

# **Do Credit Card Companies Screen for Behavioral Biases?**

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# Motivation

- Retail financial products have grown in heterogeneity and complexity over the last decades (e.g., Tufano (2003))
- Differing explanations for reasons behind this trend
  - **Functionalist view** (e.g., Merton (1992), Miller (1993)); Financial innovation accommodates consumer heterogeneity
  - **Persuasion view** (e.g., Thaler and Sunstein (2008), Campbell et al (2011)); new products and features aim to exploit consumers' behavioral biases and make it difficult for consumers to compare products.

# Question and Finding

- **How do credit card issuers target customers in US market?**
  - Three Part Tariff; Annual fees, APR, penalty fees (e.g., late fees, default APR, over-limit fees)
  - Look at educational attainment as a measure for sophistication, Lusardi and Mitchell (2007, 2011)
  - Hedonic regressions show that less educated consumers get more back-loaded and shrouded credit card offers
  - Age is used to measure the cognitive ability, Agarwal et al. (2009)
- Use reward programs to screen customers on unobservables.
  - Banks run “mini-experiments” on consumers
  - Holding constant the person and bank, show that cards with Zero APR (teaser rates) also rely more on back-loaded terms. Cards with Miles more on front loaded terms
- Issuers rely more heavily on back-loaded and shrouded contracts when credit risk of consumers is reduced
  - Use state level Unemployment insurance (UI)-shocks that increases cash flows in bad states

# Competing Models of Credit Card Market

- Behavioral view: Myopic consumers don't understand shrouded attributes (Gabaix and Laibson (2006))
  - Firms compete by lowering “visible” costs and charge high costs on hidden features. Myopic consumers subsidize sophisticated ones
  - Alternative micro foundations: Consumers don't understand their own demand, e.g. Heidhues and Koszegi (2010) or Grubb (2010)
- Rational view: Back-loaded terms to attract impatient consumers
  - Patient consumers are willing to pay for cost of credit upfront (regular APR and annual fee), while impatient consumers want to increase current consumption and postpone charges (late fees)
  - Back-loaded contracts also attract consumers with high default risk. Impatient but low risk consumers subsidize high risk consumers

# Set up

- Data on supply side of credit card market
  - Pre-approved credit card solicitations are done by mail, all the information that customers get is **observable to researcher**
- Obtain data from Comperemedia on credit card mailers sent to US households from 1999 to 2011
  - ~160,000 individual credit card mailers sent to consumers
  - Collected monthly by ~4000 “mock clients” across US, represent demographic distribution credit card owning population
- Observe all features of the offer
  - Use OCR and our own algorithms to code the mailers
  - **Visual dimension:** Colors, font, photos, amount of info and where displayed
  - **Hard features:** Fees, interest rate, reward programs

# Example:

WITH THE MISTERGOLD CARD YOUR POSSIBILITIES ARE ENDLESS

**0%** Intro APR for **12 months** on balance transfers and purchases



Dear Sir/Madam,

*You're Pre-Approved for a MisterGold Card with a Credit Line up to \$3,000.*

Isn't it time you get the credit you deserve? Your credit history shows that you're a perfect match for this card. We offer you unmatched convenience, an exclusive rewards program, no annual fee and superb client service.

*Enjoy Premium 0% Intro APR for the First 12 Months.*

Enjoy a 0% introductory APR for 12 months on purchases and balance transfers after your account is opened – after that, a variable APR, currently 18.99%. That's a year of savings!

*Enjoy the Benefits of Being a MisterGold Card Member.*

Earn one point for every dollar you spend on purchases. You can redeem points for a statement credit towards any travel purchase you have made on the Card. It gets better. With the MisterGold card, there is no annual fee and you have the flexibility to pay for your purchases over time.

*Act Now and Get Your MisterGold Card.*

Don't miss out on this exceptional opportunity to enjoy the benefits and buying power of your MisterGold card with a credit line up to \$3,000.

We look forward to welcoming you as a new XYZ Bank member.

Sincerely,

Julia Squire  
Senior Vice President

**It's All Yours**

- Gold Benefits
- Credit up to **\$3000**
- No Annual Fee
- **100%** Satisfaction Guaranteed



# Lay out

	Late fee	Default APR	Over-limit fee	Annual fee	MILE	Intro APR
% of cards that have	100.00%	100.00%	100.00%	100.00%	8.79%	51.64%
Is term on 1st page	5.80%	4.97%	6.96%	79.28%	100%	91.04%
Font size if on 1st page	9.49	9.28	9.80	13.24	14.12	11.27
Font size if not on 1st page	9.57	9.63	9.50	13.76	9.91	10.62
Font color if on 1st page	33.98%	37.88%	27.73%	66.86%	47.12%	32.28%
Font color if not on 1st page	24.67%	26.19%	27.73%	44.35%	29.47%	32.29%
Font bold if on 1st page	38.59%	27.77%	35.07%	79.01%	56.34%	53.15%
Font bold if on 1st page	49.00%	19.59%	34.53%	53.20%	18.08%	39.99%
# Obs	776,624	776,624	776,624	776,624	803,285	776,624

If term is on first page 29.38 28% 27.59 7.69

If term is in the back 35.10 27% 30.11 33.22

(Schumer box)

# Dominated Offers

**Table 3**  
**Distribution of Dominated Offers**

Panel A: Cell*Year		
	Dominated Offers	Worst Offers
Below High School	1.38%	0.74%
High School	0.76%	0.41%
Some College	1.04%	0.53%
College	0.79%	0.42%
Post College	0.85%	0.43%
Panel B: Cell*Bank*Year		
	Dominated Offers	Worst Offers
Below High School	16.61%	10.07%
Graduated High School	12.11%	7.13%
Some College	13.81%	8.19%
Graduated College	12.47%	7.35%



# Finding I: Targeting of Consumers

- Run hedonic regression of card features on consumer observable characteristics
- Issuers target less sophisticated consumers (low education) with more backward loaded fee structure
  - Have lower intro APR, but high late fees and over- limit fees
  - (Low) intro APR programs targeted at unsophisticated consumers
  - Miles programs mainly for sophisticated consumers

# Differential Targeting of Consumers

**Table 4**

	1	2	3	4	5	6	7
	APR	Late Fee	Default APRDummy	Over-limit Fee	Annual Fee	IntroAPR	Backward
FFR	0.352*** (0.004)	-0.242*** (0.006)	-0.041*** (0.001)	0.173*** (0.010)	-0.565*** (0.024)	-0.026*** (0.000)	-0.028*** (0.001)
Education_2	-0.046 (0.030)	-0.118*** (0.045)	-0.014*** (0.003)	-0.472*** (0.051)	-0.551*** (0.162)	-0.002 (0.003)	0.006 (0.007)
Education_3	0.026 (0.032)	-0.323*** (0.045)	-0.039*** (0.004)	-0.592*** (0.056)	-0.068 (0.169)	-0.015*** (0.003)	-0.032*** (0.008)
Education_4	-0.073** (0.033)	-0.277*** (0.047)	-0.040*** (0.004)	-1.118*** (0.059)	0.352** (0.176)	-0.026*** (0.003)	-0.076*** (0.008)
Education_5	-0.004 (0.035)	-0.541*** (0.052)	-0.067*** (0.004)	-1.561*** (0.068)	1.326*** (0.201)	-0.049*** (0.003)	-0.140*** (0.009)
Fixed Effects	Y	Y	Y	Y	Y	Y	Y
Observation	942,397	961,247	972,260	872,831	963,283	972,260	870,029
R-squared	0.253	0.157	0.148	0.177	0.233	0.159	0.008

# Targeting continued

**Table 4**

Dependent Variable	8 MILE	9 Format	10 Back_LateFee	11 Back_APR _Default	12 LogMax CardLimit
FFR	0.008*** (0.002)	-0.014*** (0.001)	-0.011*** (0.000)	0.027*** (0.001)	0.005*** (0.001)
Education_2	0.013*** (0.002)	0.070*** (0.007)	-0.005*** (0.002)	0.002 (0.003)	0.095*** (0.009)
Education_3	0.019*** (0.001)	0.075*** (0.008)	-0.009*** (0.002)	-0.008** (0.003)	0.103*** (0.009)
Education_4	0.046*** (0.003)	0.160*** (0.008)	-0.013*** (0.002)	-0.002 (0.004)	0.205*** (0.009)
Education_5	0.064*** (0.004)	0.190*** (0.009)	-0.017*** (0.002)	-0.017*** (0.004)	0.242*** (0.010)
Fixed Effects	Y	Y	Y	Y	Y
Observations	777,192	629,637	750,855	750,855	496,063
R-squared	0.075	0.080	0.235	0.145	0.607

# Which terms price credit cards?

- Look at pass through in interest rates and fees
  - Use funding shocks to issuers from changes in Fed-fund rate (FFR)
  - Test which terms of the cards are used to price credit, i.e. show sensitivity to FFR
  - Ausubel (2001): no perfect pass through of FFR shocks
- Differential sensitivity of customers by education levels

$$Y_{i,j,t} = \beta_1 \times FFR_M + \beta_2 \times FFR_M \times LowEdu_{i,j,t} + \beta_3 \times LowEdu_{i,j,t} + FE_{i,j,t} + \varepsilon_{i,j,t}$$

# Back-loaded terms important for pricing of

**Table 5**

Dependent Variable	1 APR	2 Annual Fee	3 Late Fee	4 Over-Limit Fee	5 Default APR Dummy	6 Intro_APR	7 LogMaxCard Limit
FFR	0.755*** (0.005)	0.671*** (0.033)	0.007 (0.011)	-0.424*** (0.011)	-0.061*** (0.001)	-0.014*** (0.001)	0.013*** (0.002)
LowEdu	0.163*** (0.032)	1.148*** (0.158)	0.007 (0.043)	-0.042 (0.047)	0.030*** (0.004)	0.011*** (0.003)	-0.053*** (0.009)
LowEdu*FFR	-0.050*** (0.008)	-0.440*** (0.048)	0.101*** (0.014)	0.173*** (0.016)	0.003** (0.001)	0.003*** (0.001)	-0.012*** (0.003)
Cell F. E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank F. E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	785,950	800,546	798,936	749,306	808,430	808,430	463,490
R-squared	0.318	0.252	0.208	0.199	0.162	0.146	0.586

# Finding II: Screening

- Within consumer groups, issuers screen consumers by offering different menu of reward programs
  - Intro APR program (Unsophisticated consumers)
    - Heavy reliance on backward loaded terms
  - Mileage program (Sophisticated consumers)
    - Heavier reliance on upfront pricing
- Hold constant consumer type and bank
  - Control for consumer fixed effects and bank fixed effects

# (Low) introductory APR vs. Mileage Programs

Dependent Variable	1 APR	2 APR	3 Annual Fee	4 Annual Fee	5 Late Fee	6 Late Fee	7 Over-Limit Fee	8 Over-Limit Fee
FFR	0.741*** (0.005)	0.728*** (0.005)	0.364*** (0.030)	0.213*** (0.029)	0.264*** (0.008)	0.385*** (0.007)	-0.226*** (0.011)	-0.096*** (0.010)
MILE	2.096*** (0.023)	1.526*** (0.042)	22.429*** (0.231)	15.681*** (0.453)	-1.654*** (0.057)	3.755*** (0.092)	-10.266*** (0.089)	-4.126*** (0.186)
MILE*FFR		0.163*** (0.013)		1.918*** (0.127)		-1.539*** (0.037)		-1.756*** (0.053)
Observations	597,489	597,489	609,055	609,055	607,868	607,868	570,300	570,300
R-squared	0.321	0.321	0.281	0.281	0.240	0.251	0.297	0.303

Dependent Variable	1 APR	2 APR	3 Annual Fee	4 Annual Fee	5 Late Fee	6 Late Fee	7 Over-Limit Fee	8 Over-Limit Fee
FFR	0.725*** (0.004)	0.897*** (0.005)	0.401*** (0.026)	1.101*** (0.035)	0.050*** (0.008)	-0.245*** (0.009)	-0.344*** (0.009)	-0.455*** (0.012)
Intro_APR	-0.925*** (0.014)	0.285*** (0.023)	-9.088*** (0.096)	-4.047*** (0.153)	1.133*** (0.020)	-0.988*** (0.028)	1.969*** (0.032)	1.223*** (0.045)
Intro_APR*FFR		-0.394*** (0.006)		-1.640*** (0.045)		0.690*** (0.010)		0.244*** (0.015)
Observations	785,950	785,950	800,546	800,546	798,936	798,936	749,306	749,306
R-squared	0.317	0.324	0.265	0.267	0.214	0.223	0.207	0.208

# Finding III: Shock to Credit Risk

- Use changes in state level unemployment insurance (UI)
  - Reduces exposure to one of the largest negative economic shock that customers might suffer
  - UI increased in staggered way across US states during 2000s
  - Instrument from Hsu, Matsa and Meltzer (2014)
- Standard Difference in Difference estimator

$$Y_{i,t} = UI_{dummy} + UI_{pre-trend} + CellFE + BankFE + TimeFE + \varepsilon$$

- UI dummy for states where the change in UI is >10% (first jump)
- Keep offers for one year before after jump
- Checked many other cut-offs as well



# Unemployment Insurance Shock

	1	2	3	4	5	6	7	8	9	10
	APR	Default APR Dummy	Late Fee	Annual Fee	Intro_APR _All	Backward	Color	DefaultAPR MainPage	LateFee MainPage	Dominated
FFR	0.421*** (0.043)	-0.048*** (0.003)				0.006 (0.005)				0.010*** (0.003)
UI	-0.276 (0.353)	0.044 (0.028)	0.909** (0.389)	0.271 (0.454)	0.123** (0.056)	0.061* (0.035)	0.027** (0.012)	-0.011*** (0.003)	-0.012** (0.005)	0.022* (0.012)
UI_Pre_3M	-0.005 (0.120)	0.022 (0.021)	0.655*** (0.185)	-0.036 (0.361)	0.140* (0.077)	0.050 (0.040)	0.015 (0.017)	-0.005 (0.005)	-0.010 (0.009)	0.007 (0.008)
UI_Pre_6M	0.156 (0.269)	-0.068*** (0.024)	-0.204 (0.450)	-0.159 (0.714)	0.066 (0.043)	0.058** (0.024)	0.012 (0.008)	-0.004 (0.004)	-0.001 (0.010)	0.034** -0.013
UI_Small	-0.052 (0.158)	-0.015 (0.015)	0.125 (0.402)	-1.321 (0.925)	0.065 (0.042)	0.020 (0.034)	0.010 (0.012)	-0.006 (0.004)	0.012 (0.010)	0.005 (0.011)
F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	93,224	93,491	92,876	93,215	93,940	90,700	81,968	46,161	46,161	68,732
R2	0.263	0.410	0.179	0.193	0.121	0.100	0.038	0.054	0.029	0.009

# Differential Effect on Low Income Groups

	1	2	3	4	5	6	7	8
	APR	Default APR Dummy	Late Fee	Annual Fee	Intro_APR _All	Backward	Color	DefaultAPR MainPage
FFR	0.425*** (0.044)	-0.048*** (0.003)				0.005 (0.005)		
UI	-0.038 (0.304)	0.030 (0.030)	0.867** (0.354)	0.695 (0.432)	0.135** (0.053)	0.035 (0.037)	0.036*** (0.010)	-0.014*** (0.005)
UI*LowEdu	-0.324*** (0.109)	0.021*** (0.006)	0.215** (0.100)	-0.597 (0.487)	-0.013 (0.019)	0.059** (0.028)	-0.006 (0.007)	0.005 (0.005)
UI*LowInc	-0.048 (0.127)	-0.004 (0.017)	-0.295** (0.119)	-0.062 (0.590)	-0.013 (0.018)	-0.009 (0.031)	-0.025* (0.013)	-0.001 (0.006)
UI_Pre_3M	0.004 (0.118)	0.021 (0.020)	0.648*** (0.187)	-0.028 (0.360)	0.140* (0.076)	0.048 (0.040)	0.015 (0.017)	-0.005 (0.005)
UI_Pre_6M	0.174 (0.281)	-0.070*** (0.024)	-0.216 (0.454)	-0.129 (0.725)	0.067 (0.042)	0.055** (0.024)	0.012 (0.008)	-0.004 (0.005)
UI_Small	-0.041 (0.159)	-0.015 (0.015)	0.130 (0.400)	-1.306 (0.923)	0.066 (0.042)	0.018 (0.034)	0.010 (0.012)	-0.007 (0.005)
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	93,224	93,491	92,876	93,215	93,940	90,700	81,968	46,161
R-squared	0.263	0.410	0.179	0.193	0.121	0.100	0.039	0.054

# Differential Implications

- Shocks to credit risk: Behavioral model would predict
  - Banks trade-off higher (short-term) fee income via shrouding versus increased credit risk: when credit risk goes down more reliance on back-loaded and shrouded terms
  - In ration model: less reliance on back loaded terms, since there are fewer impatient consumers who pose credit risk
- Lay-out of cards: Behavioral model would predict
  - More shrouding of terms (at the end of offer letter) for unsophisticated consumers
  - Differential shrouding of positive versus negative terms
  - Rational model should predict that all terms are equally displayed
- Dominated offers
  - Consumers under rational model shouldn't choose any of the dominated offers

# Conclusion

- Card issuers target households based on education levels:
  - Sophisticated: less backward loaded pricing and mileage rewards
  - Unsophisticated: more backward loaded fees and zero APR programs
- Un-observables: Screen consumers by offering rewards programs
  - Cards with rewards have more steeply backward loaded fees
  - Exception are miles programs that are more forward loaded fees
  - Suggests that cards for sophisticated consumers cannot be shrouded
- Reduced credit risk (UI shock) leads to more backward loaded and hidden credit terms
  - Card issuers take into account trade-off between short term fees and long-term exposure to worse credit risk
- Suggestive evidence that issuers use “naiveté based price discrimination”