Competition and Incentives in Mortgage Markets: The Role of Brokers

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Charts and estimates use data provided by the UK Financial Conduct Authority.

Motivation

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  → Policy debate on how to regulate compensation of experts

- **Mortgage Markets and Mortgage Brokers:**
  - Brokers act as intermediaries between households and lenders
  - Popular choice among future homeowners

    → Brokers originate 50% of residential mortgages in the UK (FCA, 2018)

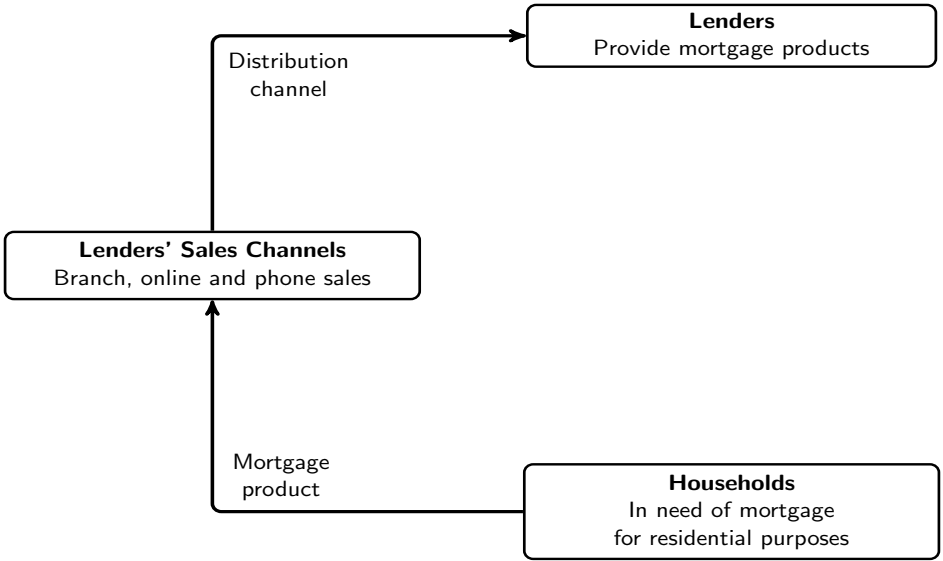
    → 33% in the US (CFPB, 2017), 53% in Australia (MFAA, 2018) and 55% in Canada (CMHC, 2018)

The Role of Mortgage Brokers

Lenders
Provide mortgage products

Households
In need of mortgage
for residential purposes

The Role of Mortgage Brokers



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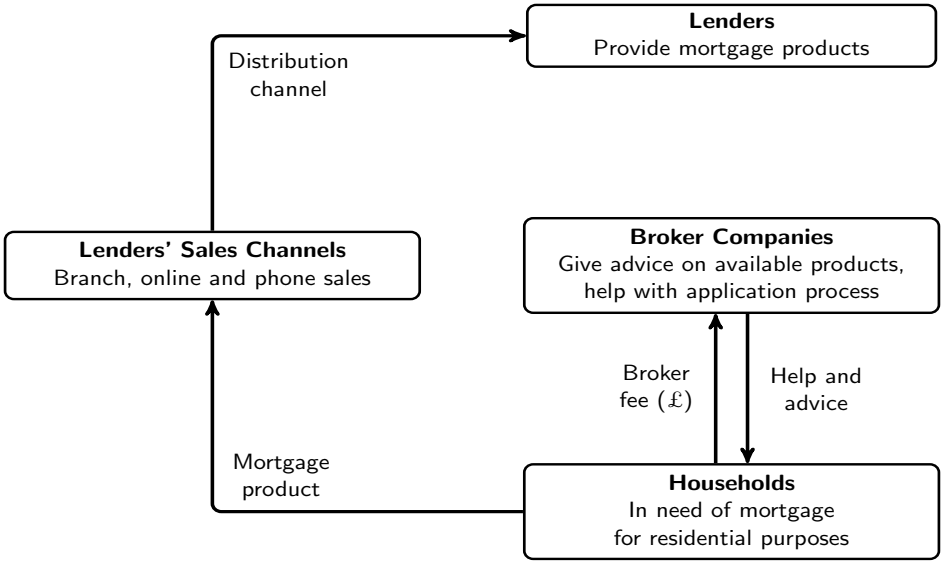

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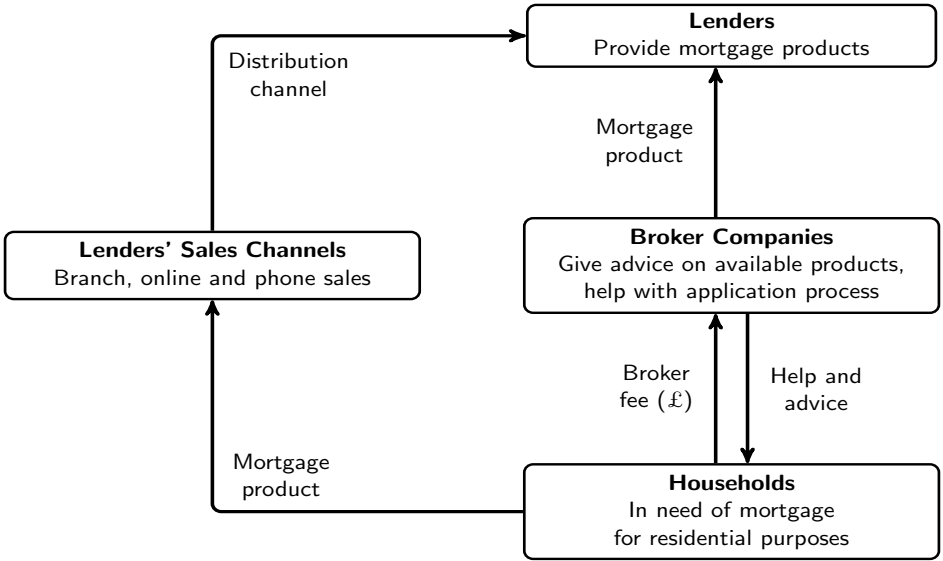

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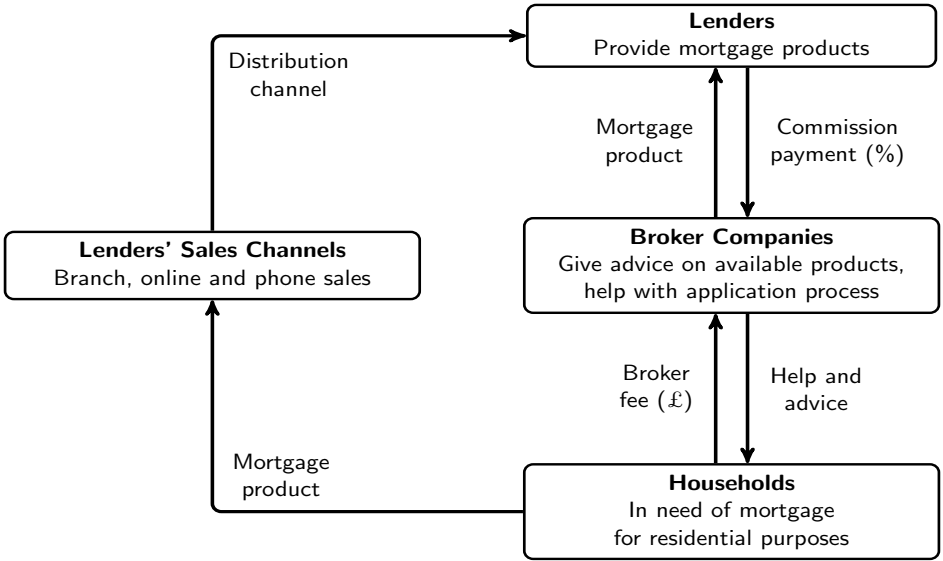

Trade-offs of Having Mortgage Brokers

(−) Potential **agency problem** between households and brokers

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(?) Recent **regulations** restricting commission payments

- US, Netherlands, Australia...
- Reduce the agency problem, but can have unintended consequences for upstream competition and efficiency

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  - → Universe of mortgage originations in UK (>2M obs)
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  2. Do brokers improve upstream competition and/or efficiency?
  3. What are the effects of regulations restricting broker compensation?

Related Literature

1. **Expert Advisors**
   - Ho and Pakes (2014), Egan, Matvos and Seru (2018), Egan (2017), Guiso, Pozzi,Tsoy, Gambacorta and Mistrulli (2018)
   - **Restriction on Upstream Payments**. Theory: Inderst and Ottaviani (2009, 2012), Martimort and Pouyet (2017). Empirical: Grennan, Myers, Swanson and Chatterji (2018).

     → Structural model with new micro data, and broker-lender remuneration variation

2. **Consumer choice in mortgage markets**
   - Campbell and Cocco (2003), Campbell (2012), Agarwal et al (2014), Best et al. (2015), De Fusco and Paciorek (2016), Benetton (2018), Hall and Woodward (2012)

     → Mortgage brokers and supply side responses to demand side

3. **Empirical Bargaining**
   - Crawford and Yurukoglu (2012), Grennan (2013), Gowrisankaran, Nevo and Town (2015), Ho and Lee (2017, 2018), Crawford, Lee and Yurukoglu (2018)

     → Financial markets, consumers can bypass intermediaries and directly access providers, new identification strategy.

DATA AND UK MORTGAGE MARKET

Data

- **Main dataset (FCA):** New loan-level dataset on the universe of prime residential mortgages originated in the UK in 2015Q1-2016Q2 (>2 million loans).
  - Mortgage characteristics ▸ Stats
    - Observed: interest, loan amount, lender, fees, rate type.
    - Unobserved: rejections, advertising, marginal costs,...
  - Borrower characteristics ▸ Stats
    - Observed: income, age, credit score, house value, postcode.
    - Unobserved: education, wealth, risk-aversion,...
  - Broker characteristics (if intermediated) ▸ Stats
    - Observed: fees, commissions, broker company.
    - Unobserved: individual brokers, advertising,...
- **Additional sources:**
  - Broker-lender contract agreements (FCA).
  - Branch network at the postcode level over time for all lenders (Experian's Goad and Shop*Point)

Specific to the UK Mortgage Market

- **Limited individual-based pricing**
  - Lender, maximum loan-to-value band and initial fixed period explain 94% of variation in interest rates

    ▸ Explained Variation ▸ Interest Rate Jumps

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- **Very concentrated lender market**
  - "The Big Six" account for more than 75% of originations Consolidation Timeline
  - ⇒ Recent entry in the market by "challenger banks" Entry Timeline
- **Also concentrated broker market**
  - Largest 20 broker companies >65% of brokered sales
  - CR4s for broker sales are on average 83% at the county level Map

UK Mortgage Brokers

	All Borrowers	First-Time Buyers	Home Movers	Internal Remortgagors	External Remortgagors
Broker-Originated	46%	72%	64%	11%	63%

- Households pay brokers a fee of £140, on average.
- Brokers get, on average, a commission of £720 from lenders (a rate of 0.41% of the loan)
  - Commission rates vary across broker-lender pairs. ▸ Commission Stats
  - Heterogeneity in broker-lender networks.

Motivating Evidence: What does the data tells us?

- Descriptive evidence suggests there is a trade-off.

  (−) Agency Problem?

  $\Rightarrow$ Higher commission, higher broker sales (cross-sectional and time-series).

  (+) Upstream Competition?

  $\Rightarrow$ Borrowers using brokers more likely to originate their mortgage with new, small banks.

  $\Rightarrow$ In counties where brokers enter, concentration ratios go down.

- Develop a model to quantify this trade-off and simulate possible regulation.

MODEL

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- Static equilibrium model.
- Three types of agents:
  - Households
  - Lenders
  - Brokers
- Face sequential decisions

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4. (Demand) Households choose a mortgage product.

Demand for Broker Services

- Household i observes its search cost, κ_i
  $\Rightarrow$ fixed cost associated with originating a mortgage
  $\Rightarrow$ heterogeneous and i.i.d. draws from a distribution F_κ^I
- **Direct channel** $\Rightarrow$ household incurs search cost κ_i
- **Broker channel** $\Rightarrow$ household gets matched to broker b with probability $\pi_{b(i)}$ and pays a fee of $f_{b(i)}$
- A household is indifferent if:

$$\underbrace{E_\epsilon\left[max\ V_i(D)|C_{iD}\right] - \hat{\kappa}_i}_{\text{Payoffs Direct Channel}} = \underbrace{\sum_{b=1}^{B} \pi_{b(i)} * \left(E_\epsilon\left[max\ V_i(b)|C_{ib}\right] - \alpha_i\ f_{b(i)}\right)}_{\text{Payoffs Broker Channel}}$$

Demand for Mortgage Products

- **Direct Sales:**

$$V^{D}_{ijlm} = \alpha_i \, r_{jlm} + X'_{jl} \, \beta_i + \xi_{jlm} + \lambda \, Branches_{ilm} + \varepsilon_{ijlm}$$

where:

- X_{jl} are observed product characteristics, and r_{jlm} are interest rates.
- ξ_{jlm} unobserved product characteristics, and ε_{ijlm} taste shock iid across mortgages and borrowers.

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$$V_{b(i)jlm} \;=\; (1-\theta_b) \left(\overbrace{\alpha_i \, r_{jlm} + X'_{jl} \, \beta_i + \xi_{jlm} + \epsilon_{ijlm}}^{\text{Household Utility } (V^{b}_{ijlm})} \right) + \theta_b \left(\overbrace{\delta c_{blm} + X'_{jl}\gamma + \zeta_{blm}}^{\text{Broker Utility } (W_{bjm})} \right)$$

where:

- X_{jl} are observed product characteristics, and r_{jlm} are interest rates.
- ξ_{jlm} unobserved product characteristics, and ε_{ijlm} taste shock iid across mortgages and borrowers.
- ζ_{blm} are broker-lender unobserved characteristics.

Lender Pricing

Lender's profits from direct sale:

$$\Pi^{l,D}_{ijm} \;=\; t_j\left(r_{jm} - mc^{D}_{jm}\right)$$

Lender's profits from broker sale:

$$\Pi^{l,b}_{ijm} \;=\; t_j\left(r_{jm} - mc^{b}_{jm}\right) - c_{lbm}$$

Expected profits:

$$\Pi^{l}_{im} = \underbrace{F_{\kappa}(\hat{\kappa}_{im}) * \sum_{j \in J_l}\left(s_{ijlm} * \Pi^{l,D}_{ijm}\right)}_{\text{Revenue from Direct Sales}}$$

$$+ \underbrace{\left[1 - F_{\kappa}(\hat{\kappa}_{im})\right] * \sum_{j \in J_l}\sum_{b=1}^{B}\left(\pi_{b(i)m} * s_{b(i)jlm} * \Pi^{l,b}_{ijm}\right)}_{\text{Revenue from Broker Sales}}$$

Lender-Broker Bargaining

- Every period, broker-lender pairs meet.
- They bargain á la Nash whether to form an agreement.
- If successful, then they set a commission (% of loan).
- If not successful, then commission is set to zero and broker cannot sell lender's products.
- All negotiations are simultaneous and separate.
  - Commissions set in other meetings, c_{-lb}, are not knwon but conjectured.

Lender-Broker Bargaining (cont.)

- In each bilateral meeting, c_{lb} maximizes bilateral Nash product:

$$NP^{lb}\left(c_{lb}|\boldsymbol{c}_{-lb}\right) = \left[\, GFT_L(b) \,\right]^{\beta_{lb}} \left[\, GFT_B(l) \,\right]^{1-\beta_{lb}}$$

$$\begin{aligned} s.t. \quad & GFT_L(b) \geq 0 \quad (PC\ lender) \\ & GFT_B(l) \geq 0 \quad (PC\ broker) \end{aligned}$$

- $GFT_L(b)$ and $GFT_B(l)$ are lender and broker gains from trade (agreement minus disagreement payoffs).
- β_{lb} is the bargaining power of lender l when negotiating with broker b.

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ESTIMATION AND IDENTIFICATION

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4. Bargaining parameters
   - Branch networks
   - Commission and link variation

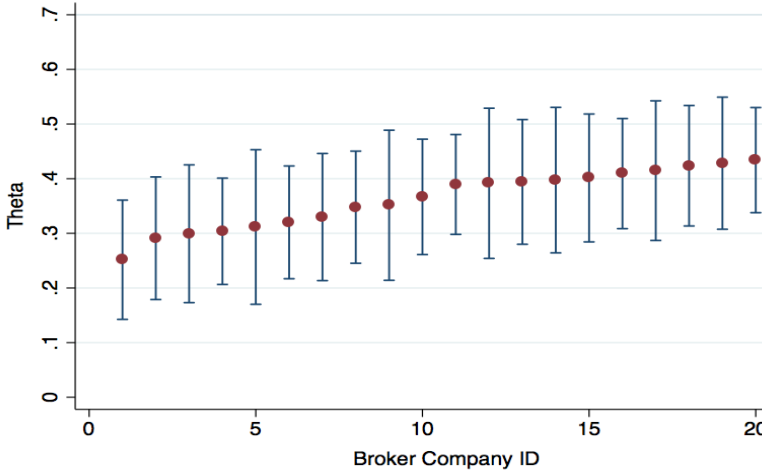
ESTIMATION RESULTS

Demand Estimates

	PARAMETERS					
	Interest Rate (α)	High LTV (ψ)	Branches (λ)	Distortion Broker ($\bar{\theta}$)	High LTV Broker ($\bar{\gamma}_{21}$)	2-Year Fixed Broker ($\bar{\gamma}_{22}$)
Estimate	-0.91	0.45	0.33	0.37	0.14	0.27
SE	0.39	0.10	0.09	0.11	0.02	0.08

▸ In-Sample Fit ▸ Out-of-Sample Fit ▸ Lender Fit ▸ Period Fit ▸ LTV Fit

Broker Distortion θ_b: No Benevolent Brokers

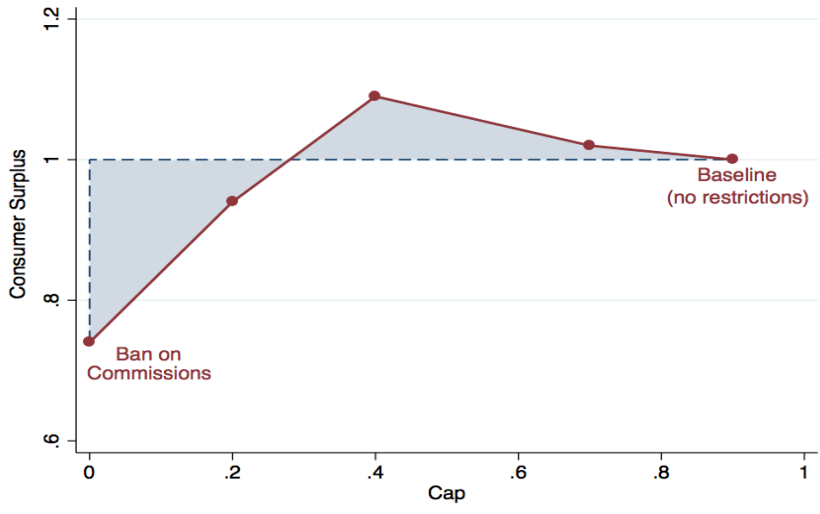


Estimates Results

- Search costs account for 20% of consumer surplus.
  ▸ Search Costs
- Marginal costs are 7% lower for broker sales.
  ▸ Marginal Costs
- Mark-ups are 35% lower for broker sales.
  ▸ Mark-Ups
- It is 46% more costly for brokers to originate mortgages with challenger banks.
  ▸ Broker-Lender FE
- Bargaining parameters reject take-it-or-leave-it offers. ▸ Bargaining Parameters

COUNTERFACTUAL:
REGULATING BROKER COMPENSATION

Restricting Commissions



▸ Mechanism ▸ Table Results ▸ Broker Fees Δ ▸ Homogeneous Commission

Mechanism: Ban on Commissions

Go back

A ban on commission payments:

$\rightarrow$ Reduces agency problem $(+)$

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Trade-off for brokers when including challenger banks:

→ Challengers offer on average cheaper products (+)

→ But, they are more costly to originate (−)

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3. Interest rates increase by 11% $(-)$

CONCLUSIONS

Conclusion and Policy Implications

- A ban on commissions can be detrimental for consumers in markets where:
  - → Search costs are high.
  - → Consumers can bypass intermediaries and access the good directly from providers.
  - → Providers have market power in the direct channel.
  - → Consumers can discipline brokers, e.g. reputation concerns, repeated sales.
- Important to account for supply-side reactions to regulation.

EXTRA SLIDES

Counterfactual: No Brokers

	Ban on Brokerage
Market Structure	
HHI (%Δ)	35%
Share Big Six (%Δ)	19%
Pass-Through	
Prices (%Δ)	24%
Marginal Cost (%Δ)	13%
Lender Profits (%Δ)	12%
Demand	
Share Direct (%Δ)	357%
Search Costs (%Δ)	156%
Consumer Surplus %Δ	-51%

Counterfactual: Mandatory Brokers

	Broker Mandatory
Market Structure	
HHI (%Δ)	-27%
Share Big Six (%Δ)	-17%
Pass-Through	
Prices (%Δ)	9%
Marginal Cost (%Δ)	-12%
Lender Profits (%Δ)	-20%
Commission Rates (%Δ)	42%
Demand	
Share Direct (%Δ)	-100%
Search Costs (%Δ)	-100%
Consumer Surplus (%Δ)	-6%

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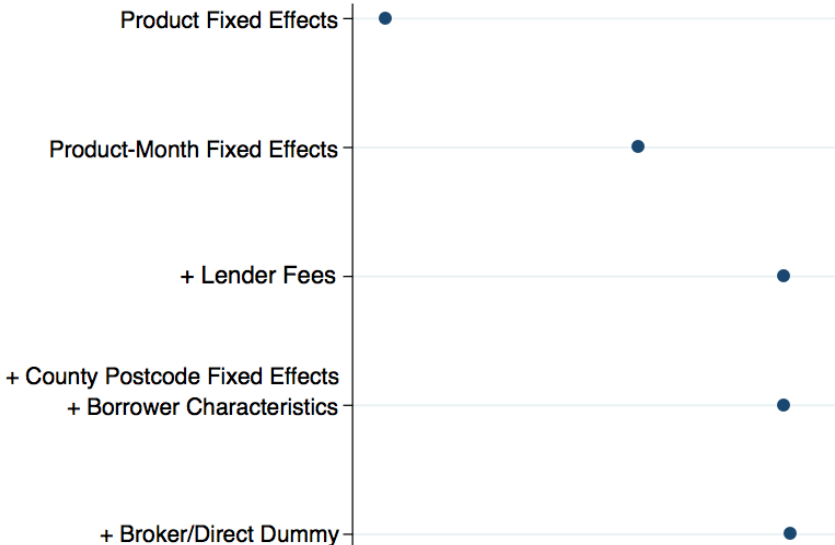
Explained Variation of Mortgage Rates

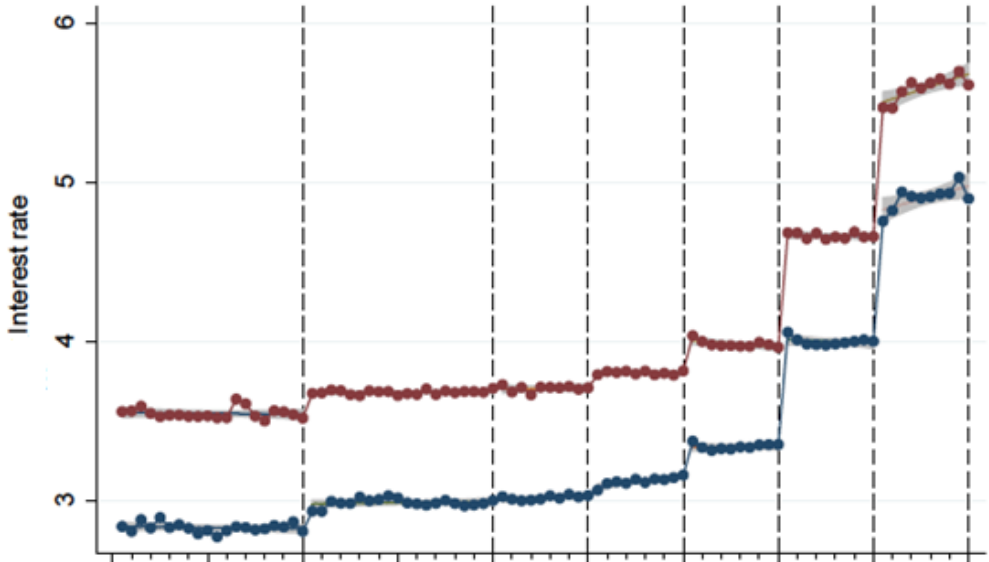
Go back

- Regressions of borrower-level interest rates on sets of dummies



Interest Jumps at Loan-To-Value

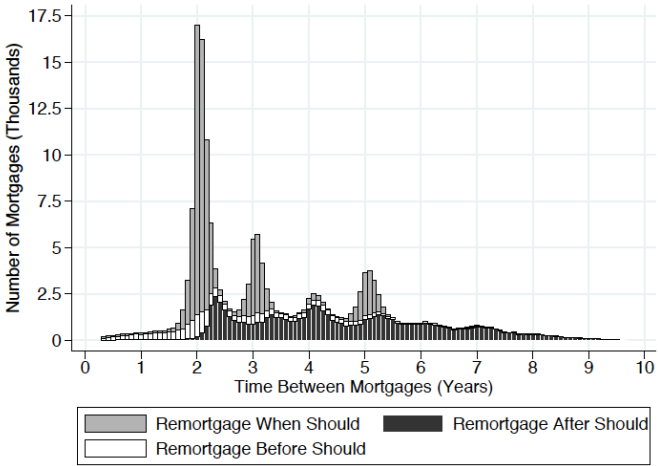
Go back 1 Go back 2



Remortgaging

Go back

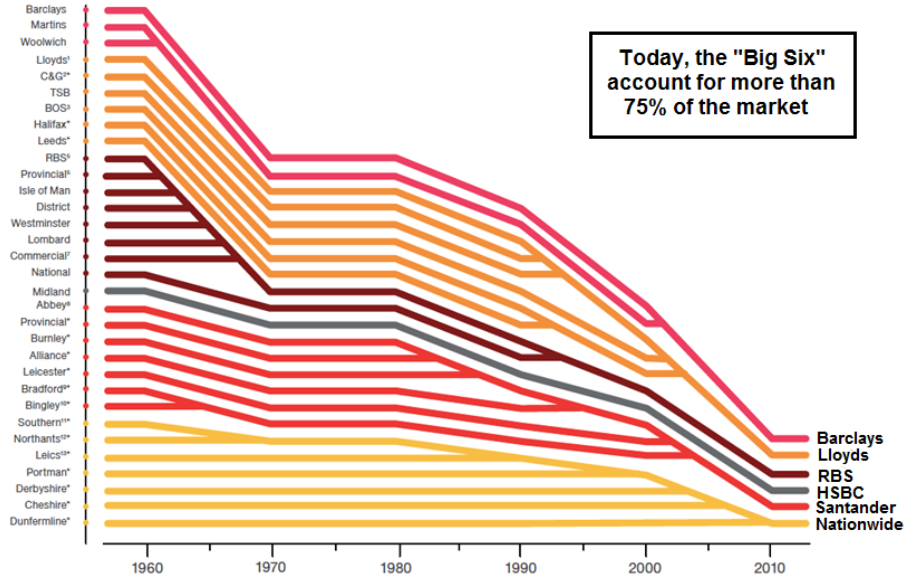
FIGURE A.1: REMORTGAGES HAPPEN WHEN THE RESET RATE KICKS IN



Source: Best, Cloyne, Ilzetzki and Kleven (2015)

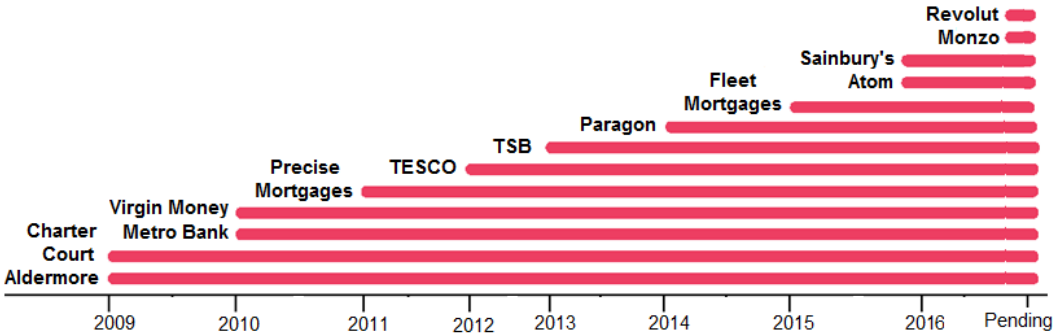
Consolidation of Major UK lenders (1960-2016)

Go back



Entrants Mortgage Market (2009-present, non-exhaustive)

Go back



Sample Statistics

Go Back

	N	Mean	SD	Min	Max
Panel A: Loan Characteristics					
Interest Rate (%)	2,236,025	2.57	0.79	1.26	6.2
Lender Fee (£)	2,236,025	467	631	0	2405
Loan Value (£1000)	2,236,025	159	129	49	903
Loan-to-Value (%)	2,236,025	60	23	15	98
Maturity (Years)	2,236,025	25	8	2	45
Initial Period (Years)	2,236,025	3.22	2.4	1	10
Panel B: Borrower Characteristics					
First-Time-Buyers	2,236,025	0.19	0.39	0	1
Home-Movers	2,236,025	0.23	0.42	0	1
Internal Remortgagors	2,236,025	0.22	0.41	0	1
External Remortgagors	2,236,025	0.36	0.48	0	1
Gross Income (£1000)	1,506,724	62.13	48.2	10	523
Age (Years)	1,506,724	38	9.6	18	85
Loan-to-Income	1,506,724	3.12	1.2	1.3	5.2
Credit Score	984,471	482	66.3	250	765

Broker-Lender Networks

Go Back1 Go Back2

Agreements between largest lenders and broker companies

	Mean	SD	Min	Max
Number of Brokers per Lender	13	7	0	23
Number of Lenders per Broker	8	3	3	14

Changes in agreements between 2015Q1-2016Q2

Lender-Broker Links Broken	11%
Lender-Broker Links Formed	18%

(2a) Do brokers react to changes in commissions?

Go Back

$$\textbf{Share}_{bjltc} = \alpha + \gamma \textbf{Commission}_{bjltc} + \epsilon_{bjltc}$$

- $Share_{bjltc}$: share product j from lender l has in broker b's sales portfolio in period t in county c
- $Commission_{bjltc}$: per-sale commission (% of loan) broker b receives from lender l in period t in county c

(2a) Do brokers react to changes in commissions?

Go Back

$$\textbf{Share}_{bjltc} = \alpha + \gamma \textbf{Commission}_{bjltc} + \delta_{jltc} + \epsilon_{bjltc}$$

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- δ_{jltc}: product-lender-time-county fixed effects

(2a) Do brokers react to changes in commissions?

Go Back

$$\textbf{Share}_{bjltc} = \alpha + \gamma \textbf{Commission}_{bjltc} + \delta_{jltc} + \mu_{btc} + \epsilon_{bjltc}$$

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- $Commission_{bjltc}$: per-sale commission (% of loan) broker b receives from lender l in period t in county c
- δ_{jltc}: product-lender-time-county fixed effects
- μ_{btc}: broker-time-county fixed effects

(2a) Do brokers react to changes in commissions?

Go Back

$$\boldsymbol{Share_{bjltc}} = \alpha + \gamma \boldsymbol{Commission_{bjltc}} + \delta_{jltc} + \mu_{btc} + \psi_{blc} + \boldsymbol{\epsilon_{bjltc}}$$

- $Share_{bjltc}$: share product j from lender l has in broker b's sales portfolio in period t in county c
- $Commission_{bjltc}$: per-sale commission (% of loan) broker b receives from lender l in period t in county c
- δ_{jltc}: product-lender-time-county fixed effects
- μ_{btc}: broker-time-county fixed effects
- ψ_{blc} : broker-lender-county fixed effects

(2a) Do brokers react to changes in commissions? Go Back

$$\textbf{\textit{Share}}_{bjltc} = \alpha + \gamma \textbf{\textit{Commission}}_{bjltc} + \delta_{jltc} + \mu_{btc} + \psi_{blc} + \epsilon_{bjltc}$$

- $Share_{bjltc}$: share product j from lender l has in broker b's sales portfolio in period t in county c
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- δ_{jltc}: product-lender-time-county fixed effects
- μ_{btc}: broker-time-county fixed effects
- ψ_{blc} : broker-lender-county fixed effects

$\Rightarrow$ Products with 13% (£100) higher commissions for a broker are associated with a 2% higher share in broker sales portfolio FE Regressions

County-level Regressions

Go Back

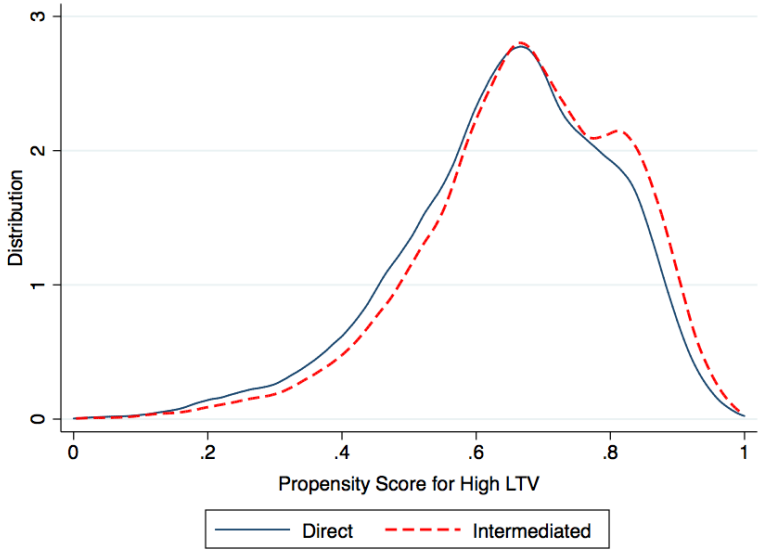
Dependent Variable: Product Market Share in Broker Sales (%)	All Borrowers (1)	Only FTBs (2)
Commission Rate (% loan)	0.163	0.271
	(0.097)	(0.180)
Product-Time-County FE	Yes	Yes
Broker-Time-County FE	Yes	Yes
Broker-Lender-County FE	Yes	Yes
Observations	327,750	153,416
Adjusted R-squared	0.953	0.937

Standard errors clustered at the broker and county level.

$\Rightarrow$ A product with a 13% increase in commission (£100) has a 2% higher share on broker's portfolio, on average.

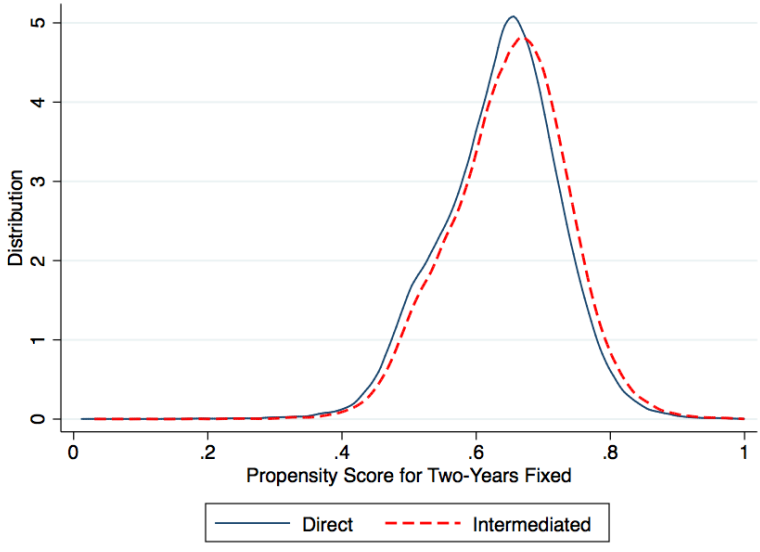
Propensity to choose high LTV products

Go Back



Propensity to choose shorter initial periods

Go Back



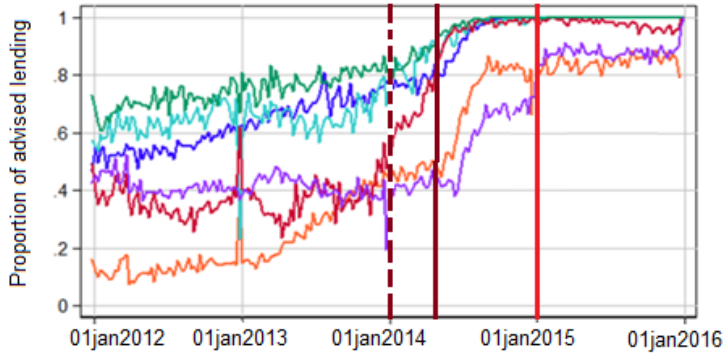
Probability of Choosing a Challenger

Go back

Dependent Variable: Challenger (0/1)	All Borrowers (exc. Internal Remortgagors) (1)	First-Time-Buyers Only (2)
Intermediated (0/1)	0.048***	0.067***
	(0.001)	(0.003)
Borrower Characteristics	Yes	Yes
Product Characteristics	Yes	Yes
Lender FE	Yes	Yes
County FE	Yes	Yes
Year-Month FE	Yes	Yes
Observations	489,352	159,486
R-squared	0.54	0.63

Direct Channel: % Advised Sales

Go back



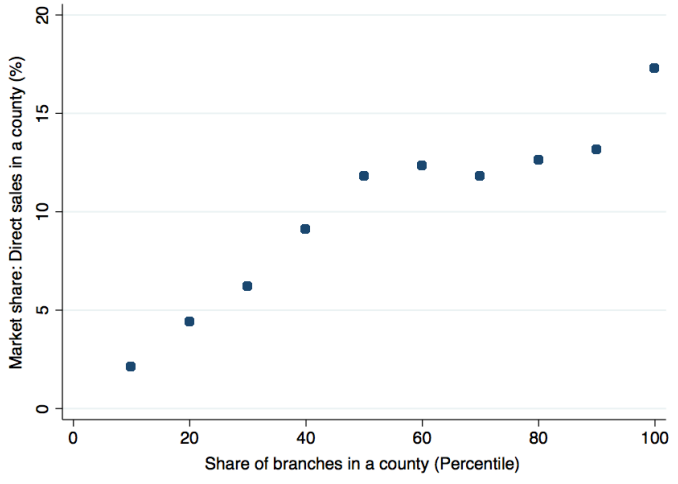
Counterfactural Choice Set

Go back

- **Characteristics approach**, given the large number of products (18K in 2015)
  - Product defined by lender, initial fixed period and maximum loan-to-value band.
- **Household-specific choice set**, based on matching on household characteristics and lenders' affordability criteria
  - Build household groups based on observable demographics (borrower type, income, age, region and quarter)
  - Counterfactual choice set: products purchased by households in the same group
  - Additional within-group restrictions:
    - Loan-to-income $<$ max. loan-to-income for given product
    - Credit score $>$ min. credit score for given product
- **Broker-specific choice set**, restricted to lenders with whom the broker has an agreement.

Branches Matter for Direct Sales

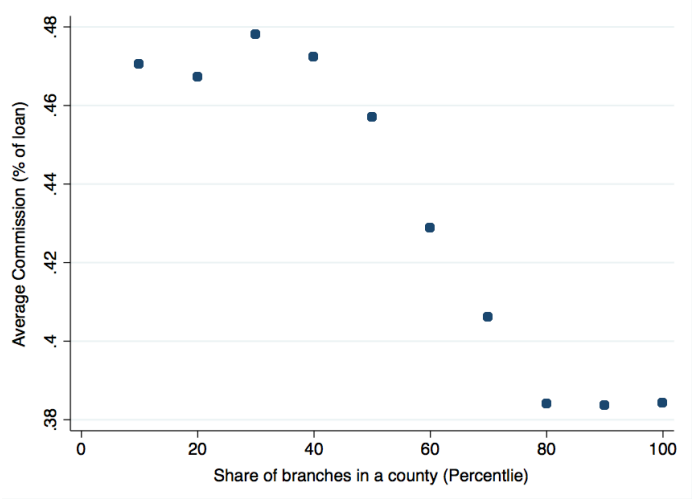
Go Back



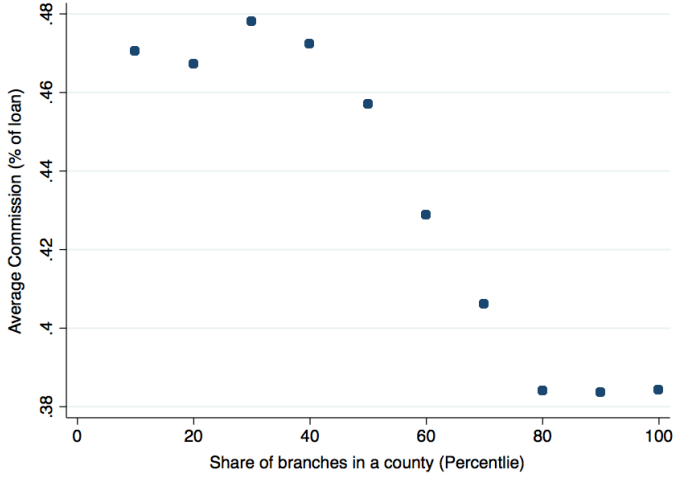
$\Rightarrow$ Even stronger after regulatory change in 2014.

Advice Requirements

Branches Compete with Brokers



Branches Compete with Brokers



⇒ **Model:**

- Lenders face different marginal costs for intermediated sales.
- Lender-broker relationship is both vertical and horizontal.

Identification Bargaining Parameters

Identification of outside options exploits that lenders and broker have both a vertical and a horizontal relationship.

- Branches compete with brokers $\rightarrow$ Affect outside option

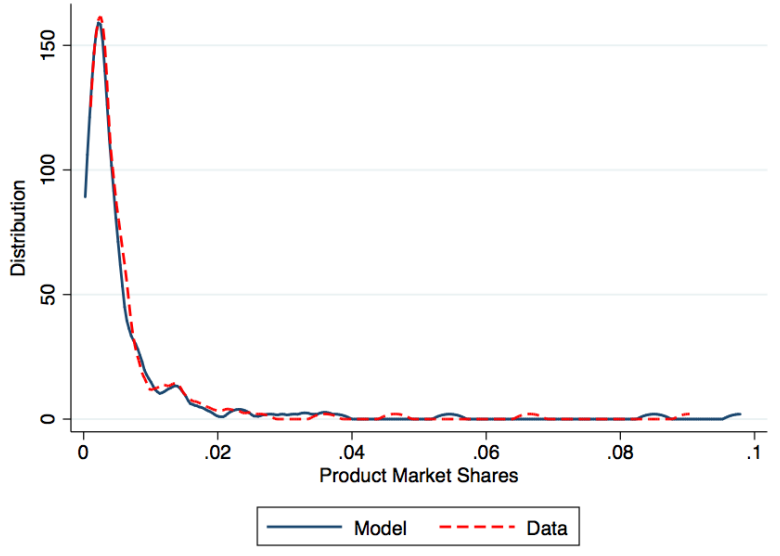
I exploit variation of bank branches across lenders over time.

- **Cross-sectional:** geographical variation of branch density across lenders
- **Time Series:** $\sim$17% branches closed during my sample.
  - Heterogeneous across lenders and regions

I also exploit that renegotiations of commissions (yearly) are less frequent than demand realizations in outside options (quarterly)

In-Sample Model Fit

Go back



Out-of-Sample Model Fit

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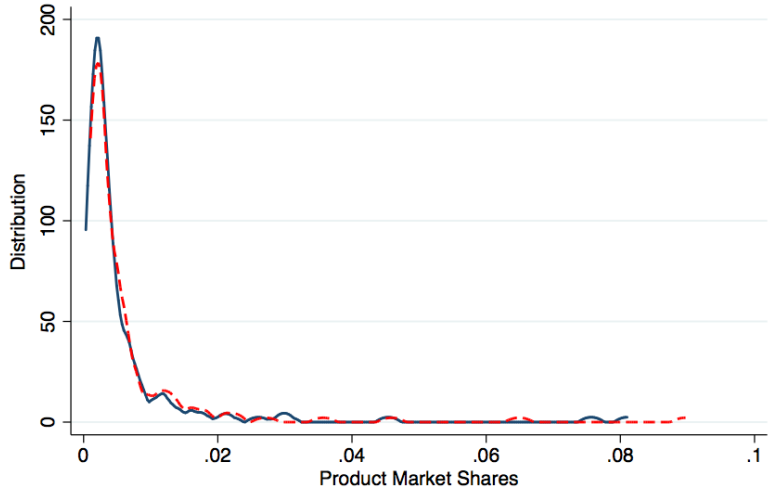

Lender Market Shares Fit

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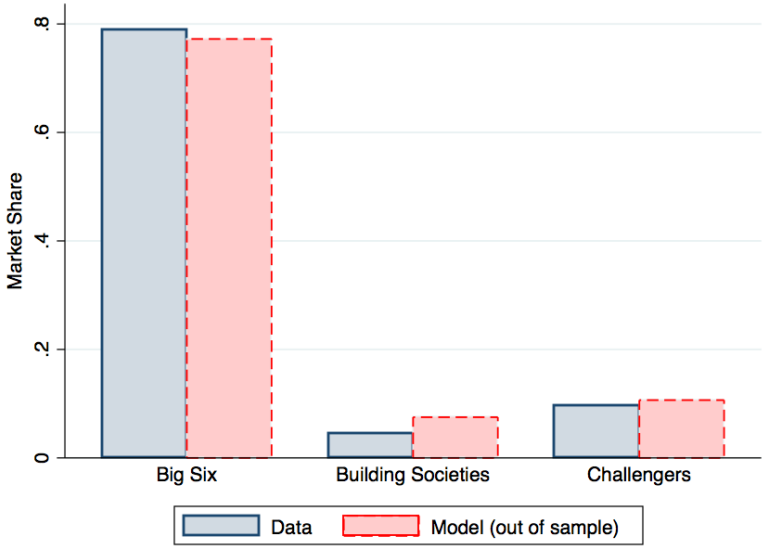

Initial Fixed Period Fit

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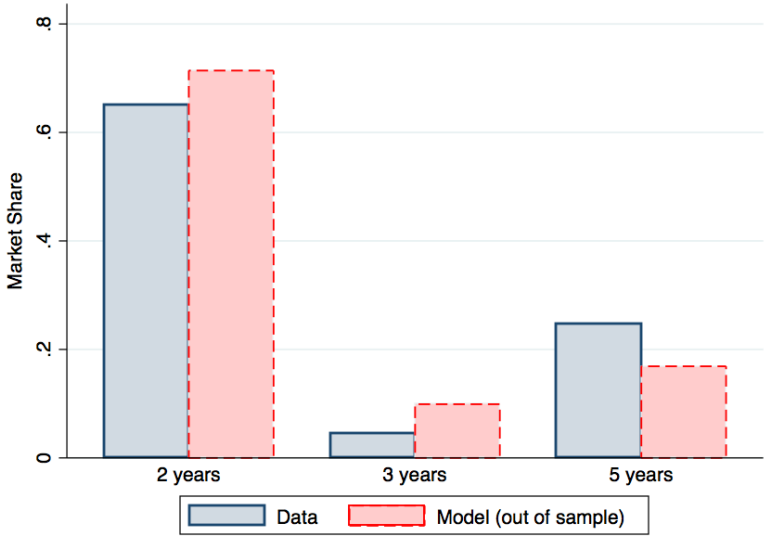

Loan-to-Value Bands Fit

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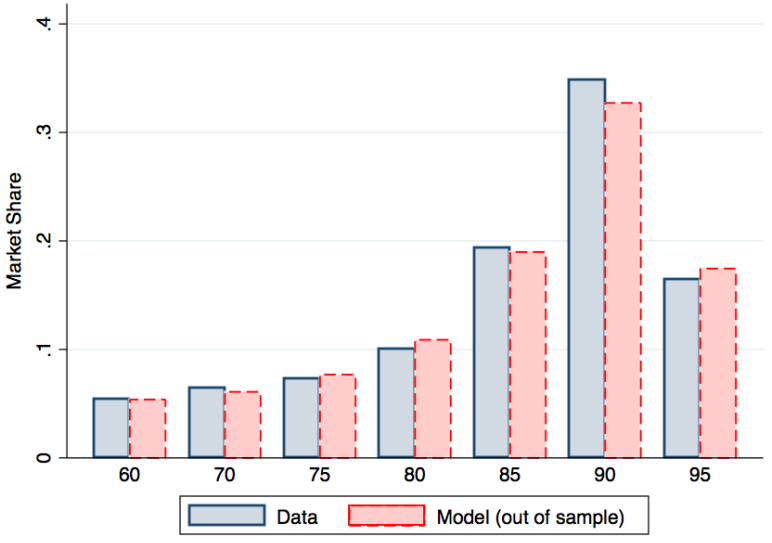


Search Cost Estimates

Go Back

	All Borrowers	London	Other Regions	Q1 Income	Q2 Income	Q3 Income	Q4 Income
Mean (μ)	3.3	2.9	4.1	3.1	3.3	3.9	5.0
Stand. Dev. (σ)	0.5	0.4	0.7	0.8	0.7	0.5	0.2

Search Distribution (Income) Search Distribution (Regions)

Marginal Costs

Go Back

	Total	Direct Sales	Intermediated Sales
All	**1.82**	**1.93**	**1.79**
Lender Type			
Big Six	1.80	1.95	1.71
Challengers	1.84	1.87	1.83
Small Banks	2.31	2.16	2.40
Building Societies	1.87	1.78	1.93
Initial Period			
2-Years	1.73	1.75	1.73
3-Years	1.94	2.02	1.89
5-Years	1.98	2.10	1.84
LTV Band			
LTV $\geq$ 80	1.60	1.79	1.50
LTV >80	2.03	2.04	2.03

Marginal Cost Distribution by Sales Channel

Mark-Ups

Go Back

	Total	Direct Sales	Intermediated Sales (Pre-Commission)	Intermediated Sales (Post-Commission)
All	**22%**	**28%**	**32%**	**18%**
Lender Type				
Big Six	22%	26%	36%	20%
Challengers	19%	30%	33%	17%
Small Banks	13%	27%	20%	7%
Building Societies	24%	36%	31%	16%
Initial Period				
2-Years	19%	29%	31%	15%
3-Years	24%	28%	34%	19%
5-Years	25%	27%	37%	23%
LTV Band				
LTV $\geq$ 80	23%	26%	38%	21%
LTV >80	17%	20%	20%	16%

Bargaining Parameters

Go Back

	β_{lb}	
	Large Brokers	Small Brokers
Big Six	0.72	0.41
Challengers	0.28	0.50
Building Societies	0.61	0.47
Small Banks	0.19	0.51

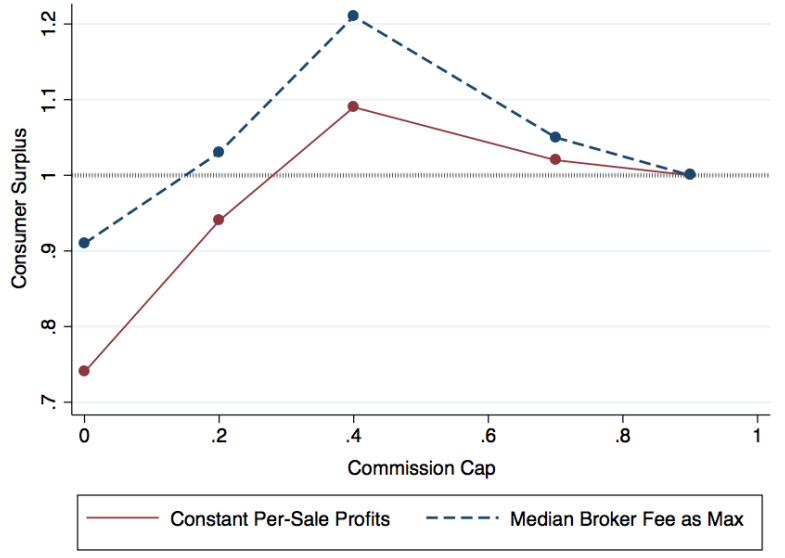
Counterfactual Estimates

Go back

	Ban on Commissions	Cap Median Commission
Market Structure		
HHI %Δ	21%	5%
Share Big Six %Δ	12%	3%
Pass-Through		
Prices %Δ	11%	-5%
Marginal Cost %Δ	9%	-1%
Lender Profits %Δ	7%	-2%
Demand		
Share Direct %Δ	115%	30%
Search Costs %Δ	83%	13%
Consumer Surplus %Δ	-26%	9%

Broker Fee Pass-Through

Go back

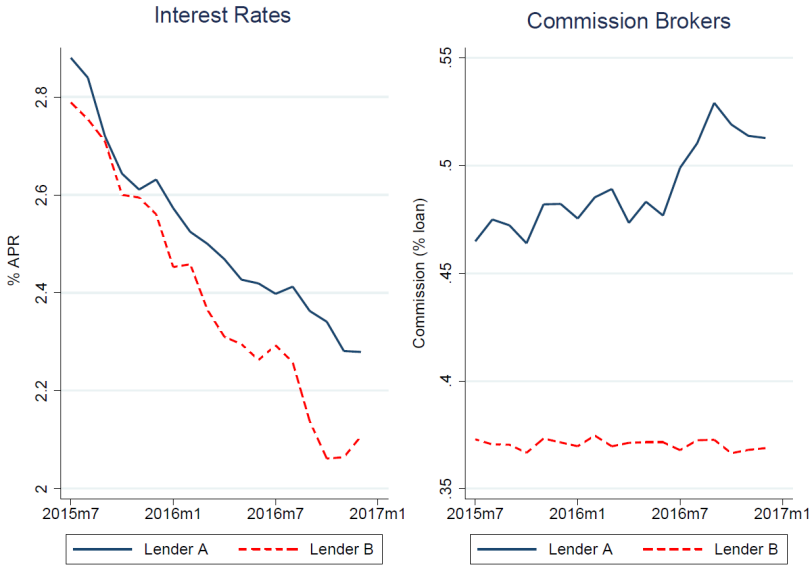


Counterfactual Estimates

Go back

	Fixed at 0.4%	Fixed at 0.8%
Market Structure		
HHI %Δ	-3%	12%
Share Big Six %Δ	-2%	8%
Pass-Through		
Prices %Δ	-1%	8%
Marginal Cost %Δ	-4%	5%
Lender Profits %Δ	0%	5%
Commission Rates %Δ	-17%	49%
Demand		
Share Direct %Δ	-1%	14%
Search Costs %Δ	-1%	19%
Consumer Surplus %Δ	2%	-11%

Example: 2-year fixed, 80% LTV for FTBs



Example: 2-year fixed, 80% LTV for FTBs

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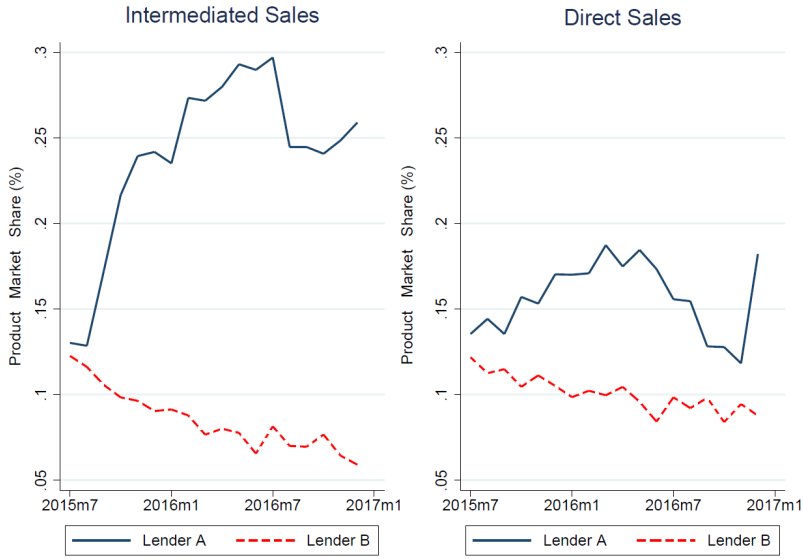

Differences in Outside Options (Intuition)

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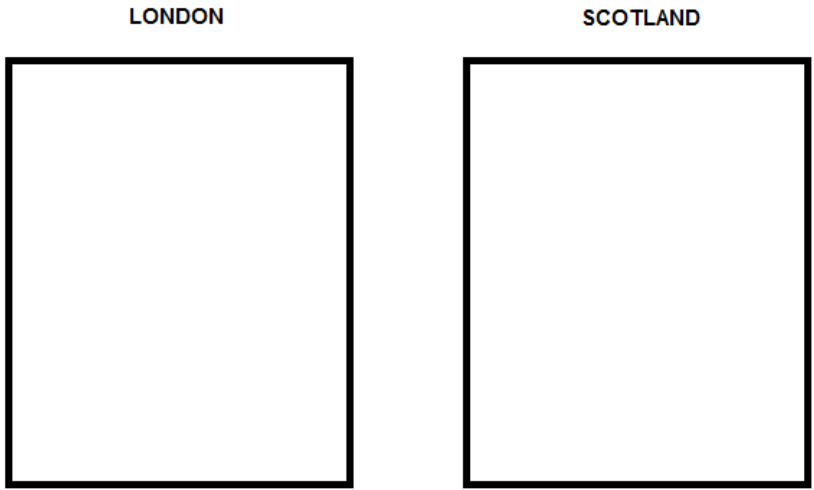

Differences in Outside Options (Intuition)

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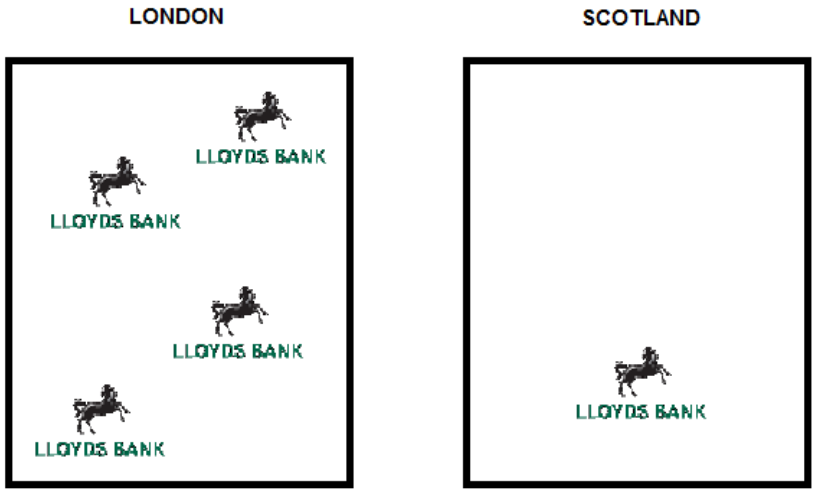

Differences in Outside Options (Intuition)

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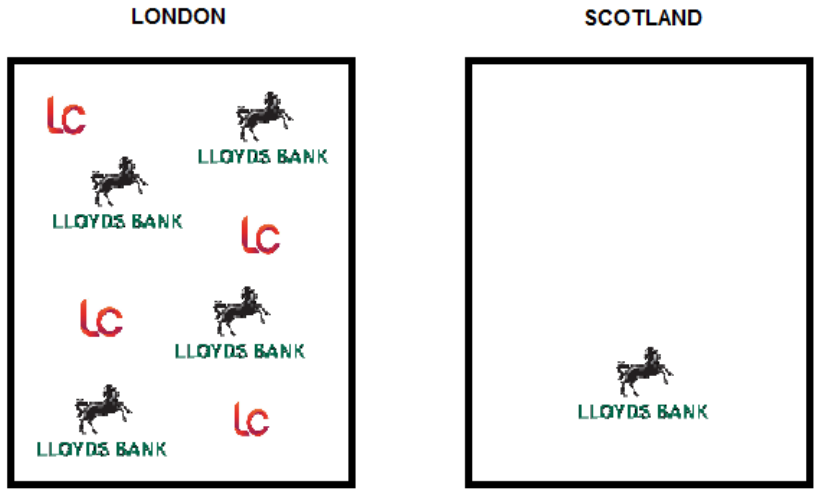

Differences in Outside Options (Intuition)

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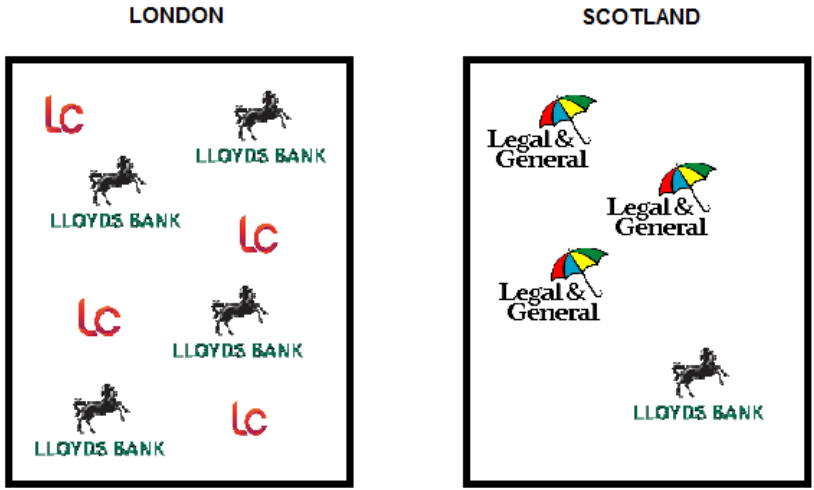

Changes in UK Branch Density (2014-2017)

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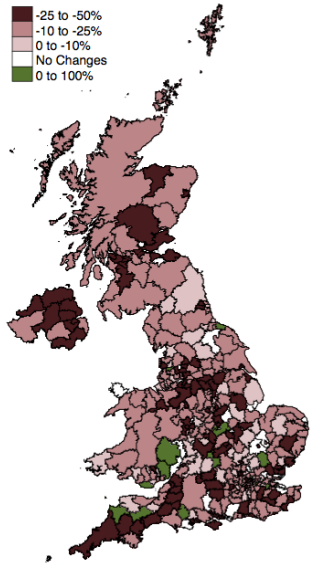

Total Branches by Lender

Go back