: More than a Literature Survey

## Meta-Analysis

The quantitative method of research synthesis.

- Developed in medicine to aggregate clinical trials.
- The method corrects for publication selection and examines the pattern of differences among estimates.
- Two previous meta-analyses on the topic, but they did not correct for publication bias.
- Brons et al. (2008):  $-0.3$  for short run,  $-0.8$  for long run.

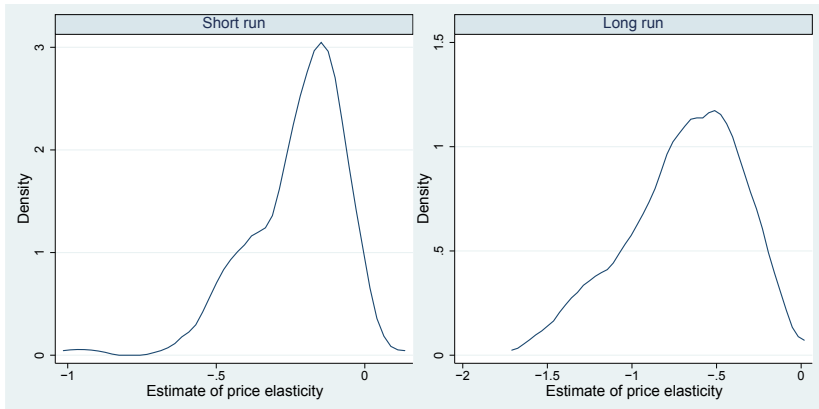
# Publication Bias

- The preference of editors and referees for some particular results based on their significance or sign.
- If authors want to publish and are rational, they will select such estimates as well  $\Rightarrow$  publication bias matters even for working papers.
- Such selection is bad for the literature, even if it makes sense at the micro level.

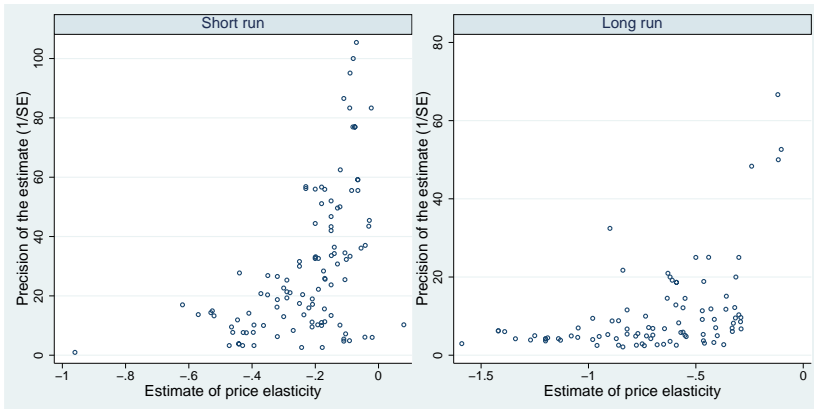


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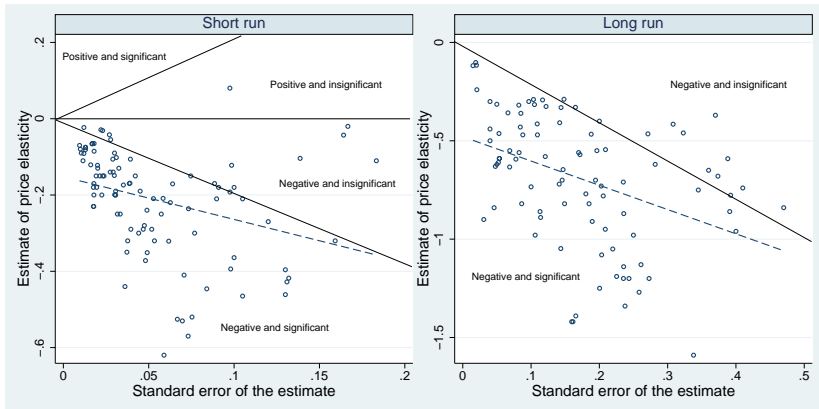
# Kernel Density of the Estimated Elasticities



# Funnel Plot of the Estimated Elasticities



# Visualization of the Funnel Asymmetry Test



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# Funnel Asymmetry Test

From the funnel plot we have

$$e_i = e_0 + \beta_0 \cdot Se(e_i) + u_i. \quad (1)$$

This is heteroskedastic; we use weighted least squares:

$$e_i / Se(e_i) = t_i = e_0 \cdot 1 / Se(e_i) + \beta_0 + \xi_i, \quad (2)$$

We account for heterogeneity among studies:

$$t_{ij} = e_0 \cdot 1 / Se(e_{ij}) + \beta_0 + \zeta_j + \epsilon_{ij}. \quad (3)$$

Finally, the Heckman meta-regression allows us to estimate the underlying elasticity:

$$t_{ij} = e_0 \cdot 1 / Se(e_{ij}) + \beta_0 SE + \zeta_j + \epsilon_{ij}. \quad (4)$$

# Test of Publication Bias

This regression tests for publication bias and for the significance of the average elasticity corrected for the bias.

Response variable: t-statistic	Mixed-effects multilevel		Clustered OLS	
	Short run	Long run	Short run	Long run
Constant (publication bias)	-2.587*** (0.465)	-2.491*** (0.707)	-2.890*** (0.595)	-3.570*** (0.808)
1/SE	-0.0611*** (0.0111)	-0.237*** (0.0393)	-0.0651*** (0.0152)	-0.189* (0.111)
Observations	110	92	110	92
Likelihood-ratio test ( $\chi^2$ )	21.78***	19.71***		

# Test of the True Elasticity Beyond Publication Bias

This regression estimates the size of the average elasticity corrected for the bias.

Response variable: t-statistic	Mixed-effects multilevel		Clustered OLS	
	Short run	Long run	Short run	Long run
1/SE (true elasticity)	-0.0913 <sup>***</sup> (0.0120)	-0.314 <sup>***</sup> (0.0334)	-0.120 <sup>***</sup> (0.0145)	-0.307 <sup>**</sup> (0.115)
SE	-0.975 (2.094)	-2.396 (2.668)	-4.960 <sup>*</sup> (2.558)	-9.343 <sup>***</sup> (3.054)
Observations	110	92	110	92
Likelihood-ratio test ( $\chi^2$ )	37.28 <sup>***</sup>	34.45 <sup>***</sup>		



# Conclusion



## Main Findings

- 1 Publication bias plagues the estimates of the price elasticity of gasoline demand.
- 2 The corrected short-run elasticity is  $-0.1$ .
- 3 The corrected long-run elasticity is  $-0.3$ .

## Related Projects

[www.meta-analysis.cz](http://www.meta-analysis.cz)

## Interested in Meta-Analysis?

-  Stanley, T. D. & C. Doucouliagos (2012): *Meta-Regression Analysis in Economics and Business*.  
Routledge, 1st. edition.
-  Havranek, T. & Z. Irsova (2011): Estimating Vertical Spillovers from FDI: Why Results Vary and What the True Effect Is.  
*Journal of International Economics* **85(2)**: pp. 234–44.
-  Rusnak, M., T. Havranek, & R. Horvath (2012): How to Solve the Price Puzzle? A Meta-Analysis.  
*Journal of Money, Credit and Banking*, forthcoming.

Reading list on RePEc: [ideas.repec.org/k/metaana.html](http://ideas.repec.org/k/metaana.html)