

Trickle-down housing economics

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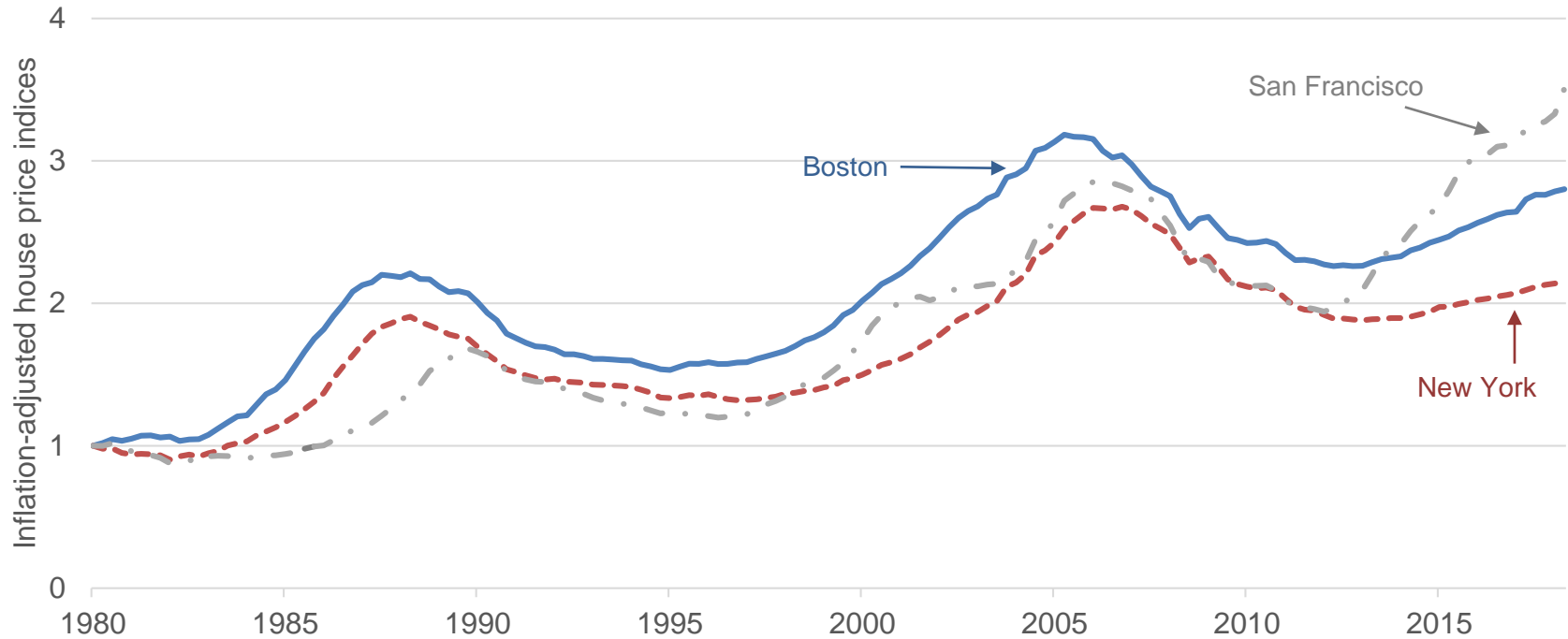
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CEPR Public Economics Symposium

Northwestern | Kellogg



The affordability crisis



Sources: BLS, FHFA



One57 (NYC)
Built in 2014
Penthouse sold for \$100m

How effective is luxury development for stemming the out-migration of poor households without a college degree from expensive metros?

Should economists support these policies?

National



- Low-income housing tax credit
- Opportunity zones tax incentives

Local



- Affordable housing plans
- Inclusionary zoning
- Foreign buyer taxes

What do we already know?

- Construction quality can affect city's house prices
 - Assumptions: open city & indivisible housing
 - Sweeney (1974a,b); Braid (1981)
 - **Missing: urban spillovers, welfare, estimation**
- New development can increase prices of nearby units
 - Schwartz et al. (2006); Baum-Snow, Marion (2009); Diamond, McQuade (2017)
 - **Missing: effects on metro**

This paper's findings

1. Luxury development optimal in closed city or with divisible housing
2. Quantitative results (open city, indivisible housing):
 - Luxury development half as effective as low-quality construction
 - Low-quality construction makes rich and educated worse off
3. Results sensitive to
 - amenity spillovers
 - substitutability of low- and high-skill labor
 - cross-city mobility

Related literatures

1. Recent papers on this question
 - Anenberg, Kung (2018); Mast (2018); Asquith, Mast, Reed (2018)
2. Political economy of housing supply regulation
 - Fischel (2001); Hilbert, Robert-Nicoud (2013); Ortalo-Magné, Prat (2014); Gyourko, Molloy (2015)
3. Filtering
 - Sweeney (1974b); Rosenthal (2014)
4. Unidimensional housing quality
 - Sweeney (1974a,b); Braid (1981); Landvoigt, Piazzesi, Schneider (2015); Davis, Dingel (2018); Épple, Quintero, Sieg (2019)
5. Heterogeneous preferences for amenities by education
 - Bayer, Ferreira, McMillan (2007); Guerrieri, Hartley, Hurst (2013); Diamond (2016)

Environment and equilibrium

Housing and households

Housing

- Cities $t \in \{1, \dots, T\}$
- Housing quality $q_{0,t}, \dots, q_{J,t}$
- Housing supply $h_{j,t}$ (exogenous)
- House price $p_{j,t}$ (endogenous)
- Price-taking rentiers initially hold all housing

Households

- Education $e \in \{L, H\}$, labor endowment z , idiosyncratic city preferences ϵ_t
- Cobb-Douglas pref. over non-housing c , housing q , city amen. a_t , and ϵ_t

Spillovers

1. Firm technology:

$$F_t(Z_L, Z_H) = \left((A_{L,t} Z_L)^{\rho} + (A_{H,t} Z_H)^{\rho} \right)^{\frac{1}{\rho}}$$

2. Productivity:

$$A_{e,t} = \tilde{A}_{e,t} N_t^{\gamma_N} \left(\frac{N_{H,t}}{N_t} \right)^{\gamma_H}$$

3. Amenities:

$$a_t = \tilde{a}_t \left(\frac{N_{H,t}}{N_{L,t}} \right)^{\gamma_a}$$

Equilibrium

- Conditions:
 - Households max. utility by choosing 1 city & house
 - Labor & housing markets clear
- Endogenous sorting:
 - House prices rise in quality w/i city
 - Housing quality rises in income w/i city & education
- Comparative statics:
 - Change exogenous housing stock in one city
 - Approximation: welfare in other cities unchanged

Estimation strategy and data

Household-level data

e_i	Education dummy
y_i	Income
o_i	Occupancy status (1 if own; 0 if rent; -1 otherwise)
v_i	Home value
r_i	Monthly rent
n_i	Construction (dummy if built in prior year)
g_i	Sample weight

$$p_i = \begin{cases} 0, & o_i = -1 \\ 12r_i, & o_i = 0 \\ \phi v_i, & o_i = 1 \end{cases}$$

- 50 bins by p_i for $o_i \in \{0,1\}$
- \hat{p}_j is average in bin
- \hat{h}_j is total in bin

GMM estimation of household distribution

- Moments for each housing bin:
 - Education share
 - Average income for H
 - Average income for L
- Select income dist. params. to match as well as possible



- Annual (since 2005) weighted sample of U.S. population
- Use public-use microdata sample from IPUMS
- Aggregate persons to households
 - Income is sum
 - Education is 1 if householder has college degree
- Sample selection:
 - Restrict to Boston metro area in 2016 (no rent control)
 - Drop renters paying no cash rent
 - Keep “group quarters” persons only if non-institutionalized, adult, non-student, and non-employed

Summary statistics for Boston-Cambridge-Newton, MA-NH metropolitan area in 2016

	Group Quarters	Renters	Owners
Panel A: All observations			
Kept in sample	0.091	0.968	1
Panel B: Estimation Sample			
Income	\$7,531	\$64,961	\$138,223
Education	0.128	0.397	0.554
Rent	-	\$1,284	-
Home value	-	-	\$491,724
Construction	-	0.005	0.004
Weighted observations	15,486	678,917	1,120,455
Unweighted observations	430	5,946	11,893

Remaining parameters

	Value	Source
ρ	0.3	Card (2009)
γ_N	0.055	Combes, Gobillon (2015)
γ_H	0.1	Moretti (2004); Gennaioli et al. (2013)
γ_a	1.1*	Diamond (2016)
ϕ	0.09	RCA data

*Lower than Diamond's due to stability requirement

	Value, $e = L$	Value, $e = H$	Source
$\frac{\beta_{c,e}}{\beta_{\epsilon,e}}$	3.3	1.7	Davis, Ortalo-Magné (2011); Diamond (2016)
$\frac{\beta_{q,e}}{\beta_{\epsilon,e}}$	1.1	0.37	Davis, Ortalo-Magné (2011); Diamond (2016)
$\frac{\beta_{a,e}}{\beta_{\epsilon,e}}$	0.25	1.0	Diamond (2016)

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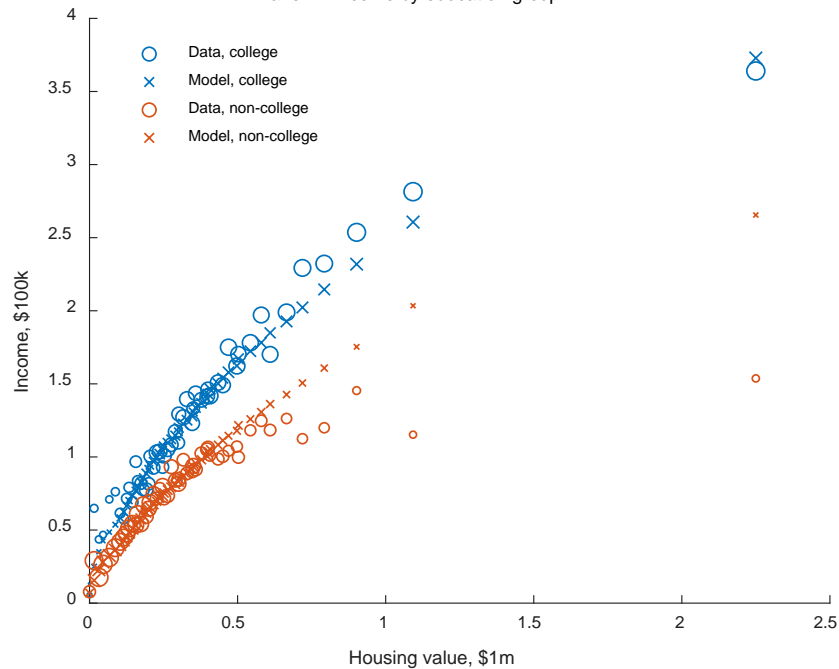
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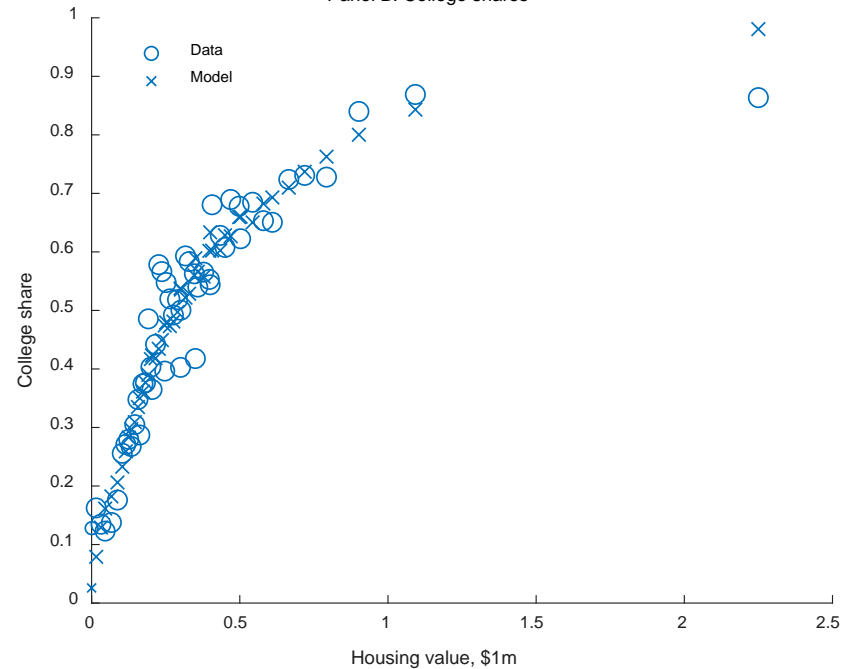
Quantitative results

Goodness of fit

Panel A. Income by education group



Panel B. College shares



Construction experiments

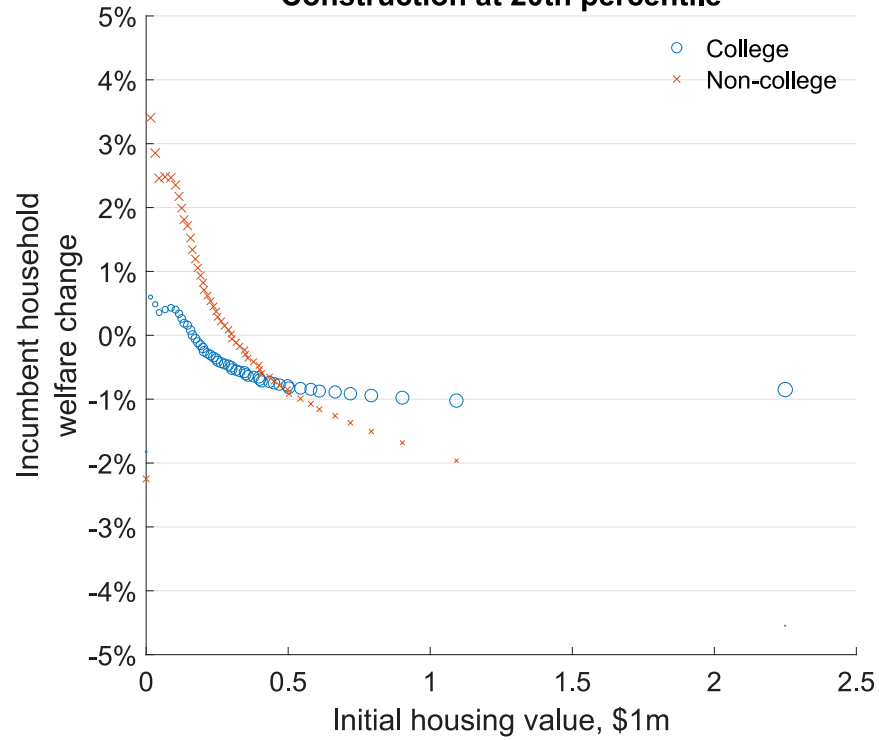
1. Build all new housing at 20th percentile
 - Pre-construction rent of \$1,000/mo
2. Build all new housing at 80th percentile
 - Pre-construction rent of \$3,500/mo

Quantity = 0.45% of total housing stock (actual construction intensity in data)

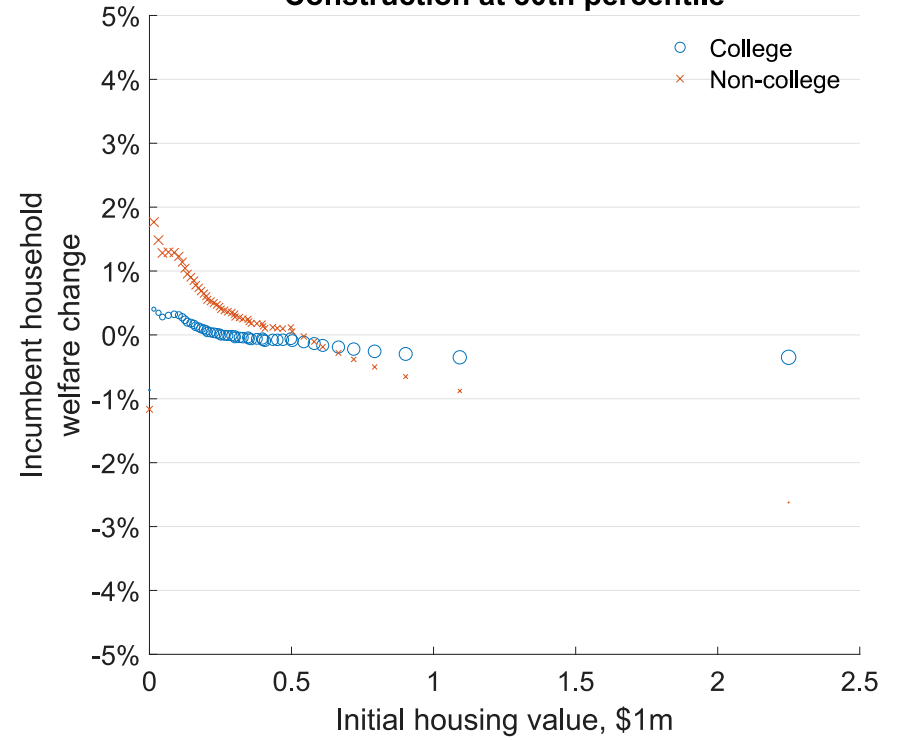
Output for each housing type in city:

- Average welfare change of households choosing that type pre-construction
- Separate calculations for each education group
- Scale by migration (1% welfare loss = 1% drop in city population)

Construction at 20th percentile



Construction at 80th percentile



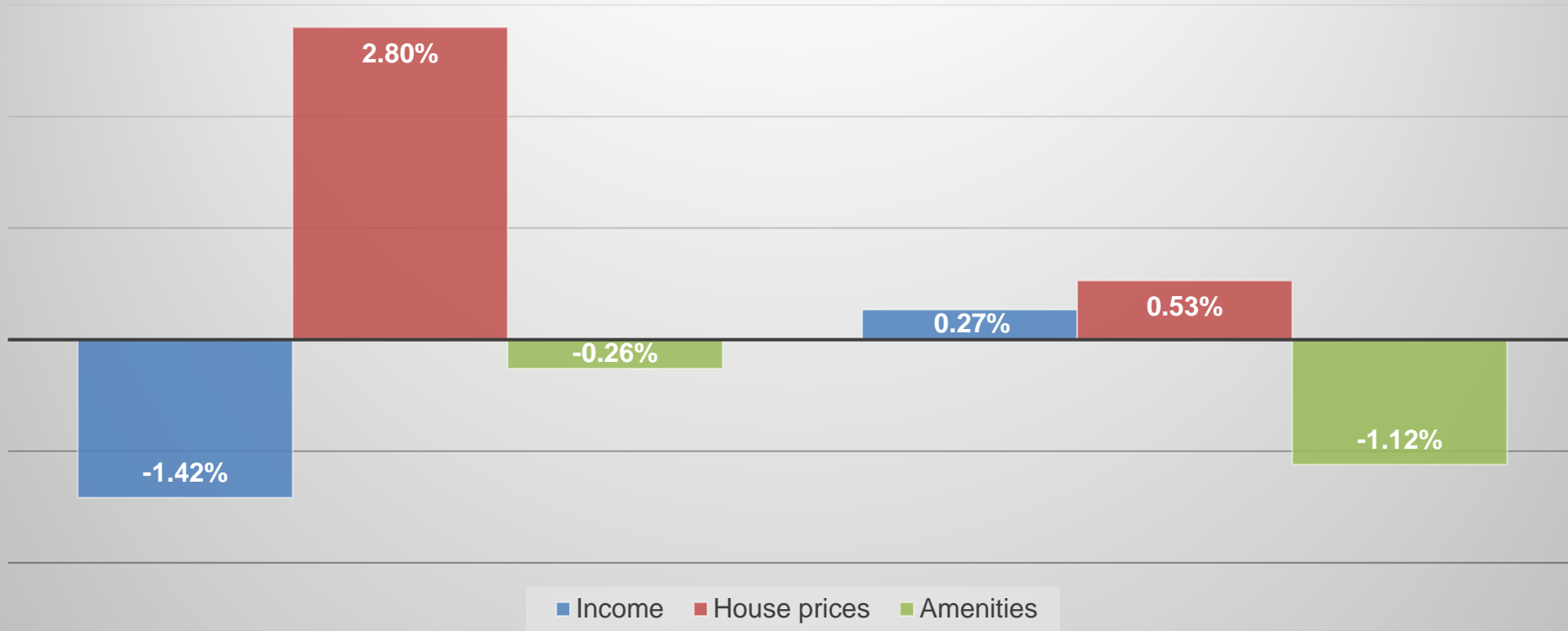
Household subgroups

- “Poor” = below median income; “rich” = above
 - Median income = \$97,197
- Focus on two subgroups:
 1. Poor non-college
 2. Rich college

Components of welfare gain from construction at 20th percentile

POOR
NON-COLLEGE

RICH
COLLEGE

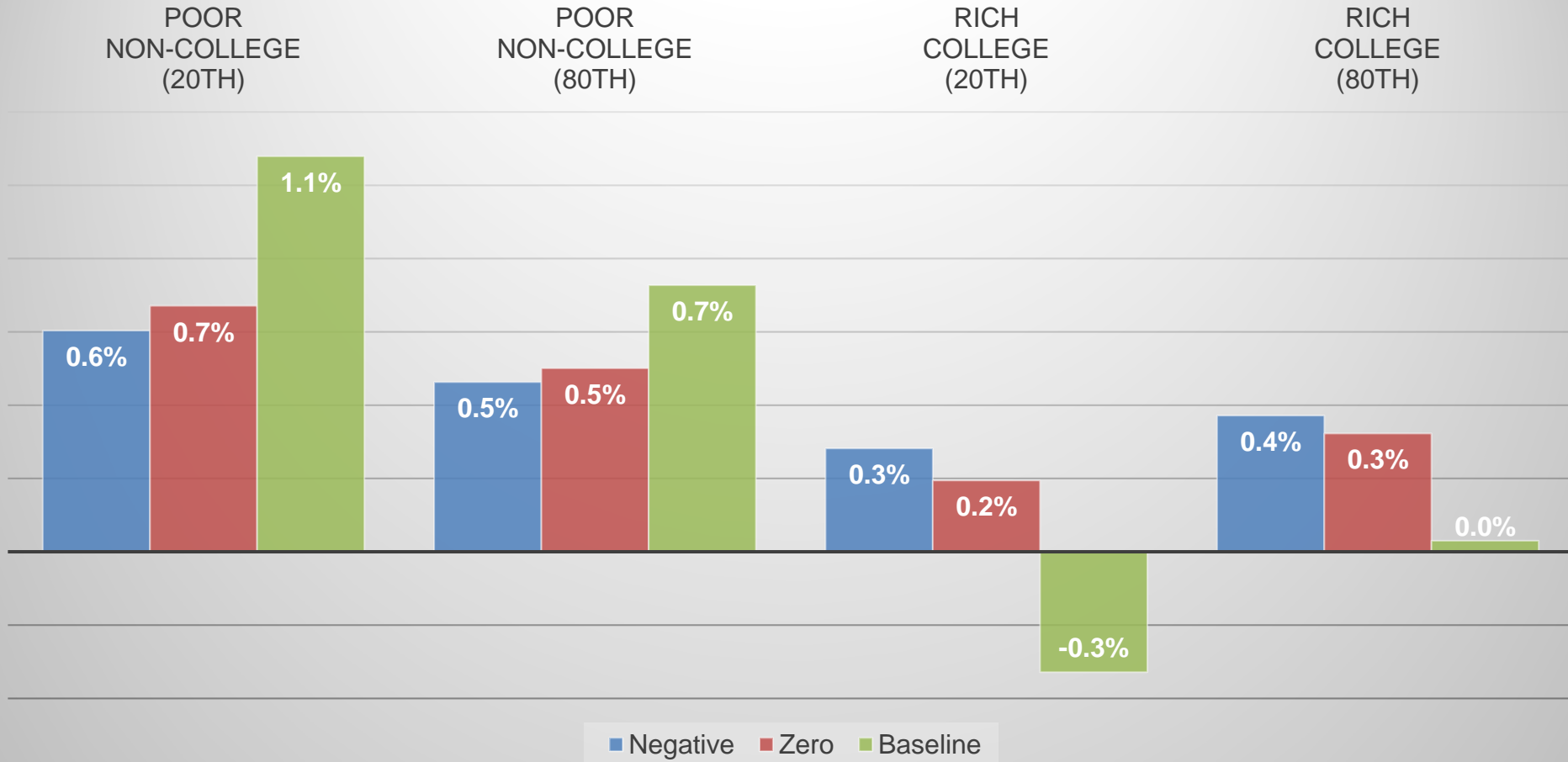


Sensitivity analysis

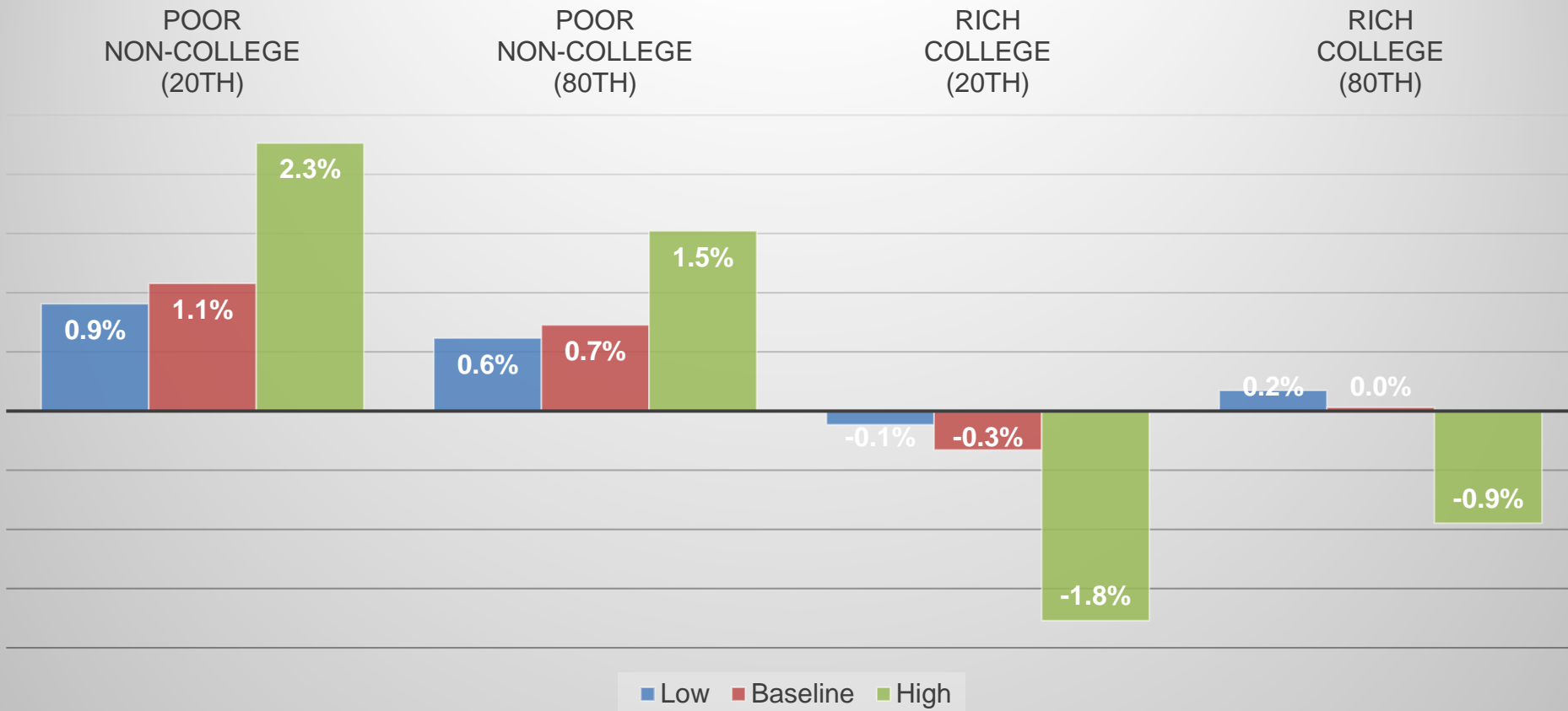
1. Amenity spillover: $\gamma_a \in \{-1.1, 0, 1.1\}$
2. Skill substitution: $\rho \in \{0, 0.3, 0.6\}$
3. Mobility: baseline vs. closed city

Not shown: density (γ_N) and human capital (γ_H) spillovers
– Results nearly same when doubling or setting to zero

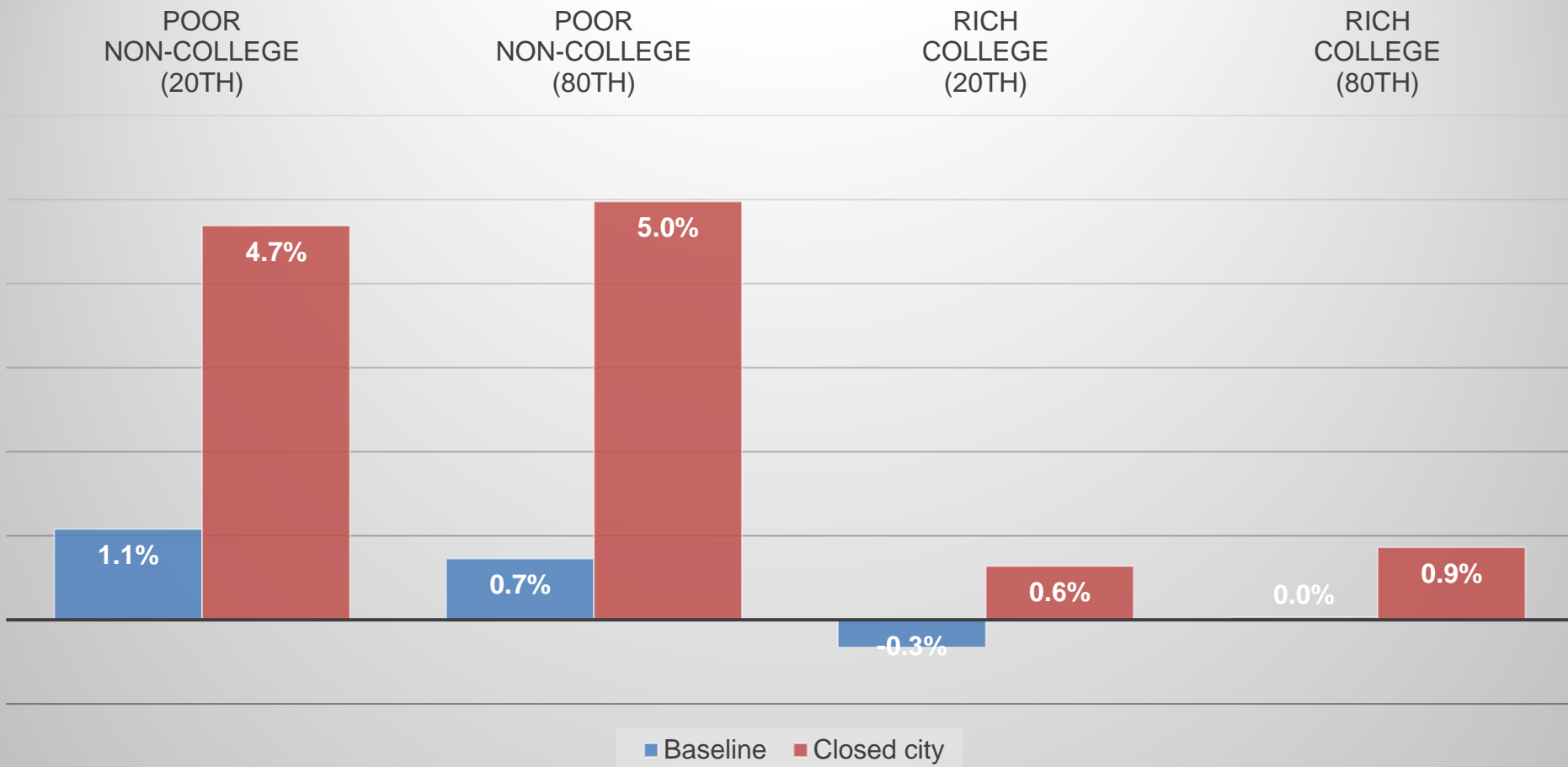
Welfare gains for different amenity spillovers



Welfare gains for different elasticities of labor substitution



Welfare gains for different cross-city mobility



Can construction counteract HP growth?

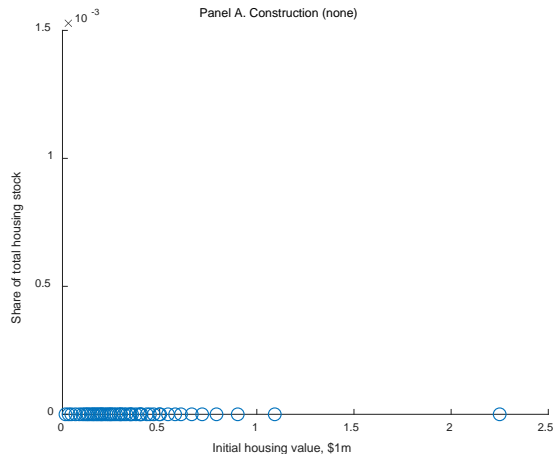
Annual Boston productivity shock, 1980-2000 (Diamond 2016)

- -1.57% for non-college, 0.38% for college

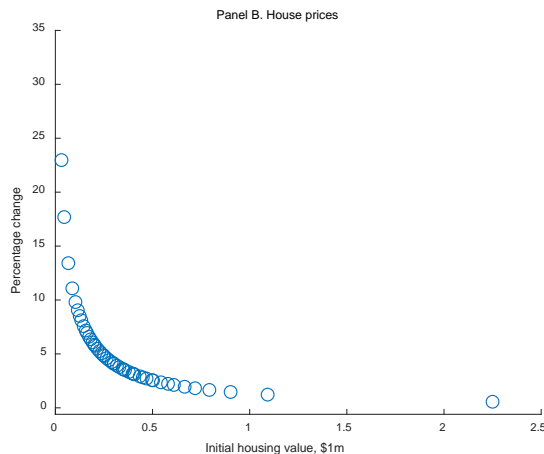
Solve for Δprice , $\Delta\text{pop.}$ in each quality bin for 3 scenarios:

1. No construction
2. Construction we observe in data
3. “Optimal” construction: min total new units such that no one worse off from productivity shock + construction

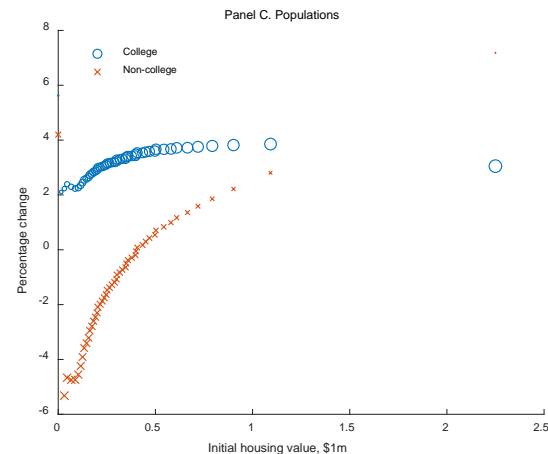
1. No construction



*0.0% housing
stock growth*

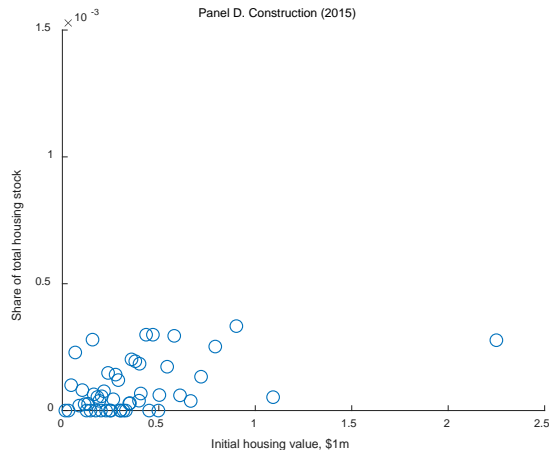


*4.2% median
house price
growth*

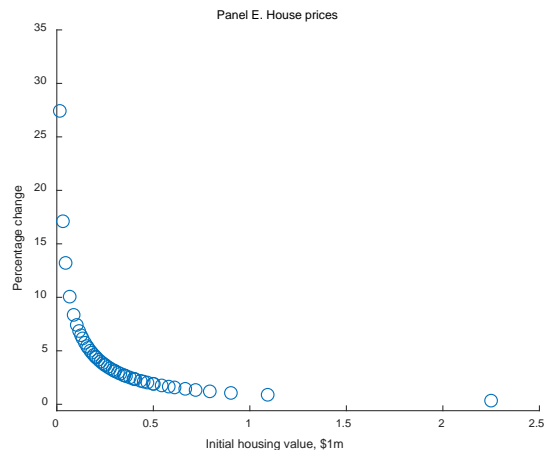


*3.3% college pop.
growth;
2.0% non-college pop.
decline*

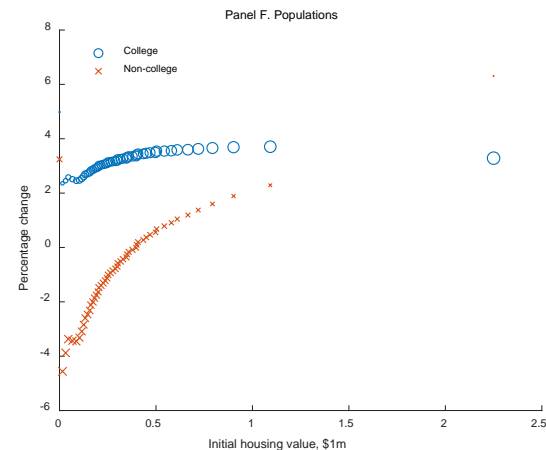
2. Actual construction (2015)



*0.5% housing
stock growth;
\$3,200 average
monthly rent*

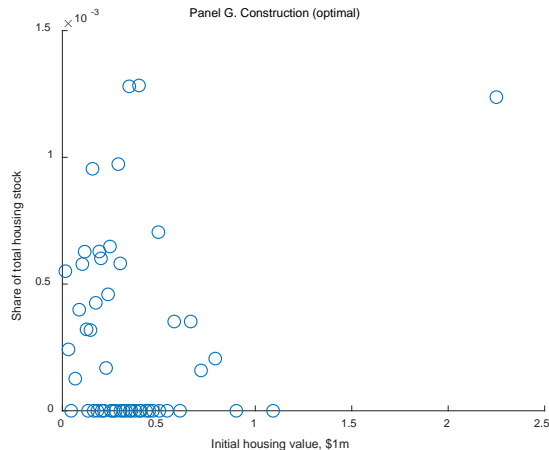


*3.1% median
house price
growth*

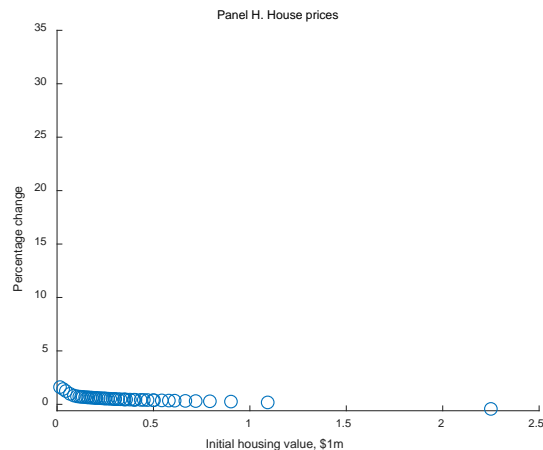


*3.2% college pop.
growth;
1.4% non-college pop.
decline*

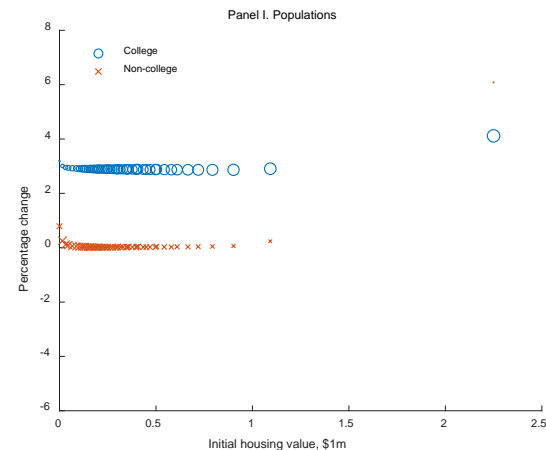
3. “Optimal” construction



*1.4% housing
stock growth;
\$1,900 average
monthly rent*



*0.5% median
house price
growth*



*2.9% college pop.
growth;
0.1% non-college pop.
growth*

Conclusion

1. Boston could end welfare losses with 1.4% stock growth
2. Policy involves building relatively more low-quality units
 - Doing so makes richer households worse off
3. Households disagree over preferred construction quality
 - Key: mobility, spillovers, indivisibility, heterogeneous pref.
 - First paper to combine these previously studied features