

Price Discrimination and Mortgage Choice

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Endless Summer Conference

August 2023

Views are solely those of the authors and so cannot be taken to represent those of the Bank of England.

What we find

- ① Most people face a daunting number of mortgages to choose from.
- ② On average, people don't pick particularly well, but cost implications small.
- ③ A small percentage (7%) leave a lot of money on the table.
 - High LTV & LTI customers → Young, first-time-buyers.
 - Bad menus → Expensive choices.
- ④ Menu-based price discrimination (rather than cost or risk) seems to best account for the patterns we find.

Literature

Data

Summary Stats

UK mortgage market

- Most mortgages: fixed rate period of 2, 3, or 5 years.
- Long period of floating rate.
- People roll over their mortgage multiple times.
- 5 components: initial period, initial rate, upfront fee, reset rate, maximum LTV.
- Customers face multi-product menus at multiple banks.

Choice Set

Evaluating choices

- ① Find all mortgages on offer at given LTV for given loan amount and initial payment period.
 - Both **within** the chosen bank, and **across** all 6 banks.
- ② Compute NPV of payment over first 7 years.
- ③ Rank NPVs.
- ④ Define baseline mortgage: 15th percentile of choice set.

Same results hold based on different time horizons and ranking based on **dominated mortgages**.

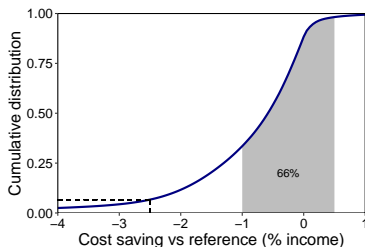
NPV calculations

Example

Within vs. Across Banks

How well do people pick?

	Choice set size	Pctile chosen
25 th pctile	46	27
Median	73	47
75 th pctile	101	70



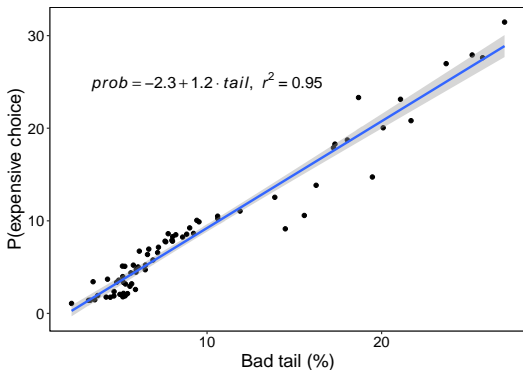
Expensive choice: costs $\geq 2.5\%$ of monthly net income. Within bank

Where do expensive choices come from?

Two aspects to an expensive choice:

- ① Quality of your choice: given your menu, did you pick well?
 - *choice* = percentile rank of choice you made.
- ② **Quality of choice set:** how many bad choices were on offer?
 - *bad tail* = % of expensive mortgages on offer.

Menu Quality and Expensive Choices



Menu quality key driver of expensive choices.

Probability of expensive choice

Menu variation

Within bank

Who chooses poorly?

	<i>Dependent variable:</i>	
	Expensive choice across MFX	MFX
Young	0.018*** (0.001)	0.005*** (0.0004)
Old	-0.031*** (0.001)	-0.006*** (0.001)
First-time buyer	0.005*** (0.001)	-0.005*** (0.0004)
Poor	0.003*** (0.001)	0.001** (0.0004)
Rich	-0.006*** (0.001)	-0.006*** (0.0004)
Bad tail		0.303*** (0.001)
Bank dummies	No	No
Product dummies	Yes	Yes
Pseudo R-squared	0.09	0.56
Mean dependent variable	0.067	0.067
Observations	883,459	883,459

Note:

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Young people and FTB are more likely to pick expensively.

→ These effects are driven by quality of the menu.

Within bank

Menu by LTI/LTV

Choice by LTI/LTV

Menu-based Price Discrimination

Suppose there are two types of customers:

- ① **Sophisticated** customers: go to all banks and pick the cheapest product available.
- ② **Randomizers**: walk into a random bank and pick a random option on the menu.

Menu design trade-off:

- ① Cheap options to entice sophisticated customers.
- ② Expensive offers to profit from the randomizers.

Offer menu with **price dispersion that is increasing in the fraction of randomizers**.

Menzio and Trachter (2018) set out a model in this spirit.

Menu-based Price Discrimination

Young, and first-time-buyers:

- **Constrained** - can't afford a bigger mortgage; may not qualify at other lenders.
- **Less likely to pick well** (Lusardi & Mitchell, 2011; Agarwal et al, 2009).

As a consequence, these customers are prone to picking expensive mortgages.

Conclusions

- ① People face a large number of choices.
- ② Most don't pick well, but cost implications small.
- ③ Small group face menu with large price dispersion - young, first-time-buyers - who thus make expensive choices.
- ④ Evidence consistent with banks using menu to price discriminate.

Literature

UK mortgage market

- Liu (2019); Iscenko (2020); Benetton (2020); Benetton, Gavazza & Surico (2022); Robles-Garcia (2020); Mysliwski & Rostom (2022).

Product choice and shopping

- Bhutta et al. (2021); Woodward & Hall (2012); Foà et al. (2019); Célérier & Vallée (2017); Agarwal et al (2016); Andersen et al (2020); Fisher et al. (2021); Keys et al. (2016); Allen et al. (2019); Allen & Li (2021).

Price dispersion

- Huge literature, recently Menzio & Trachter (2018); Kaplan & Menzio (2015); Kaplan et al (2017).

Data

Product Sales Database

- Data on universe of mortgages for 6 top UK banks
- 2009 - 2014
- Individual characteristics, loan details

Moneyfacts

- All mortgages on offer at time of take-out
- Compare what they picked with what they could have picked

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Summary Statistics

	Mean	Std. dev.	25 th pctile	Median	75 th pctile
<i>Demographics</i>					
Young (%)	36	48	0	0	100
Old (%)	11	31	0	0	0
First-time buyer (%)	40	49	0	0	100
Net income (£000s)	42	26	28	37	50
<i>Loan characteristics</i>					
Loan value (£000s)	157	90	100	136	190
House price (£000s)	201	119	125	172	242
Loan-to-value (%)	79	8	74	80	85
Loan-to-income ratio	3.2	0.9	2.6	3.2	3.8
<i>Prices</i>					
Fee (£000s)	0.66	0.57	0.10	0.76	1.00
Initial rate (%)	4.0	1.0	3.2	3.9	4.7
Reset rate (%)	4.1	0.4	4.0	4.0	4.2

The choice set

Virgin Money Fixed

	Rate	APRC	Max LTV	Product Fees	Initial Payment	Total Over 3 Years
	2.15% 2.15% Fixed to 01/03/2024 reverting to 4.34%	3.8%	65%	£995.00	£767.53	£28,946.08

Virgin Money Fixed

	Rate	APRC	Max LTV	Product Fees	Initial Payment	Total Over 3 Years
	2.39% 2.39% Fixed to 01/03/2024 reverting to 4.34%	3.8%	65%	£0.00	£788.71	£28,713.56

Coventry BS Fixed

	Rate	APRC	Max LTV	Product Fees	Initial Payment	Total Over 3 Years
	1.45% 1.45% Fixed to 31/12/2023 reverting to 3.99%	3.8%	65%	£999.00	£707.71	£26,796.56

Mortgages on offer via Moneyfacts for a given LTV

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Choice set example

- Customer borrows £150k; Deposit of £35k \rightarrow LTV = 77%.
- Choice set is all mortgage products where:
 - ① Max loan-to-value is 80%.
 - ② Max loan size is greater than £150k.

+ the customer's chosen mortgage if not in this set.
- In principle, customers qualify for all mortgages with higher max LTV, but these would represent expensive choices and relatively few customers (8%) do this.
- We restrict the choice set to focus on the menus banks target at particular customer groups, and run a number of robustness checks.

NPV calculation details

$$\text{NPV} = \text{fee} + \sum_{t=1}^{T_F} \frac{IP}{(1+i)^t} + \sum_{t=T_F+1}^{84} \frac{RP}{(1+i)^t}$$

where

- T_F is the fixation period;
- IP is the monthly payment in the initial period;
- RP is the monthly payment after the initial period; and
- the monthly discount rate i is computed using the 7yr LIBOR.

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Which comparison set: within or across?

They address different questions, and have different pros and cons.

Within

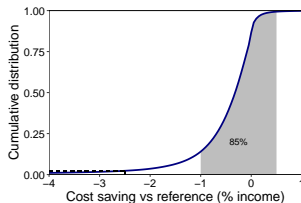
- Pros: Covers choices that were definitely available, and is informative about how banks price discriminate.
- Cons: Many people use brokers and/or comparison shop, so actual choice set is likely bigger.

Across

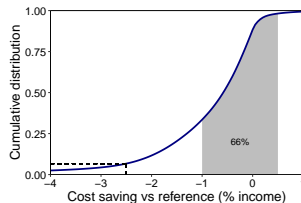
- Pros: Likely closer to the options people had and past work suggests even modest shopping leads to savings.
- Cons: Not sure if any particular person shopped or, if they did, what they saw. Indirectly related to price discrimination.

How well do people pick?

	Within		Across	
	Choice set size	Pctile chosen	Choice set size	Pctile chosen
25 th pctile	11	33	46	27
Median	16	53	73	47
75 th pctile	23	75	101	70

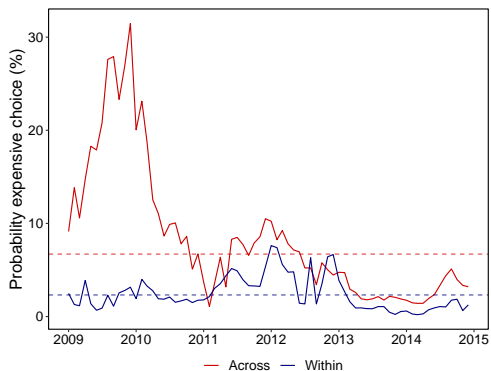


Cost savings within bank



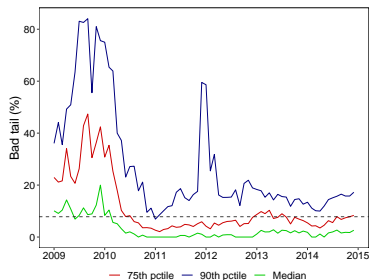
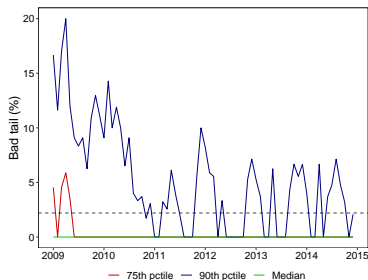
Cost savings across banks

Expensive choices



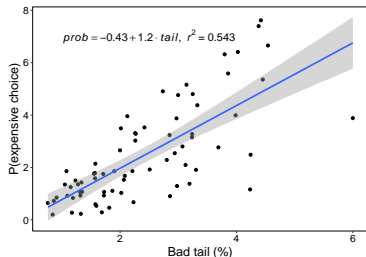
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Menu Variation

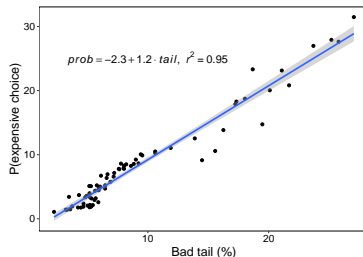


- Menu prevents the median person from picking expensive option.
- But sometimes the menu is filled with bad choices. [Back](#)

Menu Quality and Expensive Choices



Within bank



Across banks

- Plot probability of making expensive choice in a given month against mean size of bad tails in menu offerings.

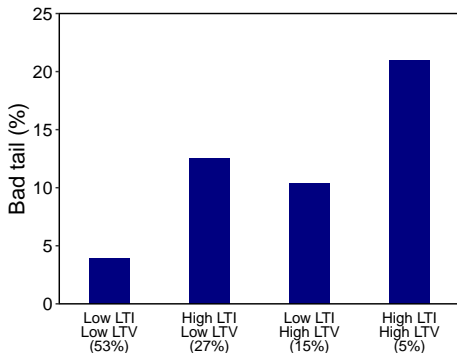
Who chooses poorly?

	<i>Dependent variable:</i>			
	Expensive choice within MFX	Expensive choice within MFX	Expensive choice across MFX	Expensive choice across MFX
Young	0.005*** (0.0004)	0.001*** (0.0002)	0.018*** (0.001)	0.005*** (0.0004)
Old	-0.008*** (0.0004)	-0.0003 (0.0003)	-0.031*** (0.001)	-0.006*** (0.001)
First-time buyer	0.006*** (0.0004)	-0.0003 (0.0002)	0.005*** (0.001)	-0.005*** (0.0004)
Poor	0.0005 (0.0004)	0.001*** (0.0002)	0.003*** (0.001)	0.001** (0.0004)
Rich	-0.0001 (0.0003)	-0.001*** (0.0002)	-0.006*** (0.001)	-0.006*** (0.0004)
Bad tail		0.117*** (0.001)		0.303*** (0.001)
Bank dummies	Yes	Yes	No	No
Product dummies	Yes	Yes	Yes	Yes
Pseudo R-squared	0.3	0.69	0.09	0.56
Mean dependent variable	0.023	0.023	0.067	0.067
Observations	894,901	894,901	883,459	883,459

Note:

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Who gets bad menus?



Note: High LTV=LTV > 85%. High LTI=LTI > 4

- Banks offer worse menus to high LTVs & LTI customers.
- Young & FTBs take high LTV & LTI mortgages → face worse menus

Who chooses high LTV and LTI mortgages?

	<i>Dependent variable:</i>		
	High LTV MFX	High LTI MFX	High LTV & LTI MFX
Young	0.078*** (0.001)	0.020*** (0.001)	0.016*** (0.001)
Old	-0.098*** (0.002)	-0.078*** (0.001)	-0.035*** (0.001)
First-time buyer	0.246*** (0.001)	0.018*** (0.001)	0.040*** (0.001)
Poor	-0.071*** (0.001)	0.070*** (0.001)	-0.001*** (0.001)
Rich	0.030*** (0.001)	-0.073*** (0.001)	-0.016*** (0.001)
Bank dummies	No	No	No
Product dummies	Yes	Yes	Yes
Pseudo R-squared	0.09	0.03	0.05
Mean dependent variable	0.32	0.2	0.05
Observations	883,459	883,459	883,459

Note:

*p<0.1; **p<0.05; ***p<0.01

- Young and first-time buyers choose high LTV and high LTI mortgages, and face worse menus.