TOM HERTEL'S INFLUENCE AND ITS LESSONS ABOUT ACADEMIC INQUIRY

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Full paper available as GTAP Working Paper No. 85 at www.gtap.agecon.purdue.edu/resources/res_display.asp?RecordID=5674

OUTLINE OF MY TALK

Some personal reflections

Hertel's contributions: citation analysis

Task Utilization in Producing Economics: the Role of GTAP in an Increasingly Complex Research Landscape

CITATION ANALYSIS: TOM HERTEL

Sources: Google Scholar, Web of Science Citation Data

Selected comparisons to other International Econ scholars

What metrics?

- Depth and breadth
- Influence within v. across fields

COMPARISON CITATION COUNTS

Table 1. Google Scholar citations, Web of Science citations and Google Scholar h-index

Author	Google Scholar Citations	Web of Science Citations	h-index
Thomas Hertel	20,098	1,454	70
Kyle Bagwell	11,167	1,395	48
Jeffrey Bergstrand	11,770	1,394	30
James Tybout	13,484	1,370	38

Google Scholar date of download: February 19, 2017

WoS date of download: March 7, 2017

GOOGLE SCHOLAR MUCH HIGHER

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Difference: citations in policy analyses not published in scientific journals

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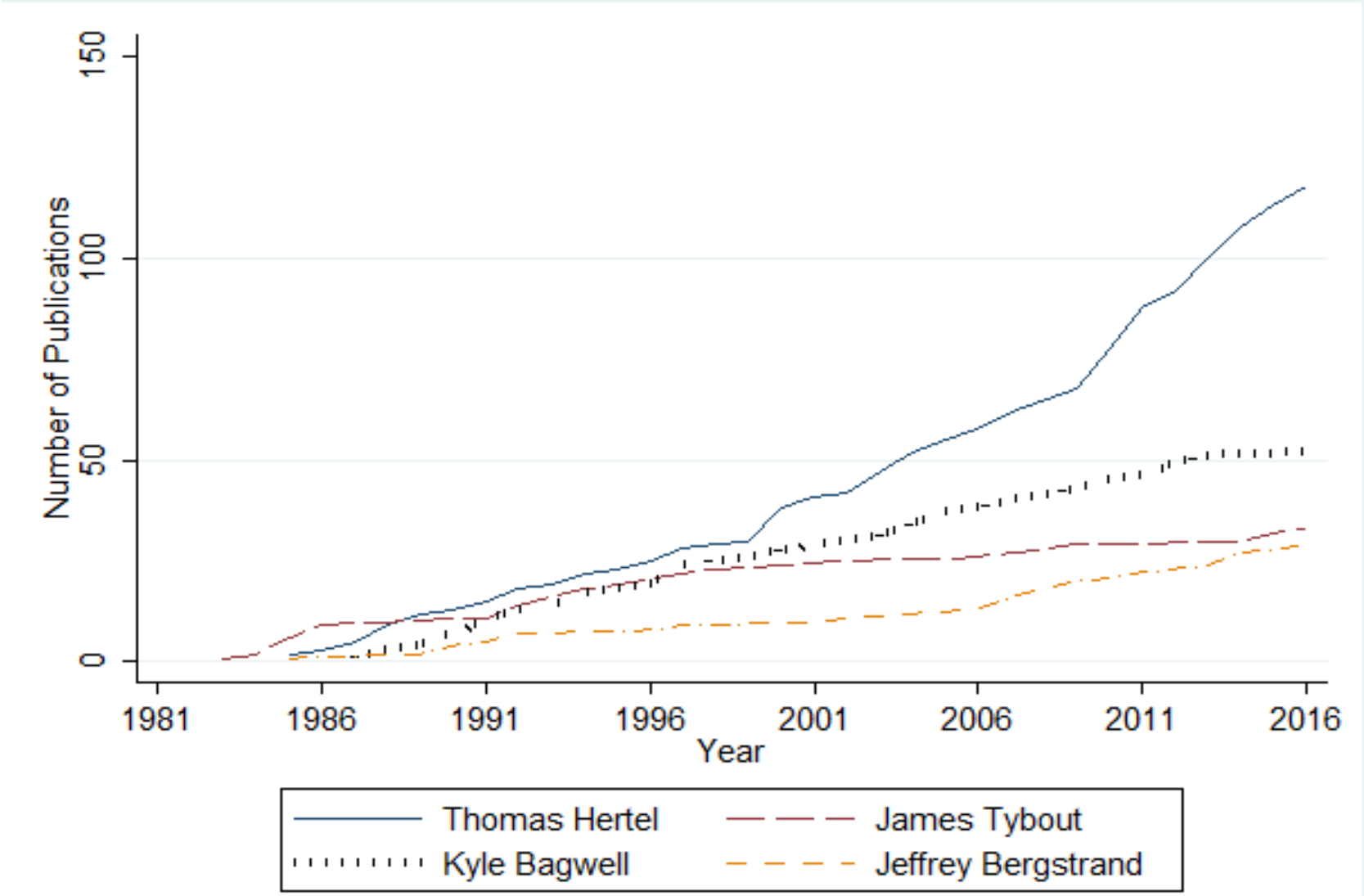
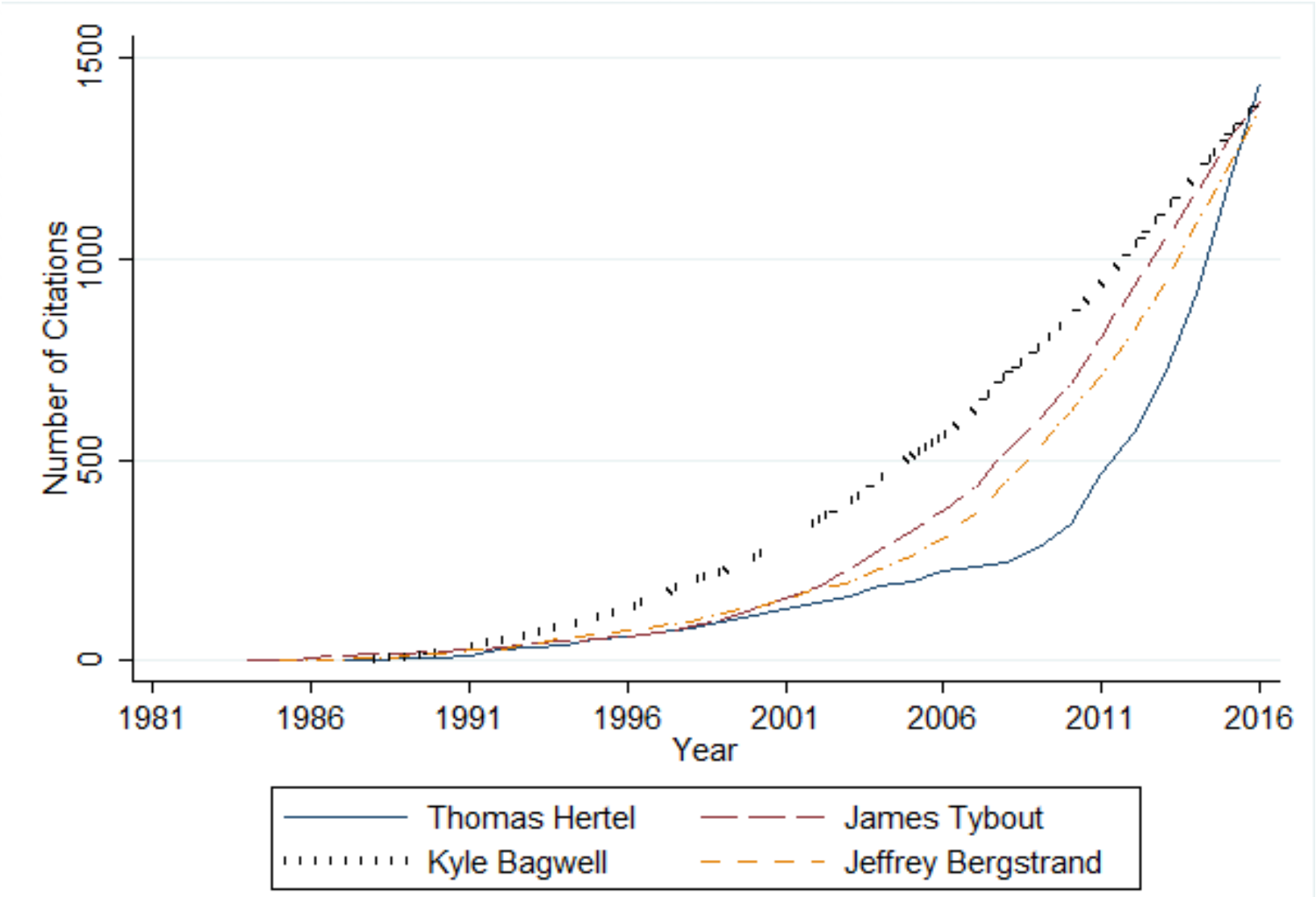
CUMULATIVE PUBLICATIONS



CUMULATIVE CITATIONS



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HERTEL'S FIELD BREADTH

Field	Number of Publications	Number of Citations
Environmental studies	15	309
Economics	69	287
Agricultural economics & policy	5	130
Energy & fuels		73
Geography		62
Food science & technology	4	60
Multidisciplinary sciences	3	58
Planning & development	6	49
Meteorology & atmospheric sciences	1	49
Green & sustainable science & technology	1	39
Agriculture, multidisciplinary		39
Engineering		35
Agronomy		26
International relations	5	23
Ecology	3	21
Forestry		21
Biodiversity conservation		15
Geosciences, multidisciplinary		15
Biology	1	12
Management		9
Area studies		8
Biotechnology & applied microbiology		8
Chemistry		7
Agricultural engineering	2	6
Law		6
Plant sciences		6
Business & finance	2	5
Public, environmental & occupational health		5
Remote sensing		5

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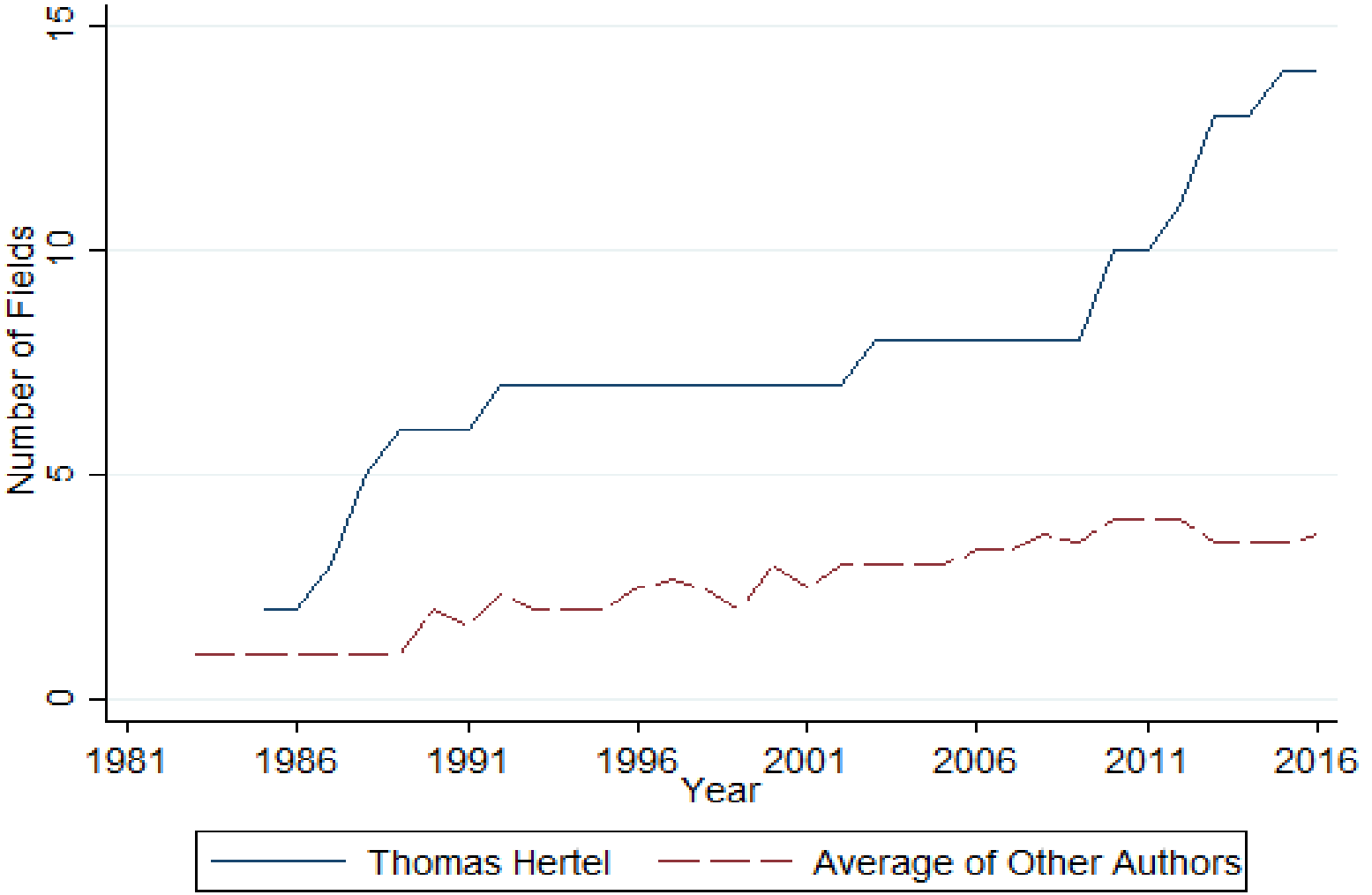
COMPARING PUBLICATION FIELDS



Note: Other authors include James Tybout, Kyle Bagwell, and Jeffrey Bergstrand.

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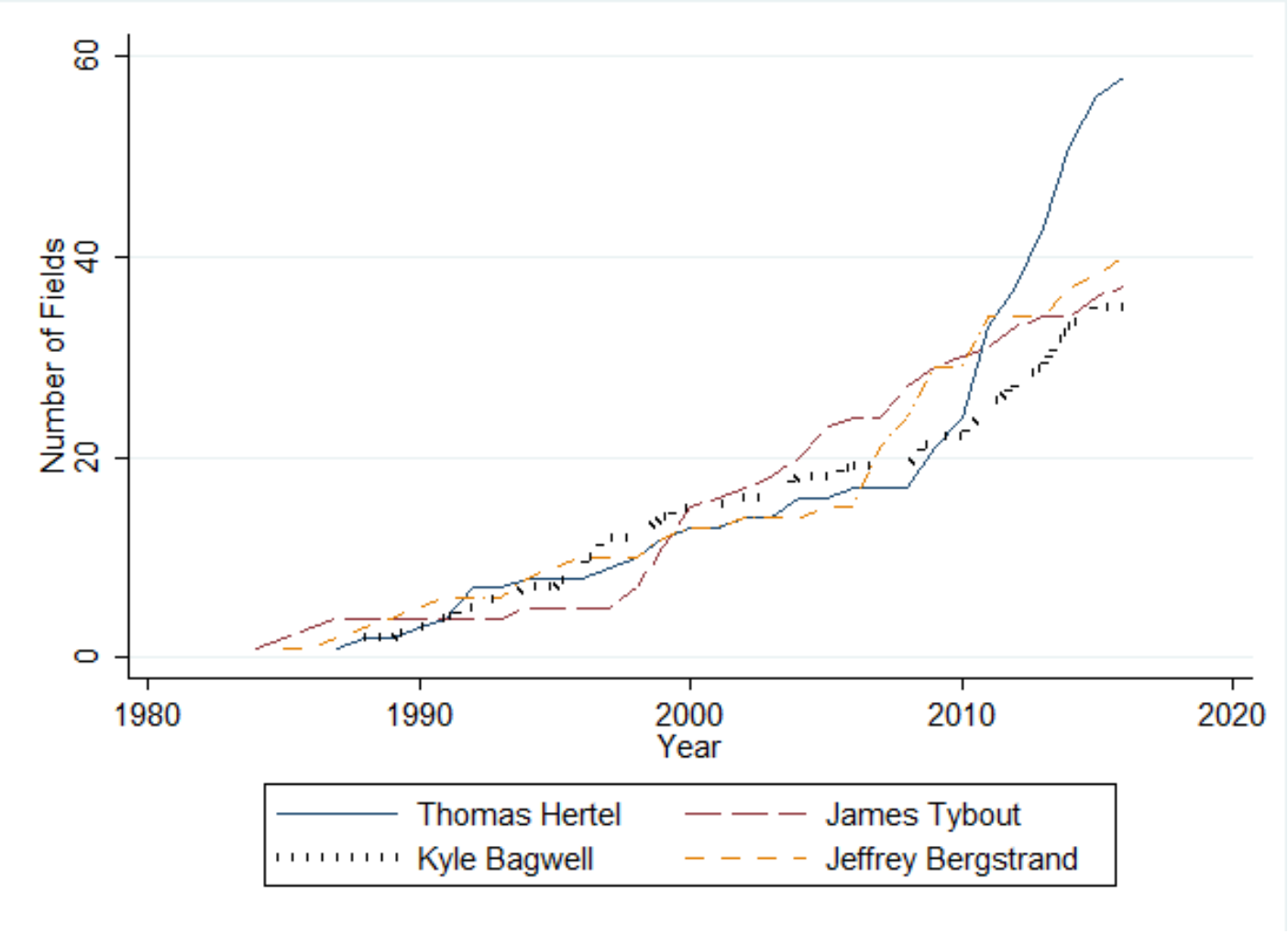
COMPARING CITATION FIELDS

Figure 5. Number of Fields of citations, by author, over time.



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IMPACT

Table 3. Tom Hertel publications with high impact factors

Journal Title	Journal Impact Factor
ENVIRONMENTAL RESEARCH LETTERS (2009, 2013a, 2013b, 2013c, 2013d, 2014)	4.134
BIOSCIENCE (2010)	4.294
CURRENT OPINION IN ENVIRONMENTAL SUSTAINABILITY (2013)	4.658
ECONOMIC SYSTEMS RESEARCH (1992, 2014, 2016)	5.306
GLOBAL ENV. CHANGE-HUMAN AND POLICY DIMENSIONS (2010a, 2010b, 2014)	5.679
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NATURE CLIMATE CHANGE (2012, 2016)	17.184
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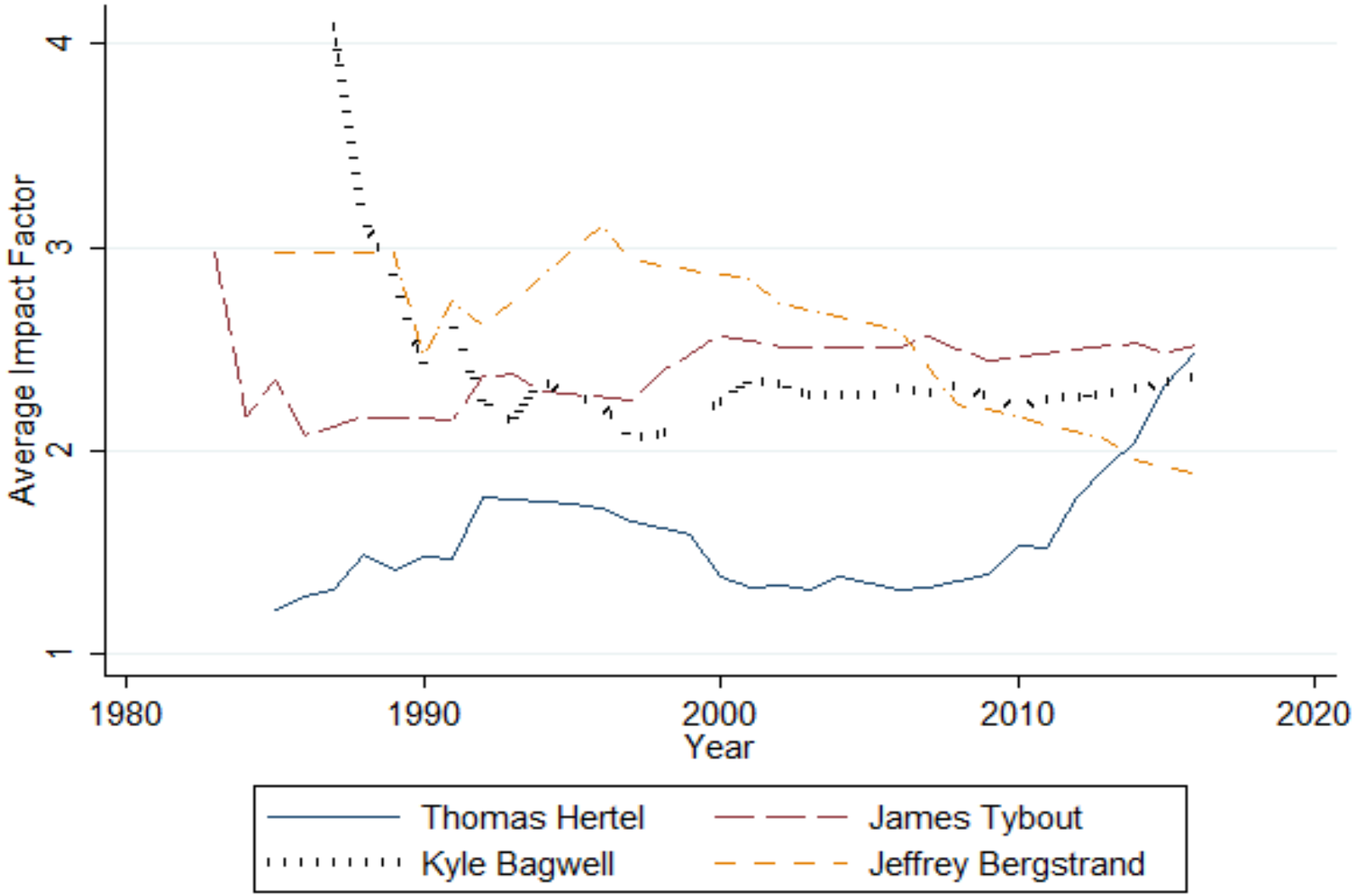
For reference: Journal of Political Economy (3.75), American Economic Review (3.833), Econometrica (4.053) Review of Economic Studies (4.077), Journal of Economic Perspectives (5.012), Quarterly Journal of Economics (5.538), Journal of Economic Literature (6.614).

AVG IMPACT FACTOR (CUMULATIVE)



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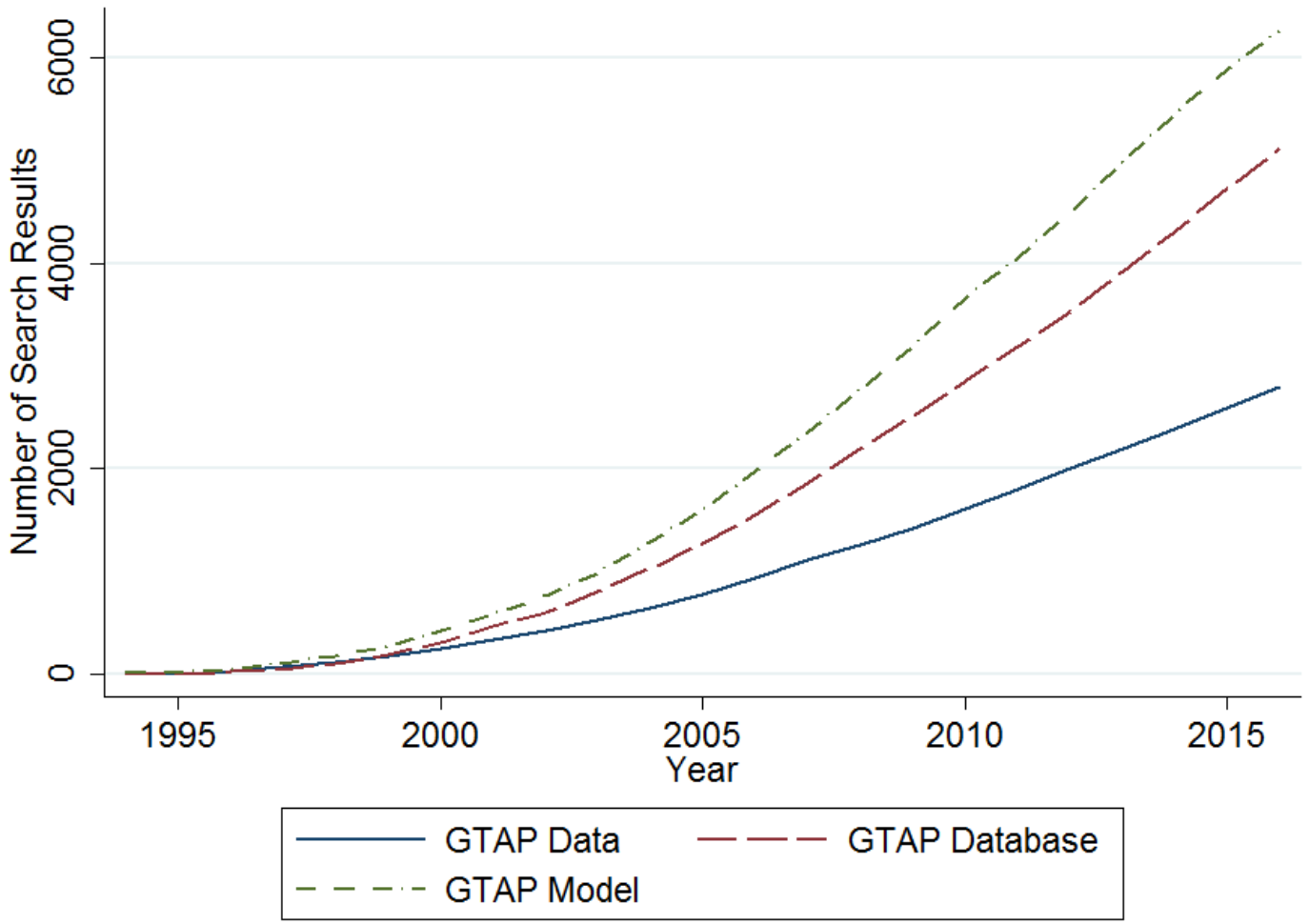
GTAP IMPACT

Figure 8. Number of Google Scholar search results for GTAP key words



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Task Utilization in Producing Economics: the Role of GTAP in an Increasingly Complex Research Landscape

1. *Introduce four "stylized facts" : NBER v. GTAP*
2. *Simple analytics to explain changing patterns of specialization in producing research*
3. *Some welfare analysis of research styles*

"What are we trying to accomplish?"

STYLIZED FACTS

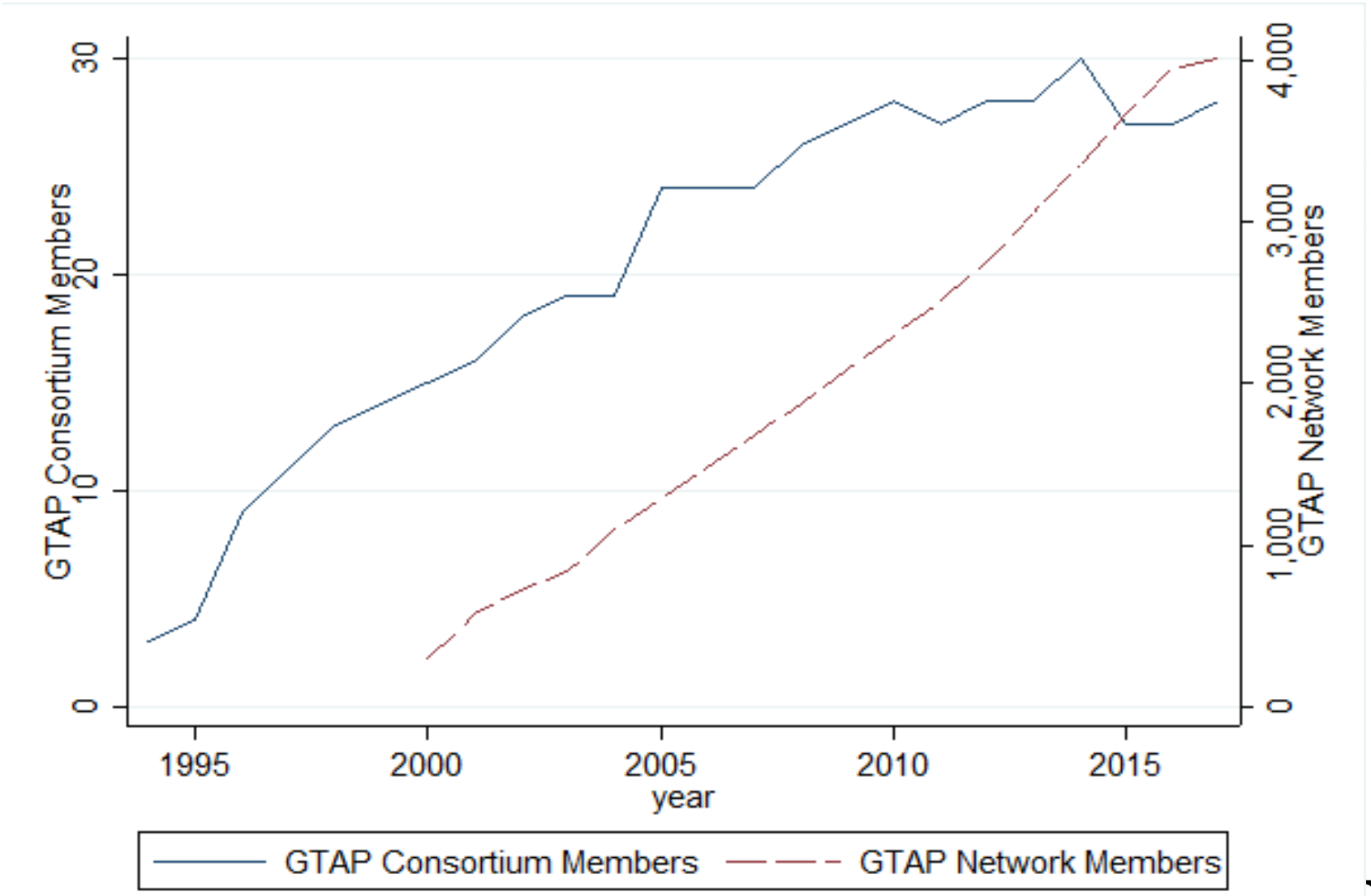
1. The scope and reach of GTAP has grown over time

2. Policy analysis is increasingly the province of CGE modelers, not NBER types

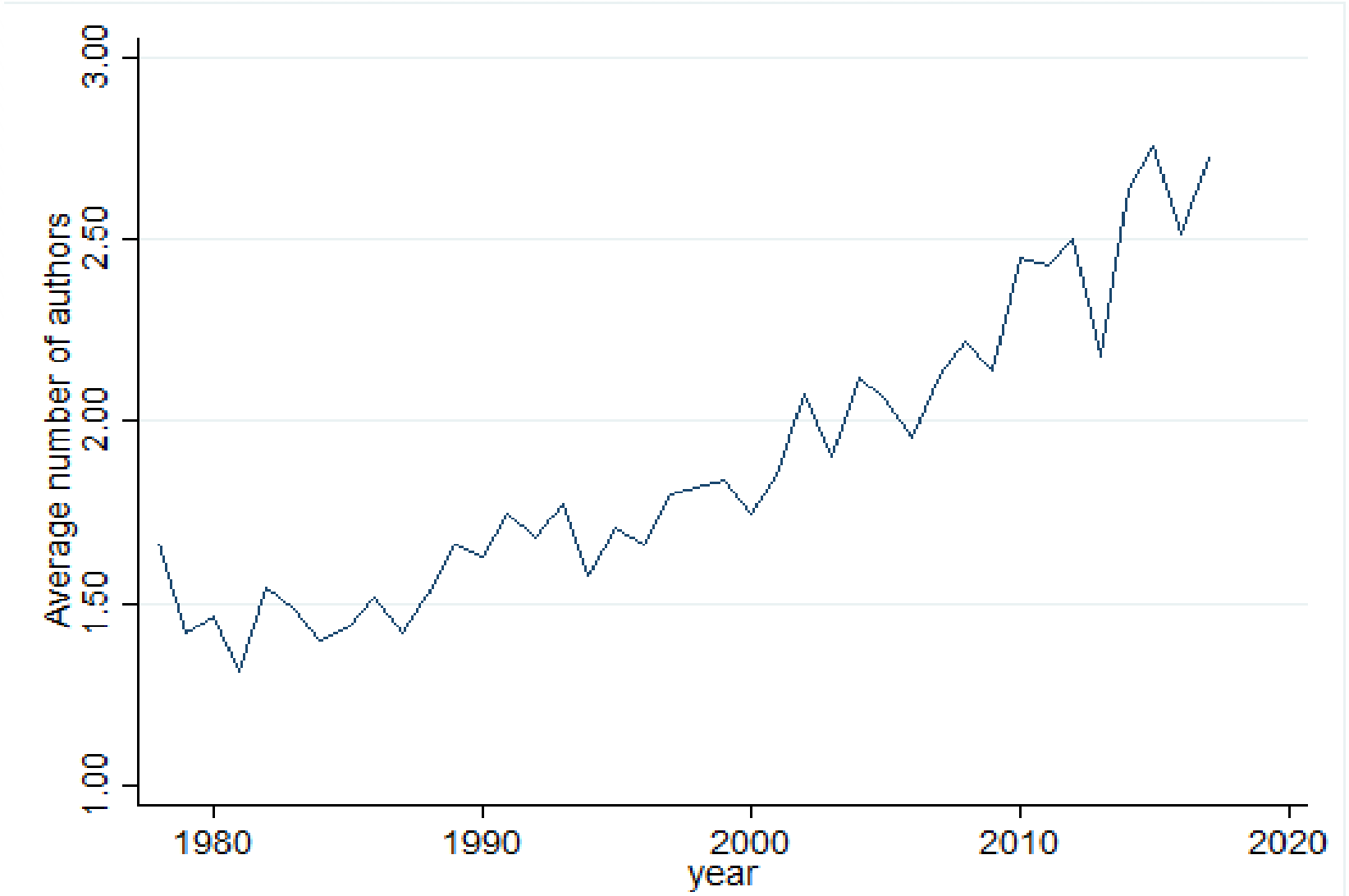
3. NBER articles have grown more complex; increasingly employ CGE-like quantitative theory

4. Physical sciences have embraced GTAP-style CGE output, not NBER quantitative theory

THE SCOPE AND REACH OF GTAP



COMPLEXITY OF NBER-ITI PAPERS



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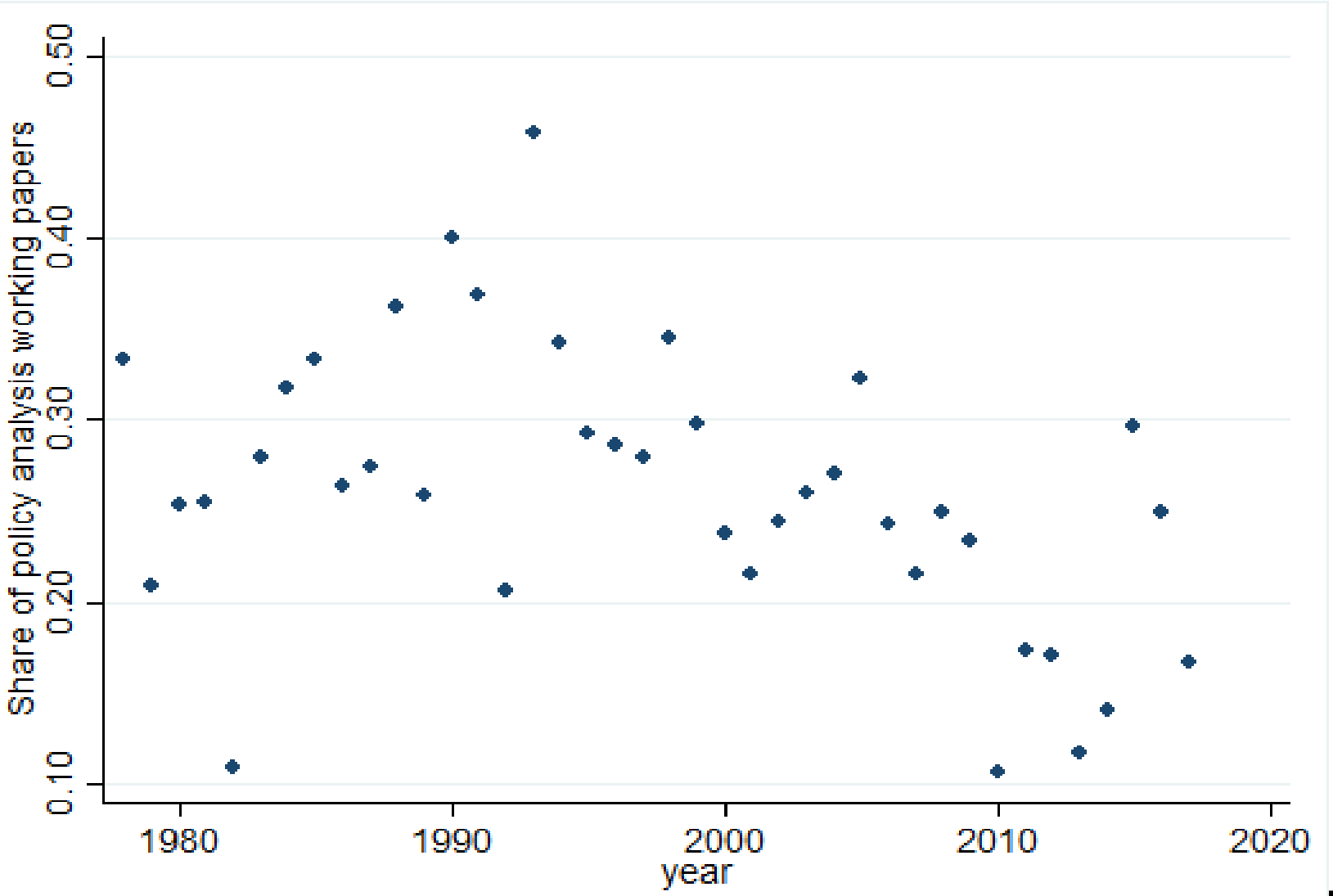
POLICY ANALYSIS IN NBER-ITI PAPERS



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HERTEL AND PHYSICAL SCIENCES

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SIMPLE ANALYTICS

Model of “results” production by a researcher involving one or more “tasks”

How many tasks should a paper employ to produce a result and in what ratios?

Should a researcher produce the task themselves or outsource?

How does this depend on the objective function of profession?

RESULTS PRODUCTION

(1) $y_i = \left(\sum_n q_{in}^{\theta}\right)^{1/\theta}$ *Researcher i produces results y using tasks n*

(2) $q_{in} = l_{in}/\varphi_{in}$ *subject to* $L_i = \sum_n l_{in}$ *adding up constraint*

Tasks "n" : questions/topics; types of theory; measurement; data analysis; presentation

$$\frac{q_{theory}}{q_{empirics}} = \left(\frac{\varphi_{theory}}{\varphi_{empirics}}\right)^{\sigma}$$ *mix of tasks*

INTERLUDE…SOME ORAL HISTORY

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ENDOGENIZING THE SET OF TASKS

(4) $y = N^{(\sigma-1)/\sigma} q.$ *The value of adding new tasks…*

Could endogenize "n" by adding new subtypes of tasks (think nested structure), or entirely new tasks

Think of incentives and note the critical role of σ.

SUPPOSE σ DROPS

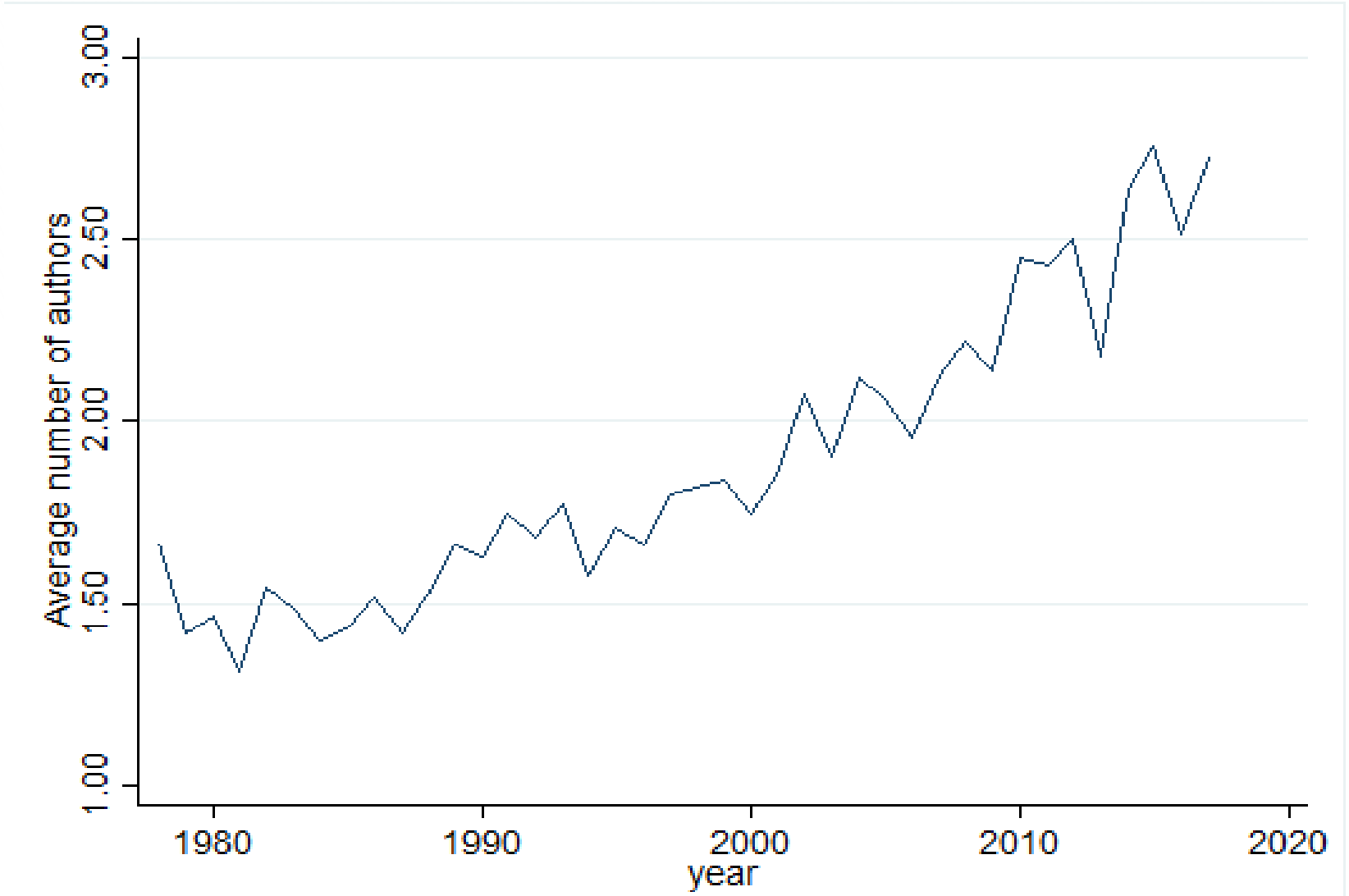
Why?

- Classic CGE terms of trade effect
- Policy analysis
  - Specificity
  - Quantification

Consequence

- More results are generated from “multi-tool” papers
- Returns to task innovation rises

COMPLEXITY OF NBER-ITI PAPERS



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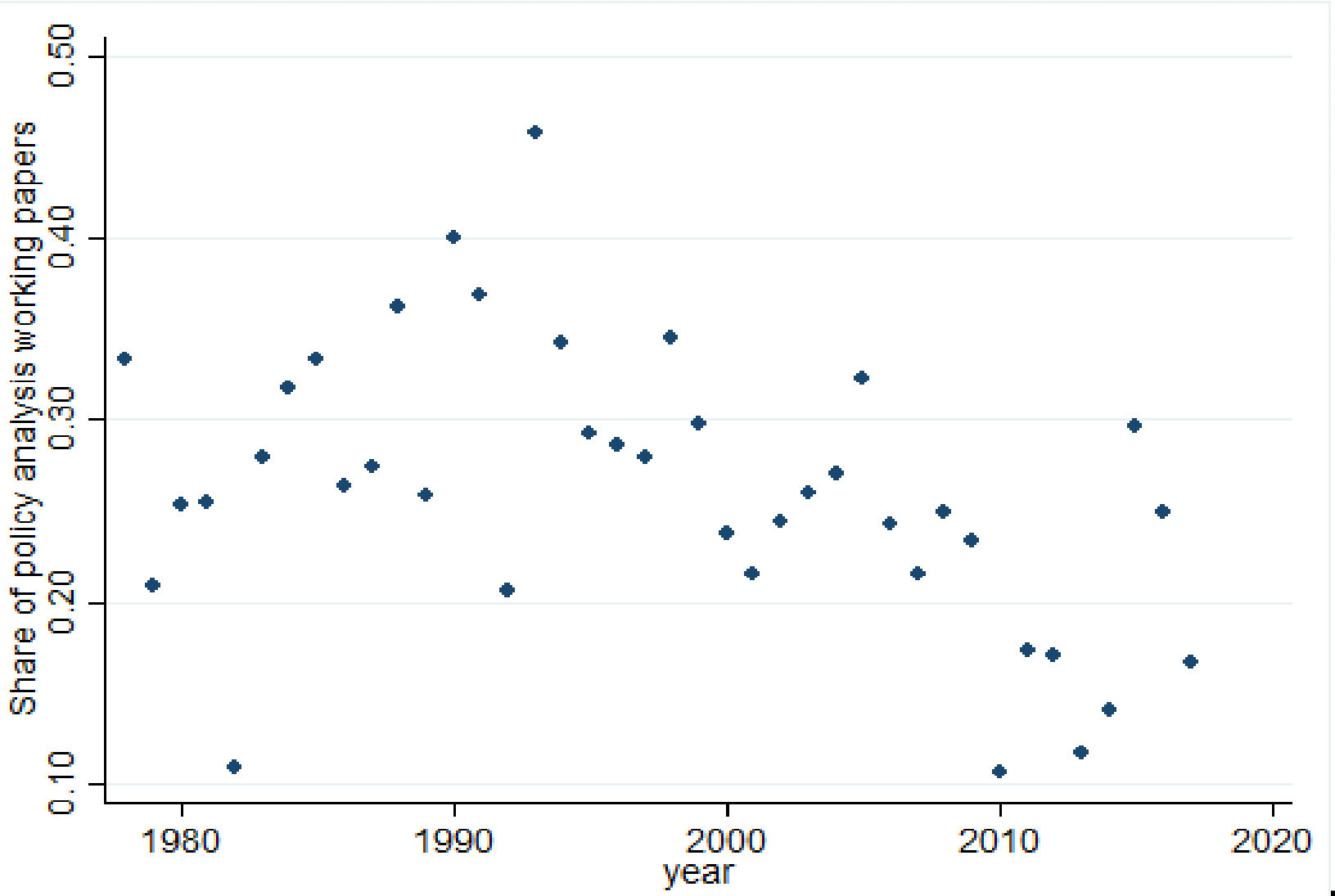
POLICY ANALYSIS IN NBER-ITI PAPERS



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INTERLUDE…MORE ORAL HISTORY

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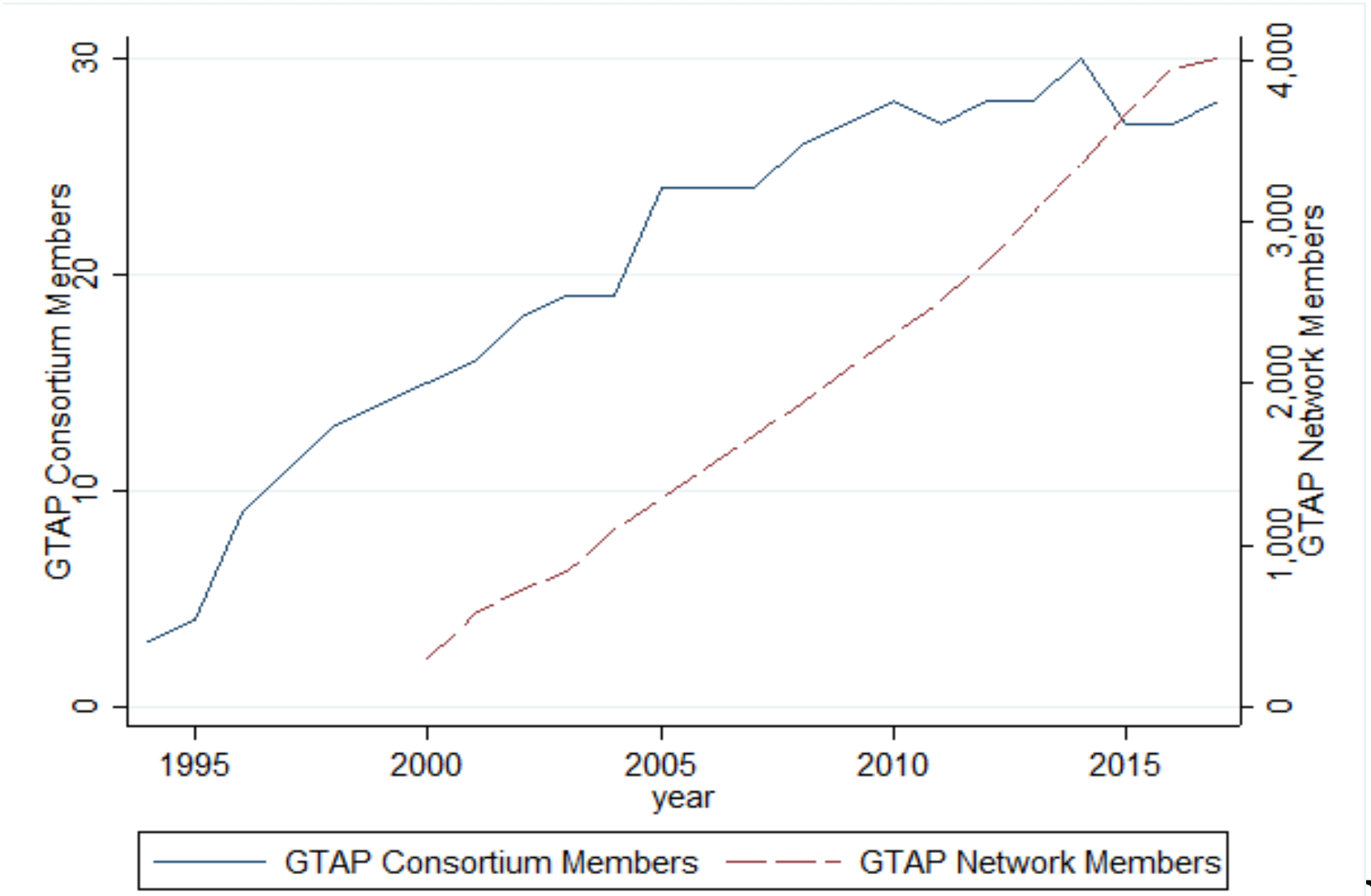
THE SCOPE AND REACH OF GTAP



O-RINGS AND GTAP OUTSOURCING

Let $\varphi_i(n)$ be the productivity of researcher i at task n.

Order the productivities of tasks $\in [1, N]$, and assume $\varphi_i(n) = \varphi_i n^2$,

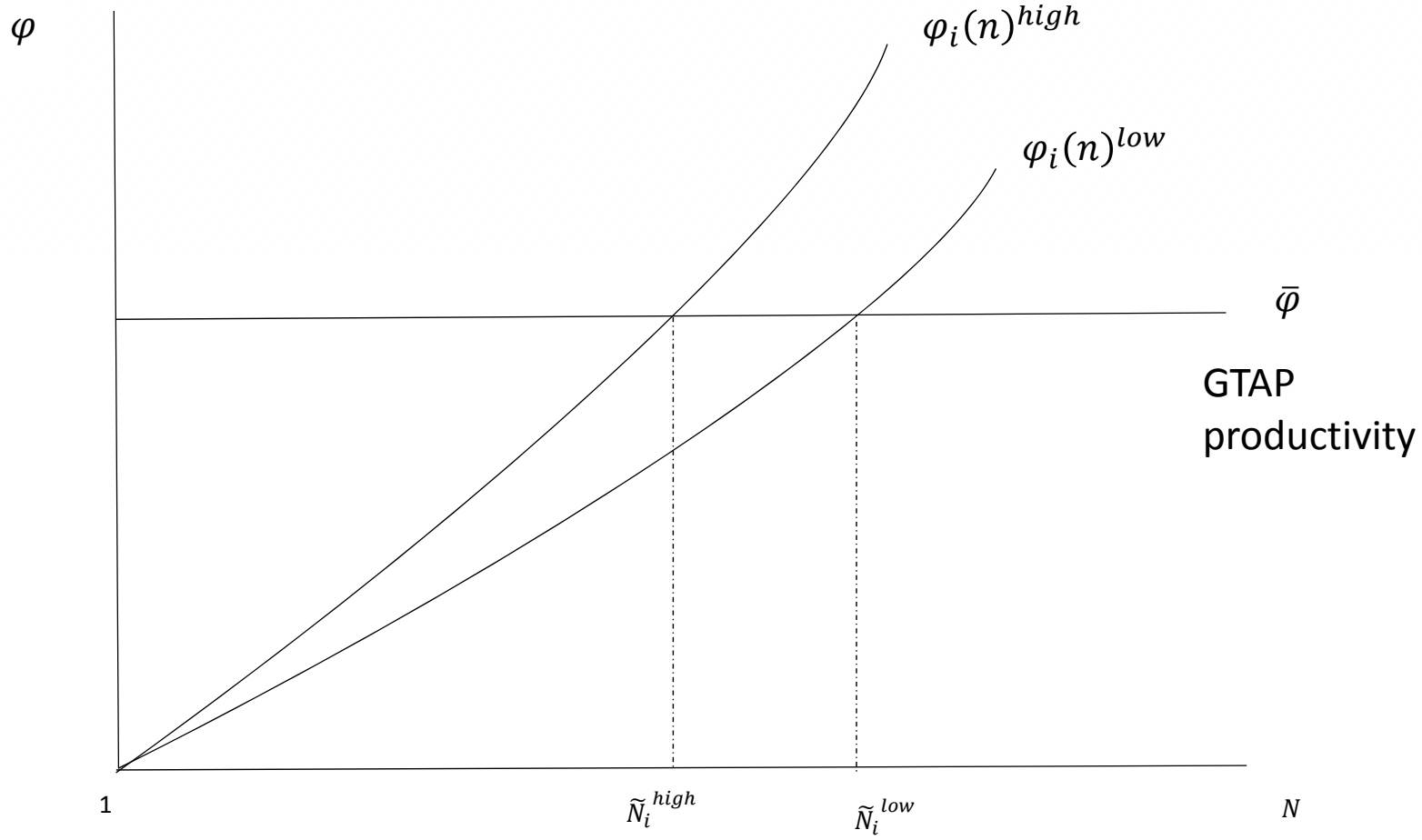
The labor required to produce task n is therefore $\frac{1}{\varphi_i n^2}$

Labor required to produce an entire unit of analysis as $\int_{n=1}^{N} \frac{1}{\varphi_i n^2} dn$.

"Autarky": Number of results produced by researcher i as a function of the total number of tasks required N, and researcher productivity φ_i:

$$(5) \quad y_i = \frac{L}{\int_{n=1}^{N} \frac{1}{\varphi_i n^2} dn} = \frac{L\varphi_i N}{N-1}$$

OUTSOURCING TO GTAP



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TASK SPECIALIZATION

Number of tasks undertaken by researcher i

$$\widetilde{N}_i = \left(\frac{\bar{\varphi}}{\varphi_i}\right)^{0.5}$$

Results output of researcher i

$$y_i = \frac{L}{\int_{n=1}^{\widetilde{N}_i} \frac{1}{\bar{\varphi}} dn + \int_{n=\widetilde{N}_i}^{N} \frac{1}{\varphi_i n^2} dn} = \frac{L}{\frac{\widetilde{N}_i - 1}{\bar{\varphi}} + \frac{N - \widetilde{N}_i}{N \widetilde{N}_i \varphi_i}}$$

INCREASES IN GTAP PRODUCTIVITY

GTAP productivity has two effects:

- inframarginal…saves researcher labor on all tasks already outsourced to GTAP
- Extensive margin… expands the set of tasks outsourced to GTAP

Combining the two, the elasticity of output wrt $\overline{\varphi} = 0.5$

$$y_i = \frac{LN\varphi_i^{0.5}\overline{\varphi}^{0.5}}{N-\varphi_i^{0.5}}.$$

The gain is greatest for high productivity researchers

(9) $$\frac{\partial y_i}{\partial \varphi_i} = \frac{0.5\varphi_i^{-0.5}LN^2\overline{\varphi}^{0.5}}{\left(N-\varphi_i^{-0.5}\right)^2}. \Rightarrow \frac{\partial^2 y_i}{\partial \varphi_i \partial \overline{\varphi}} > 0$$

WHY ISN'T GTAP USED MORE WIDELY?

Suppose utility depends on results and share of tasks produced by the researcher (penalizing outsourcing to GTAP)

$$(10) \quad U_i = \frac{N}{\widetilde{N}_i} y_i = \frac{LN^2 \bar{\varphi} \varphi_i}{\widetilde{N}_i N \varphi_i (\widetilde{N}_i - 1) + (N - \widetilde{N}_i)\bar{\varphi}}$$

Now the optimal number of tasks to outsource is

$$\widetilde{N}_i = \frac{1}{2} + \frac{\bar{\varphi}}{2N\varphi_i}$$

If $\varphi_i > \frac{\bar{\varphi}}{N}$, the researcher won't use GTAP.

WHAT'S THE TRADEOFF

GTAP raises productivity measured in terms of results, but obscures the contribution of the researcher to producing the results.

The same is true of multi-author teams, but the signal extraction problem is harder in that context.

Perverse professional incentives: to signal how smart I am, I deliberately lower my productivity by throwing away tools

GTAP AND THE PHYSICAL SCIENCES

Can this theory explain why GTAP is used more in the physical sciences, even as its used less in (NBER-style) economics?

Some hypotheses

1. Physical sciences place higher value on replicability (oh, the irony…black boxes!!!)
2. Physical sciences value y (results), not U (results scaled by researcher contribution)
    - Supported by Leslie (2015) on value of innate ability
3. High capital investment fields acknowledge value of team production.

SOME QUESTIONS

What are we, as a profession, trying to accomplish?

- Results?
- Replicability?
- Large impact from arbitraging insights across fields?

On all these dimensions, using GTAP is a dominant strategy

So, is that what we're trying to accomplish?

OR ARE WE JUST SHOWING OFF?

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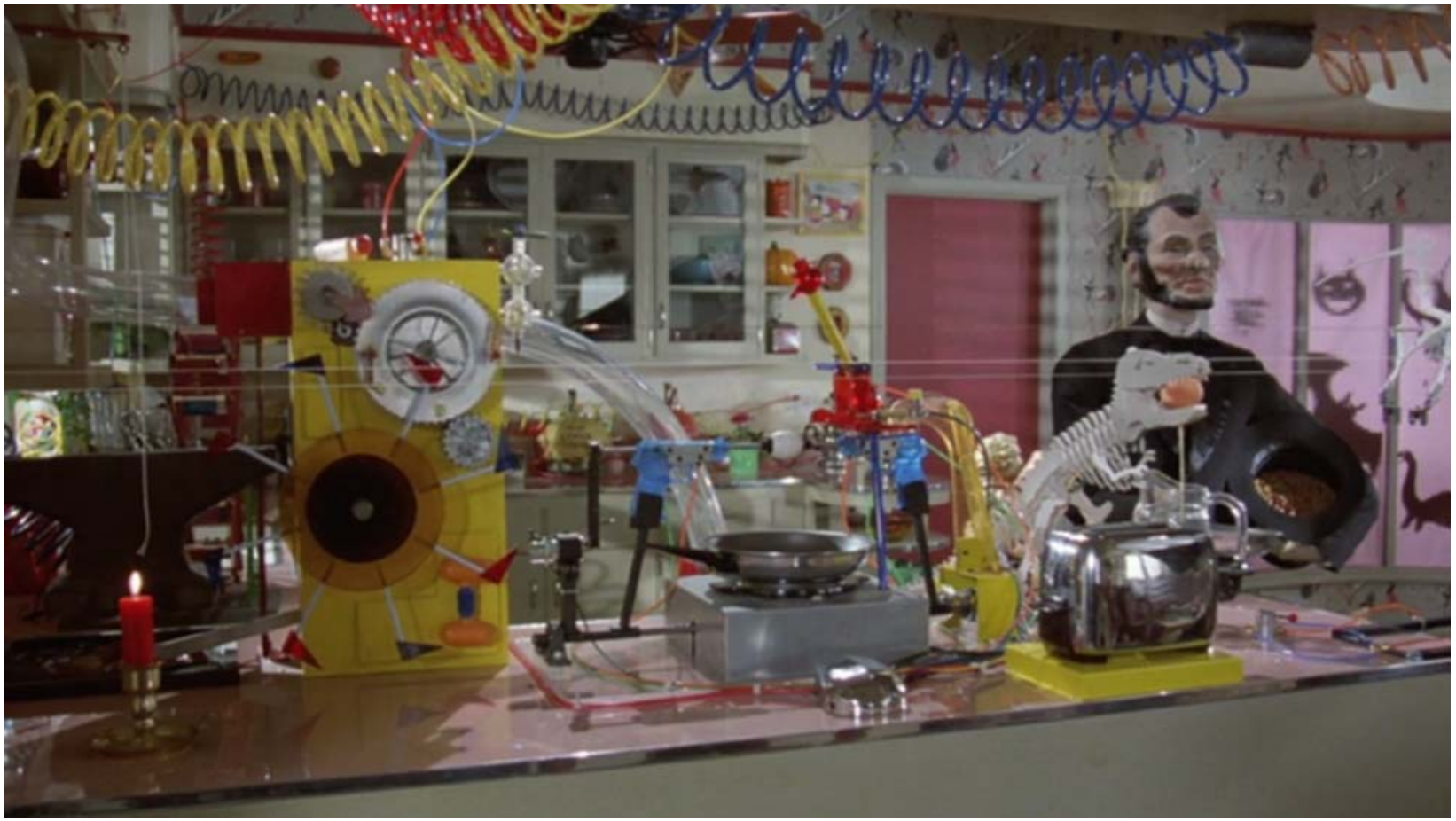
COUNTER-ARGUMENT

Does rising task complexity lead to rising insight? Rising influence outside the academic sphere?



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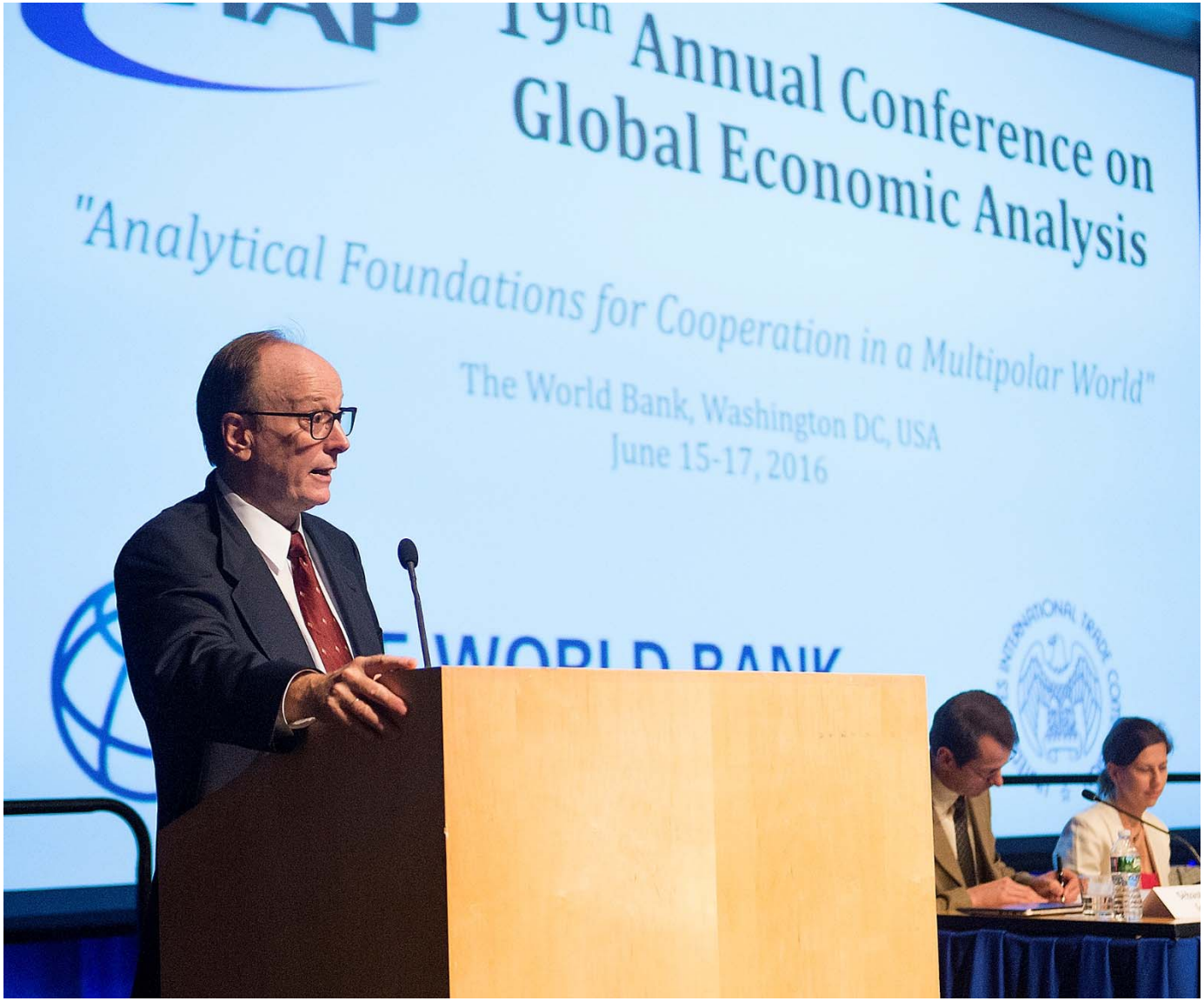

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