

A Meta-Regression Analysis of Monetary and Macroprudential Policies

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Introduction

Review of Macroprudential Policy Literature

The monetary – macroprudential policy nexus

Objectives of this study

Standardised effects

Conclusions

What is Meta-Regression Analysis?

- Metaregression analysis is a specific type of meta-analysis that uses regression analysis to combine, compare, and synthesize research findings from multiple studies while adjusting for the effects of available covariates on a response variable.
- The output of metaregression analysis is a regression coefficient that describes how the “intervention effect” changes with a unit increase in the “covariate”. The statistical significance of the regression coefficient is a test of whether there is a linear relationship between intervention effect and the covariate.
- The aim of metaregression analysis is to reconcile findings from conflicting studies or corroborate consistent ones by exploring how the intervention effect varies according to the covariates.
- Metaregression analysis can also be used to investigate multiple factors simultaneously, although this is rarely done because the number of studies which consider multiple factors is usually insufficient (minimum of 10 studies).

Advantages of Synthesising Literature with Meta-Regression Analysis

- Providing a quantitative summary of the evidence on a specific topic or question
- Identifying and adjusting for sources of heterogeneity among the studies
- Exploring and testing hypotheses about potential effects of modifiers or confounders
- Evaluating and comparing different interventions or treatments
- Assessing and controlling for publication bias or other biases

Examples from economics on the use of Meta-Regression Analysis

- **Minimum wages and employment:** synthesis of 115 studies on the effects of minimum wages on employment found that the reported effects were influenced by several factors, such as data type, publication status, geographical coverage, and time period. The analysis also detected evidence of publication selection bias towards negative effects*.
- **Foreign direct investment and economic growth:** a synthesis of 68 studies on the effects of foreign direct investment on economic growth found that the reported effects were heterogeneous and depended on several factors, such as model specification, estimation technique, data quality, and country characteristics. The analysis also found that publication selection bias was not a serious problem in this literature.**
- **Impact of fiscal policy on output multipliers:** a synthesis of 41 studies found that the reported effects varied widely and were affected by several factors, such as output gap, debt level, exchange rate regime, and methodological aspects. The analysis also revealed evidence of publication selection bias towards larger multipliers. **

*T.D. Stanley, T.D., C. Doucouliagos, S. Jarrell (2008), Meta-regression analysis as the socio-economics of economics research, The Journal of Socio-Economics, Volume 37, Issue 1, February, Pages 276-292.

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Publication bias

- Publication bias occurs when some research results are more likely to be published than others, depending on their direction, magnitude, or statistical significance¹².
- Publication bias can lead to distorted estimates of the true effect size or intervention effect, as well as reduced statistical power and increased false positives in meta-analyses.
- Publication bias can be caused by various factors, such as editorial policies, journal preferences, researcher incentives, funding sources, peer review processes, or data availability.
- Metaregression analysis can be used to detect and correct for publication bias in meta-analyses by using regression models that relate the effect estimates to their standard errors or other study characteristics.
- Some common methods for testing publication bias using metaregression are:
 - Egger's test, which regresses the standardized effect estimates on their precision;
 - Begg's test, which regresses the rank correlation of the effect estimates and their variances; and
 - Funnel plot asymmetry test, which plots the effect estimates against their standard errors and tests for deviations from symmetry.

Meta-regression Studies beginning to appear

- Araujo et. Al (2020): Collects more than 6,000 estimates. Finds i) statistically significant effects on credit, but with considerable heterogeneity across instruments; ii) weaker and more imprecise effects on house prices; iii) quantitatively stronger effects in emerging markets and among studies using micro-level data; and iii) statistically significant evidence of leakages and spillovers. Other findings include relatively stronger impacts for tightening than loosening actions and negative effects on economic activity in the near term.
- Malovaná et. Al (2022): More than 700 estimates collected from 34 studies on the effect of borrower-based measures on bank loan provision. Significant fragmentation in the literature in terms of estimated coefficients. On average, the introduction or tightening of borrower-based measures reduces annual credit growth by 1.6 pp. Verification of the presence of a strong publication bias, especially against positive and statistically non-significant estimates. Bias-corrected coefficients estimated to be about half the size of the uncorrected mean of the collected estimates but remains negative. Heterogeneity of estimates best explained by model specification, estimation method, and underlying data characteristics.

S. Malovaná, S., M. Hodula, Z. Gric, J. Bajzík (2022) Borrower-Based Macprudential Measures and Credit Growth: How Biased is the Existing Literature?

Araujo J. D., M. Patnam, A. Popescu, F. Valencia, Weijia Yao (2000) Effects of Macprudential Policy: Evidence from Over 6,000 Estimates (2000), IMF.

Appropriate assignment of monetary and macroprudential policy (Fahr and Fell, 2017)

New-Keynesian model extended with crisis probability and lending spreads for financial intermediation

Macroprudential policy objective to minimize expected losses from crisis $p_t w_t$

Joint monetary and macroprudential policy objective function:

$$\max_{i_t, c_t, r_t} \left[E_0 \sum_{t=0}^{\infty} \beta^t \left(\underbrace{-\frac{1}{2} \pi(i_t, c_t, r_t)^2 - \frac{1}{2} \kappa y(i_t, c_t, r_t)^2}_{\mathcal{L}: \text{Monetary policy objective}} + \underbrace{\beta p(y_t^+, \bar{c}_t) w(r_t^+)}_{\mathcal{M}: \text{Macroprudential policy objective}} \right) \right]$$

i : interest rate

c : cyclical policies

r : resilience policies

π : inflation

y : output gap

p : crisis probability

w : loss during crisis
(counted negative)

New Keynesian economy with lending spreads

$$\text{IS curve: } y_t = -\sigma_1(i_t - \pi_{t+1}^e) - \sigma_2(\rho_t - \pi_{t+1}^e) + y_{t+1}^e + \varepsilon_t$$

$$\text{Phillips curve: } \pi_t = \kappa y_t + \sigma \pi_{t+1}^e + v_t$$

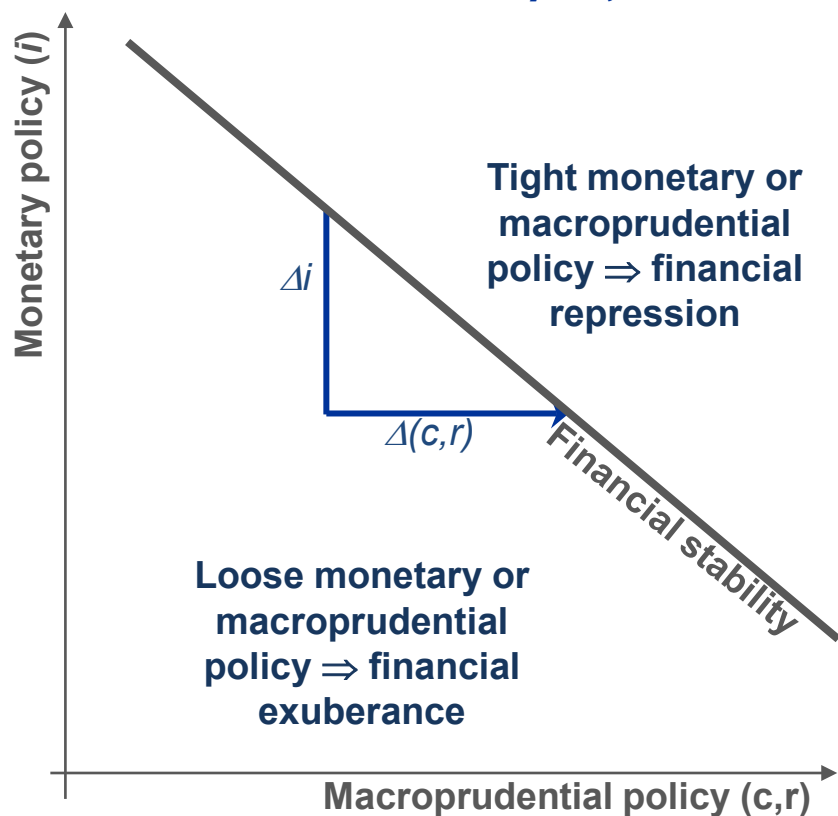
$$\text{Lending spreads: } \rho_t = i_t + \xi r_t + \lambda c_t$$

Monetary vs. macroprudential policy trade-off

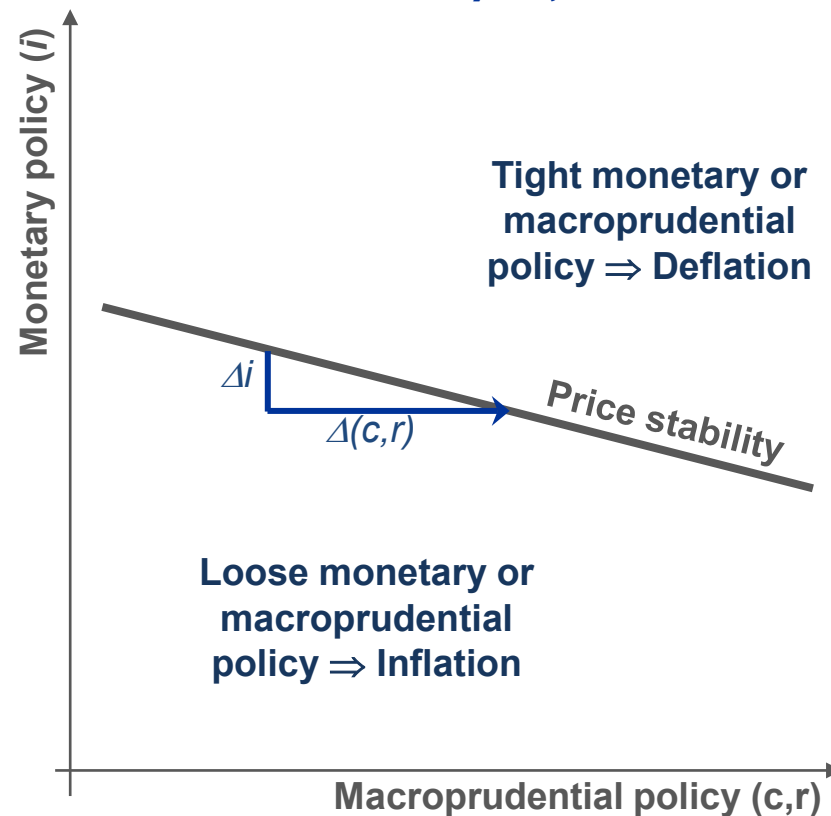
What is the relative effectiveness of achieving financial stability / price stability with monetary and macroprudential policy?

Relative slope: monetary policy more effective for attaining price stability objective

Financial stability objective



Price stability objective



Source: Fahr and Fell (2017), "Macroprudential policy – closing the financial stability gap", Journal of Financial Regulation and Compliance, Vol. 25(4), pp.334-359.

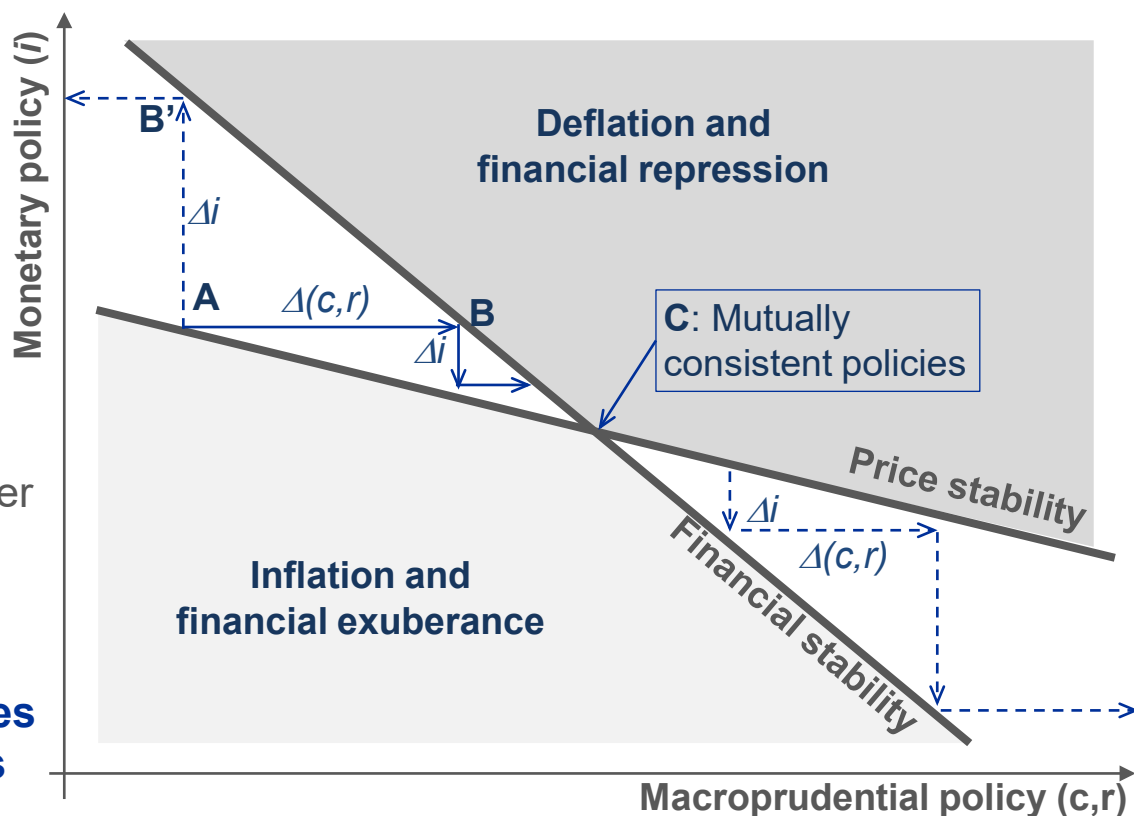
Principle of effective market classification

(Mundell, 1962)

- **Monetary policy** relatively more effective for price stability; **macroprudential policy** relatively more effective for financial stability
- Inappropriate assignment of the policies would be destabilising ($A \Rightarrow B'$)
- The policies need to take each other into account ($A \Rightarrow B \Rightarrow C$)

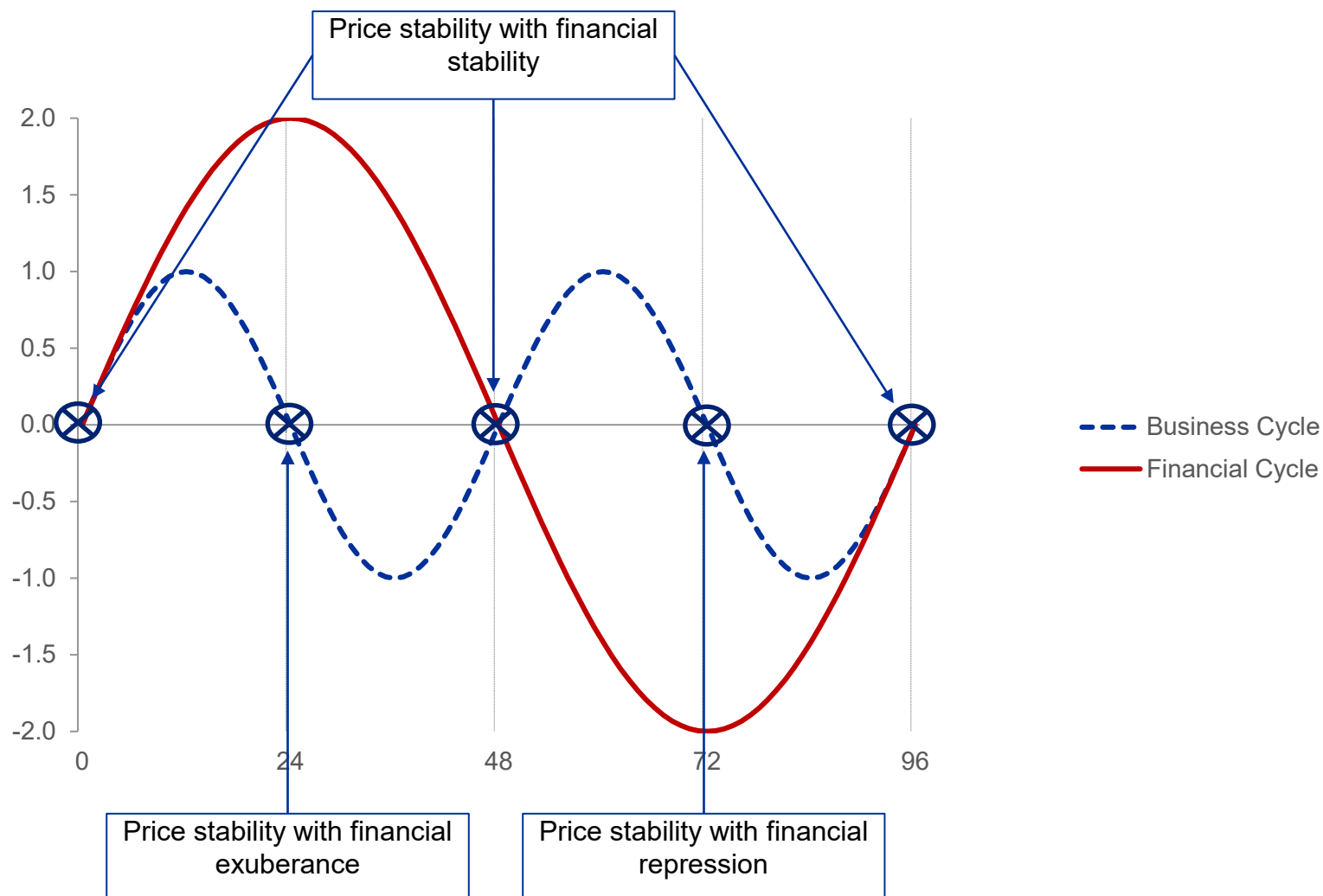
⇒ **Appropriate assignment of instruments to policy objectives mitigates spillovers and raises effectiveness**

Monetary policy – macroprudential policy assignment



Source: Fahr and Fell (2017), "Macroprudential policy – closing the financial stability gap", Journal of Financial Regulation and Compliance, Vol. 25(4), pp.334-359.

Interaction of business and financial cycles



Source: Fahr and Fell (2017), "Macroprudential policy – closing the financial stability gap", Journal of Financial Regulation and Compliance, Vol. 25(3), 2017.

Note: These stylised business and financial cycles are generated with sinusoid functions of the form: $y(t) = A \sin(2\pi ft + \varphi)$ where A is the amplitude, f is the frequency and φ is the phase or position of the cycle at $t=0$. In the example shown here, the business cycle has a length of 4 years (48 months) and an amplitude of 1 while the financial cycle has double the period (96 months, 8 years) and double the amplitude of the business cycle.

Objectives of this study

- Do macroprudential measures and interest rates have a statistically significant impact on credit growth, house prices, and other measures of the financial cycle?
- Which has a stronger impact on credit growth: macroprudential measures or interest rates?
- How do the effects of macroprudential measures and interest rates vary across different economic conditions?
- Is there an interaction effect between macroprudential measures and interest rates on credit growth? Do they reinforce or counteract each other?
- Do the effects of macroprudential measures and interest rates on credit growth vary across different types of economies (developed vs developing, for instance)?

- Moderator data collected for this study
 - Multi-country or single country study
 - Emerging or advanced economy (or mixed)
 - Individual bank or aggregate data
 - Average year of data set
 - Data-type: in place, change or intensity
 - Monetary policy included or not
 - Controls for leakage included or not
 - Modelling choices (e.g. panel, cointegration, etc)
 - Study quality
 - Citations
 - Degrees of freedom
 - Author affiliation
 - Previous studies in the same field by the same author

Notes:

- 1) list is needed in advance to avoid multiple coding rounds!!!
- 2) The longer the list, the stronger the case for an “all-set”

Which effect size measure to search for?

Choice will determine adequacy of sample size

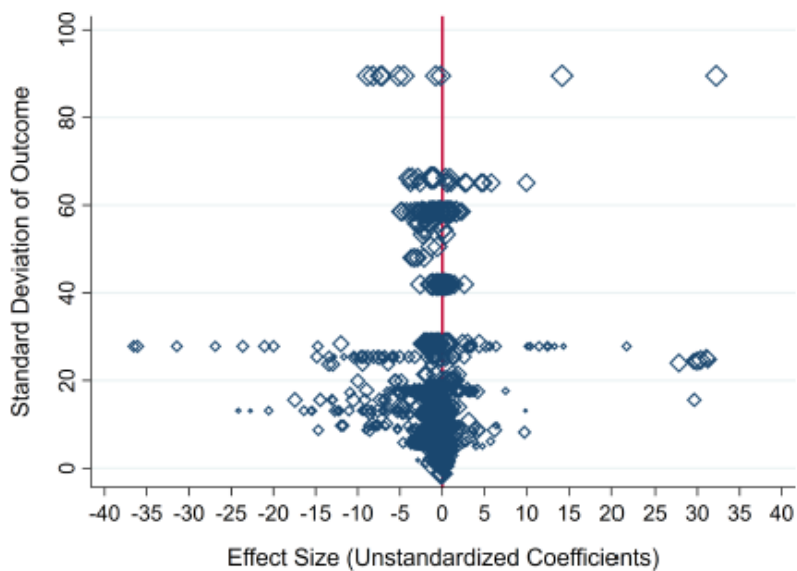
- 1) Regression coefficients (not recommended)
- 2) Standardised regression coefficients (Araujo et al. (2020))
- 3) Zero-order correlations (not recommended)
- 4) Partial correlations (recommended, likely to give large sample but does not give a size measure)
- 5) Elasticities (statistics may not be provided by all authors)
- 6) Semi-elasticities (as for 5)
- 7) T-statistics (recommended, likely to give large sample but does not offer a size measure)



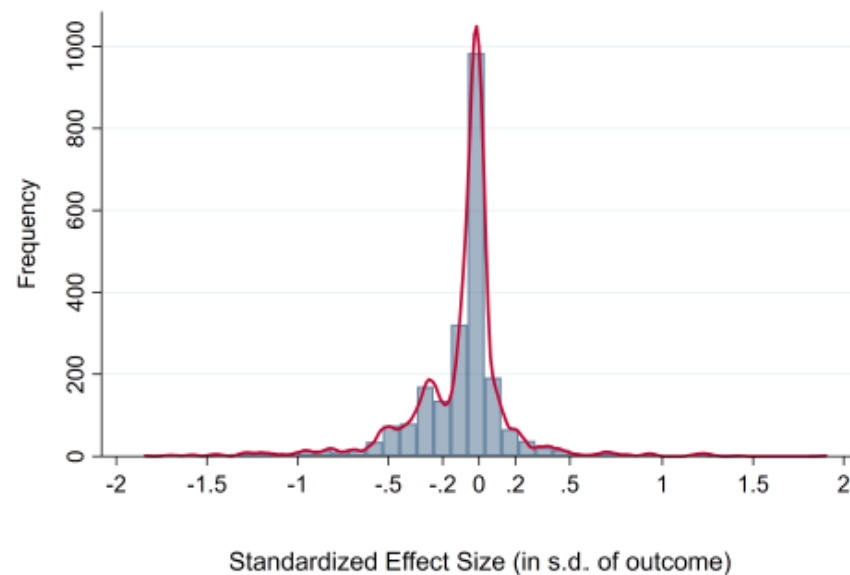
2 complemented by 4 as a robustness check

Figure 2. Effect Sizes

(a) Raw Effects and Outcome Standard Deviation



(b) Distribution of Standardized Effects



Note: Each diamond in the figure represents a coefficient; size is proportional to its precision.

Metaregression analysis can not only synthesise the results of studies but it can even uncover evidence of hypotheses authors were not specifically examining

Great care is needed in measuring the effects, both cross-section and temporally