Cross-Country Heterogeneity in Intertemporal Substitution

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Elasticity of Intertemporal Substitution in Consumption

The EIS reflects households' willingness to substitute consumption between time periods in response to changes in the expected real interest rate.

Important in models involving intertemporal choice:

- monetary policy,
- fiscal policy,
- portfolio choice,
- computing the social cost of carbon emissions, and more.

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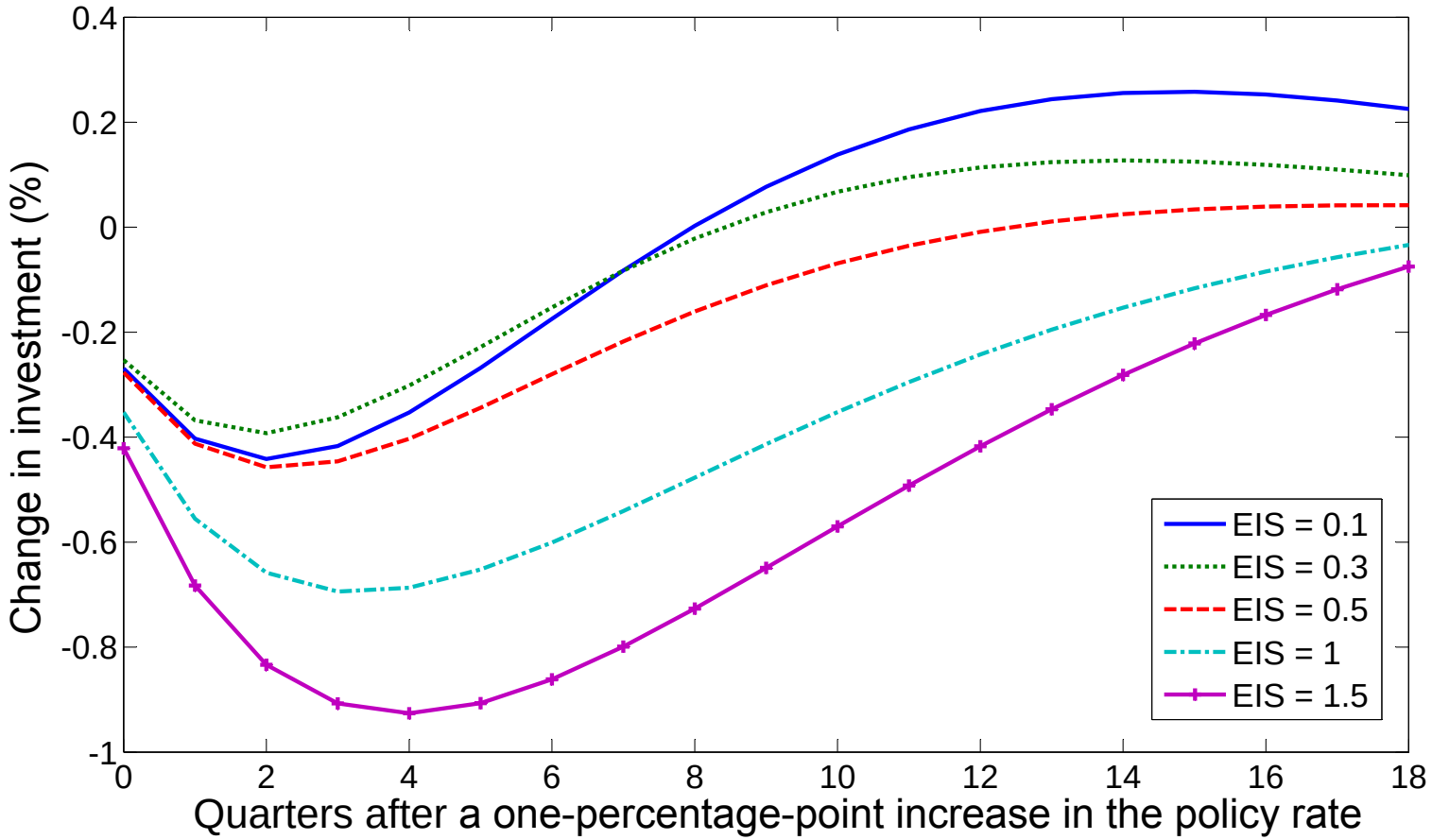
The Elasticity Matters.



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Calibrations Vary.

Study	EIS	Outlet
House & Shapiro (2006)	0.2	American Economic Review
Piazzesi et al. (2007)	0.2	Journal of Financial Economics
Chari et al. (2003)	0.2	Review of Economic Studies
Trabandt & Uhlig (2011)	0.5	Journal of Monetary Economics
Jin (2012)	0.5	American Economic Review
Rudebusch & Swanson (2012)	0.5	American Economic Journal: Macro
Smets & Wouters (2007)	2/3	American Economic Review
Bansal & Yaron (2004)	1.5	Journal of Finance
Ai (2010)	2	Journal of Finance
Barro (2009)	2	American Economic Review
Colacito & Croce (2011)	2	Journal of Political Economy

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Different Justifications

Study	EIS	Explanation
House & Shapiro (2006)	0.2	p. 1837: "Our calibration is roughly the average estimate in Hall (1988), Campbell and Mankiw (1989), and Barsky et al. (1997)."
Trabandt & Uhlig (2011)	0.5	p. 311: "For the intertemporal elasticity of substitution, a general consensus is followed for it to be close to 0.5."
Smets & Wouters (2007)	2/3	p. 593: "These are all quite standard calibrations."
Barro (2009)	2	p. 252: "Because of the shortcomings of the macroeconomic estimates, it is worthwhile to consider microeconomic evidence. The Gruber (2006) analysis is particularly attractive (. . .)."

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Call for a Meta-Analysis

Empirical studies produce very different estimates of the EIS.

Browning & Lusardi (1996, p. 1833):

- "It is frustrating in the extreme that we have very little idea of what gives rise to the different findings."
- "We still await a study which traces all of the sources of differences in conclusions to sample period; sample selection; functional form; variable definition; demographic controls; econometric technique; stochastic specification; instrument definition; etc."

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Uses of Meta-Analysis

- 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 (2013): How to Solve the Price Puzzle? A Meta-Analysis.
  Journal of Money, Credit and Banking **45(1)**: pp. 37–70.
- Havranek, T., Z. Irsova, & K. Janda (2012): Demand for Gasoline is More Price-Inelastic than Commonly Thought.
  Energy Economics **34(1)**: pp. 201–207.

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Results

Main Findings

1. The elasticity of intertemporal substitution varies a lot across countries.
2. Households in rich countries and countries with high stock market participation substitute more intertemporally.
3. Some method choices have systematic effects on the estimated elasticity (data frequency, inclusion of durables).

Project Website

www.meta-analysis.cz/substitution

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Estimating the Elasticity

Researchers usually follow Hall (1988) and use the log-linearized consumption Euler equation:

$$\Delta c_{t+1} = \alpha_i + EIS \cdot r_{i,t+1} + \epsilon_{i,t+1}.$$

- Δc_{t+1} is consumption growth at time $t + 1$
- $r_{i,t+1}$ is the real return on asset i at time $t + 1$

Instruments for $r_{i,t+1}$ typically include the values of asset returns and consumption growth known at time t.

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Data Collection

- We find 169 published studies that report estimates of the EIS.
- These studies provide in total 2735 estimates for 104 countries.
- We collect all estimates, their standard errors, 30 aspects of methodology, and characteristics of the countries.
- The average is 0.5 (0.8 for micro estimates; 0.9 for studies published in top journals).

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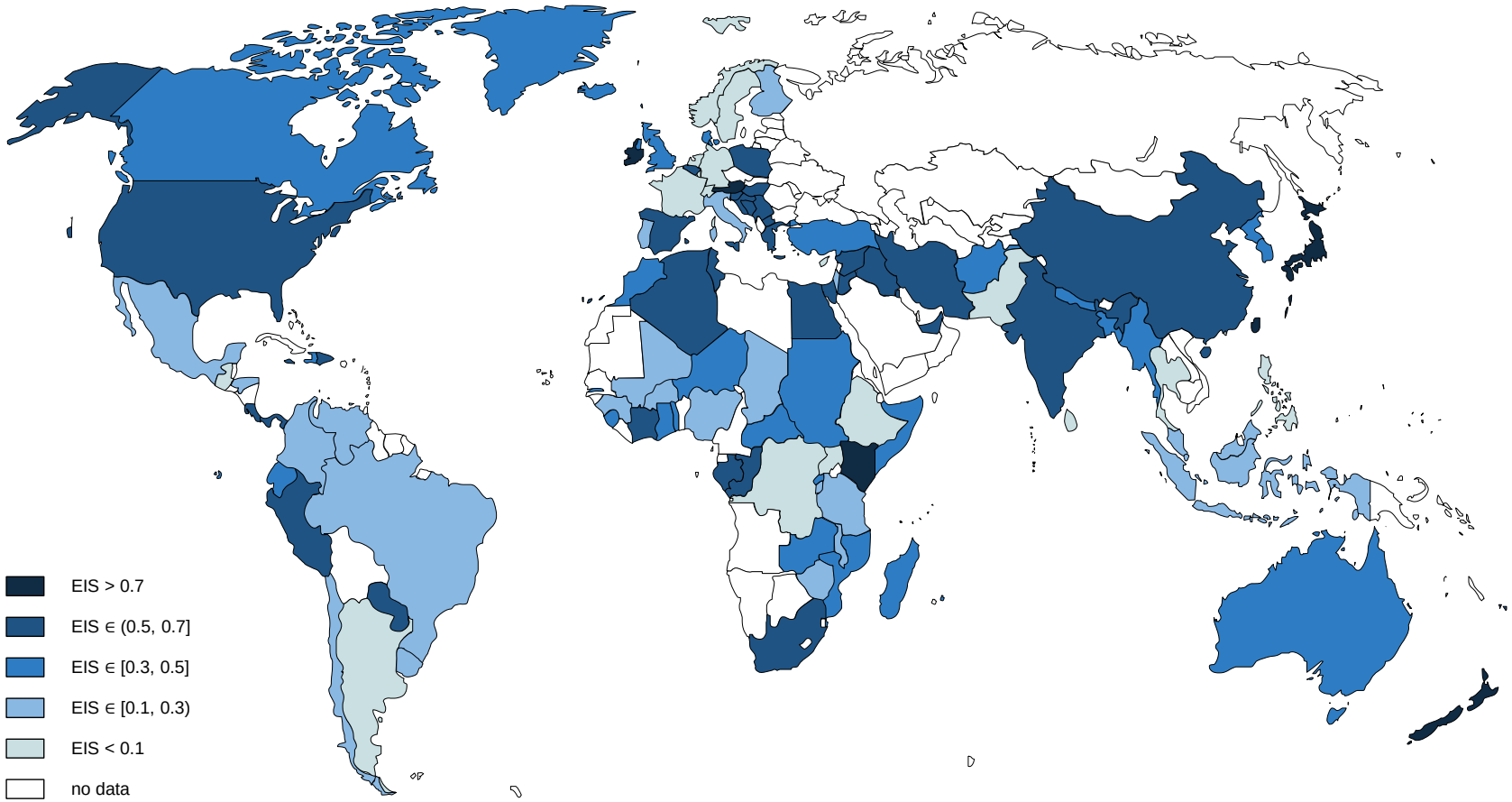
The Elasticity Varies Across Countries.



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What Explains the Differences?

Country-level variables

Stock market participation: Euler equation valid for asset holders.

GDP per capita: necessities hard to substitute across time periods.

Credit availability: financial constraints hamper intertemporal substitution.

Real interest: the elasticity does not have to be constant.

Rule of law: institutions can affect financial decisions.

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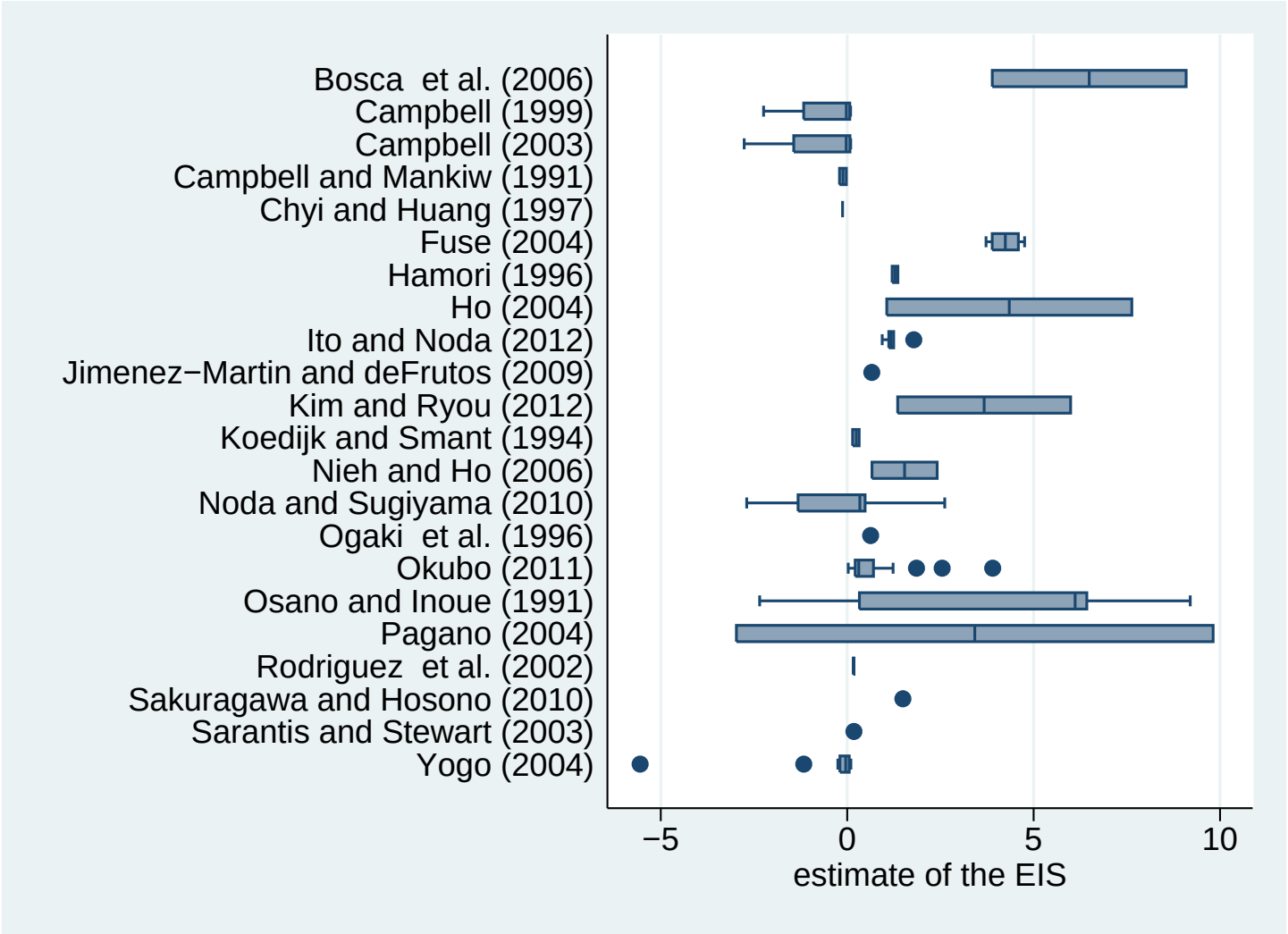
The Elasticity Varies Across Methods.



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Control Variables (1)

Utility	
Epstein-Zin	=1 if the estimation differentiates between the EIS and the coefficient of relative risk aversion.
Habits	=1 if habits in consumption are assumed.
Nonsep. durables	=1 if the model allows for nonseparability between durables and nondurables.
Nonsep. public	=1 if the model allows for nonseparability between private and public consumption.
Nonsep. tradables	=1 if the model allows for nonseparability between tradables and nontradables.
Data	
No. of households	The logarithm of the number of cross-sectional units used in the estimation (households, cohorts, countries).
No. of years	The logarithm of the number of years of the data period used in the estimation.
Average year	The logarithm of the average year of the data period.
Micro data	=1 if the coefficient comes from a micro-level estimation.
Annual data	=1 if the data frequency is annual.
Monthly data	=1 if the data frequency is monthly.

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Control Variables (2)

Design	
Quasipanel	=1 if quasipanel (synthetic cohort) data are used.
Inverse estimation	=1 if the rate of return is the dependent variable in the estimation.
Asset holders	=1 if the estimate is related to the rich or asset holders.
First lag instrument	=1 if the first lags of variables are included among instruments.
No year dummies	=1 if year dummies are omitted in micro studies using the Panel Study of Income Dynamics.
Income	=1 if income is included in the specification.
Taste shifters	The logarithm of the number of controls for taste shifters.
Variable definition	
Total consumption	=1 if total consumption is used in the estimation.
Food	=1 if food is used as a proxy for nondurables.
Stock return	=1 if the rate of return is measured as stock return.
Capital return	=1 if the rate of return is measured as the return on capital.

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Control Variables (3)

Estimation	
Exact Euler	=1 if the exact Euler equation is estimated.
ML	=1 if maximum likelihood methods are used for estimation.
TSLS	=1 if two-stage least squares are used for estimation.
OLS	=1 if ordinary least squares are used for estimation.
Publication	
SE	The reported standard error of the estimate of the EIS.
Publication year	The logarithm of the year of publication of the study.
Citations	The logarithm of the number of per-year citations of the study in Google Scholar.
Top journal	=1 if the study was published in one of the top five journals in economics.
Impact	The recursive RePEc impact factor of the outlet.

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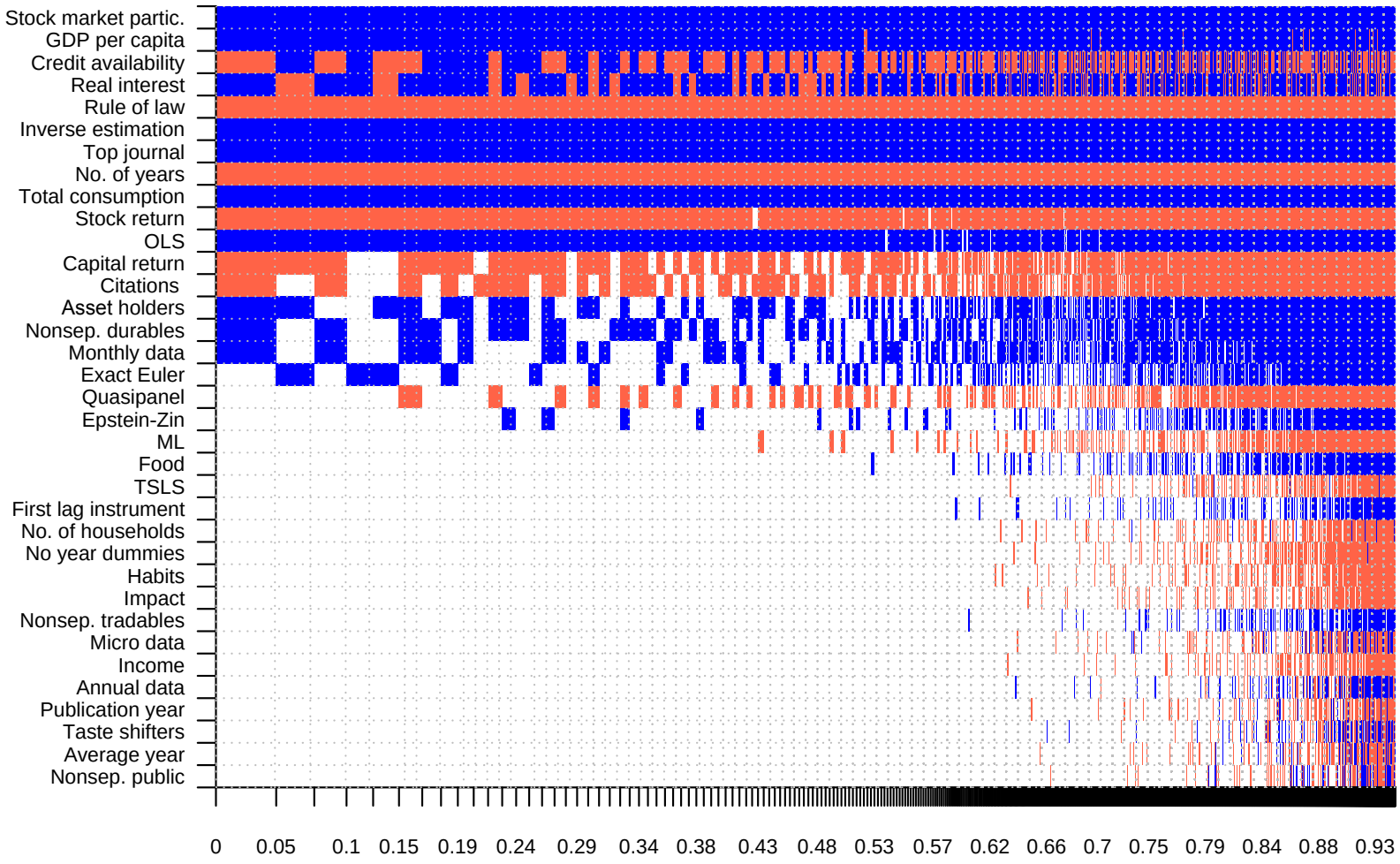
Bayesian Model Averaging



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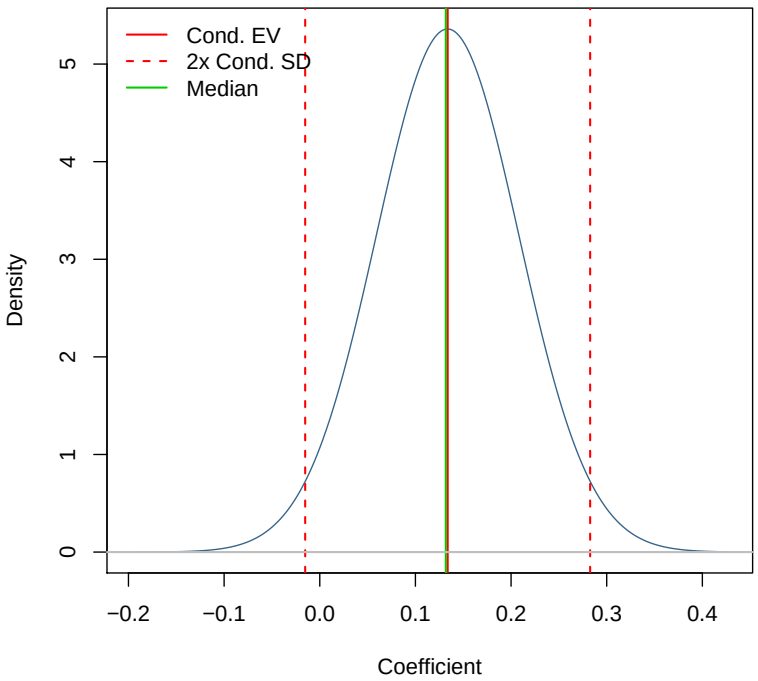
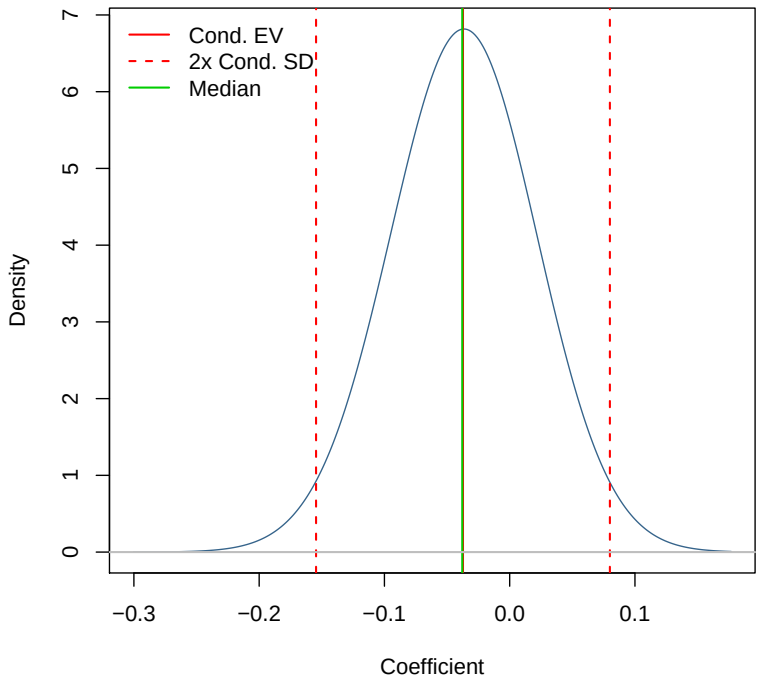
Posterior Coefficient Distributions (1)

(a) GDP per capita



(b) Credit availability



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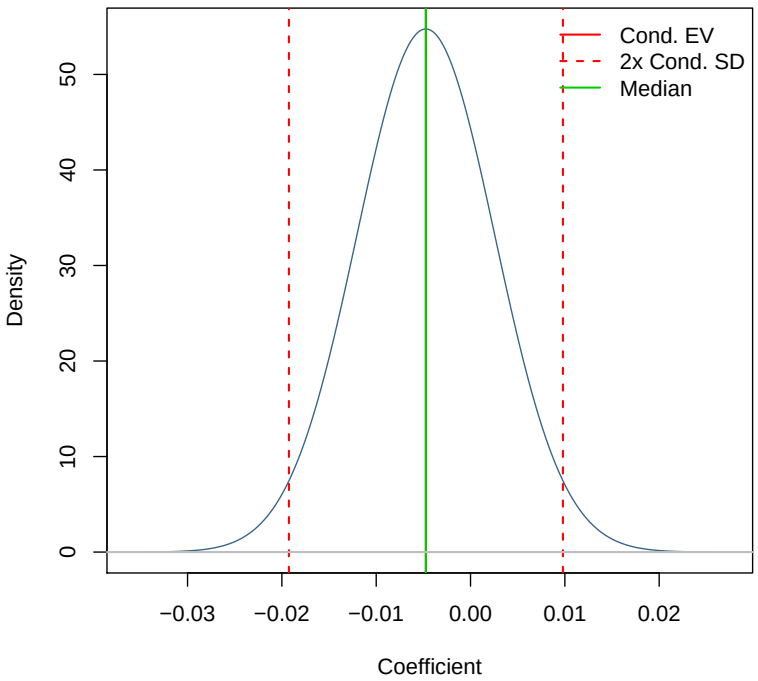
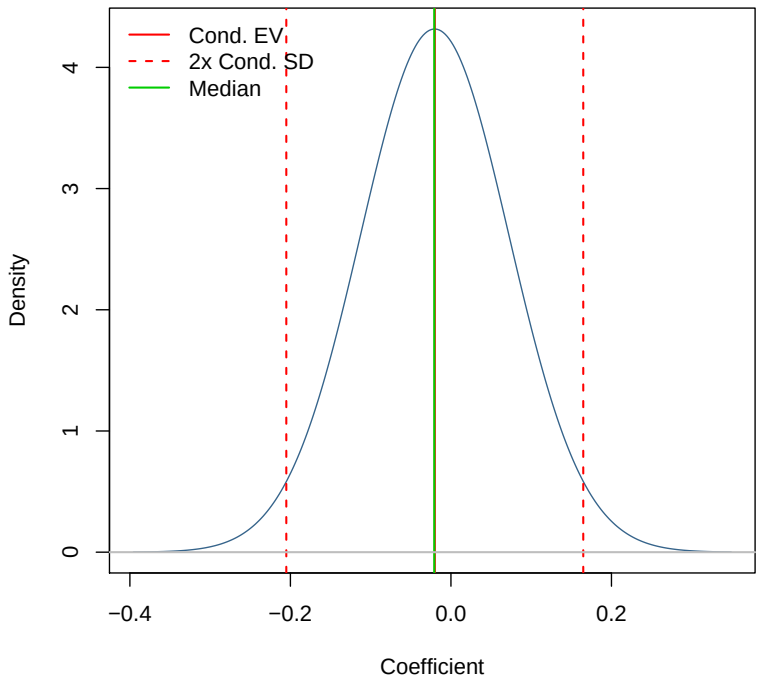
Posterior Coefficient Distributions (2)

(c) Real interest



(d) Rule of law



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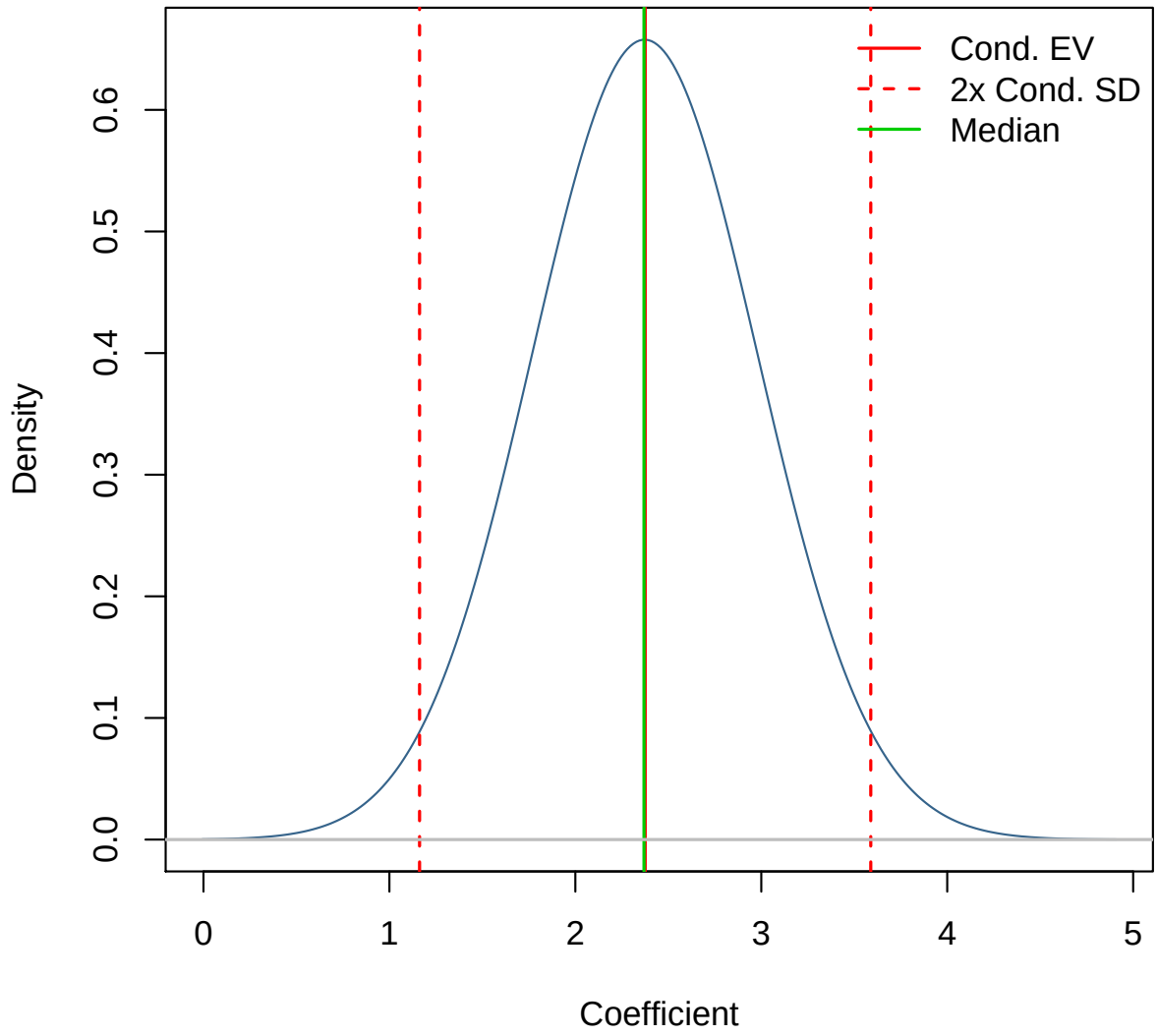
Stock Market Participation



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Economic Significance

Stock market participation and GDP per capita affect the elasticity a lot:

Variable	Maximum effect	Std. dev. effect
Stock market partic.	0.931	0.141
GDP per capita	0.683	0.088
Credit availability	-0.119	-0.020
Real interest	-0.265	-0.019
Rule of law	-0.087	-0.012

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Results. . . Once Again

Main Findings

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For Further Reading

Stanley, T. D. & C. Doucouliagos (2012): Meta-Regression Analysis in Economics and Business.
Routledge, 1st. edition.

Chetty, R., A. Guren, D. Manoli, & A. Weber (2013): Does Indivisible Labor Explain the Difference between Micro and Macro Elasticities? A Meta-Analysis.
NBER Macroeconomics Annual 2013: pp. 1–56.

Card, D., J. Kluve, & A. Weber (2010): Active Labour Market Policy Evaluations: A Meta-Analysis.
The Economic Journal **120(548)**: pp. F452–F477.

Reading list on RePEc: Google “meta-analysis in economics.”

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