Is competition a cure for confusion?

Evidence from the residential mortgage market

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Motivation

- Competition among sellers leads to lower prices
  Steuart(1767), Smith(1776),..., Stiglitz(1987), Schmalz(2017)
- Financial Sophistication also lowers transaction prices
  Lusardi and Mitchell(2014)
- Customary to think competition and sophistication is substitutive
  - Competition makes life safe for naive and uninformed
    Laibson and Yariv(2007), Carlin and Manso(2010)
  - Indexers need to know nothing about a firm before investing in it
- In this paper, we examine substitutability of competition and sophistication in mortgage market

Outline

1. Quantify the effect of unsophistication
   - How much more does an unsophisticated borrower pays for mortgage interest rate?

   Possible ways to reduce the cost of unsophistication
   - Education
   - Advice
   - Competition

2. Quantify the effect of exposure to competition
   - How rates differ for those who shop multiple lenders vs a single lender?

3. Analyze the substitutability between sophistication and competition
   - Does the rate gap between sophisticates and unsophisticates narrow in the presence of competition?

Preview of Findings

- Financial sophistication (measured as self-reported understanding of the mortgage process) is associated with lower rate spreads
  - Naifs pay 7.3 - 10.4 bp higher spread as compared to sophisticates
  - Amounts to an additional upfront expense of $\sim$ \$2000 over a thirty year period
- Competition (measured as the number of lenders seriously considered) reduces spreads on average
  - Borrower who considers multiple lenders pays 7 bp less
- Increased competition does not mitigate the cost of naivete
- Competition does not substitute for sophistication!

Literature Review

- Financial literacy leads to better mortgage outcomes
  - Houston(2012), Gerardi et al.(2013), Agarwal et al.(2014), An et al.(2015), Agarwal et al.(2017) etc.
- Shopping for mortgage and broker competition reduce cost of borrowing
  - Woodward and Hall(2012), Ambrose and Conklin(2014),Damen and Buyst(2017) etc.
- Bhutta et al.(2019) document
  - Document huge variability in interest rates paid by borrowers that can't be explained by the underwriting information
  - Mortgage rates decline with financial literacy (measured following Lusardi and Mitchell 2014), mortgage knowledge and shopping

Data: National Survey of Mortgage Originations (NSMO)

Tell us about your recent mortgage experience

A nationwide survey of mortgage borrowers throughout the United States

Learning directly from borrowers, like you, about your experiences will help us improve lending practices and the mortgage process for future borrowers.

The Federal Housing Finance Agency and the Consumer Financial Protection Bureau are working together on your behalf to improve the safety of the U.S. housing finance system and ensure all consumers have access to financial products and services.

1. Did you, in the last couple of years, take out or co-sign for a mortgage loan including any refinance or modification of an existing mortgage?

- ☐ Yes
- ☐ No → **Skip to 72 on page 7**

2. When did you take out this mortgage? If you took out or co-signed for more than one mortgage, please refer to your experience with the most recent refinance, modification or new mortgage.

_____ / _____
month year

3. Did we mail this survey to the address of the property you financed with this mortgage?

☐ Yes ☐ No

4. Who signed or co-signed for this mortgage? *Mark all that apply.*

- ☐ I signed
- ☐ Spouse/partner including a former spouse/partner
- ☐ Parents
- ☐ Children
- ☐ Other relatives
- ☐ Other (e.g. friend, business partner)

6. When you began the process of getting this mortgage, how concerned were you about qualifying for a mortgage?

☐ Very ☐ Somewhat ☐ Not at all

7. How firm an idea did you have about the mortgage you wanted?

☐ Firm idea ☐ Some idea ☐ Little idea

8. How much did you use each of the following sources to get information about mortgages or mortgage lenders?

	A Lot	A Little	Not At All
Your lender or mortgage broker	☐	☐	☐
Other lenders or brokers	☐	☐	☐
Real estate agents or builders	☐	☐	☐
Material in the mail	☐	☐	☐
Websites that provide information on getting a mortgage	☐	☐	☐
Newspaper/TV/Radio	☐	☐	☐
Friends/relatives/co-workers	☐	☐	☐
Bankers or financial planners	☐	☐	☐
Housing counselors	☐	☐	☐
Other (specify) _____	☐	☐	☐

Data: National Survey of Mortgage Originations (NSMO)

- Rich information about borrowers' experiences getting a mortgage, their perception of the market, shopping behavior
- Matched to administrative loan-level data (mortgage & borrower characteristics)
- Data covers the period January 2013 to December 2016
- Nationally representative, quarterly survey of residential mortgage
- Jointly managed by FHFA and CFPB
- Around 24,800 completed surveys
- Our analysis is restricted to conventional non-jumbo fixed-rate mortgages

Summary Statistics

Variable	Mean	Median	StDev	Min	Max
Main Variable:					
Rate Spread	0.36	0.26	0.56	-1.5	1.5
PMMS	3.65	3.64	0.48	2.38	4.58
Mortgage Term	24.66	30.00	7.50	0	40
Loan-to-Value	70.13	74.00	19.43	2	125
Credit Score 3.0	757	771	57	447	839
First Mortgage	0.14	0	0.35	0	1
College Graduate	0.66	1	0.47	0	1
USD 50k $<$ Income $<$ USD 100k	0.36	0	0.48	0	1
Income $>=$ USD 100k	0.49	0	0.50	0	1
Gender & Race:					
Female	0.46	0	0.50	0	1
Hispanic	0.07	0	0.25	0	1
Afro-American	0.04	0	0.19	0	1
Asian	0.06	0	0.24	0	1
Additional Characteristics:					
Age	50.33	51.00	13.59	19	99
Retired	0.13	0	0.34	0	1
Married	0.70	1	0.46	0	1
Veteran or Active Duty	0.09	0	0.28	0	1

Borrowers are happy with the interest rate they got!

X27B: Overall, how satisfied are you that the mortgage you got was the one with the... | Lowest interest rate for which you could qualify		
x27b	Count	Percent
1 : Very	17,999	72.4
2 : Somewhat	5,636	22.7
3 : Not at all	1,212	4.9

Measuring Ex-Ante Unsophistication

5. When you began the process of getting this mortgage, how familiar were you (and any co-signers) with each of the following?

	Very	Somewhat	Not At All
The mortgage interest rates available at that time	☐	☐	☐
The different types of mortgages available	☐	☐	☐
The mortgage process	☐	☐	☐
The down payment needed to qualify for a mortgage	☐	☐	☐
The income needed to qualify for a mortgage	☐	☐	☐
Your credit history or credit score	☐	☐	☐
The money needed at closing	☐	☐	☐

Measuring Ex-Ante Unsophistication

Based on respondents' self-assessment. Specifically,

> *x05: "When you began the process of getting this mortgage, how familiar were you (and any co-signers) with each of the following?"*

1. available interest rates
2. mortgage types
3. the mortgage process
4. the payment needed to qualify for a mortgage
5. the income needed to qualify for a mortgage
6. personal credit history and credit score
7. the money needed at closing

Respondents' answer on ordinal scale: "very", "somewhat", or "not at all"

Ex-Ante Unsophistication = 1 if they do not report "very" familiar for any of the 7 sub-questions

Measuring Ex-Post Unsophistication

Based on respondents' self-assessment. Specifically,

x56: "How well could you explain to someone the . . . "

1. process of taking out a mortgage
2. difference between fixed- and adjustable rate mortgages
3. difference between a prime and subprime loan
4. difference between interest rates and APRs
5. amortization of a loan
6. consequences of not making a mortgage payment

Respondents' answer on ordinal scale: "very", "somewhat", or "not at all"

Ex-Post Unsophistication = 1 if they do no report "very" familiar for any of the 6 sub-questions

Sophistication and Rate Spreads

$$\begin{aligned}\text{Rate spread}_i = \alpha + \beta\,&\text{Financial sophistication measure}_i \\ &+ \text{Borrower characteristics}_i + \text{Origination year-month fixed effects} \\ &+ \text{Loan term fixed effects} + \text{2-Digit credit score fixed effects} \\ &+ \text{Loan-to-value fixed effects} + \epsilon_i\end{aligned} \tag{1}$$

- i indexes a mortgage in the survey
- *Rate spread*$_i$: interest rate spread at origination (in %)

  difference between the mortgage interest rate and Freddie Mac's Primary Mortgage Market Survey rate
- Public NSMO file winsorizes rate spreads at -1.5 and 1.5 %
- We estimate all specifications using a Tobit model
- Borrower Characteristics Details
- Standard errors are clustered at origination month-year level

Financial Sophistication and the Mortgage Rate Spread

Rate Spread	1	2	3	4
Ex-Ante Unsophistication	0.073***			
	(0.015)			
Ex-Post Unsophistication				
Ex-Ante×Ex-Post Unsophistication				
Additional Controls	Yes			
Fixed Effects	Yes			
Cluster	Yr-Mth			
N	16824			
Pseudo R^2	.056			

Standard errors clustered by origination-year-month are in parentheses.
Significance levels: *** p<0.01, ** p<0.05, * p<0.1

Financial Sophistication and the Mortgage Rate Spread

Rate Spread	1	2	3	4
Ex-Ante Unsophistication	0.073***			
	(0.015)			
Ex-Post Unsophistication		0.104***		
		(0.014)		
Ex-Ante×Ex-Post Unsophistication				
Additional Controls	Yes	Yes		
Fixed Effects	Yes	Yes		
Cluster	Yr-Mth	Yr-Mth		
N	16824	16824		
Pseudo R^2	.056	.057		

Standard errors clustered by origination-year-month are in parentheses.
Significance levels: *** p<0.01, ** p<0.05, * p<0.1

Financial Sophistication and the Mortgage Rate Spread

Rate Spread	1	2	3	4
Ex-Ante Unsophistication	0.073***		0.048***	
	(0.015)		(0.015)	
Ex-Post Unsophistication		0.104***	0.096***	
		(0.014)	(0.014)	
Ex-Ante×Ex-Post Unsophistication				
Additional Controls	Yes	Yes	Yes	
Fixed Effects	Yes	Yes	Yes	
Cluster	Yr-Mth	Yr-Mth	Yr-Mth	
N	16824	16824	16824	
Pseudo R^2	.056	.057	.058	

Standard errors clustered by origination-year-month are in parentheses.
Significance levels: *** p<0.01, ** p<0.05, * p<0.1

Financial Sophistication and the Mortgage Rate Spread

Rate Spread	1	2	3	4
Ex-Ante Unsophistication	0.073***		0.048***	0.075***
	(0.015)		(0.015)	(0.019)
Ex-Post Unsophistication		0.104***	0.096***	0.109***
		(0.014)	(0.014)	(0.016)
Ex-Ante×Ex-Post Unsophistication				-0.070**
				(0.034)
Additional Controls	Yes	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes	Yes
Cluster	Yr-Mth	Yr-Mth	Yr-Mth	Yr-Mth
N	16824	16824	16824	16824
Pseudo R^2	.056	.057	.058	.058

Standard errors clustered by origination-year-month are in parentheses.
Significance levels: *** p<0.01, ** p<0.05, * p<0.1

Role of Learning

- We focus on the question which is repeated in the ex-ante and ex-post array

  x05c: "When you began the process of getting this mortgage, how familiar were you (and any co-signers) with the mortgage process?"

  x56a: "How well could you explain to someone the process of taking out a mortgage?"

- Based on how participants' knowledge has evolved, we assign them into one of the four categories:
  1. Never familiar
  2. Not familiar to familiar
  3. Familiar to not familiar
  4. Always familiar

- Who learns during the process? Details
  - borrowers with college education, first time home buyers, and middle-to-high income borrowers are more likely to learn

Learning and the Mortgage Rate Spread

Rate Spread	1
Never Familiar	0.088***
	(0.012)
Familiar to Not Familiar	0.070***
	(0.013)
Not Familiar to Familiar	-0.002
	(0.018)
Sought Advice	–
Credit Score	–
Additional Controls	Yes
Fixed Effects	Yes
Cluster	Year-Month
N	16824
Pseudo R^2	.058

Standard errors clustered by origination-year-month are in parentheses.
Significance levels: *** p<0.01, ** p<0.05, * p<0.1

Learning and the Mortgage Rate Spread

Rate Spread	1	2	3
Never Familiar	0.088***	0.081***	0.096***
	(0.012)	(0.017)	(0.017)
Familiar to Not Familiar	0.070***	0.058***	0.083***
	(0.013)	(0.022)	(0.018)
Not Familiar to Familiar	-0.002	-0.008	0.009
	(0.018)	(0.024)	(0.024)
Sought Advice	–	Yes	No
Credit Score	–	–	–
Additional Controls	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes
Cluster	Year-Month	Year-Month	Year-Month
N	16824	8501	8323
Pseudo R^2	.058	.064	.073

Standard errors clustered by origination-year-month are in parentheses.
Significance levels: *** p<0.01, ** p<0.05, * p<0.1

Learning and the Mortgage Rate Spread

Rate Spread	1	4	5
Never Familiar	0.088***	0.068***	0.112***
	(0.012)	(0.015)	(0.019)
Familiar to Not Familiar	0.070***	0.069***	0.063***
	(0.013)	(0.019)	(0.019)
Not Familiar to Familiar	-0.002	-0.010	0.008
	(0.018)	(0.024)	(0.025)
Sought Advice	–	–	–
Credit Score	–	>756	<=756
Additional Controls	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes
Cluster	Year-Month	Year-Month	Year-Month
N	16824	9883	6941
Pseudo R^2	.058	.055	.062

Standard errors clustered by origination-year-month are in parentheses.
Significance levels: *** p<0.01, ** p<0.05, * p<0.1

Sophistication and Rate Spread: Risk-Based Explanations

- Confounding question:

  Whether the influence of unsophistication on rates simply reflects an increase in risk factor associated with unsophistication

- Two possible risk factors:

  1. Probability of default Details
     - Results hold when forward looking changes in credit scores are included
  2. Probability of prepayment
     - No statistical difference between probability of loan termination between sophisticated and naifs

Financial Sophistication and Rate Spread: Robustness

- Limitations of our data set:
  1. Rate spread is winsorized at -1.5% and +1.5%
     - FHFA re-ran our specification on full sample, results hold Details
  2. Geographic location of the borrower is not available in the public files
     - FHFA re-ran our regression including geographic fixed effects, results hold Details
  3. No information on discount points/lender credits
     - Results hold for samples where they are unlikely to pay points Details
- If sophistication is associated with the ability to add a co-borrower when beneficial
  - Results hold when spouse credit score is included Details
- Wider set of fixed effects Details

Measuring Competition

- Extent to which borrowers are exposed to competition among lenders for their business Details

  x11: "How many different lenders/mortgage brokers did you seriously consider before choosing where to apply for this mortgage?"

- Thought Experiment: Randomly assign borrowers into one of the two groups
  1. Group 1
     - Each borrower is matched to a single lender
     - The lender gives the borrower a take it or leave it offer
  2. Group 2
     - Each borrower is matched to two lenders
     - The two lenders compete for business - as the borrower accepts at most one of the two offers

  However, the real world departs from our thought experiment!

  Illustrative Model

Effect of Competition on Rate Spreads

$$\begin{aligned}\text{Rate spread}_i = \alpha &+ \beta\,\text{Competition}_i + \gamma\,\text{Ex-Ante Unsophistication}_i \\ &+ \delta\,\text{Ex-Post Unsophistication}_i + \text{Borrower characteristics}_i \\ &+ \text{Origination year-month fixed effects} + \text{Loan term fixed effects} \\ &+ \text{2-Digit credit score fixed effects} \\ &+ \text{Loan-to-value fixed effects} + \epsilon_i\end{aligned} \tag{2}$$

Effect of Competition on Rate Spreads

Rate Spread	1	2	3	4	5
Competition	-0.063***				
	(0.011)				
Ex-Ante Unsophistication	0.045***				
	(0.016)				
Ex-Post Unsophistication	0.091***				
	(0.014)				
Competition Measures:					
Metro Area	No				
Consider >1 Lenders	Yes				
Concerned/Turned Down	–				
Seek Lower Rate	–				
Additional Controls	Yes				
Fixed Effects	Yes				
Cluster	Yr-Mth				
N	16824				
Pseudo R^2	.059				

Standard errors clustered by origination-year-month are in parentheses.
Significance levels: *** p<0.01, ** p<0.05, * p<0.1

Effect of Competition on Rate Spreads

Rate Spread	1	2	3	4	5
Competition	-0.063***	-0.068***			
	(0.011)	(0.011)			
Ex-Ante Unsophistication	0.045***	0.048***			
	(0.016)	(0.015)			
Ex-Post Unsophistication	0.091***	0.095***			
	(0.014)	(0.014)			
Competition Measures:					
Metro Area	No	No			
Consider >1 Lenders	Yes	Yes			
Concerned/Turned Down	–	–			
Seek Lower Rate	–	Yes			
Additional Controls	Yes	Yes			
Fixed Effects	Yes	Yes			
Cluster	Yr-Mth	Yr-Mth			
N	16824	16824			
Pseudo R^2	.059	.059			

Standard errors clustered by origination-year-month are in parentheses.
Significance levels: *** p<0.01, ** p<0.05, * p<0.1

Effect of Competition on Rate Spreads

Rate Spread	1	2	3	4	5
Competition	-0.063***	-0.068***	0.011		
	(0.011)	(0.011)	(0.021)		
Ex-Ante Unsophistication	0.045***	0.048***	0.047***		
	(0.016)	(0.015)	(0.015)		
Ex-Post Unsophistication	0.091***	0.095***	0.096***		
	(0.014)	(0.014)	(0.014)		
Competition Measures:					
Metro Area	No	No	No		
Consider >1 Lenders	Yes	Yes	Yes		
Concerned/Turned Down	–	–	Yes		
Seek Lower Rate	–	Yes	–		
Additional Controls	Yes	Yes	Yes		
Fixed Effects	Yes	Yes	Yes		
Cluster	Yr-Mth	Yr-Mth	Yr-Mth		
N	16824	16824	16824		
Pseudo R^2	.059	.059	.058		

Standard errors clustered by origination-year-month are in parentheses.
Significance levels: *** p<0.01, ** p<0.05, * p<0.1

Effect of Competition on Rate Spreads

Rate Spread	1	2	3	4	5
Competition	-0.063***			-0.038***	
	(0.011)			(0.011)	
Ex-Ante Unsophistication	0.045***			0.047***	
	(0.016)			(0.015)	
Ex-Post Unsophistication	0.091***			0.095***	
	(0.014)			(0.014)	
Competition Measures:					
Metro Area	No			Yes	
Consider >1 Lenders	Yes			No	
Concerned/Turned Down	–			–	
Seek Lower Rate	–			–	
Additional Controls	Yes			Yes	
Fixed Effects	Yes			Yes	
Cluster	Yr-Mth			Yr-Mth	
N	16824			16824	
Pseudo R^2	.059			.058	

Standard errors clustered by origination-year-month are in parentheses.
Significance levels: *** p<0.01, ** p<0.05, * p<0.1

Effect of Competition on Rate Spreads

Rate Spread	1	2	3	4	5
Competition	-0.063***			-0.038***	-0.070***
	(0.011)			(0.011)	(0.011)
Ex-Ante Unsophistication	0.045***			0.047***	0.045***
	(0.016)			(0.015)	(0.015)
Ex-Post Unsophistication	0.091***			0.095***	0.091***
	(0.014)			(0.014)	(0.014)
Competition Measures:					
Metro Area	No			Yes	Yes
Consider >1 Lenders	Yes			No	Yes
Concerned/Turned Down	–			–	–
Seek Lower Rate	–			–	Yes
Additional Controls	Yes			Yes	Yes
Fixed Effects	Yes			Yes	Yes
Cluster	Yr-Mth			Yr-Mth	Yr-Mth
N	16824			16824	16824
Pseudo R^2	.059			.058	.059

Standard errors clustered by origination-year-month are in parentheses.
Significance levels: *** p<0.01, ** p<0.05, * p<0.1

Substitutability of Competition and Sophistication

$$\begin{aligned}\text{Rate spread}_i = \alpha &+ \beta\,\text{Unsophistication}_i + \gamma\,\text{Competition}_i \\ &+ \delta\,\text{Competition} \times \text{Unsophistication}_i \\ &+ \text{Borrower characteristics}_i \\ &+ \text{Origination year-month fixed effects} \\ &+ \text{Loan term fixed effects} + \text{2-Digit credit score fixed effects} \\ &+ \text{Loan-to-value fixed effects} + \epsilon_i\end{aligned} \tag{3}$$

Substitutability of Competition and Sophistication

Rate Spread	1
Unsophistication	0.097***
	(0.014)
Competition	-0.074***
	(0.012)
× Unsophistication	0.025
	(0.032)
Competition Measures:	
Metro Area	No
Consider > 1 Lenders	Yes
Seek Lower Rate	Yes
Additional Controls	Yes
Fixed Effects	Yes
Cluster	Yr-Mth
N	16824
Pseudo R^2	.059

Standard errors clustered by origination-year-month.
Significance levels: *** p<0.01, ** p<0.05, * p<0.1

Substitutability of Competition and Sophistication

Rate Spread	1	2
Unsophistication	0.097***	0.100***
	(0.014)	(0.013)
Competition	-0.074***	-0.085***
	(0.012)	(0.014)
× Unsophistication	0.025	0.011
	(0.032)	(0.032)
Competition Measures:		
Metro Area	No	Yes
Consider >1 Lenders	Yes	Yes
Seek Lower Rate	Yes	Yes
Additional Controls	Yes	Yes
Fixed Effects	Yes	Yes
Cluster	Yr-Mth	Yr-Mth
N	16824	16824
Pseudo R^2	.059	.059

Standard errors clustered by origination-year-month.
Significance levels: *** p<0.01, ** p<0.05, * p<0.1

Why Competition & Sophistication Might Not Be Substitutes

1. Competition drives lenders to add favorable menu options, but not necessarily remove tempting but costly options chosen by unsophisticates
   - Gaibax and Laibson(2006)

2. Lenders have a noisy technology for identifying the sophistication of potential customers
   - Bond et al.(2009), Kau et al.(2012)

Conclusion

- Naifs pay 7.3 - 10.4 bp higher spread as compared to sophisticates
  - Rates do not seem to be picking up increased risk for these borrowers
- Financially sophisticated borrowers benefit as much from competition as the unsophisticated
- Analyze whether unsophisticated borrowers take additional steps to overcome their lack of knowledge
  - Borrowers who learned during the process pay similar spreads to borrowers who reported being always familiar
  - Evidence on the benefits of different sources of advice is mixed Details
- Complements work which detail the limits of advice & education
  - Bergstresser et al.(2009), Guiso et al.(2018), Fernandes et al.(2014)
  - Collectively paint a pessimistic view about the prospects of closing the mortgage rate gap

Thank you!

Background Competition and Rate Spreads

Rate Spread	1	2	3	4
Competition	0.014*	0.016*	-0.004	-0.007
	(0.008)	(0.008)	(0.009)	(0.008)
Competition measure	HHI	Top 4 share	Bank density	Bank density area
N	16821	16821	16785	16821
R2	0.0927	0.0927	0.0931	0.0926

Back

Borrower Characteristics

- Gender
- Race
- Age
- Level of education
- Two income brackets
- First time buyer
- Personal financial constraints
- Retirement
- Marital status
- Military affiliation

- Risk tolerance
- Preference for presence of a local lender branch
- Ability of lender to speak a language other than English
- Received home-buying toolkit
- Expectations about house price changes in the property bought
- Expectations about desirability of the neighborhood

Back

Who Gets Familiar - Marginal Effects

Not Familiar to Familiar	1
Female	-0.082***
	(0.011)
College Graduate	0.049***
	(0.013)
USD 50k < Income < USD 100k	0.054***
	(0.018)
Income >= USD 100k	0.077***
	(0.017)
First Mortgage	0.039***
	(0.013)
High Financial Constraints	-0.086***
	(0.024)
Some Financial Constraints	-0.071***
	(0.014)
Advice Own Lender	0.052***
	(0.011)
Advice Other Lender	0.095***
	(0.032)
Advice Agent	-0.044**
	(0.019)
Advice Mail	-0.025
	(0.040)
Advice Web	0.033*
	(0.019)
Advice Friends	-0.015
	(0.024)
Advice Bank	0.016
	(0.024)

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

Back

Sophistication and Rate Spread: Risk-Based Explanations

Rate Spread	1	2	3	4	5
Ex-Ante Unsophistication	0.045***				
	(0.015)				
Ex-Post Unsophistication	0.099***				
	(0.014)				
Credit Score Change 1 Year					
Credit Score Change 2 Years					
Credit Score Change 3 Years					
Credit Score Change Year 1 to 2					
Credit Score Change Year 2 to 3					
Additional Controls	Yes				
Fixed Effects	Yes				
Cluster	Yr-Mth				
N	16824				
Pseudo R^2	.068				

Back

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

Sophistication and Rate Spread: Risk-Based Explanations

Rate Spread	1	2	3	4	5
Ex-Ante Unsophistication	0.045***	0.044***			
	(0.015)	(0.015)			
Ex-Post Unsophistication	0.099***	0.100***			
	(0.014)	(0.014)			
Credit Score Change 1 Year		-0.247**			
		(0.118)			
Credit Score Change 2 Years					
Credit Score Change 3 Years					
Credit Score Change Year 1 to 2					
Credit Score Change Year 2 to 3					
Additional Controls	Yes	Yes			
Fixed Effects	Yes	Yes			
Cluster	Yr-Mth	Yr-Mth			
N	16824	16799			
Pseudo R^2	.068	.069			

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

Sophistication and Rate Spread: Risk-Based Explanations

Rate Spread	1	2	3	4	5
Ex-Ante Unsophistication	0.045***	0.044***	0.049***	0.052**	
	(0.015)	(0.015)	(0.017)	(0.021)	
Ex-Post Unsophistication	0.099***	0.100***	0.091***	0.082***	
	(0.014)	(0.014)	(0.018)	(0.019)	
Credit Score Change 1 Year		-0.247**			
		(0.118)			
Credit Score Change 2 Years			-0.409***		
			(0.135)		
Credit Score Change 3 Years				-0.425***	
				(0.146)	
Credit Score Change Year 1 to 2					
Credit Score Change Year 2 to 3					
Additional Controls	Yes	Yes	Yes	Yes	
Fixed Effects	Yes	Yes	Yes	Yes	
Cluster	Yr-Mth	Yr-Mth	Yr-Mth	Yr-Mth	
N	16824	16799	13781	9597	
Pseudo R^2	.068	.069	.07	.083	

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

Sophistication and Rate Spread: Risk-Based Explanations

Rate Spread	1	2	3	4	5
Ex-Ante Unsophistication	0.045***				0.051**
	(0.015)				(0.021)
Ex-Post Unsophistication	0.099***				0.083***
	(0.014)				(0.019)
Credit Score Change 1 Year					-0.468**
					(0.182)
Credit Score Change 2 Years					
Credit Score Change 3 Years					
Credit Score Change Year 1 to 2					-0.405*
					(0.223)
Credit Score Change Year 2 to 3					-0.380**
					(0.181)
Additional Controls	Yes				Yes
Fixed Effects	Yes				Yes
Cluster	Yr-Mth				Yr-Mth
N	16824				9591
Pseudo R^2	.068				.083

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

Robustness: Financial Sophistication and Rate Spread

Rate Spread	1	2	3	4
Panel A : Winsorized Rate Spread - OLS Model				
Ex-Ante Unsophistication	0.064***		0.042***	0.069***
	(0.013)		(0.013)	(0.017)
Ex-Post Unsophistication		0.089***	0.081***	0.094***
		(0.012)	(0.013)	(0.015)
Ex-Ante × Ex-Post Unsophistication				-0.068**
				(0.031)
Panel B : Full Rate Spread - OLS Model				
Ex-Ante Unsophistication	0.109***		0.076***	0.106***
	(0.021)		(0.021)	(0.027)
Ex-Post Unsophistication		0.139***	0.126***	0.141***
		(0.021)	(0.021)	(0.024)
Ex-Ante × Ex-Post Unsophistication				-0.078
				(0.052)
Panel C : Full Rate Spread & State Fixed Effects - OLS Model				
Ex-Ante Unsophistication	0.111***		0.077***	0.108***
	(0.021)		(0.021)	(0.026)
Ex-Post Unsophistication		0.141***	0.128***	0.143***
		(0.020)	(0.020)	(0.023)
Ex-Ante × Ex-Post Unsophistication				-0.079
				(0.052)
Panel D : Full Rate Spread & County Fixed Effects - OLS Model				
Ex-Ante Unsophistication	0.054***		0.032**	0.072***
	(0.015)		(0.016)	(0.020)
Ex-Post Unsophistication		0.090***	0.085***	0.103***
		(0.013)	(0.013)	(0.014)
Ex-Ante × Ex-Post Unsophistication				-0.102***
				(0.034)

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Robustness: Discount Pts/Lender Credit

	Discount Pts/Lender Credit			
Rate Spread	1	2	3	4
Ex-Ante Unsophistication	0.059***	0.060***	0.090***	0.074***
	(0.016)	(0.022)	(0.028)	(0.025)
Ex-Post Unsophistication	0.092***	0.088***	0.090***	0.112***
	(0.015)	(0.019)	(0.022)	(0.024)
Baseline Controls and FE	Yes	Yes	Yes	Yes
Cluster	Yr-Mth	Yr-Mth	Yr-Mth	Yr-Mth
N	14857	9550	6218	6294
Pseudo R^2	.058	.062	.071	.051

Standard errors clustered by origination-year-month.
Significance levels: *** p<0.01, ** p<0.05, * p<0.1

Sample restricted to respondents who are not aware of discount points and lender credits as part of their mortgage process or for whom the lender did not pay any portion of their closing costs (1), are in addition the aforementioned criteria neither financially constrained nor low income respondents (2), and negate knowledge of discount points, lender credits, and payment of closing costs by the lender at the same time (3). Column (4) is based on column (1), but limits the sample to home purchases, i.e. excludes refinancings.

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Robustness: Co-Signer

	Co-Signer		
Rate Spread	1	2	3
Ex-Ante Unsoph	0.052***	0.061***	0.042*
	(0.016)	(0.019)	(0.023)
Ex-Post Unsoph	0.096***	0.109***	0.086***
	(0.015)	(0.017)	(0.022)
Additional FE	SpCS	SpCS	–
No of Borrowers	$<= 2$	$== 2$	$== 1$
Baseline Controls and FE	Yes	Yes	Yes
Cluster	Yr-Mth	Yr-Mth	Yr-Mth
N	16549	8965	7584
Pseudo R^2	0.06	0.07	0.067

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

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Robustness: Fixed Effects

	Fixed Effects					
Rate Spread	1	2	3	4	5	6
Ex-Ante Unsophistication	0.047***	0.049***	0.046***	0.048***	0.045***	0.043***
	(0.015)	(0.016)	(0.015)	(0.015)	(0.016)	(0.016)
Ex-Post Unsophistication	0.103***	0.104***	0.095***	0.093***	0.092***	0.095***
	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
Additional FE	PtI	DtI	–	–	–	BCS
Metro FE	–	–	Yes	Yes	Yes	Yes
Agency FE	–	–	–	Yes	Yes	Yes
Loan Amount FE	–	–	–	–	Yes	Yes
Baseline Controls and FE	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	Yr-Mth	Yr-Mth	Yr-Mth	Yr-Mth	Yr-Mth	Yr-Mth
N	16571	16571	16824	16824	16824	16824
Pseudo R^2	.062	.063	.058	.063	.073	.081

Standard errors in parentheses
Significance levels: *** p<0.01, ** p<0.05, * p<0.1

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Sophistication and Competition: Illustrative Model

- Consider two types of borrowers: sophisticates and naifs
- Either type may borrow from near or far bank
- Borrowers may solicit offer from near bank for free
- Borrowers may also solicit offer from far bank but must pay a travel cost, k
- Far bank is always willing to lend to both at the PMMS rate, r
- Near bank is willing to lend at, $r_n = \text{r} + \text{m}$; $\text{m} \geq 0$
- Key assumption: Sophisticates know r, while naifs do not
- Naifs perceive the the fair rate to be $\tilde{r} \equiv r + e$; where $e \sim N(0, \sigma_e^2)$

Sophistication and Competition: Illustrative Model

- Borrowers minimize their expected rate paid, net of travel costs
- Sophisticated borrowers will pay

$$r_{soph} = \begin{cases} r_n & \text{if } m \leq k, \\ r & \text{otherwise.} \end{cases} \tag{4}$$

- Naive borrowers will pay

$$r_{naif} = \begin{cases} r_n & \text{if } m \leq k + e, \\ r & \text{otherwise.} \end{cases} \tag{5}$$

- Implications:
  - Suppose k is negligible.
  - Sophisticates will always pay essentially r
  - Naif who shop around more will enjoy meaningfully lower rates
  - Naifs' welfare will be more sensitive to r_n

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Advice as an Alternative Remedy

We analyze association between borrowers' source of information and rate spreads

> *x08: "How much did you use each of the following sources to get information about mortgages or mortgage lenders?"*

$$\begin{aligned}\text{Rate spread}_i = \alpha &+ \beta\,\text{Advice Important}_i \\ &+ \delta_1\,\text{Ex-Ante Unsoph.}_i + \gamma_1\,\text{Ex-Ante Unsoph.} \times \text{Advice Important}_i \\ &+ \delta_2\,\text{Ex-Post Unsoph.}_i + \gamma_2\,\text{Ex-Post Unsoph.} \times \text{Advice Important}_i \\ &+ \text{Borrower characteristics}_i + \text{Origination year-month fixed effects} \\ &+ \text{Loan term fixed effects} + \text{2-Digit credit score fixed effects} \\ &+ \text{Loan-to-value fixed effects} + \epsilon_i\,.\end{aligned} \tag{6}$$

Advice Important equals 1 if the borrower reports relying strongly on a particular source of information

Advice as an Alternative Remedy

- Internet seems to be the only source of helpful advice
- Information from other lenders or banks is associated with reduction in spreads for ex-post unsophisticated borrowers
- Direct mail and real estate agents are associated with increase in rate spread

Advice, Sophistication, and the Mortgage Rate Spread

	Other Lender	Agent	Mail	Web	Friends	Bank
Rate Spread	1	2	3	4	5	6
Advice Important	0.005	0.056***	0.096**	-0.079***	0.007	0.001
	(0.023)	(0.020)	(0.040)	(0.014)	(0.025)	(0.020)
Ex-Ante Unsophistication	0.048***	0.060***	0.049***	0.041***	0.048***	0.051***
	(0.016)	(0.017)	(0.015)	(0.016)	(0.016)	(0.016)
× Advice Important	-0.001	-0.146**	-0.111	0.088*	-0.014	-0.062
	(0.097)	(0.063)	(0.133)	(0.049)	(0.087)	(0.071)
Ex-Post Unsophistication	0.101***	0.089***	0.094***	0.091***	0.097***	0.102***
	(0.014)	(0.016)	(0.014)	(0.014)	(0.015)	(0.016)
× Advice Important	-0.232**	0.067	0.099	0.041	-0.022	-0.096*
	(0.093)	(0.055)	(0.125)	(0.050)	(0.064)	(0.052)
Additional Controls	Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	Yr-Mth	Yr-Mth	Yr-Mth	Yr-Mth	Yr-Mth	Yr-Mth
N	16824	16824	16824	16824	16824	16824
Pseudo R^2	.058	.058	.058	.058	.058	.058

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

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Exposure to Competition and Financial Sophistication

Multinomial Logit: Marginal Effects

No of Lenders Considered	2	3	4	5+
Ex-Ante Unsophistication	-0.016	-0.025**	0.001	-0.004
	(0.010)	(0.010)	(0.003)	(0.003)
Ex-Post Unsophistication	-0.042***	-0.026***	-0.009***	-0.000
	(0.009)	(0.008)	(0.003)	(0.002)

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

Exposure to Competition and Financial Sophistication

Multinomial Logit: Marginal Effects

No of Lenders Considered	2	3	4	5+
Ex-Ante Unsophistication	-0.016	-0.025**	0.001	-0.004
	(0.010)	(0.010)	(0.003)	(0.003)
Ex-Post Unsophistication	-0.042***	-0.026***	-0.009***	-0.000
	(0.009)	(0.008)	(0.003)	(0.002)
Female	-0.022***	-0.033***	-0.011***	-0.005**
	(0.007)	(0.007)	(0.002)	(0.002)
College Graduate	0.022***	0.024***	0.005**	0.003*
	(0.009)	(0.006)	(0.002)	(0.002)
USD 50k $<$ Income $<$ USD 100k	0.030**	-0.002	-0.001	-0.001
	(0.014)	(0.009)	(0.003)	(0.003)
Income $>=$ USD 100k	0.045***	-0.008	-0.008**	-0.004
	(0.017)	(0.010)	(0.004)	(0.003)
First Mortgage	0.024**	0.024***	0.005	-0.004
	(0.011)	(0.009)	(0.003)	(0.003)

Standard errors in parentheses.
Significance levels: *** p$<$0.01, ** p$<$0.05, * p$<$0.1