



Explaining the (non-) causality between energy and economic growth in the U.S.

A multivariate sectoral analysis



Meta-regression results

Bruns, Gross, Stern (in progress)

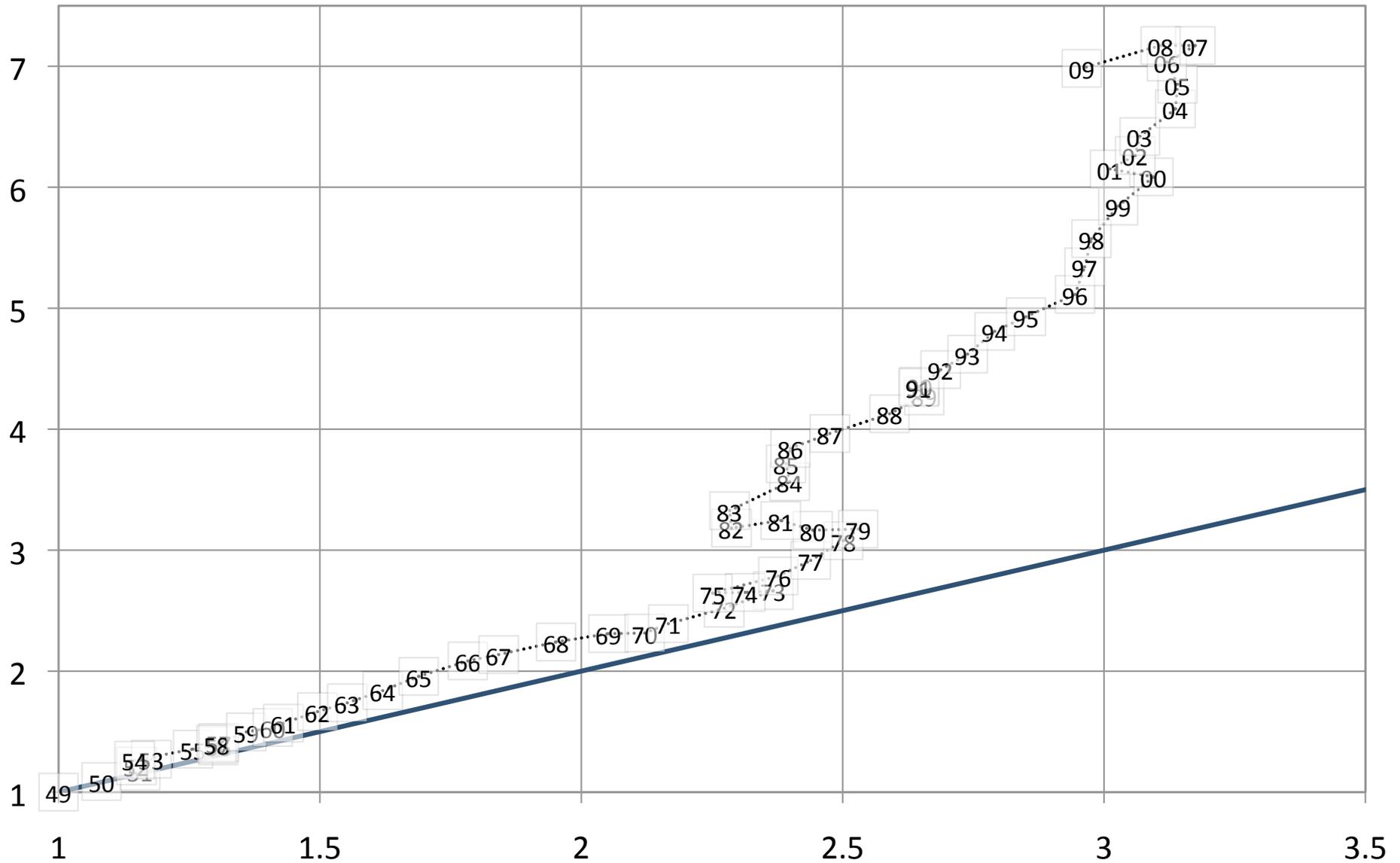
180 papers

Meta-significance tests (300 obs.)

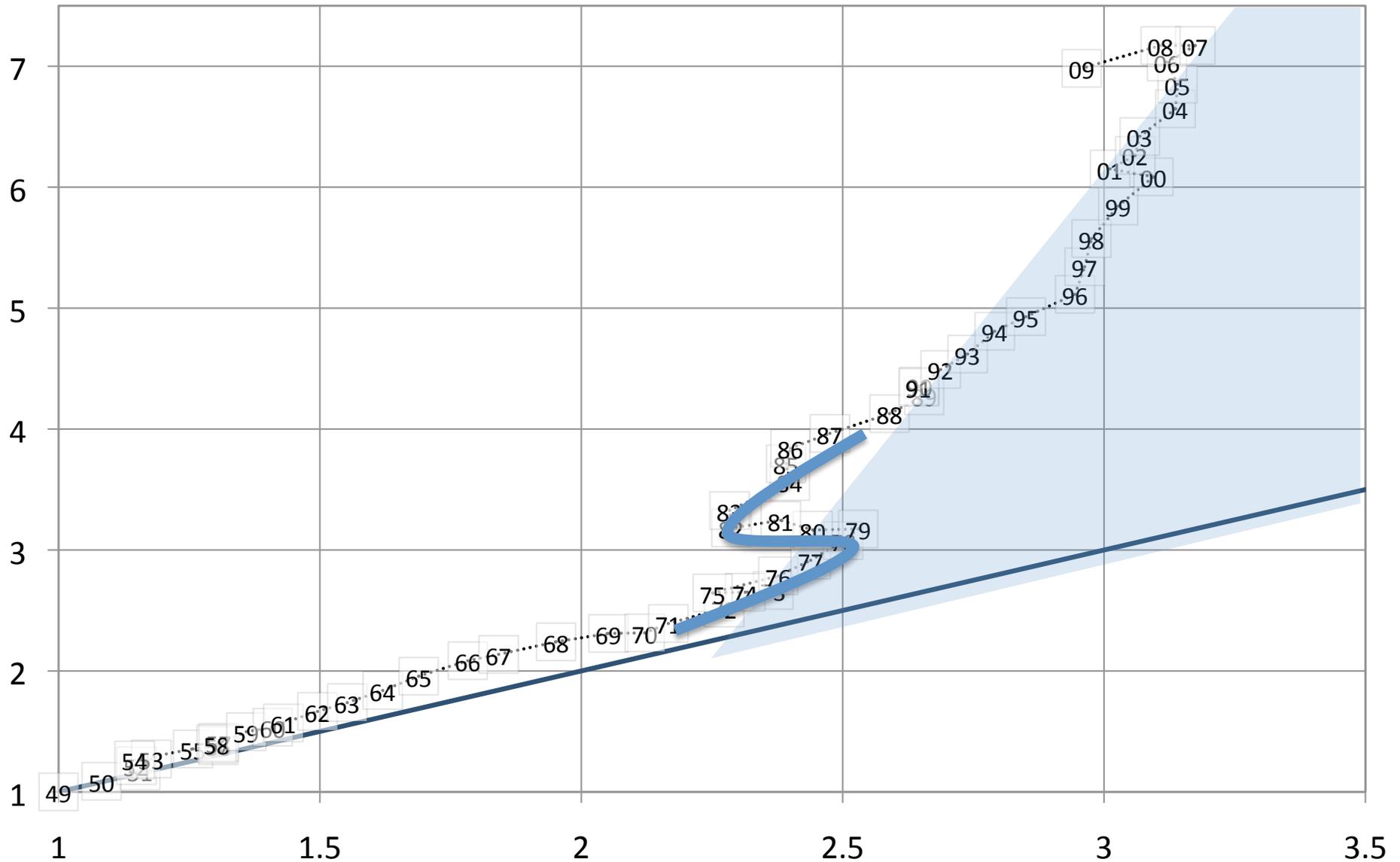
- ① National level: evidence for causality declines with strength of causality measure
- ② Causality declines with increasing level of aggregation

Simpsons' paradox?

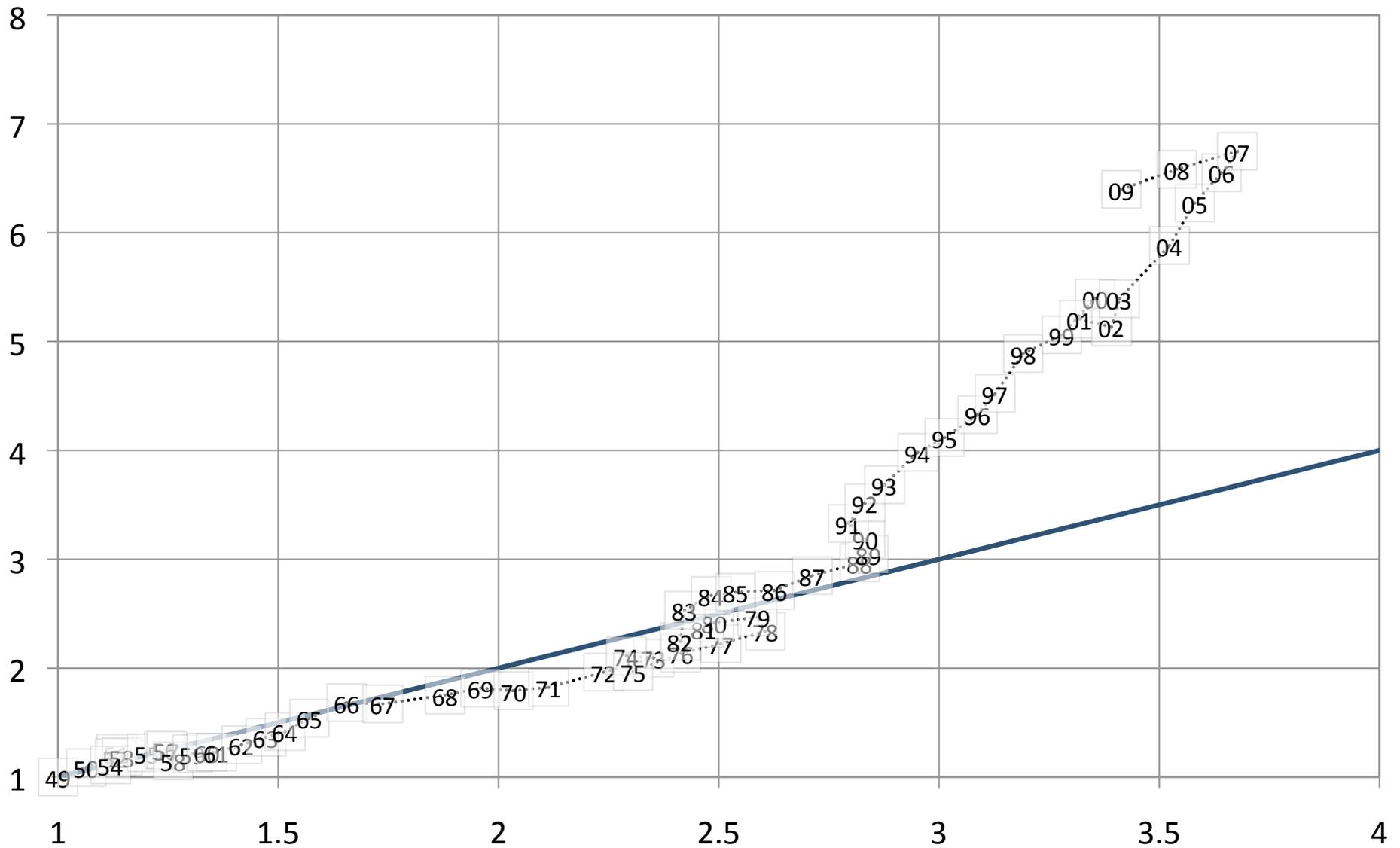
Development of GPD and energy



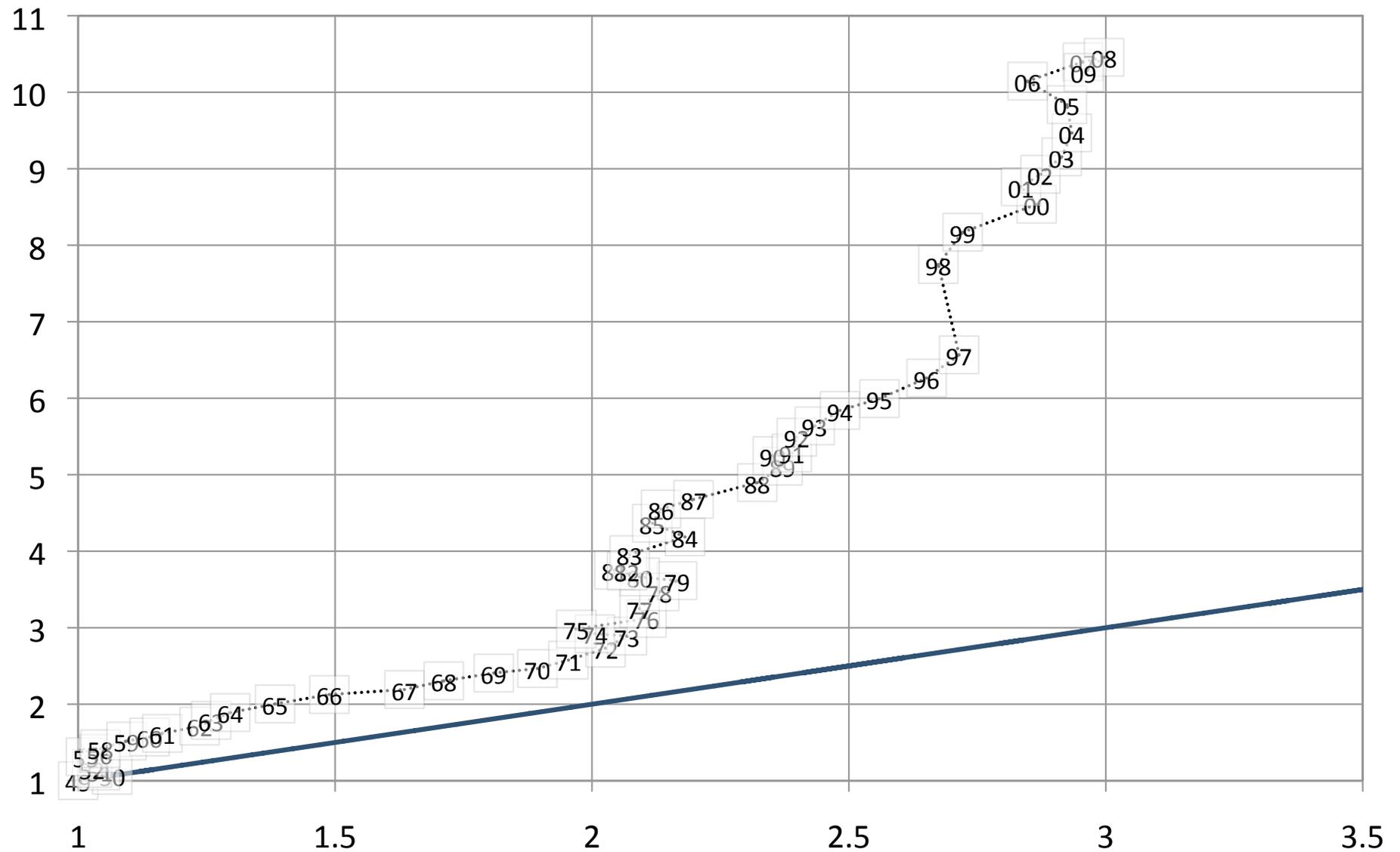
Development of GPD and energy



Transport sector



Commercial sector



Reasons for mixed evidence

Structural change ✓

Inappropriate pairs of variables

Zachariadis (2007)

Increasing energy productivity

Wang (2007, 2011)

Offshoring

Biased intermediate input price index, Diewert and Nakamura (2009),

Houseman et al. (2010)

Neglect of indirect energy consumption, OTA (1990)

Increasing energy prices

Estimation strategy

ARDL bounds testing procedure

Pesaran and Shin (1999), Pesaran et al. (2001)

- 1 Philipps-Perron test for stationarity
- 2 Unrestricted ECM: Cointegration
- 3 Restricted ECM: Long-run and short-run Granger causality

$$\Delta Y_{it} = \mu + \eta \hat{\xi}_{it-1} + \sum_{j=1}^p \gamma_j \Delta Y_{it-j} + \sum_{j=0}^{q_1} \psi_j \Delta EC_{it-j} + \sum_{j=0}^{q_2} \omega_j \Delta C_{it-j} + u_{it}$$

Control variables

Energy productivity (energy to capital ratio), Trade, Energy price

Estimation strategy, cont.

Data

1970-2009

National level and 3 sectors (industry, transport, commerce)

EIA, BEA, OECD, EU-Klems

Results presented for

Basic model (bivariate)

Cointegrated models

If no cointegration: minimum-BIC models

Granger causality results

National level

No evidence for cointegration
Weak bidirectional causality

Transport sector

Bi-directional long-run causality

- VA** Increasing energy productivity breaks long-run relationship
- E** Effect of energy productivity unclear (Jevon's paradox)
Low negative effect of energy prices

Granger causality results, cont.

Service sector

Basic model: only short-run causality from growth to energy

VA Energy productivity explains short-run causality

E Evidence for Jevon's paradox (cointegrated): future of services?

Industry sector

No evidence for long-run causality

VA Trade explains half of the short-run causality

E Evidence for Jevon's paradox

Results and implications

Level of aggregation matters (a lot)

Weak evidence at national level

Close link in service industries

Misinterpretation of non-causality in goods producing industries

Energy productivity

Jevon's paradox

Neutralizes cointegration in the transport sector

Energy policies

National: not rely on spurious results from national level studies

International: internalize foreign energy policies

Global scale: any de-coupling at all?

Link:

www.econ.mpg.de/english/staff/evo/gross

