Flipping Houses in a Decentralized Market

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KAEA Jom Market 2024-2025

November 18, 2024

MOTIVATION AND QUESTION

- **Flippers** are buying and reselling 🏠 in short periods of time
  - ▶ I identify flipped houses in data as retraded within 2 years
  - ▶ Flippers are intermediary in a housing market
- **Trade off**: thicken the market at cost of retaining houses from households

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Question: What is the role of *intermediation* on house price distribution, trade volume and welfare in a decentralized market for 🏠?

Answer: Mean of price distribution ↓, trade ↑, welfare ↓

Policy: Should we regulate fast trade of houses? What are effects of taxing short term holding of 🏠 ?   Examples

Answer: Sales tax on flippers has negative effects on current non-homeowners

WHAT I DO AND WHAT I FIND

I develop a model of decentralized trade with an intermediary. The search is random, the types are heterogeneous, and the information is asymmetric.

- I bring housing asset to OTC-search literature.
- I endogenize middleman's asset holding.
- To study intermediation $\uparrow \iff$ the mass of intermediary $\uparrow$.

I use the universe of house transaction data in Ireland to identify flippers $\approx$ double between 2012 and 2021 in Ireland.

I quantify the effects of intermediation. negative price spillover, trade $\uparrow$, welfare $\downarrow$.

I assess effects of tax on flipping current non-owners welfare $\downarrow$.

Robustness : vary holding time of asset results are consistent., distribution of types, information structure

Literature

Model

DESCRIPTION OF THE GAME

- Measure 1 of households and a mass f of flippers. s mass of houses

- Time is continuous, discount rate is r.

- Households trade with other households and flippers quantity q of 🏠 (indivisible asset) for units of a general good c (divisible asset).

- Meeting opportunities:
    - F vs HH(one-to-one) arrive at rate λ
    - HH vs HH (one-to-one) arrive at rate ρ

- **Flipper** (acting as buyer or seller) proposes a price. The household accepts or rejects the offer.

- Households when trade with each other split surplus $50:50$

DESCRIPTION OF THE GAME

- Household type is δ, drawn from distribution $G(\cdot)$, the uniform $[0, 1]$.

- Household **without** a 🏠 and all flippers receive zero flow utility.
- Household **with** a 🏠 receive δ flow.

- Households and flippers are risk neutral

- Household's type δ changes when a Poisson shock hits, with intensity γ and is redrawn from uniform distr $G(\cdot)$.

Flipper : does not observe counterparty's δ. Household does. Timing Strategies Equilibrium

Detour: Frictionless Economy

Instantaneous trade occurs only due to γ shocks. Top s households own a 🏠. $\delta^* = 1 - s$ is the highest non owner.

PRICES AND CUTOFFS

Define **reservation value**:

$$\Delta V(\delta) := V(1, \delta) - V(0, \delta)$$

- Household (q, δ) meets flipper with $1 - q$ houses $\Rightarrow$ price offer $P_{1-q} \Rightarrow$ A or R
- Cutoff $\delta_q^*(P_{1-q})$ **marginal** indifferent household type

Prices with flippers : extract all surplus of marginal agent:

$$P_0 = \Delta V(\delta_1^*(P_0))$$

$$P_1 = \Delta V(\delta_0^*(P_1))$$

Prices between buyer δ and seller δ' , s.t. $\delta > \delta'$

$$P(\delta, \delta') = \frac{1}{2}\Delta V(\delta) + \frac{1}{2}\Delta V(\delta')$$

FLIPPER'S PROBLEM

Buyer

$$rW(0) = \max_{P_0} \lambda \int_0^{\delta_1^*(P_0)} dH(1,\delta)[-P_0 + W(1) - W(0)]$$

- Flipper takes cutoff δ_1^* as given when proposes P_0
- Mass is a meeting rates
- Meetings have a.s. 0 chances to repeat $\Rightarrow$ flipper extracts all surplus of $\delta_1^*(P_0)$.
- Surplus : price + continuation value
- Household sells 🏠 if $\delta \leq \delta_1^*(P_0)$. Flipper becomes owner.

Seller

$$rW(1) = \max_{P_1} \lambda \int_{\delta_0^*(P_1)}^1 dH(0,\delta)[P_1 + W(0) - W(1)]$$

FLIPPER'S PROBLEM - PRICE SETTING

$$\underbrace{\int_0^{\delta_1^*(P_0)} dH(1,\delta)}_{\text{MB to } F(0) \text{ from paying more}} = \underbrace{[-P_0 + W(1) - W(0)] \cdot \delta_1'^*(P_0) \cdot dH(1,\delta_1^*(P_0))}_{\text{MC of } F(0) \text{ from higher price offer}}$$

- Perturbate price: $P_0 + \varepsilon$, $\varepsilon \to 0$
- Attracts more buyers, trade is more frequent **but** affects cutoff and pays more

Details

HOUSEHOLD'S PROBLEM

Seller:

$$rV(1,\delta) = \underbrace{\delta}_{\textbf{flow}} + \underbrace{\gamma \int_0^1 [V(1,\delta') - V(1,\delta)]dG(\delta')}_{\textbf{shock}} + \underbrace{\lambda F(0) \cdot \mathbb{1}[\delta < \delta_1(P_0)][P_0 - \Delta V(\delta)]}_{\textbf{HH vs F trade}}$$

$$+ \underbrace{\rho \int_0^1 \max\{P(\delta',\delta) - \Delta V(\delta), 0\}dH(0,\delta')}_{\textbf{HH vs HH trade}}$$

Buyer:

$$rV(0,\delta) = \underbrace{\gamma \int_0^1 [V(0,\delta') - V(0,\delta)]dG(\delta')}_{\textbf{shock}} + \underbrace{\lambda F(1) \cdot \mathbb{1}[\delta > \delta_0(P_1)][-P_1 + \Delta V(\delta)]}_{\textbf{F vs HH trade}}$$

$$+ \underbrace{\rho \int_0^1 \max\{-P(\delta,\delta') + \Delta V(\delta), 0\}dH(1,\delta')}_{\textbf{HH vs HH trade}} \boxed{\text{Details}}$$

HOUSEHOLD'S PROBLEM - RESERVATION VALUES <small>DETAILS</small>

$$\Delta V(\delta)\sigma(\delta) = \delta + \gamma \int_0^1 \Delta V(\delta')dG(\delta') + \lambda F(0)\Delta V(\delta_1)\mathbb{1}[\delta < \delta_1] + \lambda F(1)\Delta V(\delta_0)\mathbb{1}[\delta > \delta_0]+$$

$$+\frac{\rho}{2}\int_\delta^1 \Delta V(\delta')dH(0,\delta') + \frac{\rho}{2}\int_0^\delta \Delta V(\delta')dH(1,\delta')$$

where **endogenous discount rate**

$$\sigma(\delta) = r + \gamma + \lambda F(0)\mathbb{1}[\delta < \delta_1] + \lambda F(1)\mathbb{1}[\delta > \delta_0] + \frac{\rho}{2}\int_\delta^1 dH(0,\delta') + \frac{\rho}{2}\int_0^\delta dH(1,\delta')$$

with envelope condition:

$$\sigma(\delta) = \frac{1}{\Delta V'(\delta)}$$

$\sigma(\delta)$ **captures main mechanism!**

<small>illustration later</small>

STATIONARY DISTRIBUTION

$$\int_0^\delta dH(0,\delta) + \int_0^\delta dH(1,\delta) = G(\delta) = \delta \quad \forall \delta \in [0,1] \tag{1}$$

$$F(0) + F(1) = f \tag{2}$$

Homeownership (inflow = outflow to $[0,\delta], q = 1$)

$$\underbrace{\lambda F(1) \int_{\delta_0^*}^{\max\{\delta,\delta_0^*\}} dH(0,\delta')}_{\text{HH \textbf{buys} from F}} + \underbrace{\gamma G(\delta) \int_\delta^1 dH(1,\delta')}_{\text{change of type from}[\delta,1]} = \tag{3}$$

$$= \underbrace{\lambda F(0) \int_0^{\min\{\delta,\delta_1^*\}} dH(1,\delta')}_{\text{F \textbf{buys} from HH}} + \underbrace{\gamma(1-G(\delta)) \int_0^\delta dH(1,\delta')}_{\text{change of type to}[\delta,1]} + \underbrace{\rho \int_0^\delta dH(1,\delta') \int_\delta^1 dH(0,\delta')}_{\text{HH trade HH}} \tag{4}$$

Data

DATA ON IRELAND 2010-2024

Flipped house in a data: bought and next sold within 2 years

1. Residential Property Registry - **full** tax data on transfer of residential property. Info about Returns :
   - ▶ exact Date
   - ▶ Price
   - ▶ exact Address
     - ▶ used for: share of flipped transactions, average price, returns of flipping   Details
   - ▶ Work with **Average House Price**: hedonic regression on Location (City), Quarter Year   Regression
2. Household Finance and Consumption Survey (HFCS) similar to Survey of Consumer Finances (SCF)
     - ▶ tenure type
     - ▶ when moved in
     - ▶ consumption
     - ▶ mortgage rates
   - ▶ used for calibration of : s, r and for average price, turnover   Details

Main takeaways   Summary

1. The share of flipped transactions increased from 4.55% in 2012 to 8.05% in 2021
2. Average house price increased by 47% Plots

Results

ROADMAP

Estimate: f <small>mass of flippers</small>, ρ <small>HH vs HH meeting rate</small>, λ <small>F vs HH meeting rate</small> and γ <small>preference shock</small>.

Moments to match:

- Share of flipped transactions (Details)
- Average price
- Return on flipping
- Average time since moving to a house

Counterfactual exercises:

1. **2012 (baseline) vs 2021 (counterfactual):** Adjust f to match share of flipped.
2. **Comparative analysis:** Adjust λ to induce equal flipper meeting rates and compare.
   Difference with literature they take $\lambda \to \infty$ (Results)
3. **Tax impact:** Examine the effect of a 9% sales tax on flipping. (Results)

Focus on insights from 1

ESTIMATION TO 2012 DATA

Parameter	Description	Value			
		Externally	**Source**		
r	Mortgage rate	3.62%	HFCS		
s	Homeownership rate	68.84%	HFCS		
		MDE	**Target**	**Model**	**Data**
f	mass of Flippers	2.1%	Fraction of flipped	4.81%	4.56%
ρ	Search HH vs HH	0.3	Average price	11.62	11.42
λ	Search F vs HH	3	Return on flipping	1.27	1.29
γ	Taste shock	7%	Tenure time	2.54%	5.59%

Untargeted

EXOGENOUS TYPES SPACE
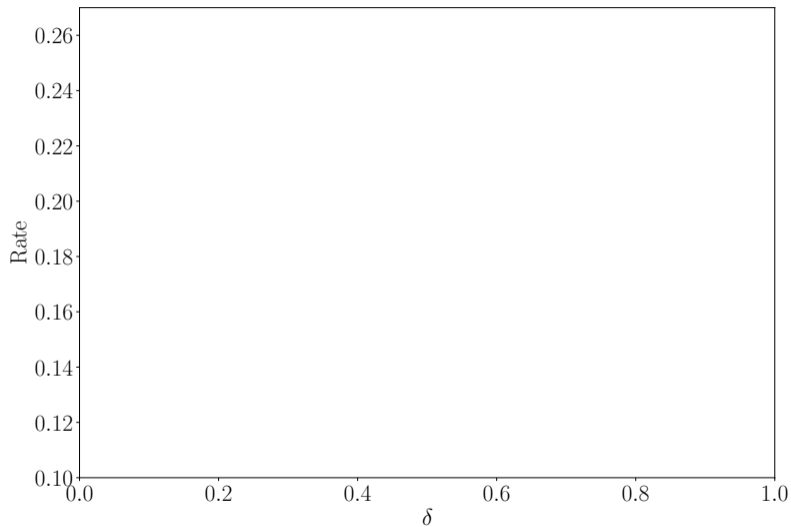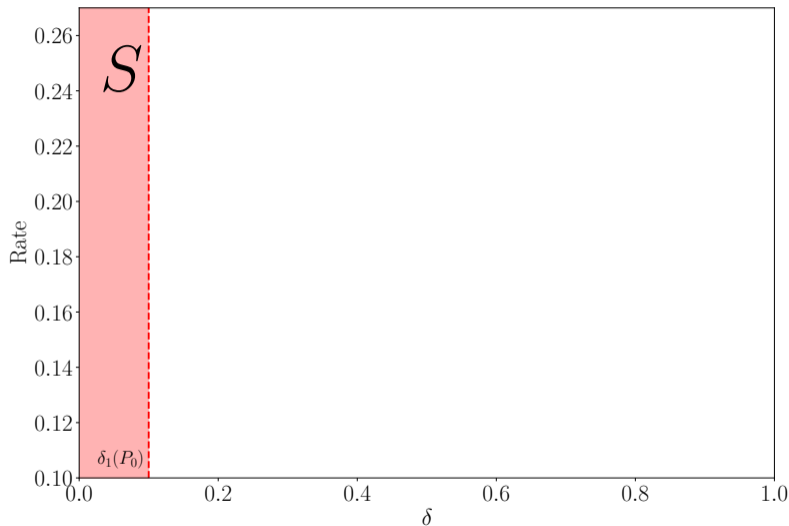
Homeowner with δ sells to flipper only when $\delta < \delta_1 \Rightarrow dH(1, \delta)$ low
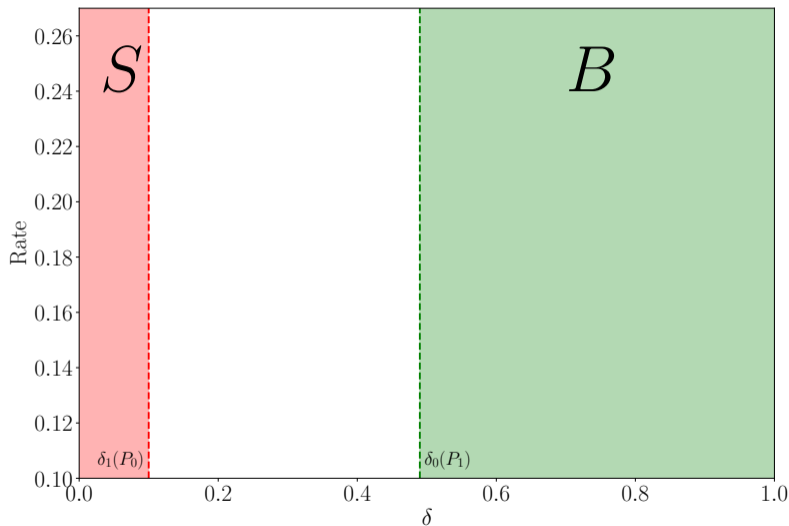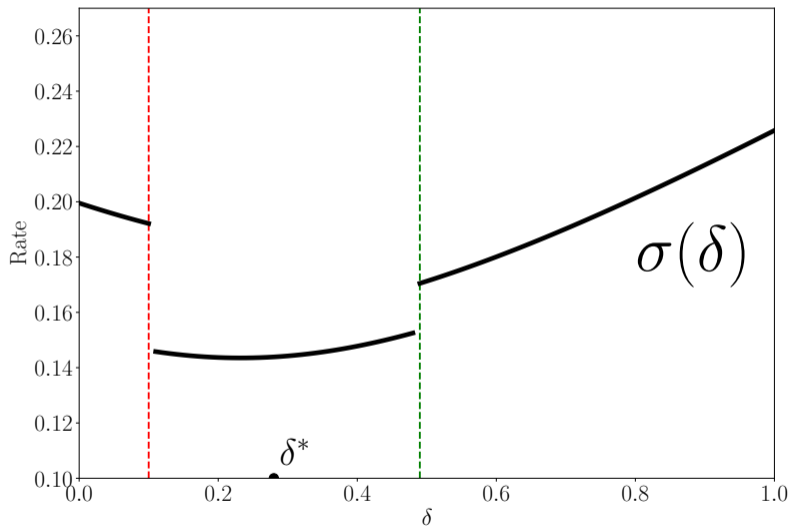
Non-Homeowner with δ buys from flipper only when $\delta > \delta_0 \Rightarrow dH(0, \delta)$ low

TRADE WITH FLIPPER
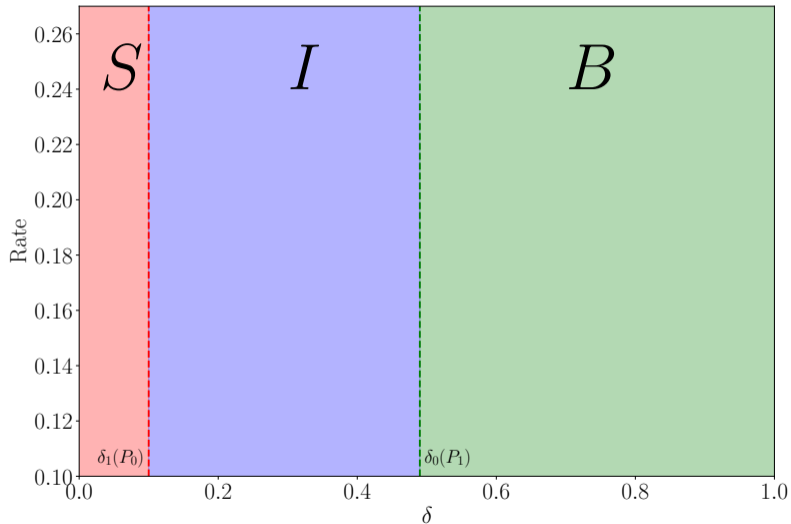
All trade with flippers from extreme types

Households around δ^* trade the most but trade at low speed $\Rightarrow$ mean price $\approx \Delta V(\delta^*)$
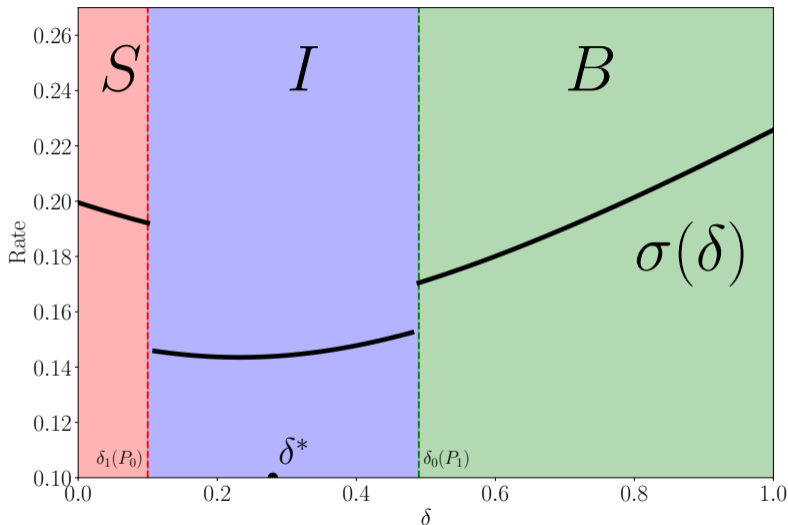
Extreme types $\Rightarrow$ trade with flipper

Moderate types $\Rightarrow$ concentration of HH vs HH trade

MAIN COUNTERFACTUAL: INTERMEDIATION

Experiment:
$f \uparrow$ to match 2021 share of flipped transactions.

Key Insight:

Results

1. Negative **price spillovers** more competition
2. **Trade Volume** $\uparrow$, but F crowd out HH vs HH trade - compression of hh inside I region
3. **Welfare of Households** $\downarrow$ main effect: homeowners distr $\downarrow$ + reservation value high

All together

ROBUSTNESS

- Alternative definitions of flipping: 1, 2, 4 years between trades `Time series` `Plot pdf` `Results`
- Role of distribution of types : vary distribution of types $G(\cdot)$ `Prices`
- Information structure: type δ is public `Prices` `Welfare`
- Validation `Comparison`

CONCLUSION

I develop a model of decentralized trade with an intermediary. The search is random, the types are heterogeneous, and the information is asymmetric.

- I bring housing asset to OTC-search theoretic literature and quantified trade-off.

- I endogenized middleman's asset holding and allowed for asymmetry of information.

- I developed algorithm for cutoff equilibrium with continuous time methods.

- To study intermediation $\uparrow \iff$ the mass of intermediary $\uparrow$.

I use the universe of house transaction data in Ireland and document empirical moments.
house price $\uparrow 46\%$, trade volume $\uparrow 135\%$, between 2012 and 2021
I identify flippers $\approx$ double between 2012 and 2021
I quantify the effects of intermediation. negative price spillover, trade $\uparrow$, welfare $\downarrow$.
I assess effects of tax on flipping current non-owners welfare $\downarrow$.
Robustness : vary holding time of asset results are consistent., distribution of types,
information structure

Literature

My results suggests that there are non trivial costs of *intermediation*

Appendix

TAXING FLIPPING AROUND THE GLOBE

- Germany : 10 years, 14-45%
- Canada : 1 year, 15-33%
- Singapour : 3 years, 12%
- Hong Kong : 3 years 20%

LITERATURE I BUILD ON:

- **Over-the-Counter** Intermediation via bilateral trade (with search) : Duffie, Gârleanu, and Pedersen 2005, Hugonnier, Lester, and Weill 2020 I take HH vs HH from this, Weill 2020, Lagos and Rocheteau 2009, Üslü 2019, Krainer and LeRoy 2002, Allen, Clark, and Houde 2019
- **This paper**: A model with two sided heterogeneity in valuation and inventory, and non trivial intermediation.
- **Housing**
  - ▶ **House flipping** : Bayer et al. 2020, Depken, Hollans, and Swidler 2009 , Lee and Choi 2011, Gavazza 2016 but rarely as intermediation in housing market
  - ▶ **Homeownership**: Acolin et al. 2016, Sodini et al. 2023, Anenberg and Ringo 2022
  - ▶ **Price distribution** : Piazzesi, Schneider, and Stroebel 2020, Rekkas, Wright, and Zhu 2020, R. Diamond and W. Diamond 2024, Head, Lloyd-Ellis, and Sun 2014, Üslü 2019
  - ▶ **Taxation of housing**: İmrohoroğlu, Matoba, and Tüzel 2018, Sommer and Sullivan 2018, Kopczuk and Munroe 2015
- **Contribution** : Quantifying effects, use universe of transaction data, consider comparative statics to study intermediation different than literature

TIMING

Morning t**:** Household (q, δ) wakes up with asset position $q \in \{0, 1\}$ and type $\delta \in [0, 1]$. Then

1. At rate λ trade opportunity with *a* flipper arrives (γ, λ, ρ independent with each other and exponential).
2. Flipper with $1 - q$ 🏠 offers a price P_{1-q}
3. Conditional on meeting household accept/reject prices -$\delta_q^*(P_{1-q})$ type is indifferent
4. At rate ρ household meets another household. If trade happens they split surplus $50 : 50$ with price $P(\cdot, \cdot)$
5. γ shock to type arrives
6. Payoffs are realized: prices are paid, flow is paid $q\delta\Delta$,
7. **evening** discounts with $e^{-r\Delta}$
8. Move to $t + \Delta$

History of shocks γ, λ can be recovered from (δ, q) ◄ Back

STRATEGIES

- History independent (no dependence on history of past realizations of λ, γ)

- Prices proposed by a flipper:
  - P_0 bid
  - P_1 ask

- Prices between buyer δ and seller δ', s.t. $\delta > \delta'$
  - $P(\delta, \delta')$

SYMMETRIC, STATIONARY MARKOV PERFECT EQUILIBRIUM WITH CUTOFFS CONSISTS OF:

Definition

1. distributions : $H : (q, \delta) \to \mathbb{R}$, $F : (q) \to \mathbb{R}$
2. value functions $V : (q, \delta; P_{1-q}) \to \mathbb{R}$, $W : (q; \delta^*_{1-q}) \to \mathbb{R}$
3. decision rules: cuttofs $\delta^*_q : (P_{1-q}) \to \mathbb{R}, q \in \{0, 1\}$, prices $P_q \in \mathbb{R}_+, q \in \{0, 1\}$ and $P(\delta, \delta') \in \mathbb{R}_+$

- Given prices P: value functions V, cutoffs δ^* and prices $P(\cdot, \cdot)$ solve household problem (given by HJB equation)
- Given cutoffs δ^*: value functions W and prices P solve flipper problem (given by HJB equations)
- Low of motions hold
- Accounting hold

Take $\Delta \to 0$ after that <small>◂ Back</small>

FLIPPPER'S PB

Flippers value functions can be written as:

$$W(1) = \frac{\lambda}{r} \frac{[H(0,1) - H(0,\delta_0)]^2}{\sigma(\delta_0)dH(0,\delta_0)}$$

$$W(0) = \frac{\lambda}{r} \frac{H(1,\delta_1)^2}{\sigma(\delta_1)dH(1,\delta_1)}$$

$$\sigma(\delta_0)^{-1} = r + \gamma + \frac{\rho}{2}[H(0,1) - H(0,\delta_0)] + \frac{\rho}{2}dH(1,\delta_0)$$

$$\sigma(\delta_1)^{-1} = r + \gamma + \frac{\rho}{2}[H(0,1) - H(0,\delta_1)] + \frac{\rho}{2}H(1,\delta_1)$$

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HOUSEHOLD'S PROBLEM BECOMES

Seller:

$$rV(1,\delta) = \delta + \gamma \int_0^1 [V(1,\delta') - V(1,\delta)]dG(\delta') + \underbrace{\lambda F(0) \cdot \mathbb{1}[\delta < \delta_1(P_0)][P_0 - \Delta V(\delta)]}_{\textbf{HH vs F trade}}$$

$$+ \underbrace{\rho \int_\delta^1 \frac{1}{2}[\Delta V(\delta') - \Delta V(\delta)]dH(0,\delta')}_{\textbf{HH vs HH trade}}$$

Buyer:

$$rV(0,\delta) = \gamma \int_0^1 [V(0,\delta') - V(0,\delta)]dG(\delta') + \underbrace{\lambda F(1) \cdot \mathbb{1}[\delta > \delta_0(P_1)][-P_1 + \Delta V(\delta)]}_{\textbf{HH vs F trade}}$$

$$+ \underbrace{\rho \int_0^\delta \frac{1}{2}[\Delta V(\delta) - \Delta V(\delta')]dH(1,\delta')}_{\textbf{HH vs HH trade}}$$

PROOF OF EXISTENCE. $\rho = 0$ CASE

- **Distributions**. Assume $f < s < 1 + f$ for given δ_q^* explicit formula for $dH(q, \delta)$, implicit for $F(q)$

- **Value functions**. Assume TVC. Show that $\Delta V(\delta)$ is strictly increasing and bounded. Use Blackwell conditions - linear in δ and *nice* continuation values. Use Blackwell to find $V(q, \delta)$. *nice* expressions for $W(q)$. Prices from $\Delta V(\delta)$.

- **Cutoffs**. Use HH problem to derive recursion on δ_q^*. Linearity kicks in. Use Lebesgue theorem to bound . Second order polynomial in δ_q^*

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Σ Matrix
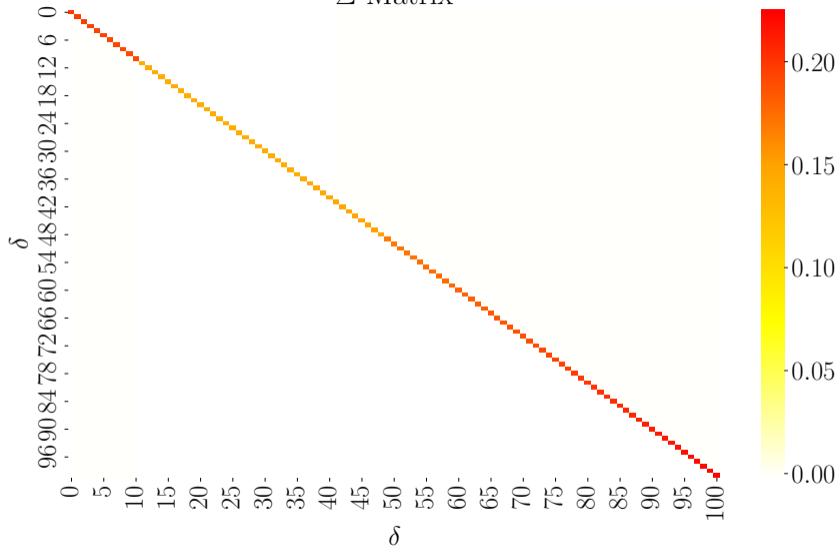
SUMMARY

Flipped house bought and next sold within 2 years

1. Number of flipped transactions out total volume of transactions was 4.55% in 2012 and 8.05% in 2021

2. Real house prices grew by 76%, average house price grew by 68% and by 47% in annual consumption expenditure units

3. Observables explain 40% of variation of house prices

4. Mortgage rates decreased from 3.62% in 2012 to 2.47% in 2021

5. Total trade volume of trade increased by 135%

6. There is negative correlation between prices and level of intermediation

7. Average gross return on flipped houses increased from 1.29 to 1.32. And are higher than on other multiply traded houses in sample

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DATA

- Residential Property Registry administrative data from Ireland on all transactions of residential property between 2010 and 2023
- 640k transactions for 5 mln country, +500k unique homes
  - ▶ 81% 🏠 traded only once
  - ▶ 5.9% 🏠 flipped
  - ▶ 13.1% 🏠 traded multiple times but not flipped
- info about
  - ▶ exact Date
  - ▶ Price (in EUR)
  - ▶ exact Address
- no information on buyer or seller, nor on quality ...
- In order to obtain **Average house price** distribution run log prices on location (city) and quarter× year fixed effects.

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Table: Regression Results with Different Fixed Effects

	(1)	(2)	(3)	(4)	(5)
Location FE	County	City	District	City	District
Quarter-Year FE	$\times$	$\times$	$\times$	$\checkmark$	$\checkmark$
Constant	12.16***	12.16***	12.19***	12.16***	12.18***
	(0.0008)	(0.0008)	(0.0007)	(0.0008)	(0.0007)
Observations	638,751	638,751	561,010	629,920	532,097
R-squared	0.273	0.378	0.550	0.426	0.566

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

I use City $\times$ Quarter-Year Fixed Effects

Table: Variation Explained by Observables

Fixed Effects	R^2
County	0.27
City	0.36
District	0.50
City, Quarter-Year	0.42
District, Quarter-Year	0.57

Note: The table presents the R^2 values from hedonic regressions of log prices on various spatial and time-fixed effects. The city and quarter-year fixed effects specification captures 42% of the price variation, highlighting significant unobserved heterogeneity in household valuations beyond geographic and time-specific factors.

I use City $\times$ Quarter-Year Fixed Effects

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HISTOGRAMS
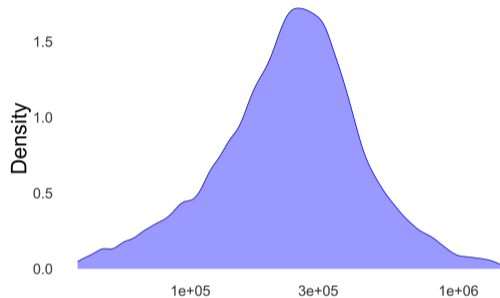
Figure: Raw data
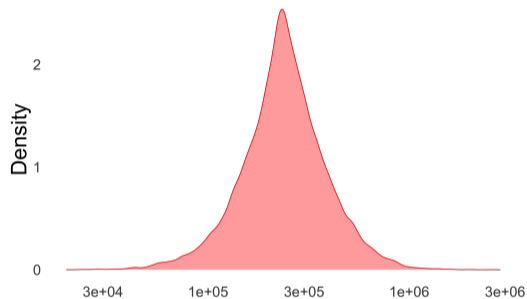
Figure: Average House - City,
Quarter×Year FE

FRACTION OF FLIPPED
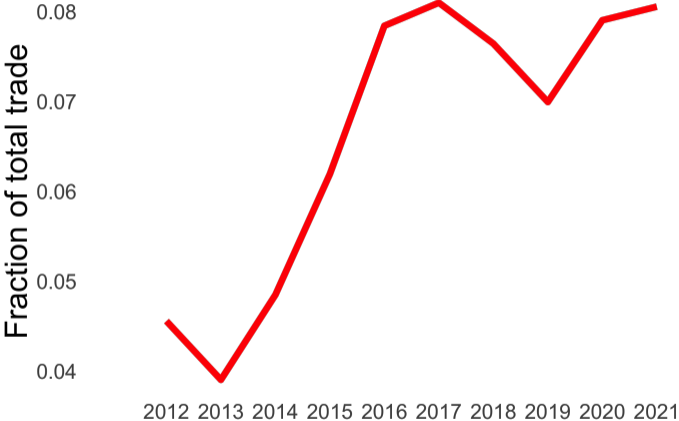
HFCS HOUSEHOLD SURVEY DATA

Variable	Moment	2012 Value	2021 Value
Homeownership	Fraction	68.84	69.05
Mortgage Rate	Net Rate	3.62	2.47
Consumption	Mean	17,000	19,000
Live in House	Mean years	17.88	17.28
Home Value	Mean	190,000	316,000
Other Property	Mean	391,000	448,000
Wealth	Mean	216,000	370,000
Size of House	Mean sqm	111	129
Home Price at Acquisition	Mean	157,000	176,000
Current Home Value	Mean	192,000	316,000
Nr of Mortgages on hmr	Mean	1.52	1.56
Nr of Properties	Mean	1.77	1.80
Income	Mean	55,000	71,000

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HOUSE QUALITY DATA ON ENERGY CERTIFICATION

- Source: Sustainable Energy Authority of Ireland (equivalent of EPA)
- County (equivalent of US state) level data on house energy efficiency certification
- Costly certification (120 EUR, 1.5h) mandatory for selling a house
- 1.117 mln issued for whole Ireland 2010-2024
- detailed physical characteristics of a house
- Data contains:
  - ▶ daily Date of inspection
  - ▶ Date of construction
  - ▶ square footage (whole and each room and roof)
  - ▶ number of doors, windows
  - ▶ emission of energy and CO_2 per sq m
- **Problems**: no matching with transaction data
- However can used for estimation of λ in quantifying toy model using flow equations

FINDINGS REMINDER - (LOG NON RESIDUAL)

- Flipped 🏠 constitutes a quarter of all houses traded multiple times
- Fraction of flipped 🏠 and house prices both doubled in Ireland between 2012 and 2021
- Evidence from time series
    1. **Prices** mean and variance ↑
    2. **Returns of sellers** mean and variance ↓
- Evidence from cross section (wrt fraction of flippers)
    1. **Prices** mean and variance ↓
    2. **Returns of sellers** mean and variance ↑
- Flipped houses are cheaper and have lower standard deviation
- Some evidence on linear relationship between transactions and potential sellers across locations and time

EVIDENCE FROM TIME SERIES

1. **Price** mean and standard deviation is increasing in time
2. Flipped houses have lower mean and standard deviation than non retraded or traded after 2 years houses
3. **Returns of sellers** mean and standard deviation are decreasing with time
4. Flipped houses have higher mean and standard deviation of return

(YEAR, COUNTY) OBSERVATIONS

1. **Price** Means and standard deviations are decreasing in fraction of flipped houses
2. **Returns of a seller** Means and standard deviations are increasing in fraction of flipped houses
3. **Important moment**:Variance of prices decreasing in fraction of flippers

MEAN RETURNS

Table: Gross returns

Year	Retraded < 2y	Retraded ≥ 2y	Overall
2012	1.29	0.93	1.22
2013	1.28	0.97	1.18
2014	1.47	1.00	1.29
2015	1.55	1.11	1.42
2016	1.45	1.16	1.36
2017	1.45	1.14	1.30
2018	1.38	1.15	1.25
2019	1.33	1.12	1.19
2020	1.27	1.10	1.15
2021	1.32	1.10	1.15

Note: Annualized gross returns for multiply traded houses in Ireland, categorized by flips (re-traded within 2 years), trades that took over 2 years, and the overall sample. The returns are averaged based on the year of the second trade. Flipped properties consistently show higher annualized returns compared to houses

SHARE OF FLIPPED
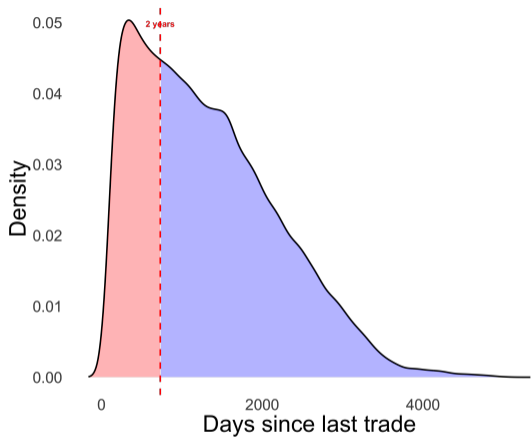
Figure: Data
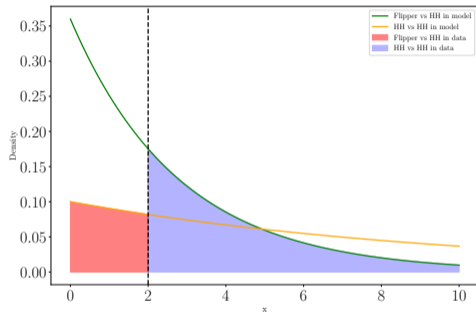
Figure: Model

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ADDITIONAL MOMENTS ◄ BACK

Trade volume

$$\kappa = \underbrace{\rho \int_0^1 \int_0^1 \mathbb{1}[\delta' \geq \delta] dH(0,\delta) dH(1,\delta)}_{\kappa_1} + \underbrace{2\lambda F(0) H(1,\delta_1)}_{\kappa_2}$$

Price distribution (cdf)

$$F(p) := \frac{\rho}{\kappa} \int_0^1 \int_0^1 \mathbb{1}[P(\delta,\delta') \leq p] \mathbb{1}[\delta' \geq \delta] dH(0,\delta) dH(1,\delta) + \frac{\kappa_2}{2\kappa} \mathbb{1}[P(0) \leq p] + $$
$$+ \frac{\kappa_2}{2\kappa} \mathbb{1}[P(1) \leq p]$$

HH vs HH trade rate over 2 years

$$\rho \int_0^1 \int_\delta^1 dH(0,\delta') * \exp(-2\rho \int_0^\delta dH(1,\delta'')) dH(1,\delta)$$

FF vs HH trade year under 2 years:

$$\lambda F(0) \int_0^{\delta_1} dH(1,\delta')(1-\exp(-2\lambda \int_{\delta_0}^1 dH(0,\delta''))) + \lambda F(1) \int_{\delta_0}^1 dH(0,\delta')(1-\exp(-2\lambda \int_0^{\delta_1} dH(1,\delta'$$

CAN MODEL EXPLAIN GROWTH OF PRICES BETWEEN 2012 AND 2022? UPDATE

| | r, f **2012** | | f **2012,** r **2021** | | r, f **2021** | |
	Data 2012	**Model**	**Data 2021**	**Model**	**Data 2021**	**Model**
Fraction of Flipped	4.56%	4.81%	8.05%	4.97%	8.05%	8.28%
Average Price	11.42	11.62	16.78	16.83	16.78	16.66
Return on Flipping	1.29	1.27	1.32	1.19	1.32	1.20
Turnover	5.59%	2.54%	5.79%	2.54%	5.79%	2.69%

s, γ, λ, ρ **at 2012**

Note: Externally calibrate r to 2012 from data, estimate f to 2012, 2021 (keeping r at 2012), use r from 2021 data without reestimating the model.

MODEL FIT - TRADE-UPDATE

	Data	Model
2012		
Total trade	1.274	1.298
Flipper trade	0.058	0.062
2021		
Total trade	2.410	1.243
Flipper trade	0.183	0.103

Note: In second part of table f comes from counterfactual (with r at 2012 level) and r was adjusted to 2021 level, no reestimation of model otherwise

◄ Back

MODEL FIT - REGRESSION

Simulate model and use price data for 2012 and run regression of prices on dummy flipper variable for transactions in which trade happened with flipper:

$$P_i = \alpha + \beta F_i$$

	Data	Model
β	-0.21	-0.29
Fixed effects	✓	
Consumption adjusted	✓	

Note: β was calculated in simulation for $T = 100$ and $N = 10000$ agents. Sample in empirical regression $25,000$

◂ Back

MODEL VS DATA: PRICE DISTRIBUTION
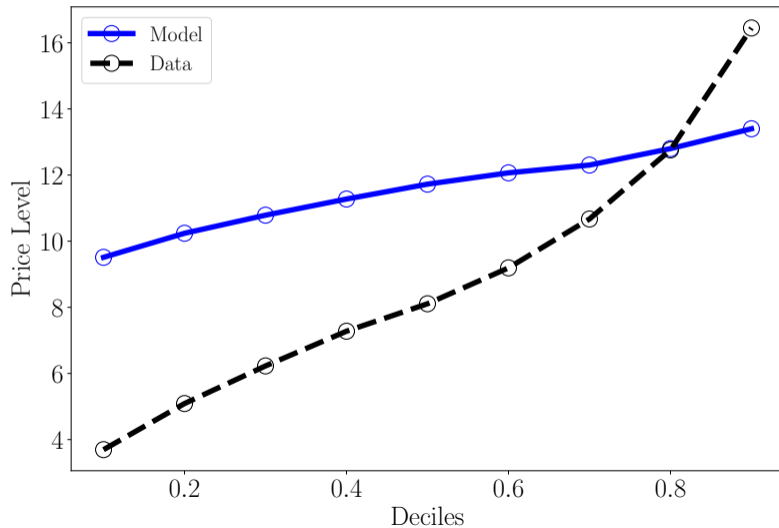
KEY OBSERVATIONS

1. Non-monotonicity in Discount Factor

- Endogenous discount rate creates a non-monotonic relationship with non differentiability at cutoffs.

2. Reservation Value

- Initially convex, then concave as δ changes.

3. Frictionless Marginal Type δ^*

- δ^* type drives the majority of trade volume.

Reservation Value $\Delta V(\delta)$
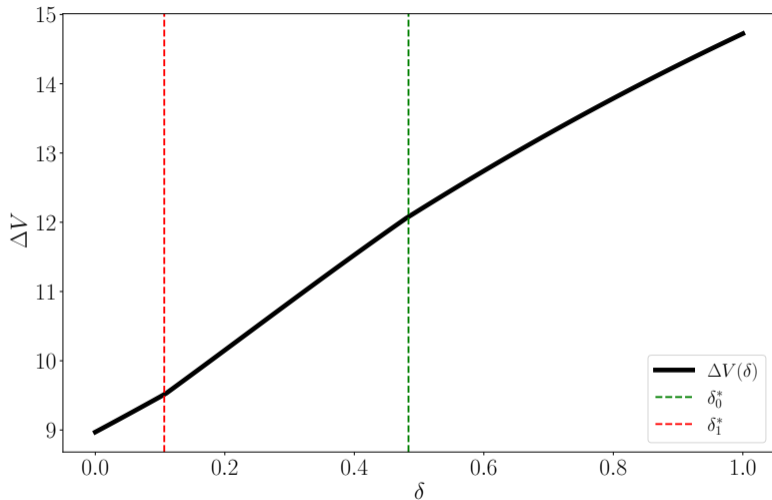
ΔV **strictly increasing, convex-concave, non differentiable at cutoffs** ◂ Back

PROBABILITY DISTRIBUTIONS OF HOUSEHOLDS
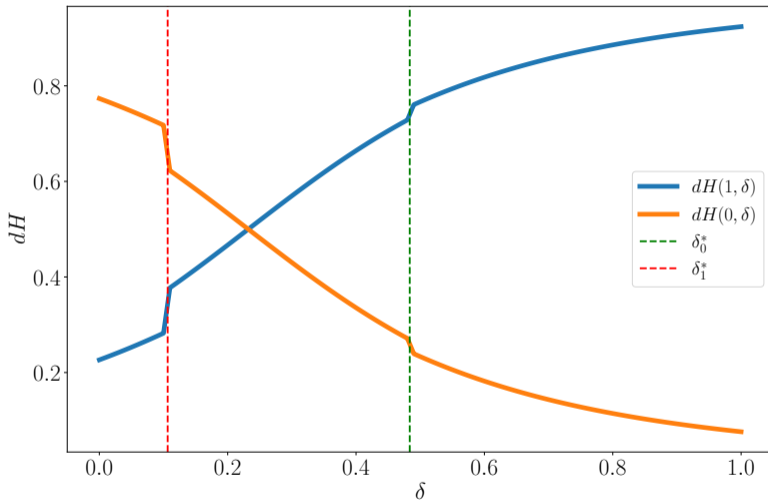
Owners have high types more likely ◄ Back

ENDOGENOUS MEETING RATES

Keep in mind that meeting rates λ and ρ are parameters for 1-1 meetings

For each δ household there is endogenous meeting rate

What are endogenous contact rates for each (δ, q) household?

What is the excess rate at which they meet households vs flippers ◂ Back

EXCESS RATE OF MEETING: HOUSEHOLD VS FLIPPER
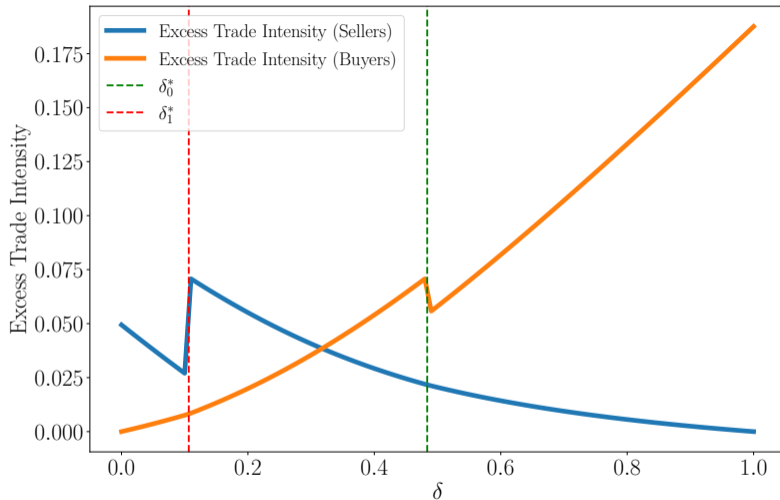
Flipper's contact rates: 0.48 (buyer), 0.11 (seller) ◂ Back

A Detour: Frictionless Economy

Instantaneous Trade:

Trade occurs only due to γ shocks. Top s households hold a 🏠, while the rest and all flippers remain non-owners.

Frictionless Equilibrium:

In equilibrium, there exists a single price P^*:

$$P^* = \frac{\delta^*}{r} = \frac{1-s}{r}$$

Trade volume:

$$\gamma s G(\delta^*) = \gamma s(1-s)$$

Misallocation:

Assets are misallocated if a household has the 'wrong' asset position compared to the frictionless case:

$$M(\delta) = \int_0^\delta \mathbb{1}\{\delta' < \delta^*\}dH(1,\delta') + \int_0^\delta \mathbb{1}\{\delta' > \delta^*\}dH(0,\delta')$$

MISALLOCATION DENSITY $M'(\delta)$
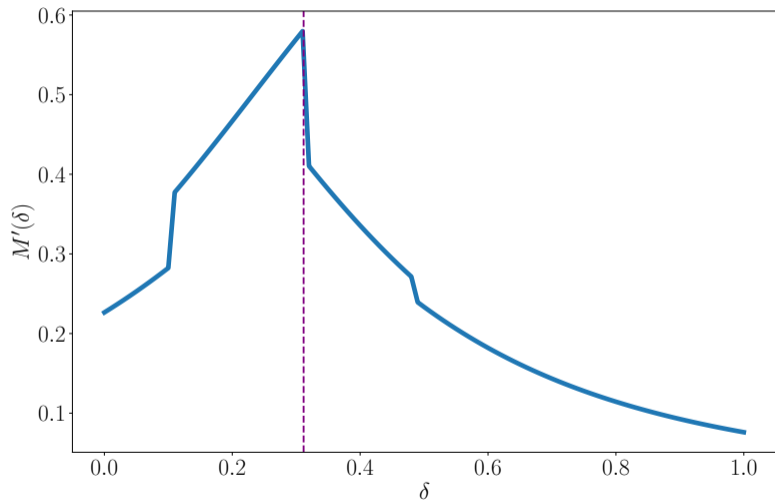
- Extreme δ agents have high chance of meeting counterparty- they trade fast
- Near $\delta*$ types account for frequent trade
- Those are types with highest misallocation at margin

Variable	% Change
Mean Price	-1.51
Var Price	-0.31
HH Trade	-7.95
Total Trade	5.16
Return	0.99
Turnover	5.16

As **flipping** activity ↑ ⇒ Mean **price** ↓

◂ Back

Variable	% Change
Welfare pc	
Households	-0.20
Homeowners	0.34
Non-Homeowners	3.02
Flipper	-23.43

As **flipping** activity ↑ ⇒ **Household Consumption** ↓

SIMULATION

Simulate model:
Draw $N = 1000$ δ agents and simulate for $T = 100$ periods with discretized step $dt = 0.1$.

Analyze ownership:
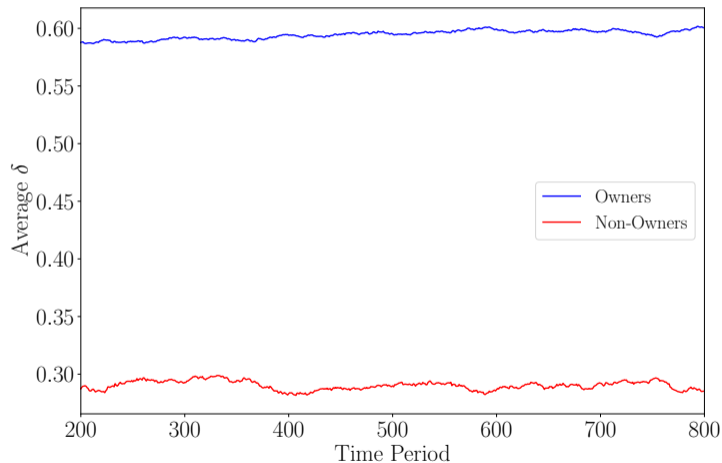Observe the average δ of owners and non-owners over time.

Event study:
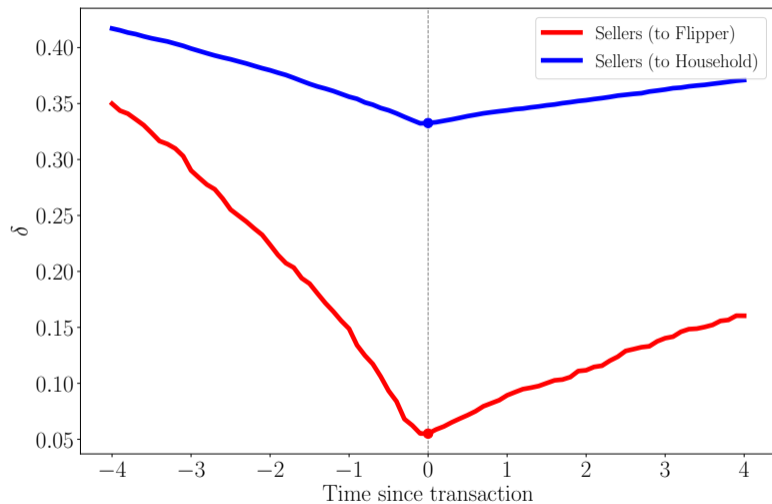Examine the behavior of the seller around the time of the transaction.
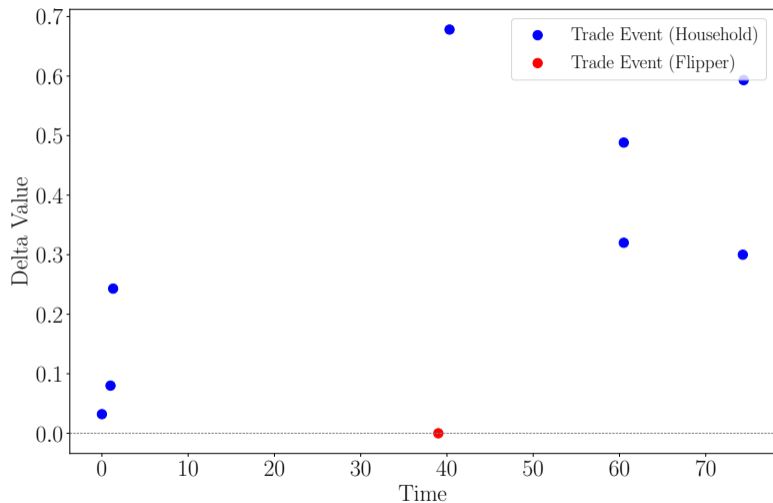
- Simulation allows to track history of owner type δ
- Is there a ladder?
- House moves only to higher type household until it's traded to flipper
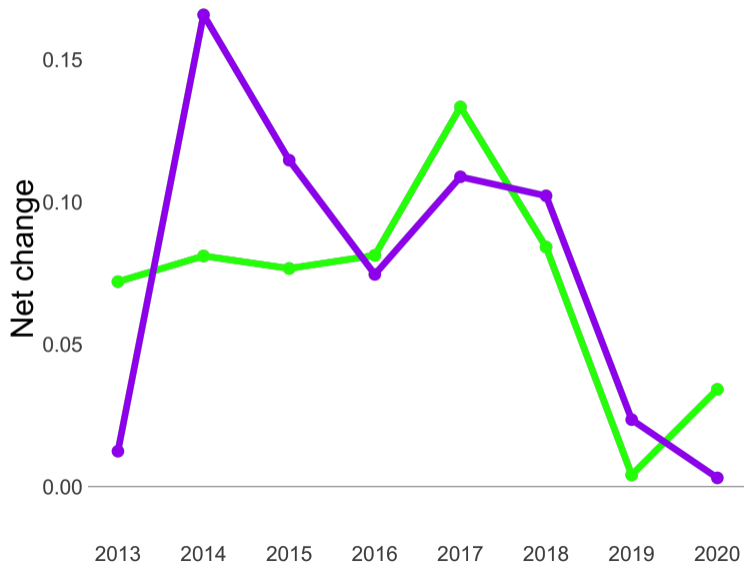- Then ladder restarts

- 🏠 moves to higher δ agent
- But eventually traded with flipper
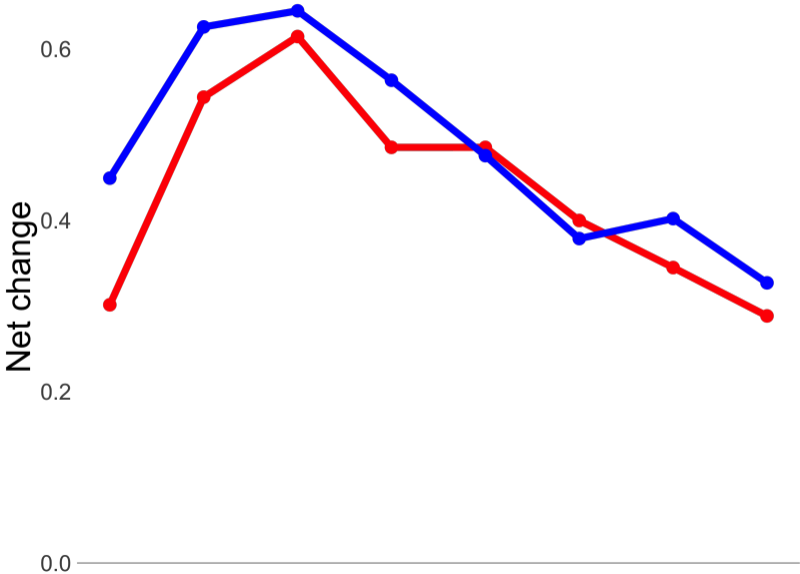- $\Rightarrow$ Lack of ladder behavior

EVENT STUDY

- Three types of shock γ, λ, ρ
- Who is the seller? Unlucky agent
- More extreme types sell to flipper
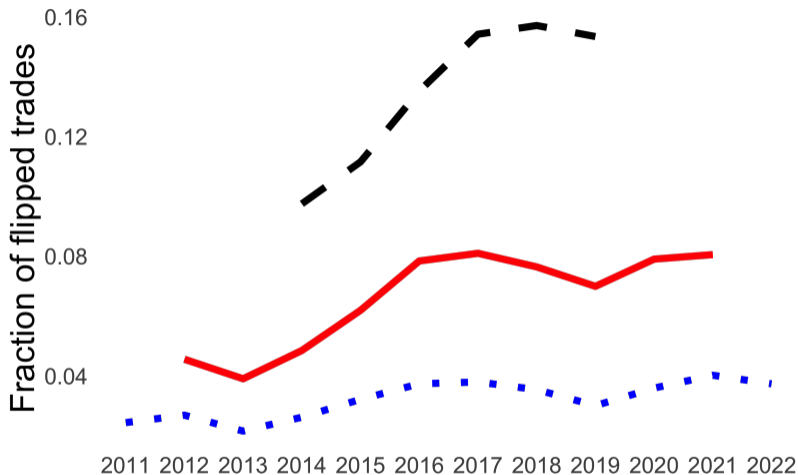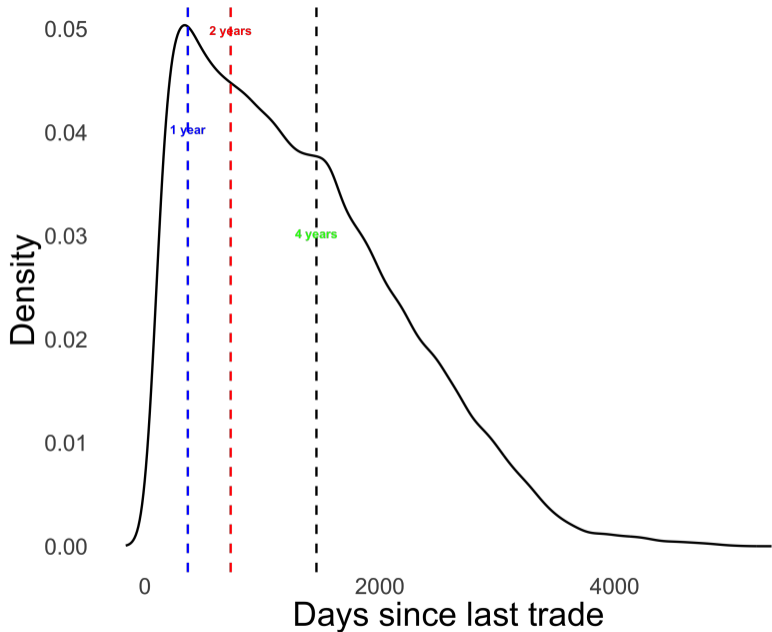- Mean reversion after

CASE SHILLER INDEX
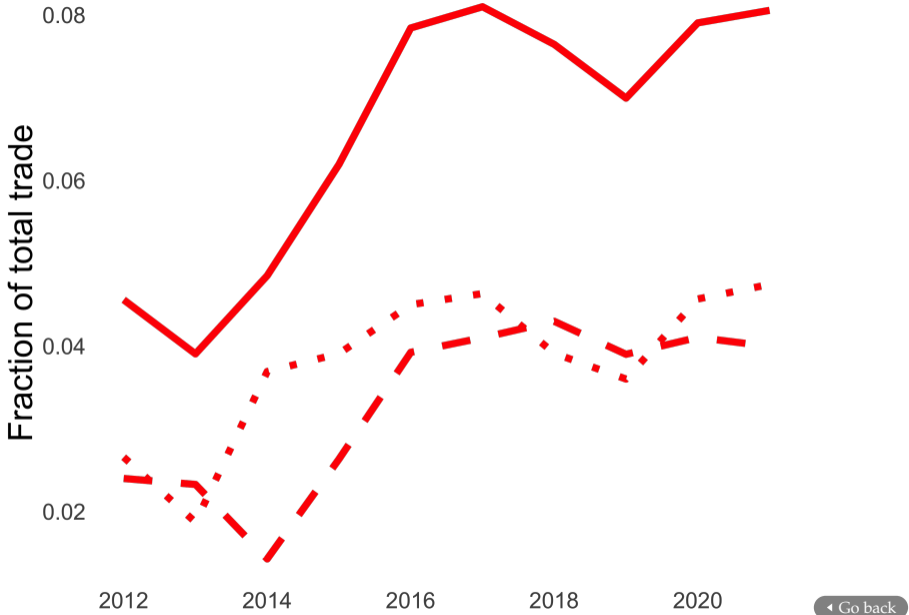
Figure: Blue-1y,   Red-2y,   **Black**-4y

All definitions imply ≈ doubling flipping. Results are consistent

ROBUSTNESS CHECKS ⟨◂ BACK⟩

	1 year		**2 years (baseline)**		**4 years**	
f	0.009		0.0021		0.013	
γ	0.09		0.07		0.09	
ρ	0.3		0.3		0.3	
λ	3.0		3.0		5.0	
	Model	Data	Model	Data	Model	Data
Fraction of flipped	2.53%	2.44%	4.81%	4.56%	9.27%	9.75%
Mean price	11.98	12.88	11.62	11.42	11.85	12.54
Return on flipping	122.73%	111.29%	126.96%	129.33%	123.35%	151.41%
Tenure time	2.72%	5.59%	2.54%	5.59%	2.86%	5.59%
Loss function	0.28		0.30		0.28	

ROBUSTNESS CHECKS ◂ BACK

	1 year	**2 years (baseline)**	**4 years**
	Main Counterfactual % Change		
Mean Price	-2.34	-1.51	-2.53
Var Price	0.70	-0.31	-0.07
Flipper Share	240.90	67.42	104.13
HH Trade	-10.28	-7.95	-16.50
Total Trade	10.62	5.16	12.50
Return	0.90	0.99	1.45
Turnover	10.62	5.16	12.50
Welfare pc			
Total	-3.38	-2.44	-2.58
Household	-0.41	-0.20	-0.52
Homeowners	0.38	0.34	0.54
Non-Homeowners	5.49	3.02	5.53
Flipper	-29.41	-23.43	-32.67

Table: Untargeted moment: prices and intermediation

|	1 Years	2 Year	4 Years
		Data	
Year	2011	2012	2014
β	-0.19	-0.21	-0.08
		Model	
β	-0.22	-0.29	-0.15

Note: The table presents results of regression from Table **??** applied to various definitions of flipping. Simulated data was run for $T = 100$ periods, burn in 20 periods with $N = 10000$ number of households
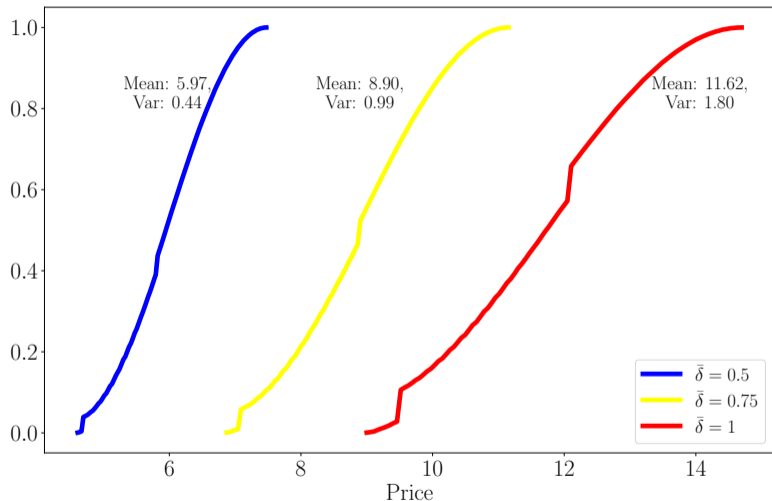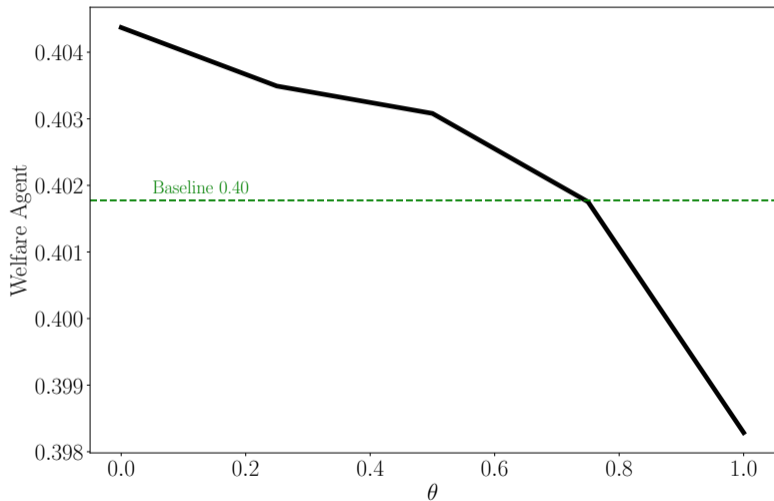
- Work with uniform $G \sim [0, \bar{\delta}]$ for upper bound $\bar{\delta} = 0.5, 0.75, 1$
- Changes in G are proportional to changes in price distribution
- It comes from linear flow utility

Baseline 11.62
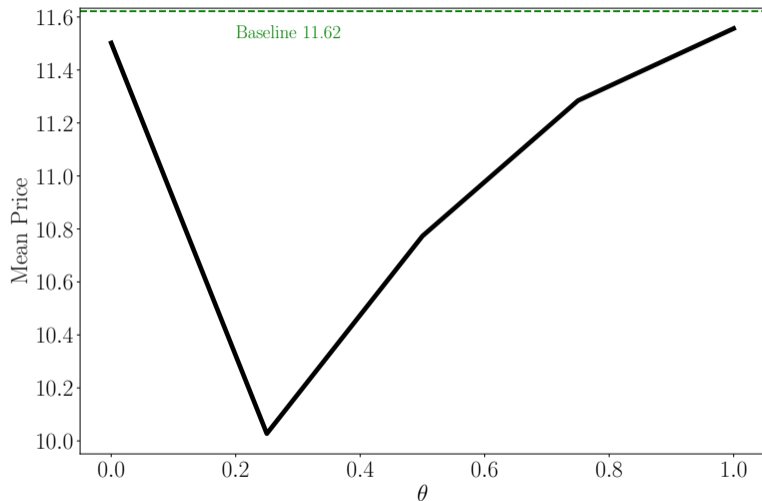
- Alternative price-setting mechanism: flipper observes the household's δ after meeting
- The surplus split via Nash Bargaining, with flipper weight $\theta \in (0, 1)$
- Prices are lower than in baseline

- Welfare of households is increasing in flipper's bargaining weight θ
- Model with $\theta = 1$ is different than baseline

EXPERIMENT: VARY MEETING RATE INSTEAD OF f

Comparative statics exerecise in OTC literature:
To study intermediation vary meeting rate λ

Experiment:
Consider change in λ equivalent to keep overall endogenous meeting rates with flipper $\lambda F(0), \lambda F(1)$ at the same level as in previous exercise.

Key Insight:
Increase in flippers welfare is unlikely big

Variable	% Change	
	Change in f	**Change in λ**
Mean Price	-1.51	-1.47
Var Price	-0.31	-3.54
Flipper Share	67.42	279.04
HH Trade	-7.95	-13.56
Total Trade	5.16	6.67
Return	0.99	1.39
Turnover	5.16	6.67
Welfare pc		
Total	-2.44	1.34
Households	-0.20	0.17
Homeowners	0.34	0.43
Non-Homeowners	3.02	2.49
Flipper	-23.43	147.15

POLICY EXPERIMENT: 9% SALES TAX ON FLIPPING

Pre-2011 Policy in Ireland:
9% tax on non-household main residence sales.

Experiment:
Compare no tax (baseline) to $\tau = 0.09$ (counterfactual).

Key Insight:
Most of flipping activity evaporates, leaving non-owners with substantial losses.

RESULTS

Table: Effects of Sales Tax on Flipping $\tau = 0.09$

Variable	% Change
Mean Price	0.71
Var Price	4.51
Flipper Share	-54.81
HH Trade	3.60
Total Trade	-3.30
Return	4.59
Turnover	-3.30
Welfare pc	
Total	-0.43
Households	-0.01
Homeowners	-0.22
Non-Homeowners	-1.88
Flipper	53.22