Empirical essays on monetary policy transmission

Dissertation defense

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Dissertation

- Dissertation consists of five chapters.
- All of them can be linked to the monetary policy transmission mechanism

1. How to Solve the Price Puzzle? A Meta-Analysis
2. Transmission Lags of Monetary Policy: A Meta-Analysis
3. Habit Formation in Consumption: A Meta-Analysis
4. Nowcasting Czech GDP in Real Time
5. Revisions to Czech National Accounts: Properties and Predictability

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How to Solve the Price Puzzle: A Meta-Analysis

- Coauthored with Tomas Havranek and Roman Horvath.
- Published in the *Journal of Money, Credit, and Banking*.
- Cited in *Meta-Regression Analysis in Economics and Business* (a meta-analysis textbook by Tom Stanley and Hristos Doucouliagos).

- Summary:
  - Investigation of the effect of monetary policy shocks on prices.
  - Model misspecifications likely drive the estimates resulting in price puzzle: especially the omission of commodity prices, neglect of potential output, and reliance on recursive identification.

Transmission Lags of Monetary Policy: A Meta-Analysis

- Coauthored with Tomas Havranek.
- Published in the *International Journal of Central Banking*.
- Cited in *JMCB, FED San Francisco president speeches*.
- First prize of Young Economist Award by the Czech Economic Society, 2012.

- Summary:
  - Systematic investigation of what drives the differences in the estimates of the speed of the effect that monetary policy has on the economy (transmission lags).
  - The only country specific robust determinant of the length of transmission is the degree of financial development.

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Habit Formation in Consumption: A Meta-Analysis

- Coauthored with Anna Sokolova and Tomas Havranek.
- Published in the *European Economic Review*.
- Cited in *American Economic Review, IMF Economic Review*

- Summary:
  - Investigation of the diversity in estimates of habit formation.
  - Divergence between macro and micro studies estimates remains high even after controlling for 30 factors.
  - Difference between internal and external habits disappears when data and method characteristics are controlled for.

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Nowcasting Czech GDP in Real Time

- Solo-authored.
- Published in the *Economic Modelling*.
- Cited by various central bank researchers (Federal Reserve, Bank of Finland, Banque de France, OeNB, National Bank of Slovakia, Croatian Central Bank)

- Summary:
  - First evaluation of the performance of dynamic factor model in forecasting Czech GDP growth in real time.
  - Comparable to Czech National Bank forecasts in precision, the role of foreign variables is crucial.

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Revisions to Czech National Accounts: Properties and Predictability

- Solo-authored.
- Published in the *Czech Journal of Economics and Finance*.
- Summary:
  - First to provide stylized facts about the magnitude of revisions to the Czech national accounts and assess whether they are predictable.
  - Revisions are rather large (on average 1.4 p.p. for the annualized quarterly real GDP growth rate, between 1 to 12 p.p. for other variables).

Meta-Analysis: More than a Literature Survey

- The quantitative method of research synthesis.
- Developed in medicine to aggregate clinical trials.

Main questions:

1. Are intuitive results more likely to be published? Is there selective reporting bias affecting the average of the empirical estimates?
2. What is the role of structural, data, specification, estimation, and publication characteristics for the heterogeneity of estimates?

- Careful systematic review and meta-analysis may improve statistical inference and offer some policy guidance

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Meta-analysis: caveats

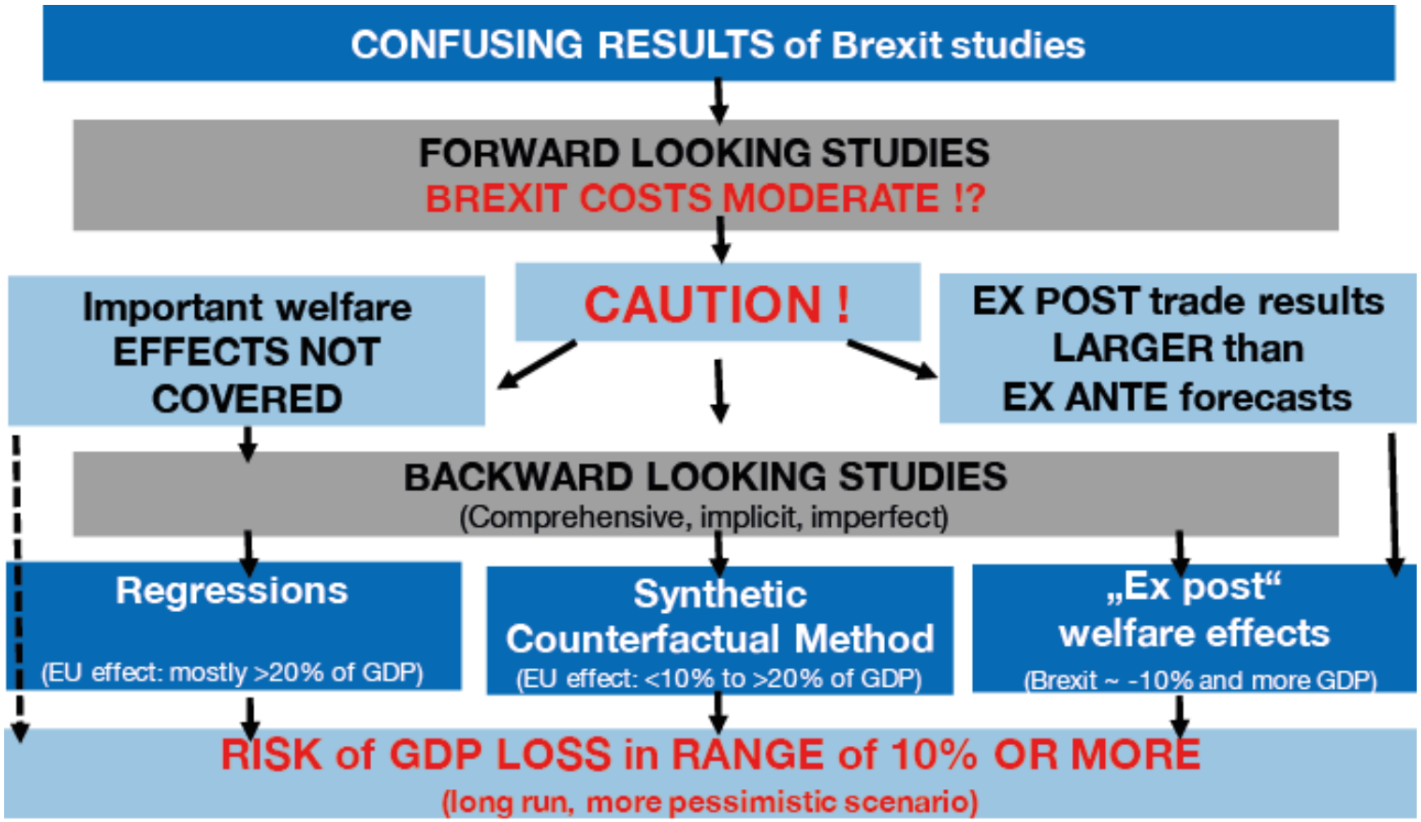
- Cannot claim that meta-analysis always allows us to explain variation in the true degree of the effect.
- Meta-analysis attempts to explain differences in estimates reported in previous studies.
- This is a task that meta-analysis can accomplish.

Meta-analysis: use in economics

- Relative to medicine still underused in in economics (approximately 160 topics covered in economics, in medicine there are around 100000 meta-analyses).
- Meta-analysis in top journal: Card and Krueger (1995, AER), Smith and Huang (1995, JPE), Stanley (2001, JEconPersp), Goerg and Strobl (2001, EJ), Disdier and Head (2008, REStat), Card et al. (2010, EJ), Ioannidis et al. (2017, EJ)
- Recently, many more papers by Tomas Havranek & co. (see: meta-analysis.cz)

Meta-analysis: example of use for policy

Figure 4. Approach of the meta study of existing studies on Brexit



Source: Busch, B. & Matthes, J.,(2016): "The economic impacts of Brexit: Results from a meta-analysis", https://voxeu.org/article/meta-analysis-economic-impact-brexit

Causes and identification of publication selection bias

- Journal review process, confusion of scientific importance with statistical significance, small-samples, specification searches, etc.
- Funnel assymetry test: $\widehat{\theta}_{ij} = \theta_0 + \gamma \cdot SE(\widehat{\theta}_{ij}) + \varepsilon_{ij}$
- In principle, there should be no relationship between $\widehat{\theta}_{ij}$ and $SE(\widehat{\theta}_{ij})$, bias might occur in presence of
  1. Selection for sign: estimates with small standard errors are close to the underlying effect, but as precision decreases, the dispersion of estimates increases; some get large, some get negative. e.g. if negative estimates are underreported, a positive γ follows
     - even if rational on micro level and researchers may be correct in discarding (e.g. signal of misspecification), in aggregate, however, the effect will be biased average
  2. Preference for significance: authors might continue with specification searches until they find θ large enough to offset the standard error and produce a sufficiently large t-statistic.
- For this reason, most meta-analyses test - and, if necessary, correct - for so-called publication/selective reporting bias.

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Evidence of publication bias in economics

- A recent survey among the EEA members (Necker, 2014) reveals that a third of economists in Europe admit that they have engaged in
  - presenting empirical findings selectively so they confirm their arguments
  - searching for control variables until they get a desired result
- Brodeur et al. (2016) collect 50,000 p-values reported in economics and document widespread publication bias.
- Ioannidis et al. (2017) survey meta-analyses conducted in economics and find that most fields suffer from the bias, as editors, referees, or authors themselves prefer statistically significant results that have an intuitive sign.

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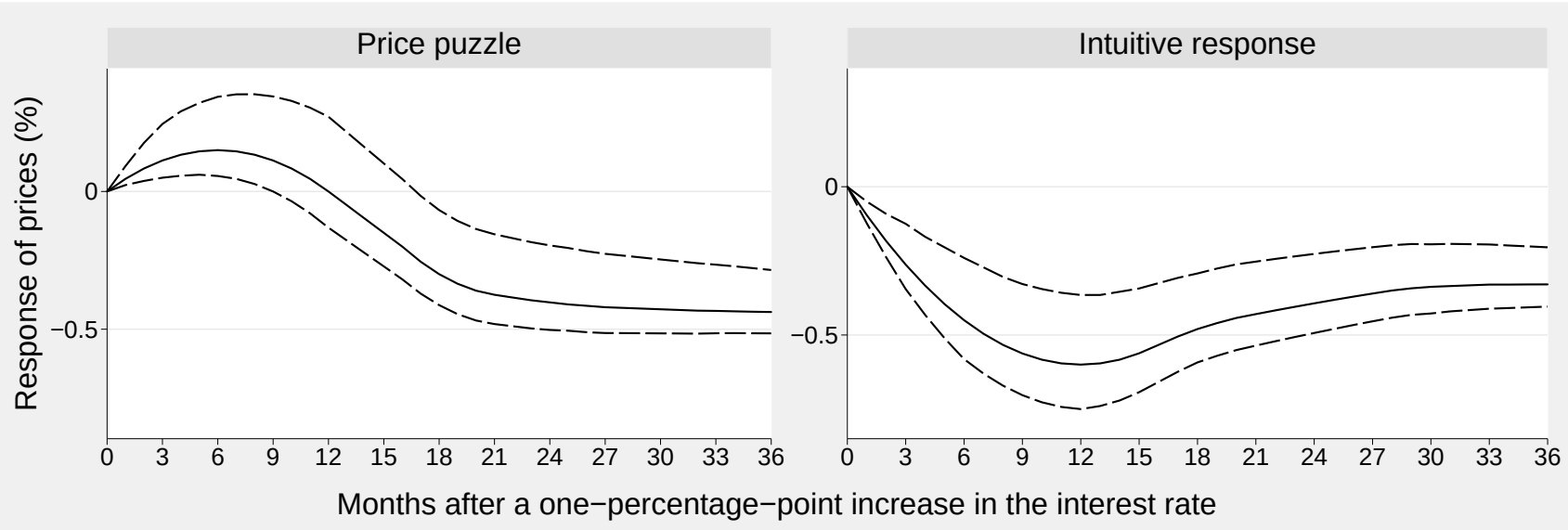
Publication selection in macroeconomics

Two examples from the dissertation:

1. Publication selection in the literature on the transmission of monetary policy shocks
2. Publication selection in the literature on habit formation in consumption

Example 1: Effect of monetary policy on prices

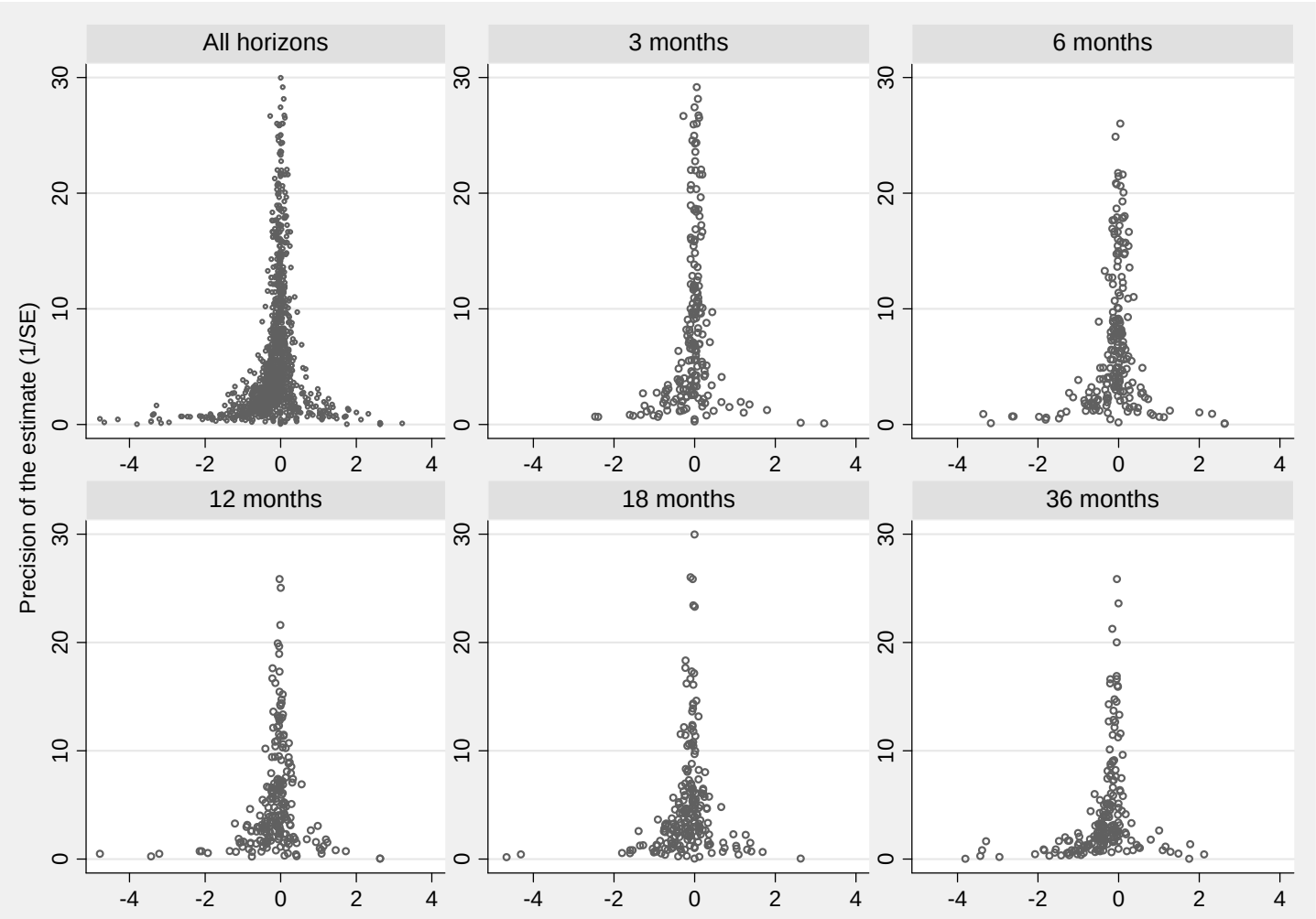
- Fundamental question of monetary economics
- Main tool to provide the answer: vector autoregression model (Chris Sims, Nobel prize in 2011)
- Results reported graphically $\rightarrow$ impulse responses.



- Is there an evidence of publication selection in empirical estimates? Does it depend on the horizon?

Example 1: Funnel plot of collected estimates

- Left part of the funnels heavier, suggesting selection in favour of negative estimates, but interpretation subjective



Example 1: Formal test $\frac{\hat{\theta}_{ij}}{SE(\hat{\theta}_{ij})} = \gamma + \theta_0 \frac{1}{SE(\hat{\theta}_{ij})} + \varepsilon_{ij}$

- Some evidence of publication selection against the price puzzle the selection seems to strengthen for responses with longer horizons.

	Mixed-effects multilevel				
Horizon	3 months	6 months	12 months	18 months	36 months
Intercept (bias)	0.058	-0.088	-0.176	-0.325**	-0.806***
	(0.167)	(0.166)	(0.145)	(0.128)	(0.126)
$1/SE$ (effect)	0.009	0.007	-0.014	-0.019	-0.009
	(0.009)	(0.011)	(0.014)	(0.012)	(0.010)
Within-study correlation	0.43	0.56	0.46	0.41	0.14
Observations	208	215	215	217	205
Studies	69	70	70	70	63

Note: Standard errors in parentheses. Response variable: the approximated t-statistic of the estimate of the percentage response of prices to a one-percentage-point increase in the interest rate.
***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

- Results are robust to adding controls for structural, data, estimation and publication factors (see Table 2.4 in the dissertation).

Example 1: Effect of monetary policy on prices

Possible explanation:

- The finding is in line with Doucouliagos & Stanley (2013), who suggest that publication selection is likely to be stronger for research areas with less theory competition.
  - Macroeconomists agree about the effects of monetary policy on prices in the long run: prices should eventually decrease after a contraction.
  - On the other hand, a smaller consensus arises regarding the exact effects of monetary policy in the short run because of the cost channel, for example.
- Published results often exhibit the price puzzle for the short run; on the contrary, results showing the price puzzle for the long run would be difficult to publish.

Example 2: Habit formation in consumption

- Habit formation in consumption (excess smoothness) important for explaining various stylized facts in macroeconomics and finance

Examples:

- Habits allow to replicate high risk premiums without high risk aversion (Constantinides, 1990)
- Adding habits to real business cycles framework helps explain joint behavior of asset prices and consumption (Boldrin et al., 2001)
- General equilibrium models rely on habit to replicate hump-shaped responses to policy shocks (Fuhrer, 2000)
- External habits help explain happiness puzzle (Choudhary et al., 2012)

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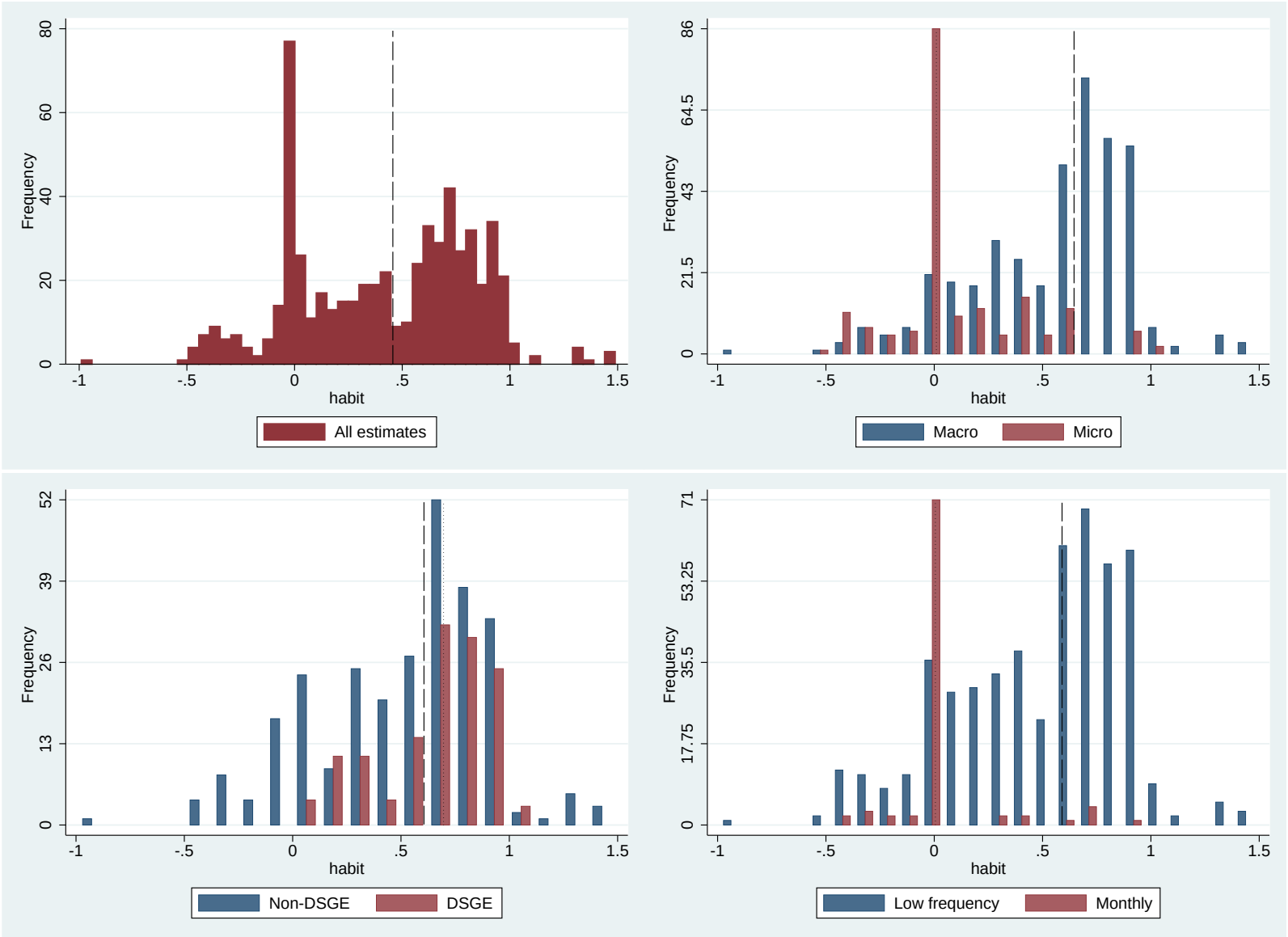
Example 2: Heterogeneity of habit estimates



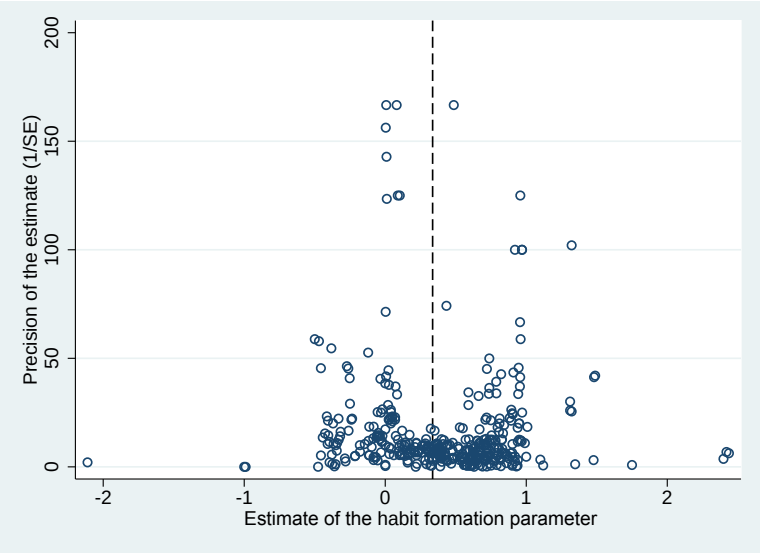
Example 2: Habit formation in consumption

Potential sources of selective reporting:

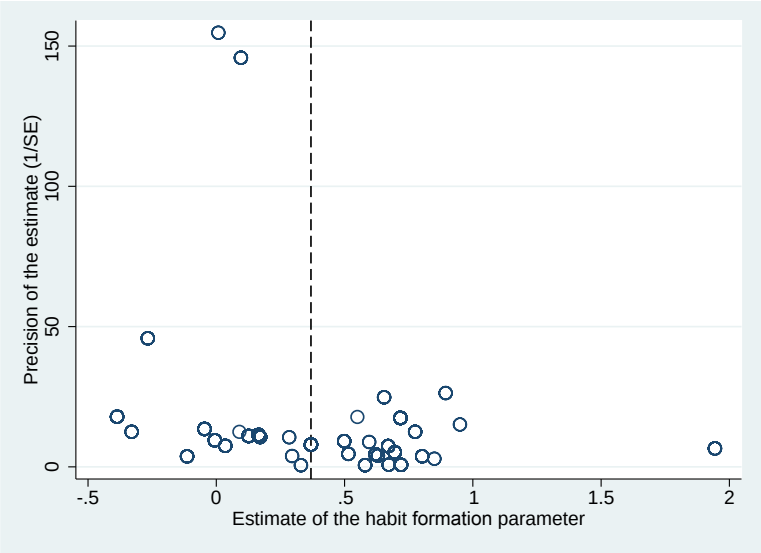
1. Negative estimates are not consistent with the habit formation
   - might allow for intuitive explanation: they may result from durability of the consumption measure used in the estimation
2. Estimates that exceed 1 implausible because they imply non-stationary consumption growth.
   - Researchers may consider these large estimates as evidence of model misspecification and adjust their models accordingly to produce more intuitive results.

Example 2: Funnel plot of collected estimates

(a) All estimates



(b) Median estimates from studies



Example 2: Formal test for publication bias

- Various specifications of funnel asymmetry test indicate no publication bias

	Baseline	Instrument	Study	Precision	Median
SE (publication bias)	-0.222	-0.133	-0.214	0.174***	0.276
	(0.211)	(0.854)	(0.165)	(0.0315)	(0.207)
Constant (effect beyond bias)	0.397***	0.380**	0.444***	0.000679***	0.345***
	(0.0397)	(0.161)	(0.0405)	(0.0000417)	(0.0858)
Observations	462	462	462	462	38

Notes: The table presents the results of regression $\widehat{HABIT}_{ij} = \alpha_0 + \delta \cdot SE(\widehat{HABIT}_{ij}) + \varepsilon_{ij}$. $\widehat{HABIT}_{ij}$ and $SE(\widehat{HABIT}_{ij})$ are the i-th estimates of the habit formation parameter and their standard errors reported in the j-th studies. As in Figure 4.3, we only use non-restricted estimates. The standard errors of the regression parameters are clustered at study level. All estimations except for the last include study fixed effects. *Instruments*: we use the inverse of the square root of the number of observations in the individual study as an instrument for the standard error of the estimate of the habit formation parameter. *Study*: we weight the estimates by the inverse of the number of estimates reported in the study. *Precision*: we weight the estimates by the inverse of the reported estimate's standard error. *Median*: we estimate the equation by including the median estimate of the habit formation parameter and the median standard error of the estimated habit formation parameter reported in the individual studies.

- Precision specification does indicate bias, but 0.18 is "little to modest" according to Doucoliagos & Stanley (2013) guidelines

Example 2: Habit formation in consumption

- While we find some indications of publication selection related to the 0 and 1 thresholds that define the range consistent with habit formation, we find little evidence of any systematic bias resulting from this selection.
- Our findings suggest that the effects of potential selection against negative estimates and potential selection against estimates larger than 1 cancel each other out, rendering the mean estimate reported in the habit formation literature unbiased.

Thanks to my advisor, referees, and all of my co-authors!

Thank you for your time and attention!

Background slides

Main revisions since the pre-defense

- Most of the comments taken on board, thanks to referees, the thesis is improved.
- Three new pages in introduction discussing main concerns of prof. Pugh.
- Additional references to literature thanks to dr. Baxa and prof. Balke.

- See Appendix A for detailed responses to all issues raised by the referees.

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Papers, data, codes available at:

How to Solve the Price Puzzle? A Meta-Analysis

- meta-analysis.cz/price_puzzle

Transmission Lags of Monetary Policy: A Meta-Analysis

- meta-analysis.cz/lags

Habit Formation in Consumption: A Meta-Analysis

- meta-analysis.cz/habits

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