MONETARY NON-NEUTRALITY IN THE CROSS-SECTION

by Elisa Rubbo

Discussion by Ludwig Straub, Harvard

MOTIVATION: UNEQUAL TIMES …

- Live in unequal times …
  - rising inequality
  - unequal recovery from Covid pandemic
  - energy crisis
  - climate change / green transformation

MOTIVATION: UNEQUAL TIMES …

- Live in unequal times …
  - rising inequality
  - unequal recovery from Covid pandemic
  - energy crisis
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- Only natural to ask: Does monetary policy, e.g. current monetary tightening,
  - … **exacerbate** those inequalities?
  - … or **mitigate** them?

HETEROGENEOUS EFFECTS OF MONETARY POLICY

- Need to study the heterogenous effects of monetary policy …
  - across industries and / or workers
- Many dimensions of heterogeneity come to mind …
  - durable / investment goods producers, construction *McKay-Wieland, Winberry-vom Lehn*
  - balance sheets, asset revaluation, unhedged interest exposures *Auclert, Ottonello-Winberry, HANK…*
  - exchange rate exposure, exporters vs. importers *Auclert-Rognlie-Souchier-Straub, Ottonello-Perez, Zhou*
  - heterogeneity in price or wage rigidity *Aoki, Benigno, Rubbo, Pasten-Schoenle-Weber*

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Focus of this paper (for now)

Main finding: this channel alone can be powerful!

ROADMAP

- Review of the current version of the paper
- Three comments on: direction of the paper, model, relation to literature

REVIEW OF THE PAPER

THE MODEL

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  - I-O linkages among producers, het. consumption baskets, ownership patterns

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- Aspiration: “Make Baqaee-Farhi useful for (monetary) policy analysis”
- Specifically, start with the most complicated Baqaee-Farhi model
  - “HA-IO”: many distinct consumers, producers, fixed factors
  - I-O linkages among producers, het. consumption baskets, ownership patterns
- Make it more complicated along four dimensions:
  - add price (+ wage) rigidities
  - flexible labor supply and something resembling investment
  - dynamics: full infinite horizon economy
  - monetary policy rule (for now money supply rule)

HOW COMPLICATED IS THIS?

$$\begin{cases} \boldsymbol{\pi}_t = \kappa \mathbf{l}_t - \mathcal{V}\mathbf{p}_{t-1} + (I - \mathcal{V})\,\rho\mathbb{E}\boldsymbol{\pi}_{t+1} & \text{Phillips curves} \\ \mathbf{l}_t = (I - \mathcal{X})^{-1}\left[\mathbf{1}\bar{l} + \mathcal{F}\left(\mathbf{p}_{t-1} + \rho\mathbb{E}\boldsymbol{\pi}_{t+1}\right)\right] & \text{cross-sectional demand} \\ \pi_t^Y + \bar{y}_t = m_t - p_{t-1}^Y & \text{aggregate demand} \end{cases}$$

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where

$$\frac{\partial\log\left(\text{real income}\right)}{\partial\log\left(\text{factor prices}\right)} = S^{-1}\left[\begin{pmatrix} I & \mathcal{Z}^T\frac{\Phi_K}{1+\Phi_K} \\ \mathbb{O} & \frac{1}{1+\Phi_K} \end{pmatrix} diag\left(\boldsymbol{\Lambda}\right)\right] - \lambda^T\alpha$$

$$\frac{\partial\log\left(\text{real income}\right)}{\partial\log\left(\text{real marginal cost}\right)} = S^{-1}\begin{pmatrix} \Xi^T \\ \mathbb{O} \end{pmatrix} diag\left(\bar{\lambda}\right) - \lambda^T$$

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Proposition 1. *Sector-by-agent Phillips curves are given by*

$$\boldsymbol{\pi}_t = \kappa \mathbf{l}_t - \mathcal{V}\mathbf{p}_{t-1} + (I-\mathcal{V})\,\rho\mathbb{E}\boldsymbol{\pi}_{t+1} \tag{23}$$

where the matrix $\mathcal{V}$ is such that $\sum_j \mathcal{V}_{ij} = 0$, $(I-\mathcal{V})_{ij} \in [0,1]$ and, as long as no sector has fully flexible prices ($\delta_i = 1$), the matrix $I-\mathcal{V}$ is invertible. Moreover,

$$\kappa \equiv \Delta\left(I-\Omega\Delta\right)^{-1}\alpha\kappa^w\mathcal{E} \qquad \in \mathbb{R}^{N\times H+F} \tag{24}$$

$$\mathcal{V} \equiv \Delta\left(I-\Omega\Delta\right)^{-1}\left[I - \alpha\kappa^w\underline{\lambda}^T\left(I-\Delta\right)\left(I-\Omega\Delta\right)^{-1}\right]\left(I-\Omega\right) \qquad \in \mathbb{R}^{N\times N}$$

The matrix $\kappa^w\mathcal{E}$ is the slope of the (flexible) factor price Phillips curves. The expressions for κ^w, $\mathcal{E}$, and $\underline{\lambda}$ are

$$\kappa^w \equiv \left[I - \beta^T\Delta\left(I-\Omega\Delta\right)^{-1}\alpha - \begin{pmatrix} \textit{wealth effect} \\ \mathbb{O}\end{pmatrix}\right]^{-1} \qquad \in \mathbb{R}^{H+F\times H+F}$$

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- It’s a lot of math and notation! Baqaee-Farhi is light afternoon reading comparatively.
- Will propose a more tractable model …

A (SOMEWHAT) MORE TRACTABLE MODEL

- 4 simplifications:
  - Preferences + production functions are Cobb-Douglas
  - Households consume the same bundle (not crucial)
  - Complete markets $\Rightarrow$ can think of this like a "big family", pooling their income
  - Infinite Frisch elasticity of labor supply

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$$\max \ \log C + \log \frac{M}{P} - \sum_f N_f$$

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Sectors

$$\Pi_i = \max \ P_i \prod_f N_{if}^{\alpha_{if}} \prod_j X_{ij}^{\Omega_{ij}} - \sum_f W_f N_{if} - \sum_j P_j X_{ij}$$

price reset w.p. Δ_i

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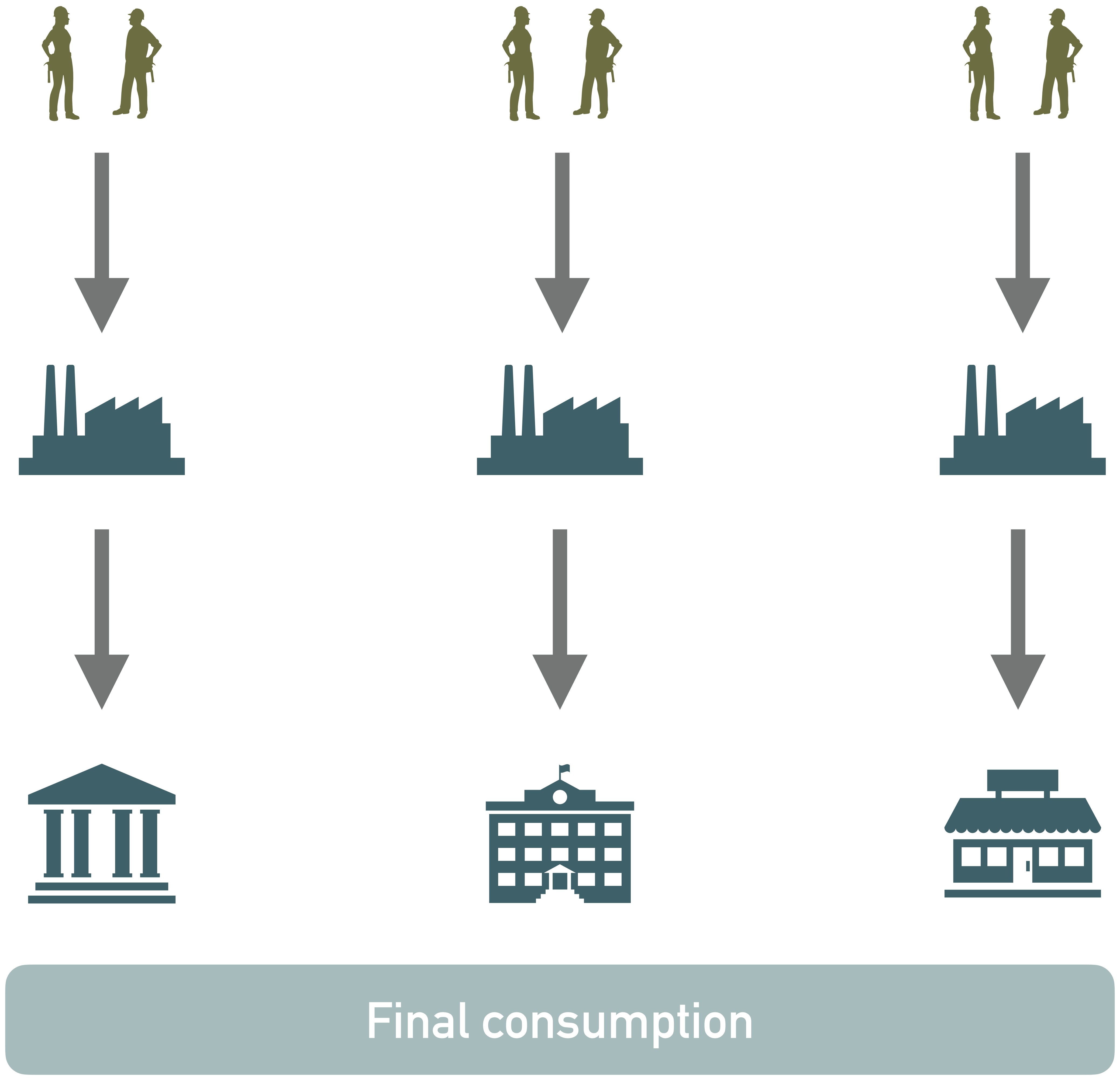
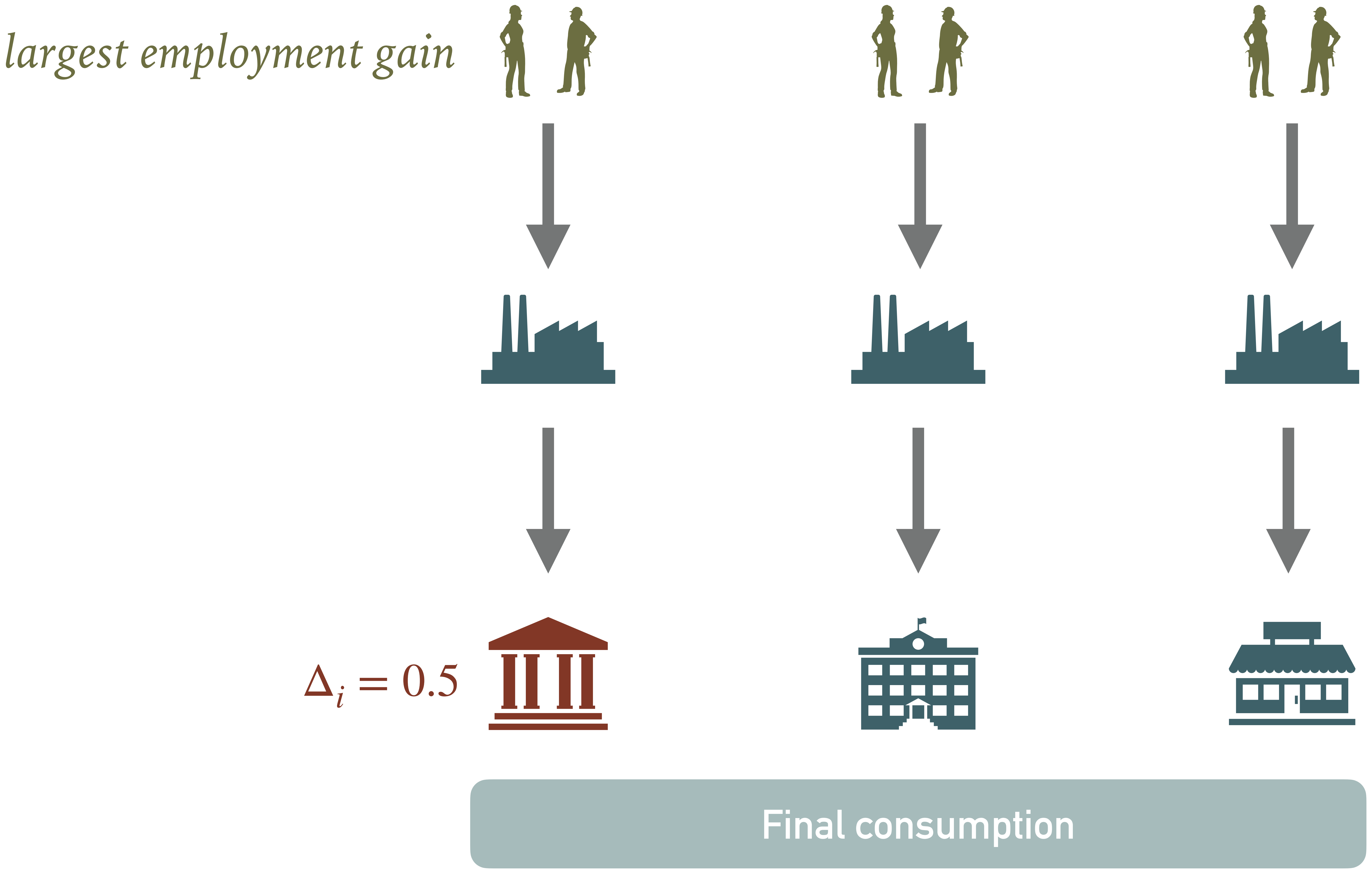
- Employment gains are larger where there is more price rigidity downstream
  - weights are generalized form of "sales to income" ratios (Basu)

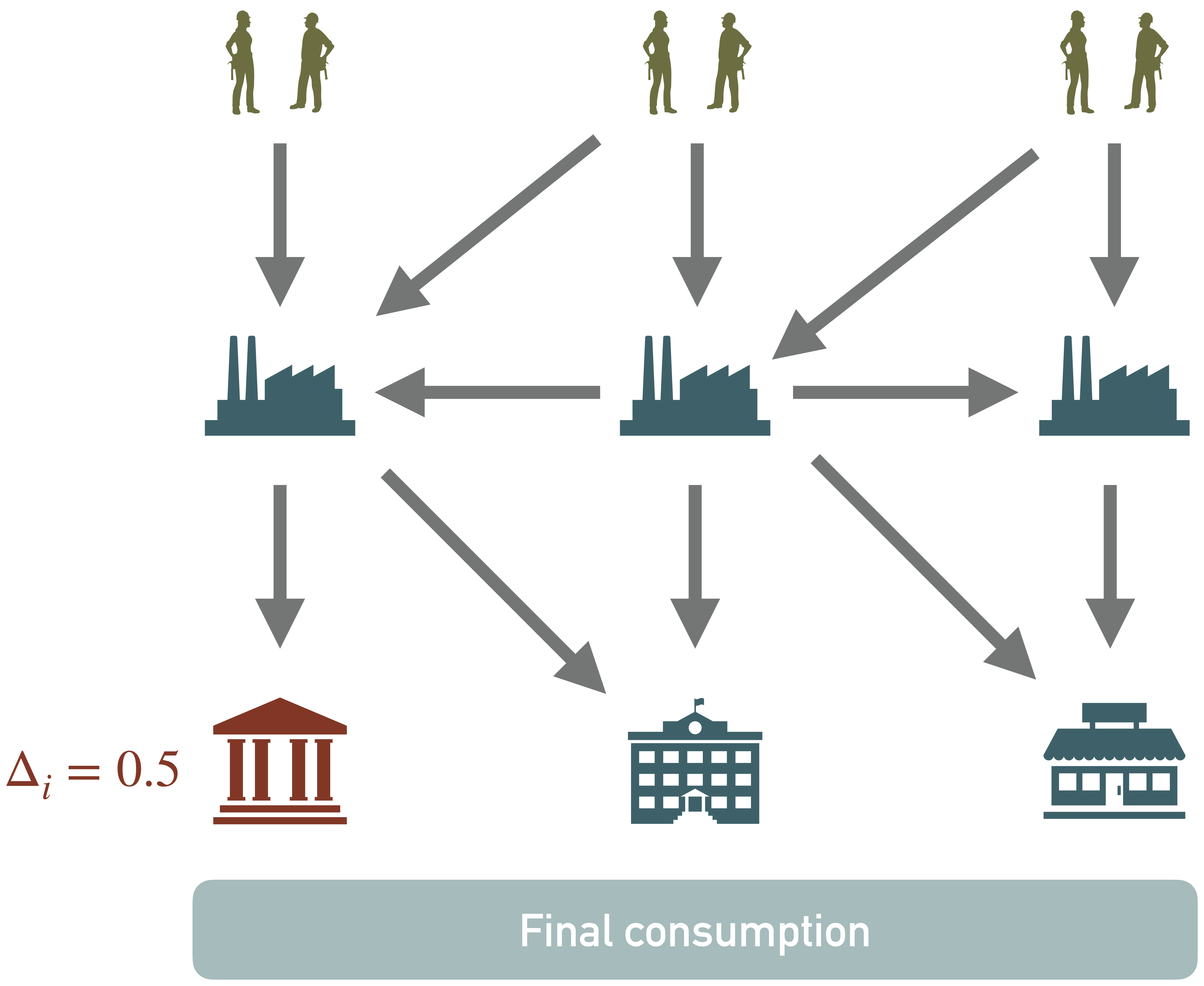
AN EXAMPLE



AN EXAMPLE



. . . BUT WHAT IF STRUCTURE IS MORE COMPLEX?

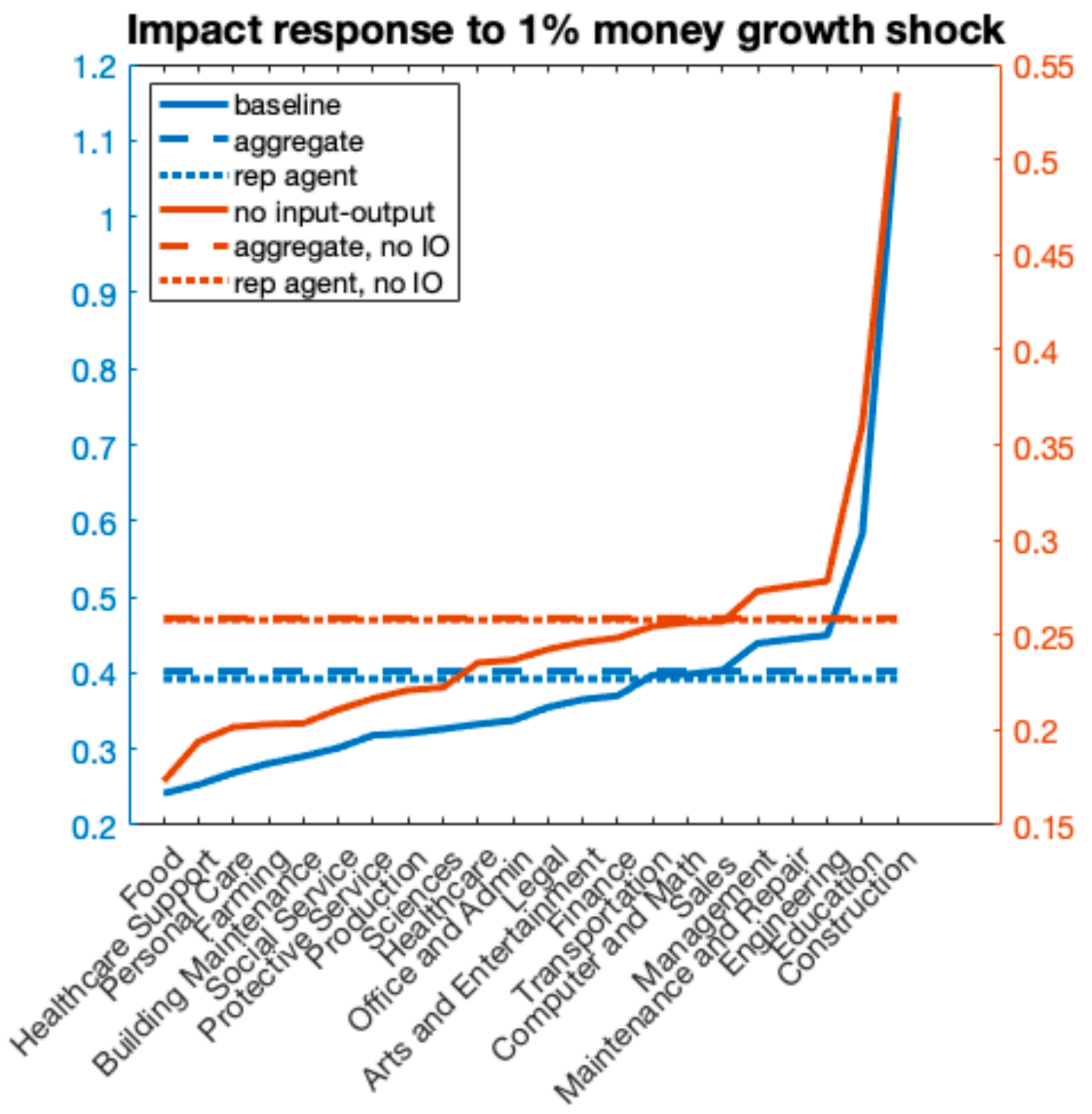


RELAXING THE 4 SIMPLIFICATIONS

- What about **deviations from Cobb-Douglas**?
  - Since relative prices move, substitution patterns become relevant.
  - Still remains tractable, since relative prices are not a function of substitution.
- What about **dynamics**? Can probably do it closed form.
- What about **finite Frisch, fixed factors**?
  - This is what makes the model much less tractable.
  - Simplified intuition: where labor is supplied more inelastically, employment moves less, wages more
  - Unclear what happens to nominal income (depends on elasticities)

FINDINGS IN THE US

- Calibrate to US I-O and Chile, interpret households as occupations.



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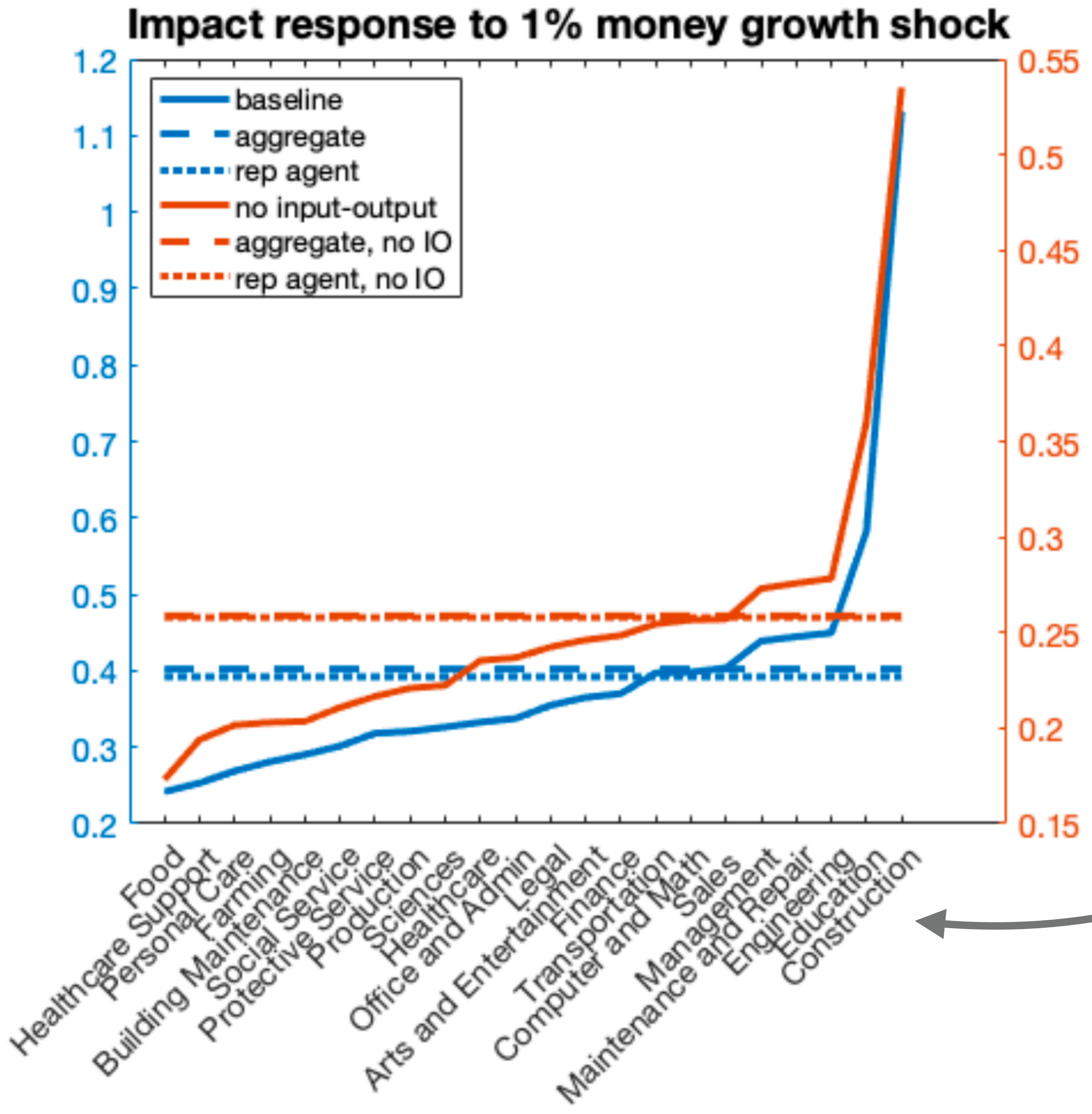

Does construction have very sticky prices?

COMMENTS

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  - How do supply chains matter? Decompose empl. response into what is driven by each sector?
- **Route 2:** Quantitative. The "CEE/SW route".
  - Here all the bells & whistles are necessary.
  - E.g. inflation is inertial in the data, but not the model.
  - Need a proper model of investment: full depreciation + no time lag kill monetary transmission through investment.
  - Need to think about all the other possible sources of heterogeneity!

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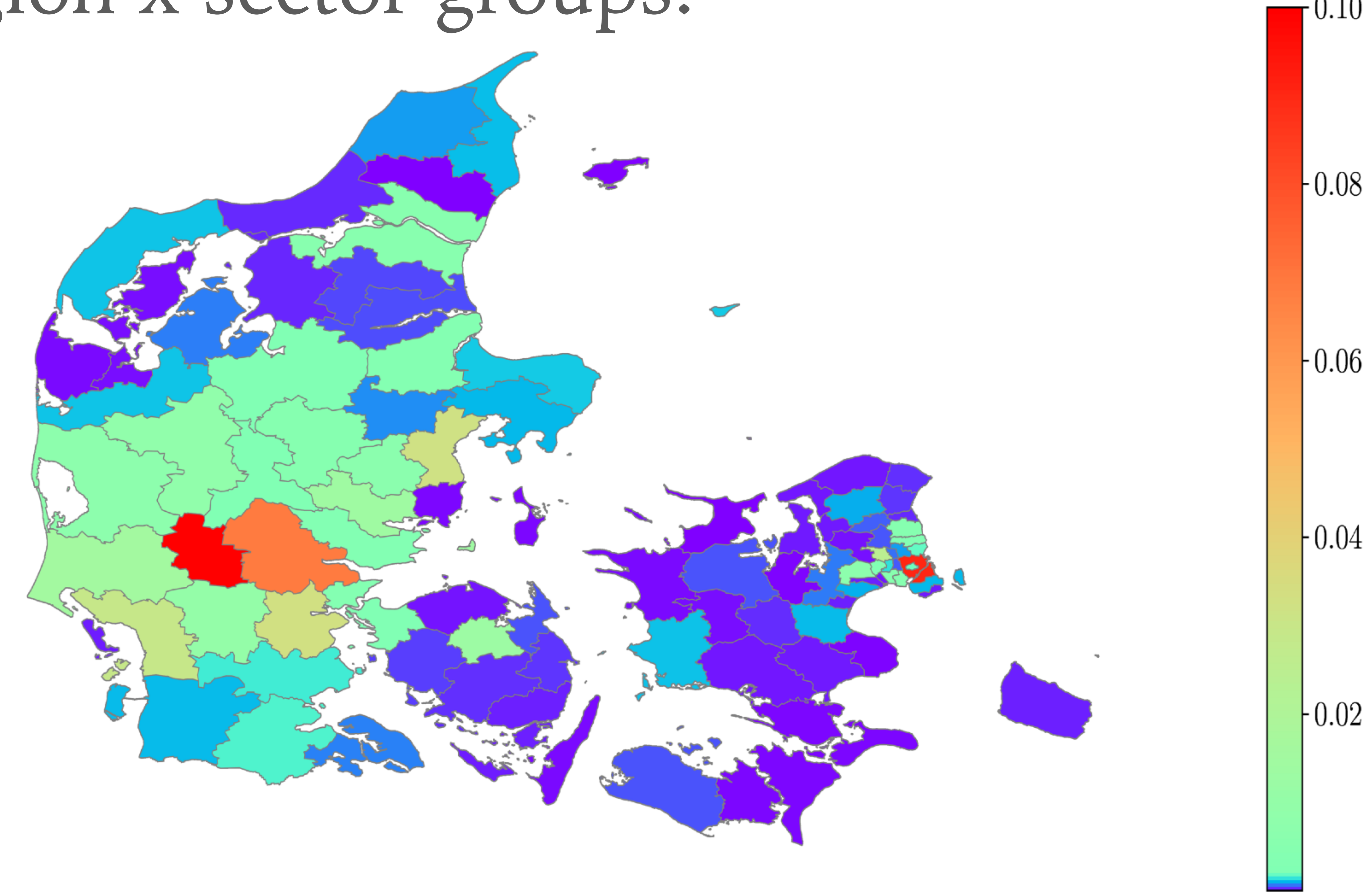
- In recent work with Andersen, Hansen, Huber, Johannesen, we disaggregate all flows of Danish national accounts to level of small region x sector groups.
- E.g. see geographical distribution of spending:
- I imagine that such heterogeneity becomes visible once geography is included.



COMMENT #3: RUBBO 2021 VS RUBBO 2022

- In my tractable model, predictions for total employment by *sector* (not by factor) are independent of the number of factors.
  - e.g. could collapse all factors into a single one.
- How true is this in the full Rubbo 2022 model?
- How much does Rubbo 2022 (many factors) look like Rubbo 2021 (one factor)?

CONCLUSION

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- Very exciting new paper on heterogeneous effects of monetary policy!

- Three comments:
  - What is the nature of the paper? Gali or CEE/SW (or both)
  - Price rigidity is all there is (so far)
  - Rubbo 2021 vs. Rubbo 2022