Housing-market Matching, Regional Mobility and Unemployment Insurance

Preliminary

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Motivation

What's the optimal UI design with frictional housing market?

Usual tradeoffs:

- disincentives to find a job: *liquidity* and *moral hazard* effects (−)
- improve welfare (+)

→ Hsu et al. (2018): UI reduces foreclosures + increase house price level.

→ Unemployment is a major source of mortgage default.

This paper:

- Study **optimal UI** in a standard incomplete markets model with **frictional housing market**.

Key idea

1. Housing *takes time* to sale (frictions)
   - Higher prices $\leftrightarrow$ lower selling probability
   - distressed households might **default** on their mortgage payment.

2. Households use housing as collateral for debt
   - Policy that impacts the level of housing price spillover to all homeowners.

Key effects:

- optimal to vary UI duration in line with housing frictions.
- higher UI benefits $\rightarrow$ easier to repay the mortgage when unemployed.

$\rightarrow$ higher UI $\rightarrow$ makes homeownership less risky $\rightarrow \uparrow$ homeownership rate.

$\rightarrow$ GE: $\uparrow$ UI $\rightarrow \uparrow$ prices, improves the collateral value of all agents $\leftarrow$ feedback.

Our contribution

Data:

→ **Unique and most complete data** on housing transactions and *unsold stock* for all the US (from 2008 - 2017).

Theory: incomplete markets model with

- endogenous job search.
- mortgage/foreclosure and housing frictions (tradeoff Time on Market/listing price)

→ Calibrated to different US location to feature ***heterogenous* impacts of the GR**.

Evaluate optimal UI design

→ *location-dependent*: depends on the frictions on the housing market, homeownership rate and the foreclosure risk (mortgage debt to income ratio).

→ separate role of UI duration (cover the time needed to sell) vs UI benefits (mortgage payments).

Data

Data: Housing Market

Rich data on housing transaction for all the US from 2008-2017:

- including **unsold** stock
- contains approximately **all the US properties/parcels** ($\approx$ 105 millions).
- combines Zillow records and public records.
- homeowner can not hide information $\rightarrow$ parcels/houses are geolocalized

For each county/location, construct:

$\rightarrow$ **house price index**, controlling for county fixed effect, size, quality...

$\rightarrow$ **time on market** + **probability to sell a house**

Data: Housing

Housing Data:

Stats Webscrap

ALL (about **105 millions**) **US properties** (as of 2018).
Collected online on

DATE	EVENT	PRICE
6/27/2013	Sold	$278,000
8/27/2010	Sold	$225,000
4/24/2010	Price change	$219,900
4/8/2010	Listed for sale	--
4/15/2004	Sold	$325,000
6/3/2003	Sold	$300,000
10/12/1999	Sold	$203,500

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All transactions (110 millions):

1. Listed & Sold on Zillow (21 mill, 19%)
2. Sold elsewhere

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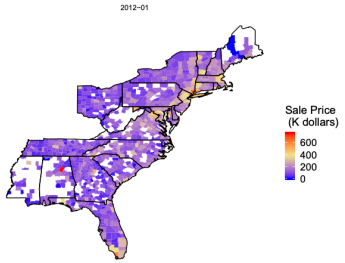
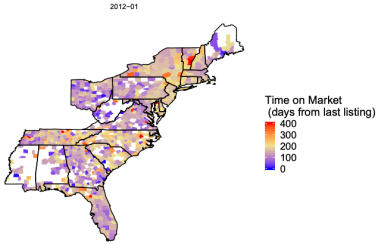
2. Sold elsewhere

+ *Houses with **no sale record** (43 mill).*

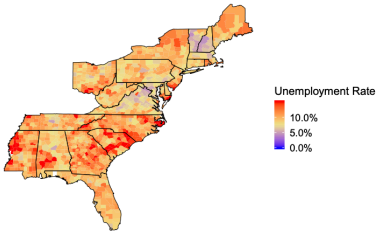
Data



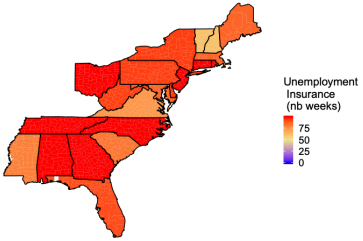
(e) Sale price (K$)



(f) Time on market (days)



(a) Unemployment rate (%)



(b) Unemployment Insurance (weeks)

Data

	Dependent variable:		
	Sale price	Pr(Sale | on market)	TOM (days)
Unemployment rate (%)	−7,925.01**	−0.001***	2.59***
	(3,398.94)	(0.0002)	(0.35)
Unemp. Insurance (weeks) × Unemp rate (%)	43.95*	0.00001***	−0.01***
	(24.06)	(0.000001)	(0.002)
Fixed effects:			
County	Yes	Yes	Yes
Period (month)	Yes	Yes	Yes
Observations	86,753	90,504	86,753
R^2	0.23	0.91	0.85
Adjusted R^2	0.23	0.91	0.85
Note:			*p<0.1; **p<0.05; ***p<0.01

- UI decreases the pressure to sell house: number of listing decreases, prices increase and TOM decreases(competition effect)

Model

Model

Previous literature:

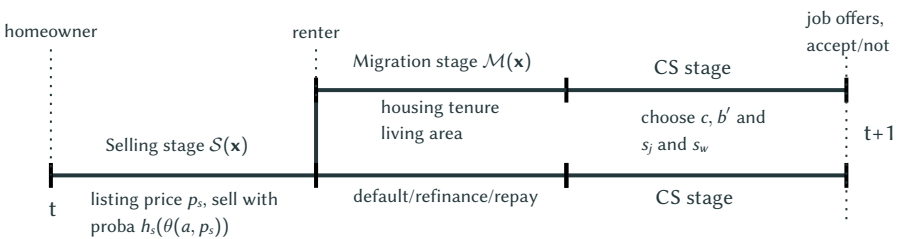
- stylized DMP housing models without mortgage default/*fire sales*.
- moving restrictions: exogenous.

Our model:

- **Spatial model** with moving restrictions (housing frictions,moving costs)
- Housing with **mortgage/foreclosure** and **TOM/listing price tradeoff**
  - → **Parameterized to replicate the US data based on our micro Zillow data**
- Labor markets with **job search** (outside and within the location).
  - → Characterize job search behavior in function of moving costs (homeownership, fixed costs, commuting distance).
  - → **Isolated locations** with long unemp. duration and high foreclosure risk.

Model: Households

- **living area**: a
- **housing tenure**: homeownership or renter
- **Equity**: mortgage ($b < 0$) / saving ($b > 0$)
- **job situation** (employment status, wage/UI benefit, location) = (e, w, j)
- **job search**: s_j (outside the living area), s_w (within the living area).



Model: Subperiod 3 – Homeowner

Homeowner who repays ($d = 1$) / **refinance** ($d = 0$):

$$\mathcal{H}^{p/r}(\mathbf{x}, d) = \max_{\substack{c>0, b', \\ s_j>0, s_w>0}} u(c, a, h = 1) - \underbrace{\chi(s_j, s_w)}_{\text{job search cost}} + \beta \int_{\mathbf{x}'} \mathcal{S}(\mathbf{x}') dF(\mathbf{x}' | s_j, s_w, e)$$

$$s.t: \quad c + b' \geq b(1 + r + r_m 1_{b<0}) + \underbrace{W(w, j, e)}_{\text{wage / UI benefits}} - \underbrace{\zeta(a, j)}_{\text{commuting cost}} - M - 1_{d=0}(\underbrace{c_h + \Psi}_{\text{extra payment if refi}})$$

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$$(refi) \qquad b'(1 - d) \underbrace{1_{e=w, w \geq \tilde{w}}}_{\text{refi if work}} \geq - \underbrace{\lambda p(a; \Omega_a)}_{\text{downpayment requirement}}$$

$$(repay) \qquad b' d \geq b + \min\{ \underbrace{c_h}_{\text{min payment}}, -b\}$$

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Homeowner in foreclosure:

$$\mathcal{H}^{def}(\mathbf{x}) = \max_{s_j>0, s_w>0} u(\overline{m}, a_h, h = 0) + \chi(s_j, s_w) + \beta \int_{\mathbf{x}'} \mathcal{M}(\mathbf{x}') dF(\mathbf{x}' | s_j, s_w, e)$$

$\rightarrow$ an external bank sells the house. DWL is shared among the population.

Decision: $\max\{\mathcal{H}^{p/r}(\mathbf{x}, 1), \mathcal{H}^{p/r}(\mathbf{x}, 0), \mathcal{H}^{def}(\mathbf{x})\}$

Model: Subperiod 1 and 2

- **Subperiod 2**: Migration stage (choose new living location a')

$$\mathcal{M}(\mathbf{x}) = \max_{a'} \Big\{ \underbrace{\sigma_\epsilon(a')}_{\text{type I extreme value shock}} + \mathcal{R}\big(a', \tilde{b}, (e, w, j)\big) + h_b(a') \max\Big\{ \mathcal{H}^{p/r}(a', \tilde{b} - p_b(a'), (e, w, j)) - \mathcal{R}\big(a', \tilde{b}, (e, w, j)\big) - \eta_b, 0 \Big\} \Big\}$$

$$s.t \qquad \tilde{b} = b - \underbrace{1_{a' \neq a} \tau}_{\textit{fixed moving cost}}$$

- **Subperiod 1**: Selling stage (choose listing price p_s)

$$\mathcal{S}(\mathbf{x}) = \max\Big\{ \max_{p_s \geq \underline{p}(\mathbf{x})} \Big\{ \underbrace{h_s\big(\theta_s(p_s; \Omega_a)\big)}_{\text{tradeoff TOM}/p_s} \mathcal{M}\big(a, b + p_s(1 - \tau_s), (e, w, j)\big) + \big(1 - h_s\big(\theta_s(p_s; \Omega_a)\big)\mathcal{H}(\mathbf{x}) - \eta_s \Big\}, \mathcal{H}(\mathbf{x}) \Big\}$$

- **Bound on listing price** (must reimburse debt): $\underline{p}(\mathbf{x}) = \max\Big\{ \frac{-b}{(1-\tau_s)}, 0 \Big\}$

  → **generates *lock-in* effect**.

Model: Housing Market

1. Seller: **direct their search on submarket** (a, p_s), as Hedlund et Garriga (AER, R&R); **posts** p_s and infers proba to sell.

2. **Brokers** (seller side) play the intermediate role, free entry condition:

$$\underbrace{\kappa_s}_{\text{Ope. cost}} = \underbrace{\alpha_s(\theta_s(p_s, \Omega_a))}_{\text{prob to match with seller}} \underbrace{(p(a) - p_s)}_{\text{profit}}$$

$\theta_s(p_s, \Omega_a)) = \frac{brokers}{sellers} = \alpha_s^{-1}\left(\frac{\kappa}{p(a)-p_s}\right)$

$\rightarrow$ determine $h_s(\theta_s(p_s, \Omega_a)) \rightarrow$ prob. to sell (if CD technology: $h_s(x) = x^\gamma$)

$\rightarrow$ **tradeoff:** the higher p_s (for fixed $p(a)$), the lower $\theta_s(.)$ (higher TOM)

3. **Buyer side:** similar, but fix buying price to $p_b(a) = (1 + \sigma)p(a)$.

4. $p(a)$ **clears the housing market**: $H_{buy} = H_{sold}$

$\rightarrow$ generate right comovement: when $p(a) \uparrow$ then $h_s(.) \uparrow$ for fixed p_s.

$\rightarrow$ Block Recursivity: $\theta_s(p_s, \Omega_a) \equiv \theta_s(p_s, a)$

Model: Labor Market

Agents search with efforts:

- s_j **(outside** a**)** $\rightarrow$ draw submarket (w', j'), decide to participate if $V(w', j') > V(w, j)$
- s_w **(within** a**)** $\rightarrow$ draw submarket (w', a), decide to participate if $V(w', a) > V(w, j)$

Conditional on participating in (w', j'), the **proba to get an offer** is obtained from the **representative firm's condition** in location j':

$$J(w,j) = w\Big(\underbrace{\eta(j)}_{\text{prod. location } j} - \underbrace{\omega(j,\rho)}_{\text{wage level - varies with UI } \rho} \Big) + \frac{1-\delta(j)}{1+r} EJ(w,j)$$

$$V(w,j) = -\kappa_w w + q\big(\theta_w(w,j)\big) J(w,j)$$

$\rightarrow$ homogeneity in w for simplicity

$\rightarrow$ proba to find a job: $p_w(\theta_w(.)) = p_w\Big(q^{-1}\Big(\frac{\kappa_w}{J(1,j)}\Big)\Big)$

Key: search depends on moving costs, UI, homeownership, $\{\theta_w(j), ..., \theta_w(j_N)\}$.

Model: Equilibrium

Collection of:

1. agents val and policies: $\mathcal{H}(\mathbf{x})$,$\mathcal{R}(\mathbf{x})$,$\mathcal{S}(\mathbf{x})$,$\mathcal{M}(\mathbf{x})$, $b'(\mathbf{x})$, $p_s(\mathbf{x})$, $d(\mathbf{x})$, $s_w(\mathbf{x})$, $s_j(\mathbf{x})$
2. housing market tightnesses $\theta_s(a, p_s)$ from brokers' program.
3. labor market tightnesses $\theta_w(j)$ from firms' condition.
4. prices: $\omega(j, \rho)$ and $p(a)$.
5. (for now): UI benefits financed by labor tax.

Tractability:

$\rightarrow$ closed form solutions for job search efforts (depends on options values ΔV): pre-computed

$\rightarrow$ discrete/continuous choices: DC-EGM (Iskhakov et al. (2017,QE))

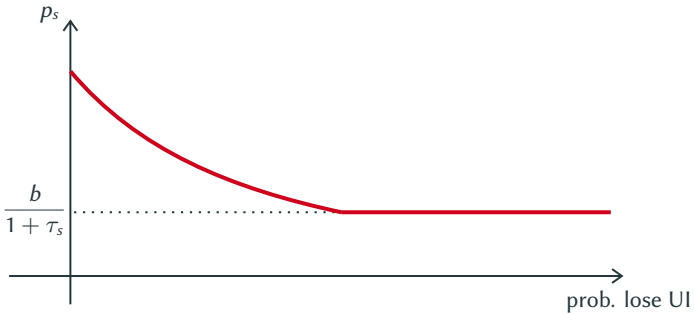
Results: Partial Equilibrium

For now, fixed prices $p(a)$, $\omega(j, b)$.

- ***Two locations*** differing in firm's productivity (different $\theta_w(j)$), η_j, and housing frictions, γ_j (CD parameter).
  $\rightarrow$ fix moving costs (commuting + fixed costs), then vary those parameters.
- **3 unemp. status**: very short-run, short-run, long-run (without UI).
- homeownership preference fits aggregate homeownership rate
- disutility of search fits unemployment rate and migration flows (related to work) for given distribution of wage $F(w)$.
- **downpayment requirement**: 20%, **minimum mortgage payment**: $c_h(a) = \frac{(r+r_m)(1+r+r_m)^{20+1}}{(1+r+r_m)^{20+1}-1}\lambda p(a)$.

Results: Model Mechanism

Listing price as function of UI duration.



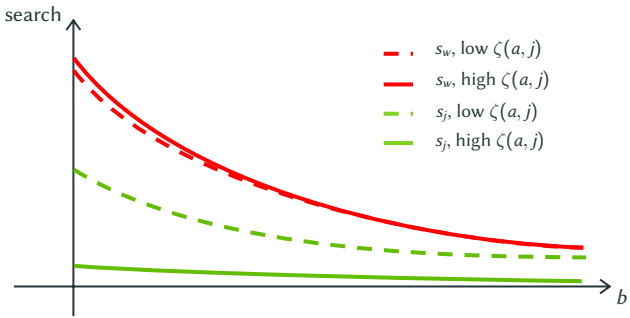
→ pressure to sell the house when the proba to lose UI increases.

→ even with low price, might be very long to sell the house

→ **strong link between list price, proba to sell and proba to lose UI (and therefore foreclosure risk)**.

Results: Model Mechanism

Search efforts and commuting cost.



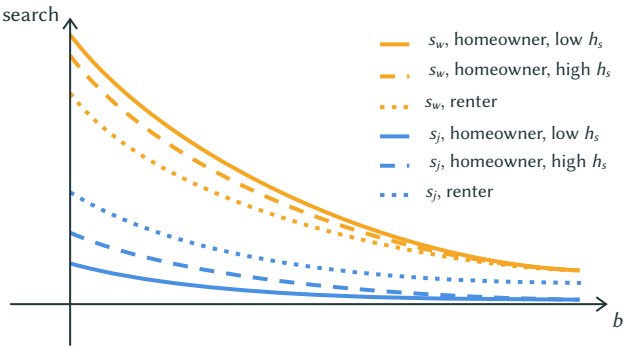
$\rightarrow$ lower probability to find a job when commuting cost high.

$\rightarrow$ higher probability to foreclose if do not find a job.

$\rightarrow$ **strong link between foreclosure, proba to find a job and moving costs**.

Results: Model Mechanism

Search efforts and housing tenure.



$\rightarrow$ lower probability to find a job when homeowner.

$\rightarrow$ even larger if frictions increase (low h_s).

$\rightarrow$ **strong link between proba to find a job and proba to sell a house**.

Next step: GE model and Parameterization

→ **Calibrate the GE model to replicate the US Great Recession**

→ Study interaction between **moving costs** and:

- unemployment rate
- price dynamics
- foreclosure rate

Evaluate *location-dependent* UI design:

- welfare improving?
- optimal conditions? should depend on the degree of isolation?

Conclusion

1. Study interaction btw **job relocation**, **housing tenure**, **moving costs**.

2. Build a **spatial model** accounting for main features

   $\rightarrow$ Calibrated to replicate moving restrictions during the GR

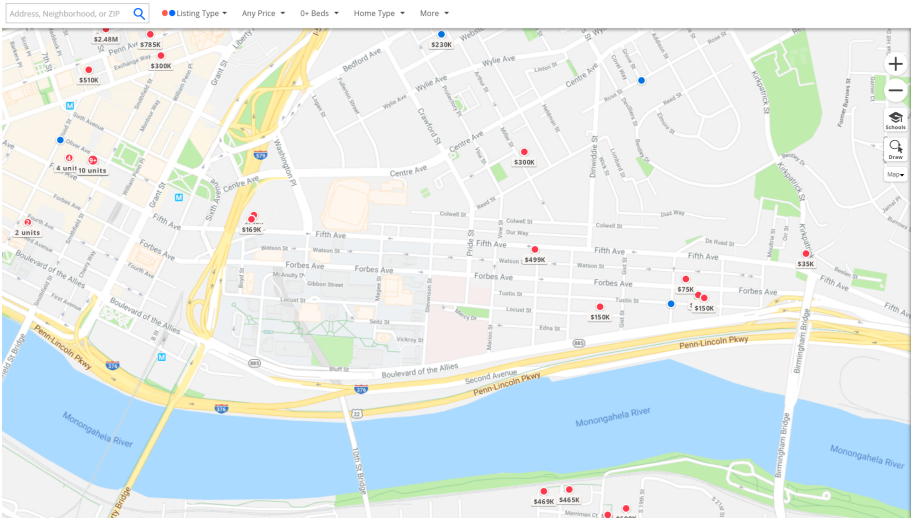
3. (in progress) Evaluate/characterize *location-dependent* **optimal UI design**

   - depends on moving costs.
   - should take into account spillovers on the housing market – foreclosure/*fire sales* (but need GE model)

Thank you!

Zillow Scrap

Back



Zillow Scrap

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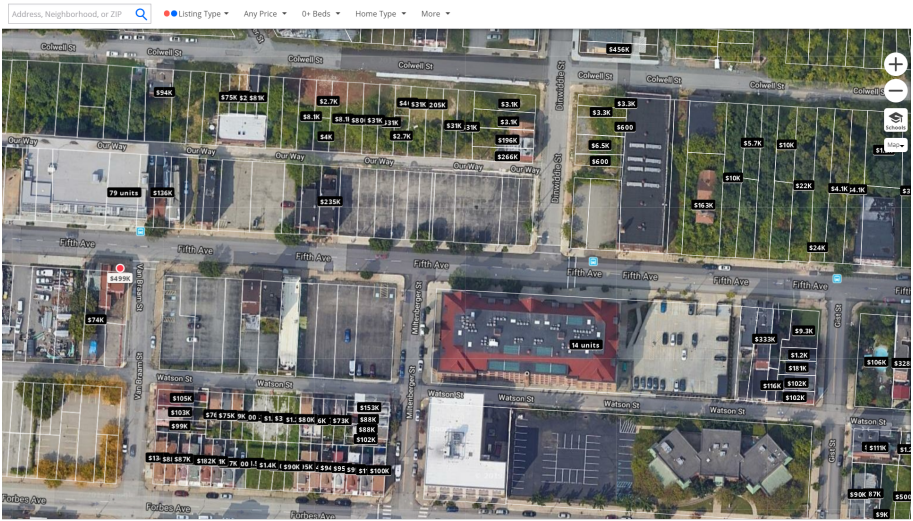

Data: Housing

	Transactions		All Transactions +
	Listed on Zillow	All	Never sold Houses
Number of transactions	**20,882,701**	**110,306,651**	**153,733,797**
Transaction information:			
Sale Price	288,522.10	240,849.30	
Listing Price	299,468.00		
Sale/Listing	0.97		
Time on Market (days)	87.96		
House Characteristics:			
Zestimate	206,299.80	198,523.00	183,622.20
Living Area (sqft)	2,043.07	1,949.43	1,894.26
Bathrooms	2.34	2.21	2.12
Bedrooms	3.39	3.31	3.25
Year Built	1,975.45	1,973.06	1,970.70
Lot Size	32,368.95	37,913.81	49,765.91

→ **Selection bias**: listed/sold houses are of better quality.

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