

Dynamic Urban Economics

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CURE Conference, London School of Economics

Summary

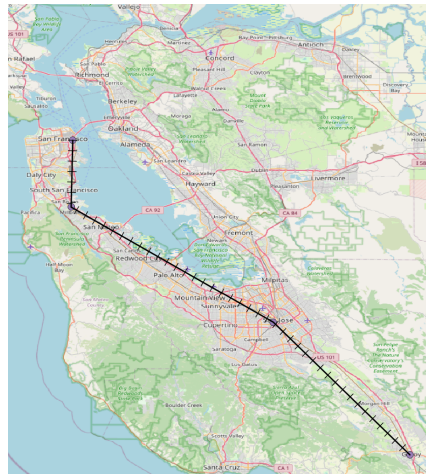
- ▶ **Contribution:** Dynamic QSM that features heterogenous welfare effects by
 - ▶ time
 - ▶ groups (including housing tenure)
 - ▶ locations
- ▶ **Highlights:**
 - ▶ Dynamic model bridges quantitative spatial and macro-housing literatures
 - ▶ tractable mixed-time computation.
 - ▶ Forward-looking behavior, homeownership, and costly migration
 - ▶ Clever computation design to reduce state space
- ▶ **Improvements:**
 - ▶ At this stage, not for me to decide or to suggest...

Contribution

- ▶ Static QSMs: rich geography
 - ▶ no transition path
 - ▶ no spatial incidence
 - ▶ no welfare effect by housing tenure
- ▶ Dynamic model adds costly migration, tenure choice, and intertemporal welfare
 - ▶ Dynamic QUM original even without tenure
 - ▶ Enables long-run vs short-run welfare comparisons
 - ▶ Can rationalize opposition to long-run beneficial projects
 - ▶ Technically impressive
- ▶ Host of potential applications that will keep the field busy for many years

HSR Case Study: Setup and Findings

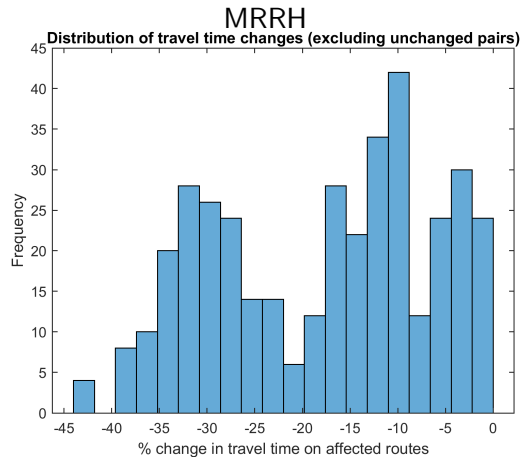
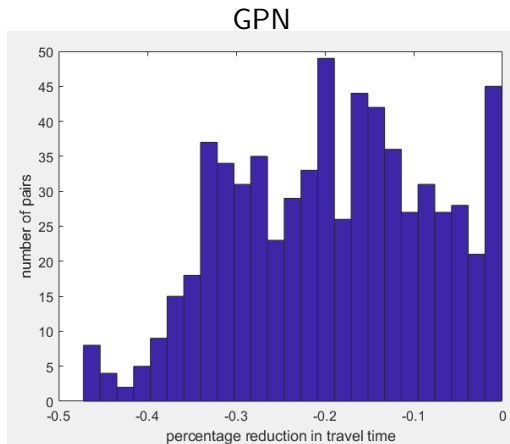
- ▶ Four new HSR stations integrated into Bay Area commuting network.
 - ▶ Improves accessibility, reshapes residence-workplace patterns.
 - ▶ Adjustment gradual—multi-decade reallocation.
 - ▶ Gains concentrated near stations; heterogeneous across tenure and age
 - ▶ Welfare gain: 0.45% (closed-"city" 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!



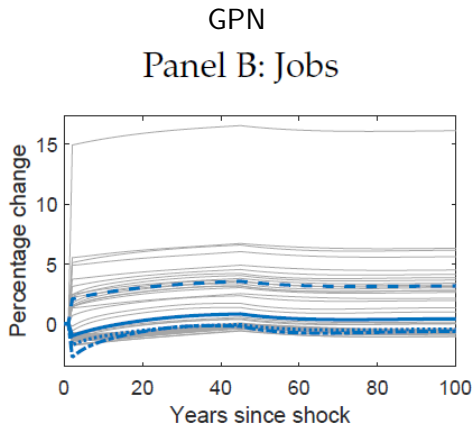
Simulating the HSR in the MRRH model

- ▶ 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

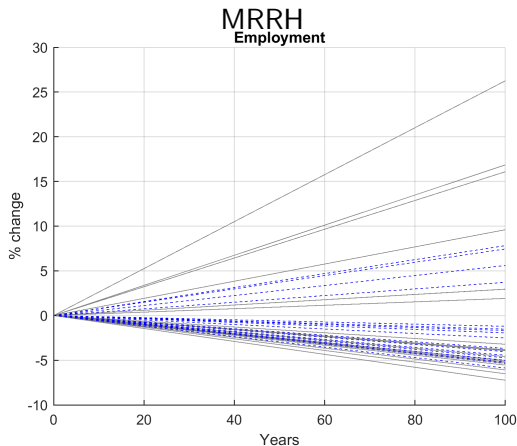
Change in travel times (15x15 km grid)



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



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

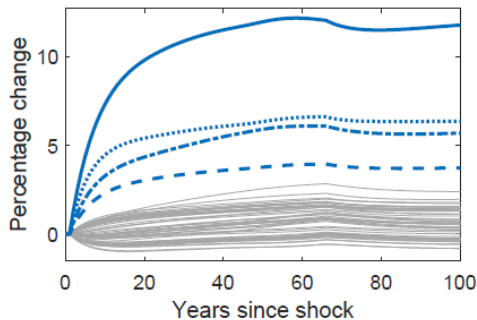


Welfare effect: +1.32%

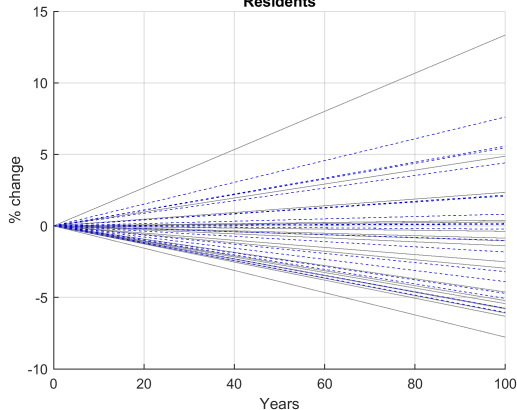
Simulated HSR, DSM vs. MRRH 15x15 km grid: Population

GPN

Panel A: Residents

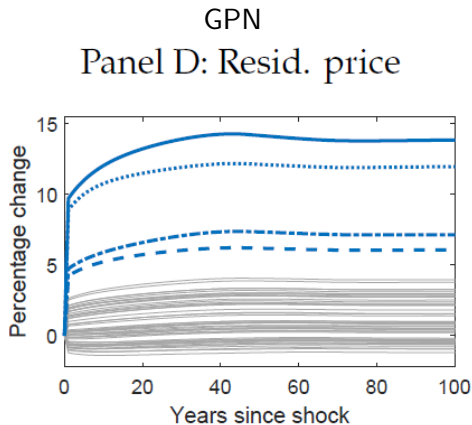


Welfare effect: +0.45% (closed-"city")

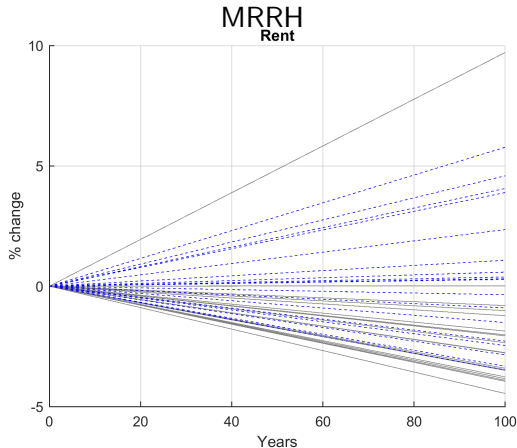
MRRH
Residents

Welfare effect: +1.32%

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



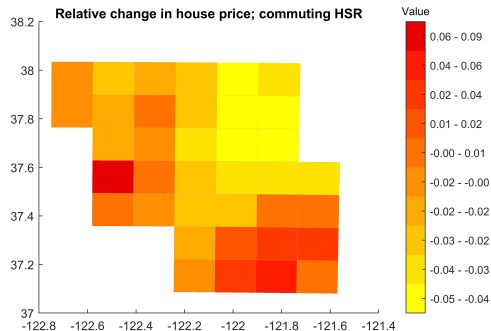
Welfare effect: +0.45% (closed-"city")



Welfare effect: +1.32%

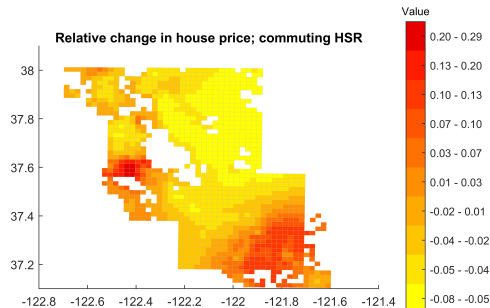
MRRH 15x15 km grid vs. MRRH 2x2 km grid

MRRH 15x15 km grid



Welfare effect: +1.32%

MRRH 2x2 km grid



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?**

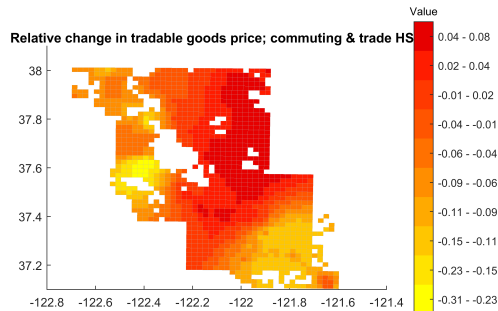
What's next I (estimation)

- ▶ **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 of a quant model (GMM or indirect inference)
 - ▶ SQUM assumes we observe long-run transition \Rightarrow small change in forcing primitive
 - ▶ DQUM understands that just part of the transition is completed \Rightarrow 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 unlikely 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 trade effect realistically
- ▶ This is just to make a point...

MRRH: HSR used for commuting & trade



Welfare effect: +7.68%

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

Takeaways

- ▶ **Welcome to a new age of urban economics!**
- ▶ Agenda for the new age
 - ▶ Go through the obvious QSM applications where spatial incidence matters
 - ▶ Structural transformation, 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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