Dynamic Urban Economics

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Summary

- **Contribution: Welcome to a new age of urban economics**
    - Dynamic QUM (DQUM) that features heterogenous welfare effects by
        - time vs. no transition path in static QSM (SQUM)
        - groups housing tenure vs. all renters in SQUM
        - locations vs. no spatial incidence in SQUM
- **Highlights:**
    - Too many to list...
    - Also, you will (have to) read and see for yourself anyways...
- **Improvements:**
    - At this stage, not for me to decide or to suggest...

> Q: How does the new world of urban economics compare to the old?

HSR Case Study: Setup and Findings

- ▶ Four new HSR stations integrated into Bay Area commuting network.
    - ▶ Improves accessibility, reshapes residence-workplace patterns.
    - ▶ Adjustment gradual—multi-decade reallocation.
    - ▶ Gains concentrated near stations; heterogeneous across tenure and age
    - ▶ Welfare gain: 0.45% (closed-"city" case)
- ▶ How do the welfare effects in the dynamic QUM compare to the static model?
    - ▶ Compare our new toy with what we have!
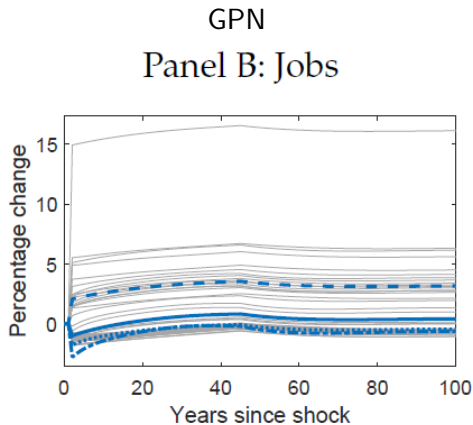   - ▶ Let's do the analysis in the MRRH model!
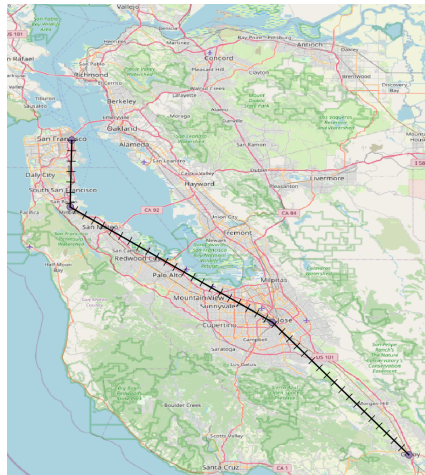
Simulating the HSR in the MRRH model

▶ Download data from `AABPL-toolkit` (prime locations) ● ▶ AABPL-toolkit
  ▶ San Francisco and San Jose metro areas
▶ Run `GRID-toolkit` to aggregate downloaded data to any grid you like (squares or hexagons) ● ▶ GRID-toolkit ● ▶ Result
  ▶ We will do 10x10 km and 2x2 km squares
▶ Use `TTMATRIX-toolkit` to compute bilateral travel times for grids ● ▶ TTMATRIX-toolkit
  ▶ Choose on-HSR and off-HSR speeds and compute travel times with and without HSR
▶ Read grid data and travel time matrices in `MMRH-toolkit` and simulate HSR
  ▶ Quantify the model (all automatic)
  ▶ Define relative change in commuting times as the forcing variable and simulate
  ▶ Simulate and inspect results (welfare, maps of changes, etc.) ● ▶ MRRH-toolkit
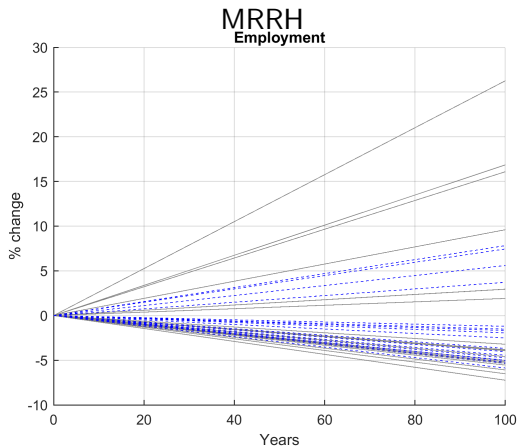
Change in travel times (15x15 km grid)

GPN
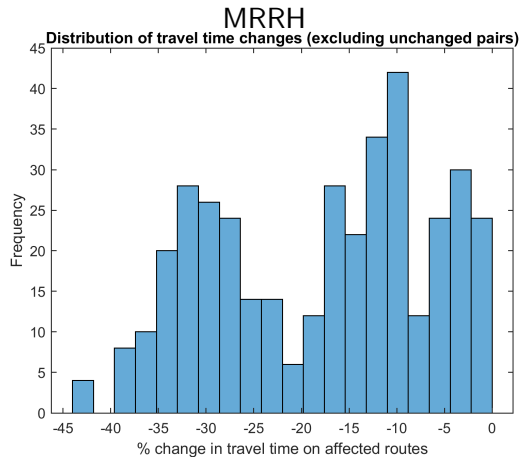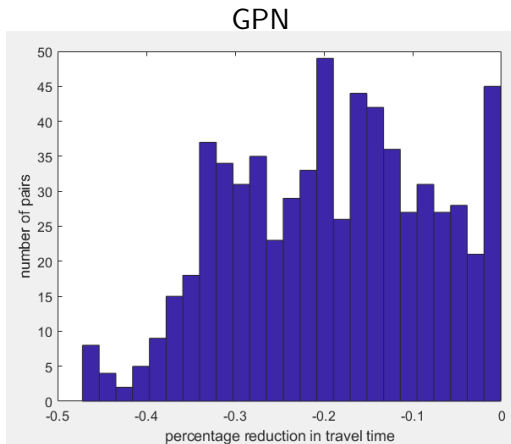
MRRH

Simulated HSR, DSM vs. MRRH 15x15 km grid: Employment

GPN

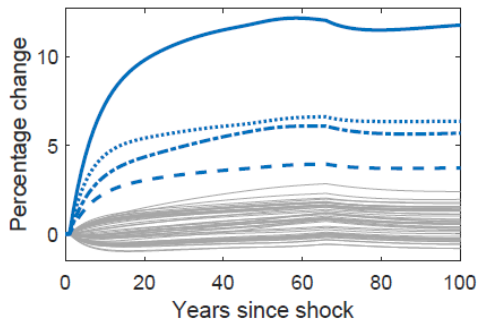Welfare effect: $+0.45\%$ (closed-"city")
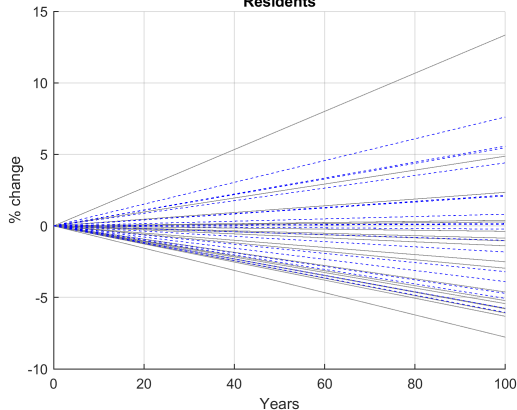
MRRH

Welfare effect: $+1.32\%$

Simulated HSR, DSM vs. MRRH 15x15 km grid: Population
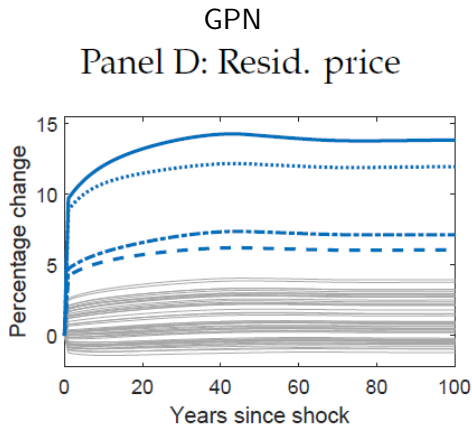

GPN

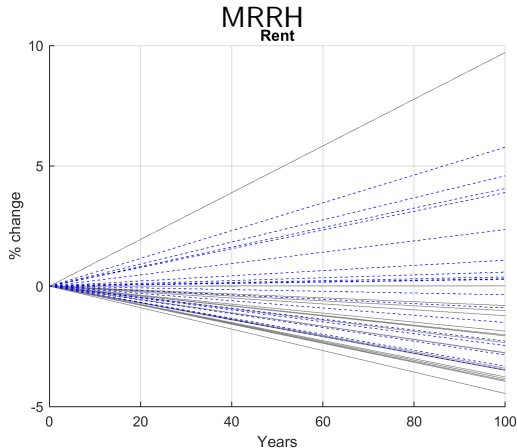Panel A: Residents

Welfare effect: +0.45% (closed-"city")

MRRH
Residents

Welfare effect: +1.32%

Simulated HSR, DSM vs. MRRH 15x15 km grid: Rent

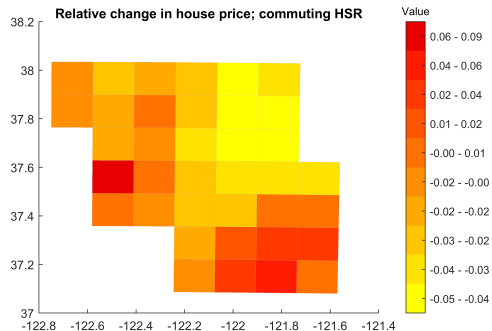GPN
Panel D: Resid. price

MRRH
Rent

Welfare effect: +0.45% (closed-"city")

Welfare effect: +1.32%

MRRH 15x15 km grid vs. MRRH 2x2 km grid

MRRH 15x15 km grid

MRRH 2x2 km grid
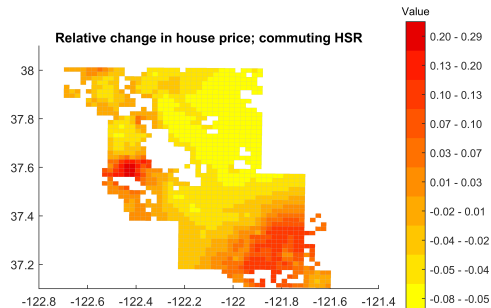
Welfare effect: $+1.32\%$ Welfare effect: $+2.44\%$

MRRH 15x15 km grid vs. MRRH 2x2 km grid

- ▶ Welfare effect substantially larger with a smaller grid
    - ▶ A variant of the **MAUP** (modifiable areal unit problem)
    - ▶ A coarse grid makes it harder to capture fine-grained accessibility gains
- ▶ Is it feasible to quantify and simulate the model truly micro-geographically?
    - ▶ 2x2 km grid has 1,271 locations vs. 55 in DQUM (183 for NY).
    - ▶ "Thousands" of bilaterals $\neq$ "millions" of bilaterals
    - ▶ Getting rid of workplace as a state variable helps, but is it enough?
- ▶ Is there a **role for the static model when micro-geography matters**?

What's next I (estimation)

- ▶ **DQUM gives lower welfare estimates**, does it?
  - ▶ The same shock to a primitive should trigger a smaller response than in SQUM
- ▶ But what if we consider **estimation**?
  - ▶ At some point we will want to estimate parameters from quasi-experimental variation, e.g. a HSR shock
  - ▶ We rationalize observed variation in endogenous outcomes through the lens if a quant model (GMM or indirect inference)
  - ▶ SQUM assumes we observe long-run transition ⇒ small change in forcing primitive
  - ▶ DQUM understands that just part of the transition is completed ⇒ larger change in forcing primitive
- ▶ **If we infer the change in primitive from the shock**
  - ▶ **Not so clear** which model will deliver the larger welfare effect...

What's next II (tradable goods)

- ▶ Careful
    - ▶ HSR unlike to affect trade cost in ways that are proportionate to travel time reductions!
    - ▶ Closed region does not make sense when modelling trade!
    - ▶ Welfare effect will shrink as we increase the study area and model model trade effect realistically
- ▶ This is just to make a point...

MRRH: HSR used for commuting & trade

Relative change in tradable goods price; commuting & trade HS
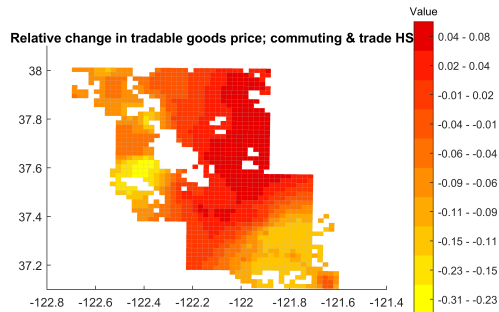
Welfare effect: $+7.68\%$

Someone will have to write a DQSM w commuting and fricitonal trade...

Takeaways

- ▶ Agenda for the new age of urban economics
  - ▶ Go through the obvious QSM applications where spatial incidence matters
    - ▶ Structural transformaiton, upzoning, transport, gentrification, place-based policies, etc.
  - ▶ Structural estimation
    - ▶ Use GMM or indirect inference to recover primitives from changes over time in DQSM-consistent ways
  - ▶ Add frictional trade

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