

The Last Mile of Monetary Policy: Inattention, Reminders, and the Refinancing Channel

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The views expressed in this paper are those of the authors
and not necessarily those of the Central Bank of Ireland

The Refinancing Channel of Monetary Policy Transmission

- Immediate monetary policy pass-through for floating-rate debt (Badarınza, Campbell, Ramadorai, 2017)
- For fixed-rate mortgages need to refinance to realize rate cut
- Unconventional MP transmission through refinancing (Di Maggio Kermani Palmer, 2020)
- Conventional MP transmission through refinancing (Cloyne et al., 2020)

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Refinancing frictions inhibit monetary policy transmission (Amromin et al., 2020)

- ➊ Need to qualify for refinancing mortgage (DeFusco and Mondragon, 2020)
- ➋ Need to have positive equity (Beraja et al., 2020)
- ➌ Need to be in segment with credit-market access (Di Maggio et al., 2020)
- ➍ Need to be paying attention (Andersen et al., 2020)

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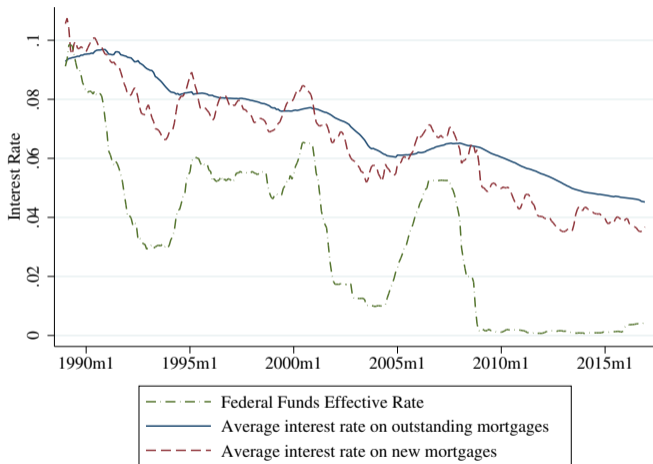
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⇒ Addressing refinancing frictions can strengthen refinancing channel & improve the last-mile delivery of MP to household sector

Monetary Policy's Last-Mile Problem

- Monetary policy can create financial slack but needs real accomplices
 - Especially take-up from demand and velocity of lenders' interest rate passthrough
- ⇒ Any frictions that inhibit demand response weaken MP (e.g., Gormsen and Huber, 2022)
- **Attention** likely culprit given lack of active choice across a wide-range of financial decisions (e.g., insurance, retirement savings, shopping for credit, mortgage refinancing)
- This paper: target inattention as key friction and show treatment that worked in field.
Estimate treatment effects on inattention ⇒ new monetary/fiscal tool

Less monetary policy pass-through to *outstanding* mortgage rates in US

ΔFFR has R^2 of 0.35 for new mortgage Δr , 0.05 for outstanding Δr

Could direct communication overcome inattention to refinancing?

- Maybe not?
 - Fed publications college reading level (Haldane and McMahon, 2018)
 - 2/3 consumers unaware FOMC announcements (Lamla and Vinogradov, 2019)
 - HHs inattentive to disclosures (Adams Hunt Palmer Zaliauskas, 2021)
 - Overestimate time to reoptimize (Adams et al., 2021; CBI, 2017)

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- Maybe?
 - New multi-faceted direct communication efforts (Blinder et al., 2022)
“some promise... many challenges” (reggae music videos!)
 - Forward Guidance can be powerful (McKay et al., 2016)
 - Peer effects in refinancing (Maturana and Nickerson, 2019)
 - Optimize disclosures? (Wang and Burke, 2022; Bhattacharya et al., 2023)
 - Improving financial literacy improves communication usefulness (Binder et al., 2022)
 - Send reminders? (Adams et al., 2015; Karlan et al., 2016)
- If so, potentially useful tool, especially at zero lower bound or in monetary union

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→ This paper: test for communication effects with RCT of optimized disclosures, reminders

Outline

- ① **Setting and Experimental Design**
- ② Treatment Effects
- ③ Inattention Model and Counterfactuals
- ④ Conclusion

Failure to Refinance in Ireland

- Failure to refinance documented in many countries
(Campbell, 2006; Keys et al., 2016; ACCC, 2018; Bajo & Barbi, 2018; Johnson et al., 2019; FCA, 2019; Andersen et al., 2020)
- Both external and internal refinancing in Ireland similarly infrequent.
- Low pass-through of ECB policy rate to Irish variable-rate mortgages
- Yet 60% Irish mortgages could save €1,000 in year #1 (Byrne et al., 2020)

Structure of Irish Mortgages

Three flavors of residential mortgages in Ireland, ~25-30 year terms typical

1 Fixed rate mortgages

- ~UK fixed rate, ~US ARM. Fixed for 1-5 years
- Convert to variable rate after the fixed-rate period
- Prepayment penalty of ~2% of balance

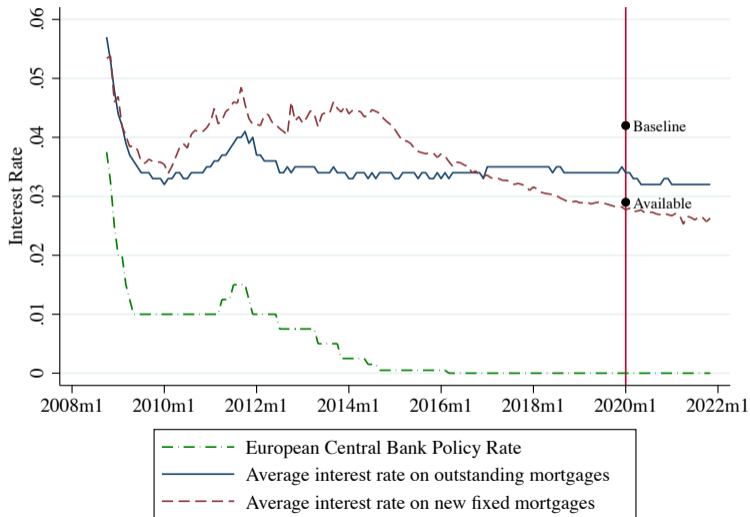
2 Variable-rate mortgages

- Not indexed; 100% discretionary, limited pass through
- Internal refinances without increasing term easy, basically no fee

3 Tracker mortgages

- ECB rate + ~100 bp
- Stopped offering new in 2008.

Lots of potential to improve monetary policy delivery



Attempt to address low pass-through with disclosure regulation

Provision 6.5(g) of the Ireland Consumer Protection Code 2012 Amended 2016

At least annually, must provide variable rate mortgage holders with statement disclosing:

- ➊ **summary of bank's other products that could save the consumer € at that time**
- ➋ how the personal consumer can obtain further information on these mortgage products
- ➌ statement that the consumer should review other options that could provide savings
- ➍ link to CCPC website on switching lenders or changing mortgage type
- ➎ reminder that the bank's Provision 4.28a summary statement is online
- ➏ whether and how consumer can qualify for lower rate if appraisal finds lower LTV
- ➐ if not, notification that consumer can switch to other provider using new appraisal

Field Trial Details

- Partner with large Irish bank to vary design of their mandatory disclosure letters
- Test whether optimized disclosures support refinancing
- Estimate a model of inattention to refinancing

Control			
Treatment Group	1	Simplification + Personalized €	+ Reminder
	2	+ Color	+ Reminder
	3	+ Headline	+ Reminder
	4	+ Headline + Gain-frame	+ Reminder
	5	+ Headline + Loss-frame	+ Reminder
	6	+ Headline + Loss-frame + Process	+ Reminder

- Representative sample, $N \sim 12,000$. 12 treatment groups + control
- Letter mailed February 2020, reminder 4-6 weeks later, track refinancing June + Dec

Control Group Letter

Treatment Group #2 Letter

Mortgage Account Number: 1234567

You may be able to save money on your mortgage

Dear John,

This letter supplements the information we sent with your annual mortgage loan statement in the leaflet called "Information about your mortgage (You may be able to save money on your mortgage)".

The standard variable interest rate we currently charge you on your mortgage loan is 4.34%. However, we want to make sure you are getting the best deal and we may have a lower interest rate for your mortgage.

What rates are available?

The lowest interest rate currently available to you is a one or two-year fixed rate of 2.9%. We also offer fixed rates for periods of three, five and ten years. The ten-year rate varies depending on your Loan to Value (LTV). We explain Loan to Value at the end of this letter.

Explaining the tables below

These tables show you the interest rates along with the Annual Percentage Rate of Charge (APRC). We explain APRC at the end of this letter.

Fixed interest rates

Fixed interest rate options	Loan to Value Up to 60%	Loan to Value 61-80%	Loan to Value over 80%
1-year	2.9% (3.9% APRC)	2.9% (4.2% APRC)	2.9% (4.4% APRC)
2-year	2.9% (3.8% APRC)	2.9% (4.0% APRC)	2.9% (4.3% APRC)
3-year	3% (3.7% APRC)	3% (3.9% APRC)	3% (4.1% APRC)
5-year	3.2% (3.7% APRC)	3.2% (3.8% APRC)	3.2% (4.0% APRC)
10-year	3.5% (3.7% APRC)	3.5% (3.8% APRC)	3.7% (4.0% APRC)

Mortgage Account Number: 1234567

You may be able to save money on your mortgage

Dear John,

Your current mortgage interest rate is a standard variable rate of 4.25%. We want to make sure you are getting the best deal and we may have a lower interest rate for your mortgage.

Current monthly repayment at 4.25%:	€717	<ul style="list-style-type: none">We have a range of interest rates that could save you money.Our lowest rate is a fixed rate of 2.9%, which could result in an immediate monthly saving to you of about €131. Over the course of a full year, that's approximately €1,572 in savings.Below, we outline the full range of interest rate options currently available, along with the next steps to take if you wish to choose one of these alternative options.
Potential monthly repayment at 2.9% fixed:	€586	
Estimated difference in monthly repayments	-€131	
Potential difference over the year:	-€1,572	

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2-year	2.9% (3.8% APRC)	2.9% (4.0% APRC)	2.9% (4.3% APRC)	-€131	-€1,572
3-year	3% (3.7% APRC)	3% (3.9% APRC)	3% (4.1% APRC)	-€123	-€1,476
5-year	3.2% (3.7% APRC)	3.2% (3.8% APRC)	3.2% (4.0% APRC)	-€108	-€1,296
10-year	3.5% (3.7% APRC)	3.5% (3.8% APRC)		-€84	-€1,008
10-year			3.7% (4.0% APRC)	-€67	-€804

Reminder letters sent 4-6 weeks later to 1/2 treatment group

Mortgage Account Number: 1234567

REMINDER: You may be able to save money on your mortgage

Dear X,

We recently wrote to you about the availability of lower mortgage interest rate options and the potential for savings on your monthly mortgage repayments.

This is a reminder to take action to avail of one of these options.

If you wish to take up a lower interest rate for which you are eligible, you can go online at websiteaddress.com/mortgages, call us on 01 XXX XXXX, or visit a branch.

Yours sincerely,

Firstname Secondname

Head of Mortgages

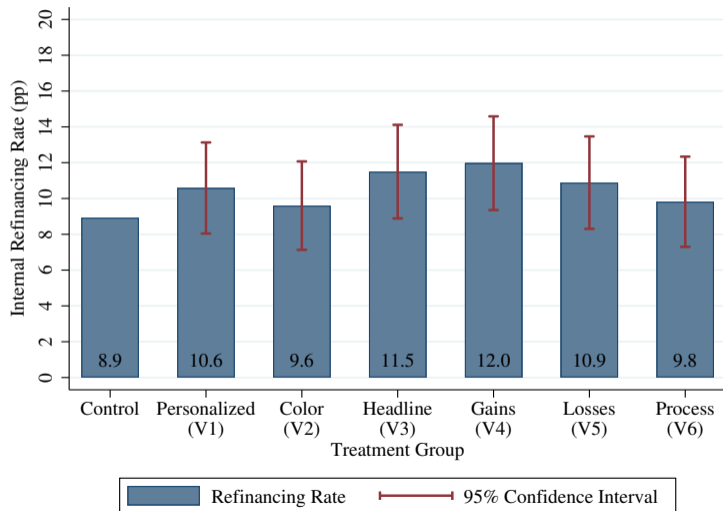
Experiment balanced on observables

Treatment Group	Control	Treatment No Reminder	Treatment Reminder	Market (Variable Rate)
Dublin indicator	0.20 (0.40)	0.19 (0.39)	0.20 (0.40)	0.27 (0.44)
Borrower age	49.8 (9.2)	50.2 (9.4)	50.0 (9.3)	49.1 (9.9)
First-time buyer	0.40 (0.49)	0.41 (0.49)	0.39 (0.49)	0.39 (0.49)
Mortgage balance (€)	84,212 (84,141)	82,185 (89,348)	83,587 (93,700)	104,224 (96,368)
Interest rate	0.042 (0.003)	0.042 (0.002)	0.042 (0.002)	0.037 (0.007)
Years to maturity	13.8 (8.5)	13.2 (8.5)	13.3 (8.5)	14.7 (8.8)
1-year savings (€)	1,056.7 (1,013.9)	1,043.9 (1,144.2)	1,053.7 (1,126.4)	1,033.5 (1,176.8)
Covid forbearance	0.09 (0.28)	0.08 (0.27)	0.08 (0.28)	0.12 (0.32)
Observations	1,659	4,931	4,942	220,299

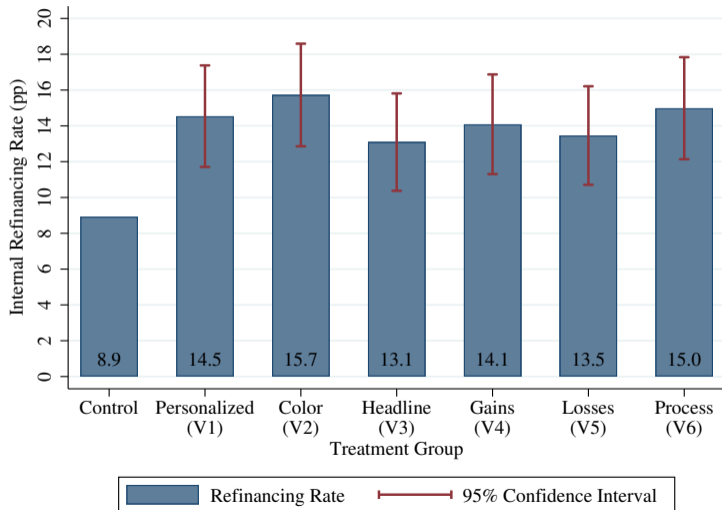
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Refinancing Rates Without Reminder



Refinancing Rates With Reminder



Pooled Treatment Effect Estimates

Parameter	(1)	(2)	(3)	(4)
Disclosure Redesign Treatment	0.036*** (0.008)	0.040*** (0.008)	0.018** (0.008)	0.022*** (0.008)
Disclosure Treatment \times Reminder			0.036*** (0.007)	0.035*** (0.007)
Constant	0.089*** (0.007)	-0.311*** (0.067)	0.089*** (0.007)	-0.307*** (0.066)
Borrower Controls		✓		✓
R-squared	0.002	0.042	0.004	0.044
Observations	11,200	11,200	11,200	11,200

Role of Covid?

- Might reminder effectiveness simply be Covid?
 - Letters sent Feb 2020, reminders March/April 2020, outcomes measured June/Dec 2020
- All the more reason to have a RCT!
- Not much heterogeneity by most-affected group: Covid forbearance
- Why didn't treatment alone have an effect if Covid causes attention?
...seems something special about reminders
- No 2020-1 trends at other banks/external refinancing vs. 2019
- Splits by employment sector don't show any strong heterogeneity ▶ 411

Treatment Effects Summary

- Best treatment+reminder had a +80% (6.9 pp) effect on refinancing
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- Suggests reminders were effective at getting through to borrowers
- Simple, unexpected, reinforce procrastinated task
- No heterogeneity by work from home industry, Covid forbearance, etc.

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- What does this imply for effect on $\Pr(\text{attention})$, relative effectiveness of Δrates ?

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Andersen et al. (2020) mixture model of inattentive refinancing

- Inattentive households never refi. Attentive households refinance if

$$e^{\beta} Incentive_i + \epsilon_i > 0$$

- Agarwal Driscoll Laibson (2013) optimal exercise of refinancing option [▶ Alternatives](#)

$$Incentive_{it} = (r_{it}^{old} - r_{it}^{new}) - O_{it}^*(x_i, \theta)$$

- Assume $\epsilon_i \sim T1EV \Rightarrow \Pr(refinancing_i = 1 | attentive_i = 1) = \Lambda(e^{\beta} Incentive_i)$

Extend to allow for treatment effects on attention

- Attention depends on observables and attention shock $\eta_i \sim T1EV$
- Inattentive if

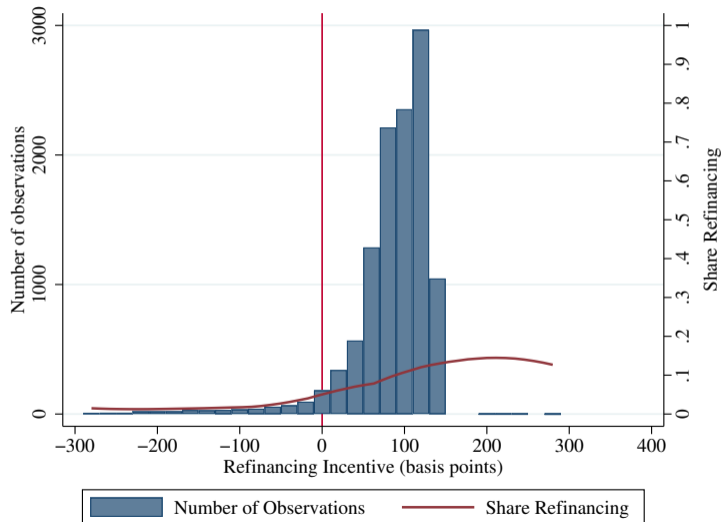
$$\delta_0 + \delta_1 Treatment_i + \delta_2 Reminder_i + \eta_i > 0$$

$$\Pr(inattentive_i | \delta) = \Lambda(\delta_0 + \delta_1 Treatment_i + \delta_2 Reminder_i)$$

$$\Rightarrow \Pr(refinancing_i = 1 | x_i, \beta, \gamma, \delta) = \Pr(attention_i | \delta) \Pr(refinancing_i = 1 | attention_i, \beta, \gamma)$$

- Estimated δ_1 and δ_2 quantify attention treatment effects, allow counterfactuals
- Interpretation of δ_0 less clear (beliefs, constraints, private information, etc.)

Refinancing Increasing in ADL Incentive



Maximum Likelihood Estimation

Maximum likelihood

$$\mathcal{L}(\beta, \delta, \gamma | \mathbf{x}, \text{ref}_i) = \left(\prod_{\text{ref}_i=1} (1 - w_i(\mathbf{x}_i, \delta)) \Lambda(e^\beta \text{Incentive}(\mathbf{x}_i, \gamma)) \right) \\ \times \left(\prod_{\text{ref}_i=0} w_i(\mathbf{x}_i, \delta) + (1 - w_i(\mathbf{x}_i, \delta)) \Lambda(-e^\beta \text{Incentive}(\mathbf{x}_i, \gamma)) \right)$$

where w_i is the probability i is inattentive

$$w_i \equiv \Pr(\text{inattentive}_i | \mathbf{x}_i, \delta) = \Lambda(\delta_0 + \delta_1 \text{Treatment}_i + \delta_2 \text{Reminder}_i)$$

Maximum Likelihood Mixture Model Estimates ▶ Alternatives

Parameter	(1)	(2)	(3)	(4)	(5)
Incentive Sensitivity (β)	-125.48*** (1.12)	-1.61*** (0.01)	-0.23 (0.51)	-1.58*** (0.05)	-1.65*** (0.05)
Fixed Cost of Refinancing (γ_0)		13.15*** (0.70)	6.43*** (0.49)	8.71*** (0.03)	8.71*** (0.20)
Inattention Constant (δ_0)			1.28*** (0.19)	1.13*** (0.11)	1.02*** (0.12)
Treatment on Inattention (δ_1)				-0.31** (0.12)	-0.33** (0.13)
Reminder on Inattention (δ_2)				-0.43*** (0.08)	-0.44*** (0.09)
Fixed Cost Controls					✓
Observations	11,200	11,200	11,200	11,200	11,200

Interpreting Marginal Effects

- Once allowing for unobservable fixed costs, $\exp(\hat{\beta})$ implies a 50 bp response in $\Pr(\text{refinancing} \mid \text{awake})$ for 10 bp decrease in rates
- Fixed costs estimates implausibly high ($\sim\text{€}514\text{k}$) w/o allowing for inattention
- Still high ($\sim\text{€}6\text{k}$) even allowing for inattention, consistent w/ pessimistic process beliefs (Adams Hunt Palmer Zaliauskas, 2021)
- Estimates imply 76% probability of being inattentive
- Treatment + reminder reduces inattentive probability by 16 pp to 60%

Back-of-envelope cost-effectiveness high as stimulus tool

- Mean year 1-year savings by average refinancer: €1,210
 - MPC out of UK mortgage interest savings (Anderson et al., 2014) $\sim 0.5 \Rightarrow \bar{C}_{refi} \uparrow \text{€}605$
- Cost effectiveness: if average letter costs €1 to send and generates $\text{€}605 \times 7\% = \text{€}42$ in additional mortgagor consumption
 \Rightarrow multiplier is €42 per €1 of spending
- n.b., effect on aggregate consumption less if bank equity domestic
- Tool available to competition authorities, consumer protection authorities, policymakers in a currency union or at zero-lower bound.

Benchmarking to conventional monetary tools

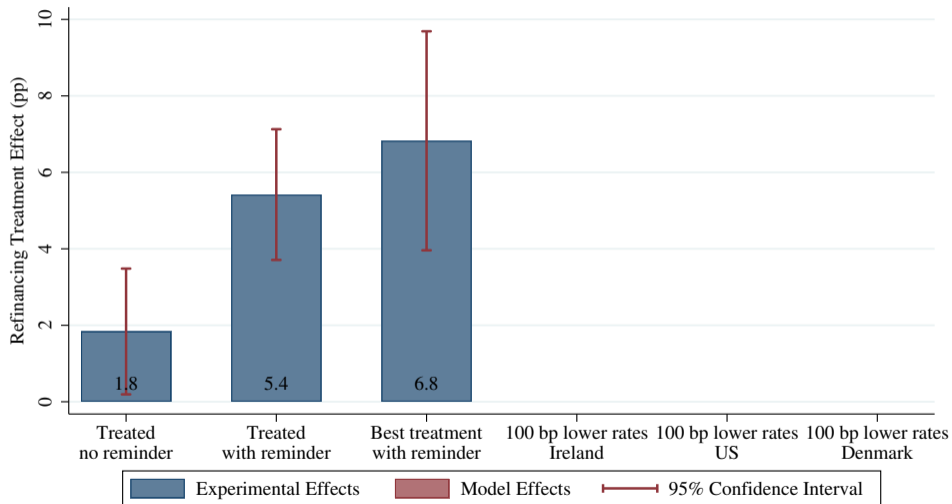
- How does effectiveness of communication compare to changing r ?
- Model implied change in refinancing rate if incentive to refinance moves 100 \rightarrow 200 bp

$$\Delta\% \text{Refinancing} = \underbrace{\left(1 - \Lambda(\hat{\delta}_0)\right)}_{\text{Pr(attentive)}} \underbrace{\left(\Lambda(2e^{\hat{\beta}}) - \Lambda(e^{\hat{\beta}})\right)}_{\Delta \text{Pr(refi|attentive)}}$$

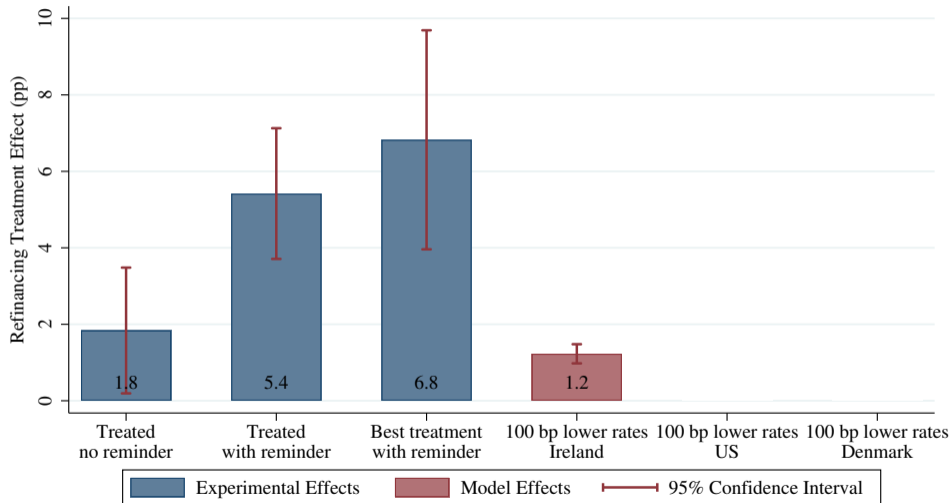
(note that this would require extraordinary monetary stimulus)

- Use model estimates for Ireland
- Andersen et al. (2020) estimates for Denmark
- Estimate non-experimental model on CRISM data for the US in 2019

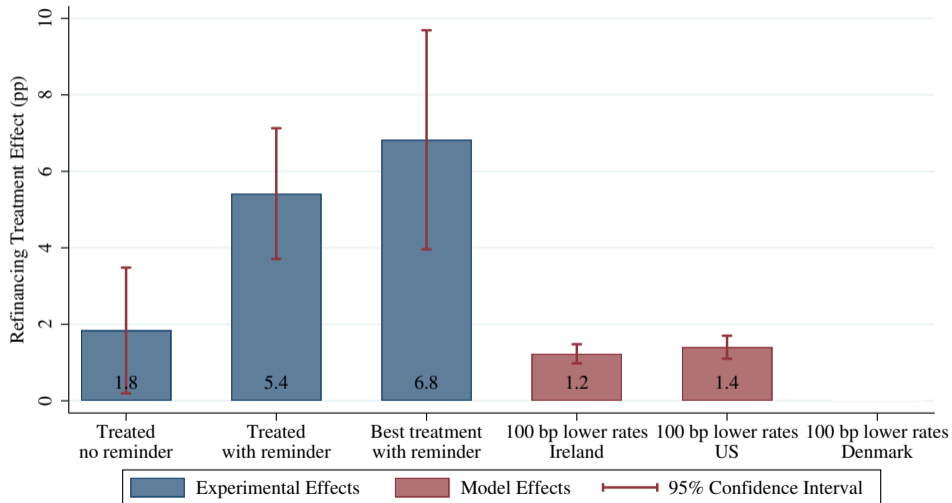
Reminders outperform 100 bp decrease in rates (ceteris paribus)



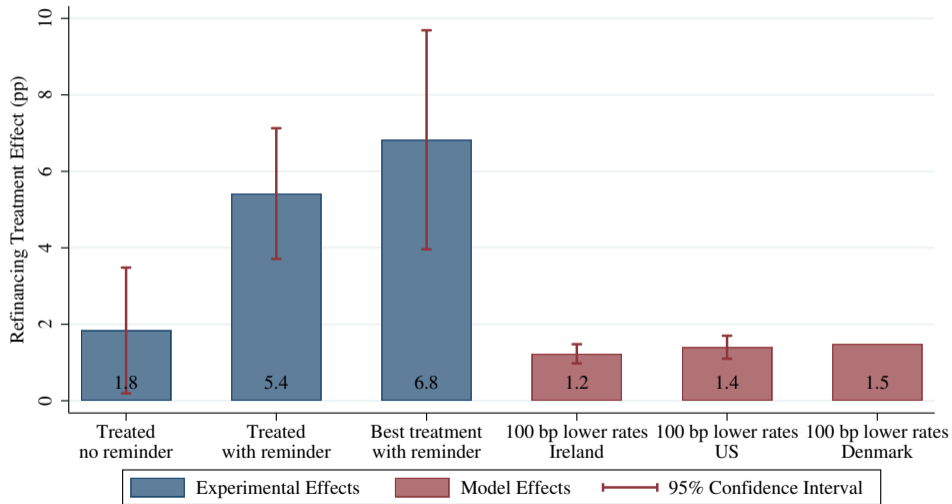
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Caveats

- 1 Communication may depend on trust in the discloser (send letters from gov't?)
- 2 More responsive refinancing could raise rates in GE (Berger et al., 2022)
- 3 Effects on aggregate consumption less if bank equity domestic
- 4 Reminders more effective when rates have fallen (complementary)
- 5 Treatment likely more effective when status-quo disclosure worse (undoes obfuscation)
- 6 Repeated reminders more/less effective (dynamic selection, lose salience, peer effects)

Conclusion

- Consumer inattention to optimization is common in many settings
- Inattention is a significant source of refinancing inertia, weakens MP refinancing channel
- Remedy! Targeted communication reminders can reduce inattention, stimulate refinancing

- Direct communication has potential to help solve last-mile problem in monetary policy
- Complementary and possibly more effective than monetary policy for household sector

Competition unlikely to discipline rate-setting discretion

Variable rate setting could be disciplined by competition, but...

- 1 Irish banking highly concentrated.
 - Top 3 banks have 73% market share for residential mortgage lending
- 2 Refinancing is infrequent.
 - 6% of Irish mortgages switched provider in 2019
 - In our sample, 9% refinance internally
 - Close to EU, US average
 - 60% Irish mortgages could save €1,000 in year #1 (Byrne et al., 2020)

▶ back

Box A Chart 2: Number of Banks Present and Active in the Irish Mortgage Market



Source: Credit and Banking Statistics, Tables A.18.1, A.18.2, and B.2.1, author's calculations.

Structure of Irish Mortgages

Three flavors of residential mortgages in Ireland, 25-30 year terms

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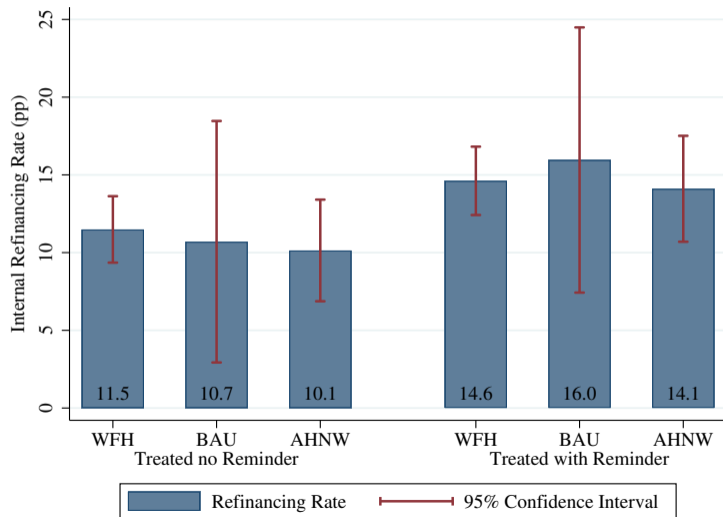
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Employment Sector Definition

Working from home (WFH)	Business as usual (BAU)	At home not working (AHNW)
Inform. and communication	Agric., forestry, fishing	Manufacturing
Financial and insurance	Electricity, gas supply	Construction
Profess., scientific, technical	Transport and storage	Wholes. retail trade, vehicle repair
Public administration		Accommodation and food services
Other service activities		

Treatment effects similar by Covid employment sector



ADL Appropriateness Abroad

- ADL assumes US fixed-rate mortgages refinancing onto US fixed-rate mortgages
 - In UK, Australia, Ireland, etc. “fixed rate mortgages” only fixed for a (relatively) short fixation period 1-5 years (as in US ARMs)
 - Suggests ADL refinancing threshold might be too low
 - Given that cost of refinancing is incurred for a much shorter duration of locked rates, might not be worth refinancing but for very large Δr
- ⇒ Model might be misattributing too much to inattention
- (OTOH, typical IE mortgage duration \sim 10 years, similar to US FRMs)

How would attentive people exercise refinance option?

- Agarwal Driscoll Laibson (2013) solve optimal exercise of FRM refinancing option in closed form under simplifying assumptions
- Threshold to refinance: minimum decrease in interest rates O_{it}

$$O_{it} = \frac{1}{\psi_{it}} [\phi_{it} + W(-\exp(-\phi_{it}))]$$

$$\psi_{it} = \frac{\sqrt{2(\rho + \lambda_{it})}}{\sigma}$$

$$\phi_{it} = 1 + \psi_{it}(\rho + \lambda_{it}) \frac{\kappa(m_{it})}{m_{it}(1 - \tau)}$$

- ρ discount rate, σ volatility of r , τ is marginal tax rate, m is mortgage balance, $\kappa(m)$ is refinancing costs, λ is expected rate of decline in real principal
- Implies incentive to refinance $Incentive_{it} = (r_{it}^{old} - r_{it}^{new}) - O_{it}$
- Robust to using $Incentive_{it} = (r_{it}^{old} - r_{it}^{new})$ ▶ Alternatives

Model Parameters θ

Parameter	Name	Value	Source
Inflation	π	0.02	Average IE inflation
Real discount rate	ρ	0.05	Standard
Nominal interest rate volatility	σ	0.002	CBI monthly interest rate series
Marginal tax rate for interest deduction	τ	0	Eliminated in Ireland in 2019
Exogenous Pr(termination)	μ	0.11	Microdata from partner bank
Perceived fixed costs of refinancing (€)	κ	100	Usual cost is zero

Alternative Refinancing Formulations

- 1 Be agnostic about the location of the optimal refinancing threshold.

Model the incentive as $Incentive_{it} = (r_{it}^{old} - r_{it}^{new})$ instead of $(r_{it}^{old} - r_{it}^{new}) - O_{it}$

- 2 Hack ADL to mimic the pressures of a shorter fixation period with exogenous $\Pr(\text{prepayment}) \mu = 0.5 \Rightarrow$ borrowers expect to face market rates every two years

Similar results with alternative ADL parameterization

Parameter	(1)	(2)	(3)	(4)	(5)
Incentive Sensitivity (β)	-125.48*** (1.56)	-1.44*** (0.02)	-1.63*** (0.05)	-1.63*** (0.05)	-1.72*** (0.05)
Fixed Cost of Refinancing (γ_0)		9.66*** (0.03)	8.05*** (0.04)	8.04*** (0.04)	9.01*** (0.15)
Inattention Constant (δ_0)			0.57*** (0.05)	1.05*** (0.11)	0.78*** (0.13)
Treatment on Inattention (δ_1)				-0.32** (0.13)	-0.35** (0.14)
Reminder on Inattention (δ_2)				-0.45*** (0.09)	-0.51*** (0.10)
Borrower Controls					✓
Observations	11,200	11,200	11,200	11,200	11,200