Human Frictions in the Transmission of Economic Policies

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Full Information Rational Expectations

- Policy assumes households understand economic incentives fully
  - Forward guidance

    Eggertsson & Woodford (2003)
  - Unconventional fiscal policies

    D'Acunto, Hoang, & Weber (2021)
  - Conventional fiscal policies

    Farhi & Werning (2017)
- **BUT** policies often ineffective: e.g., *forward guidance puzzle*

  Del Negro, Giannoni, & Patterson (2015)
- Recent progress: heterogeneous agents, incomplete markets

  Kaplan, Moll, & Violante (2018); McKay, Nakamura, & Steinsson (2016)

Theory: Cognition Matters BUT Representative Agent

- Households often reason differently than models and experts

  Agarwal and Mazumder (2013), Andre, Pizzinelli, Roth, Wohlfart (2021)

- Recent macro theory: limited cognitive abilities, bounded rationality

  Farhi & Werning (2018), Woodford (2018), Angeletos (2019), Laibson et al. (2021)

  - Obtain deviations from FIRE, discounted Euler equation

- Issue: representative-agent models BUT large heterogeneity in data
  - Need empirical evidence to inform advances in heterogeneous models with limited cognitive abilities
  - To what extent does het. cognition matter for policy transmission?

- Major empirical hurdles
  - Need to measure cognitive abilities for a representative population
  - Need to observe actual choices around fiscal, monetary policy measures

This Paper: Cognition and Reactions to Policy

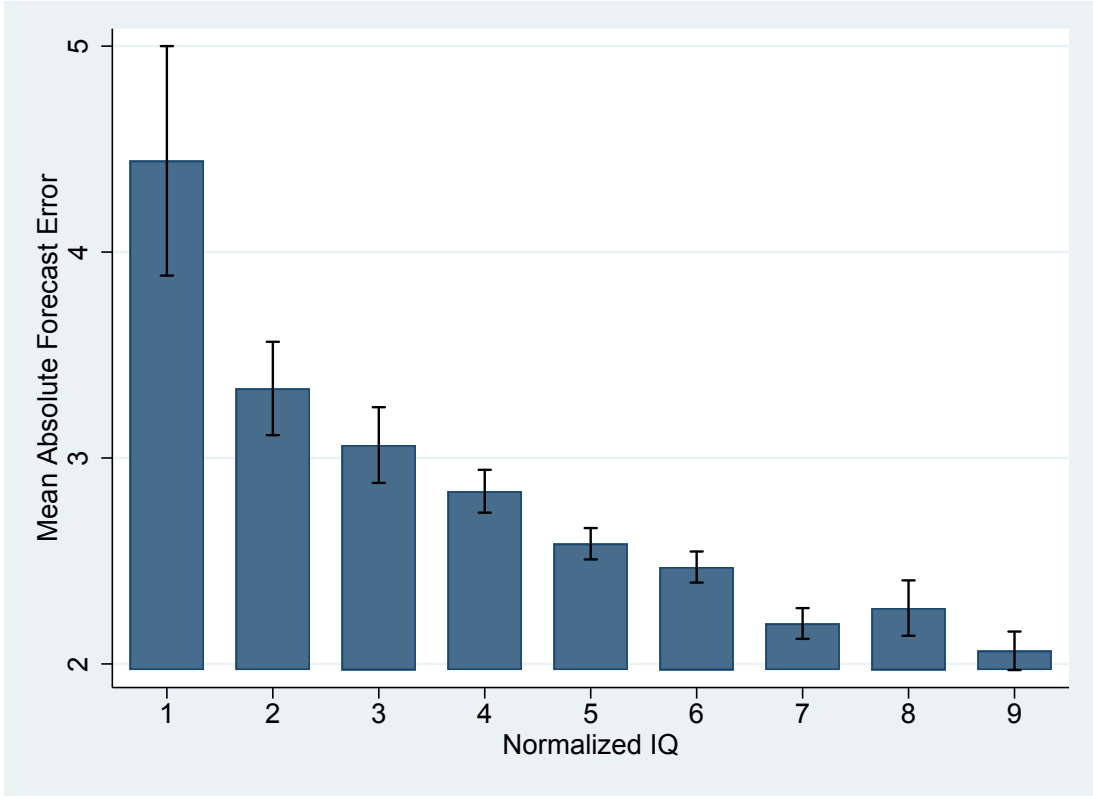
Unique individual-level sample on cognition and reactions to policy

- Measure IQ for all men in Finland from Finnish Defence Forces (FDF)
- Match with unique administrative data on
  - Debt
  - Wealth
  - Stock and flow of cars
  - Participation in car scrappage scheme
  - Tax records
- Match with survey data on plans, attitudes, expectations

Cognitive Ability Data

- Mandatory military service in Finland: FDF
- Around age 19, 120 questions to measure cognitive abilities
- FAF aggregates scores into a composite: IQ
- FAF standardizes IQ to follow a stanine distribution
  - 9 points to approximate normal
  - Lowest 4% of scores at least 1.75 std from mean: standardized IQ of 1
  - 4% with highest test scores: standardized IQ of 9

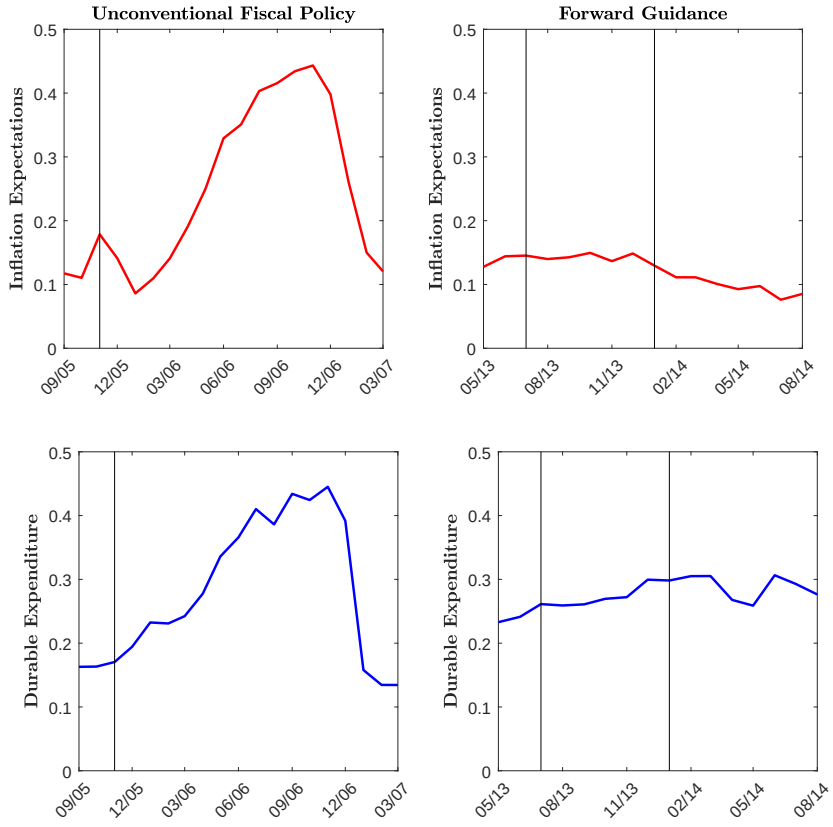
Heterogeneous Cognition→Mistaken Expectations



Source: D'Acunto, Hoang, Paloviita, Weber, Restud (2022): *"IQ, Expectations, and Choice"*

- Men with low IQ: absolute forecast error for inflation of 4.5%
- Forecast error still large for the highest-IQ group (2%)
- Economically and statistically different across the IQ distribution
- Effect barely changes when partialling out income and education levels

Simple Policies vs Complex Policies



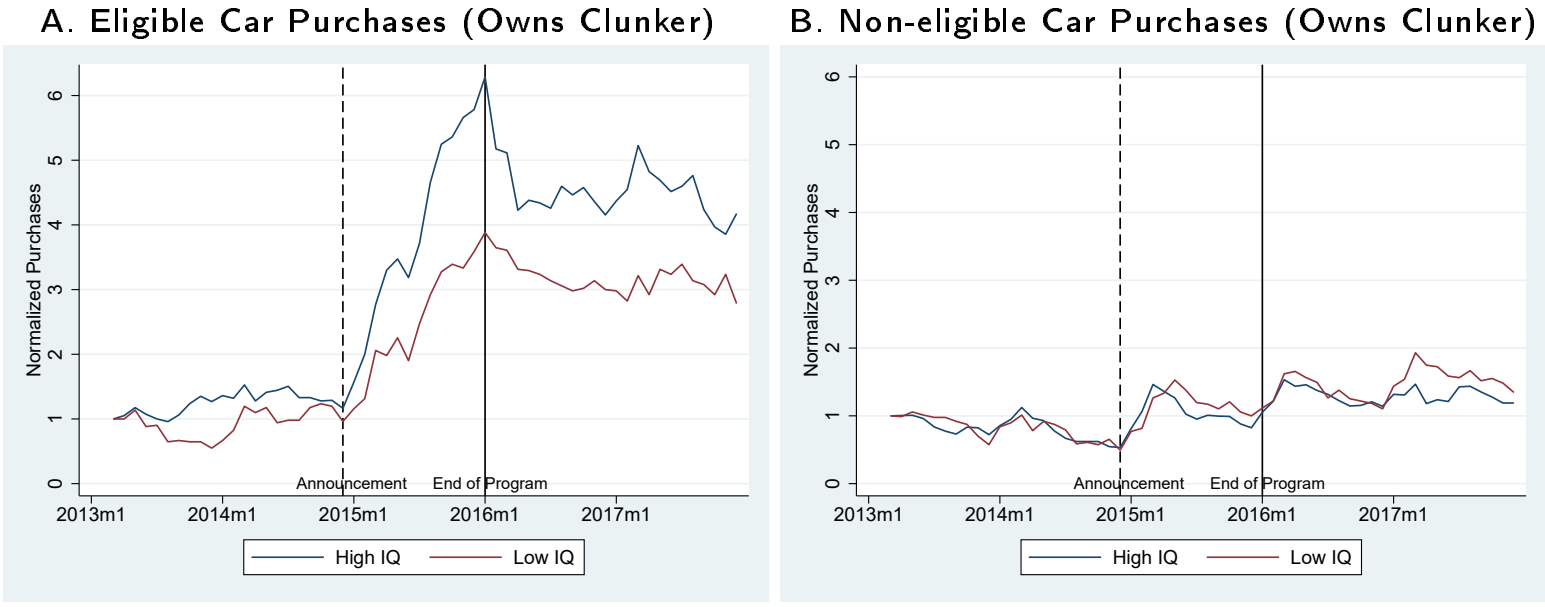
Source: D'Acunto, Hoang, Weber, RFS (2022):
"Managing Household Expectations with Unconventional Policies"

- Pre-announced VAT increase (left): inflation expectations AND spending react
- Fwd guidance announcements (right): nothing moves
- Both policies theoretically operate through identical channel: Euler equation

Differential Reaction to Economic Policies

- Heterogeneous cognitive abilities might be human frictions to the transmission of economic policies
  - Study reaction to conventional fiscal policy
    - subsidy to purchase new cars
  - Study reaction to conventional monetary policy
    - propensity to take out loans and debt balance to changes in interest rates

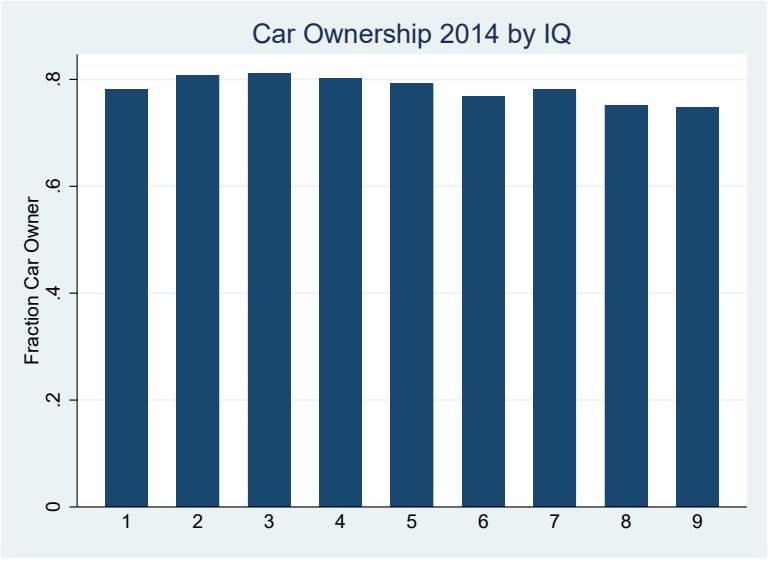
Differential Uptake of Car Purchasing Policy



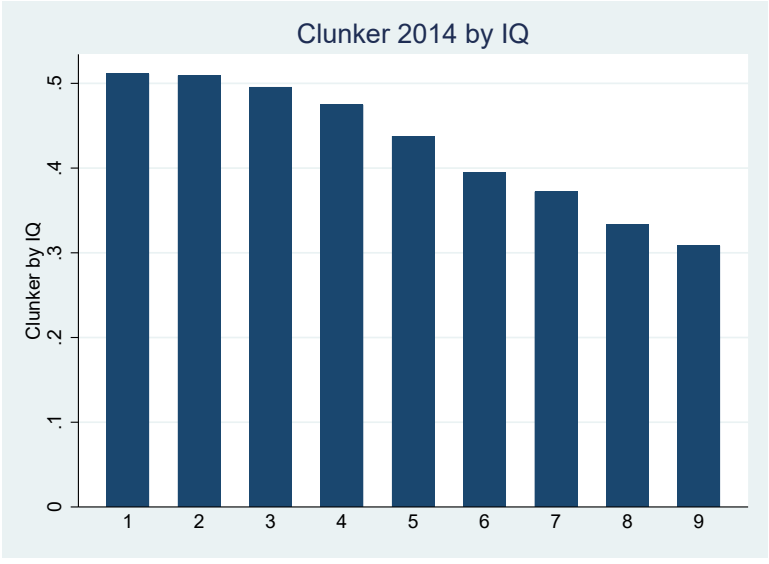
- Conditional on owning clunker at announcement
- Split by median IQ
- Reaction of high-IQ men twice as strong post announcement for eligible cars
- No differential reaction for non-eligible car by IQ

Clunker and Car Ownership

A. Ownership of Car in Dec 2014 by IQ

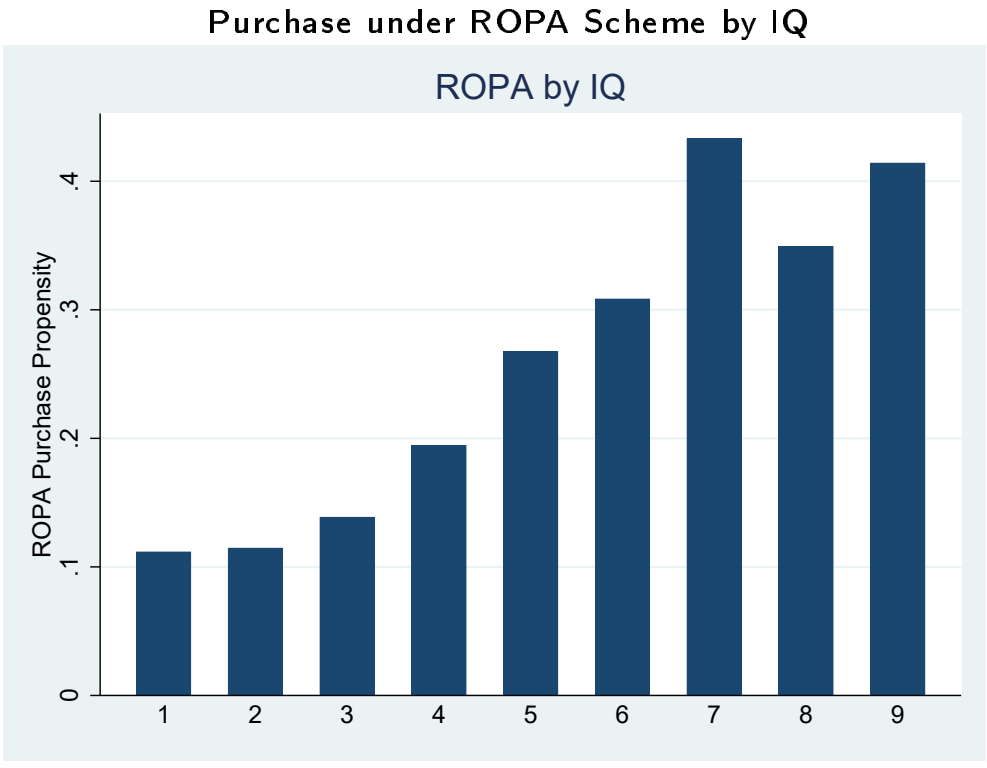


B. Ownership of Clunker in Dec 2014 by IQ



- Stable car ownership across IQ distribution
- Decreasing likelihood of owning clunker by IQ

Actual Participation in Program



- Increasing propensity to participate in program in IQ

IQ and Car Purchase

$$ROPA_i = \alpha + \beta High\ IQ_i \times Clunker_i + \zeta High\ IQ_i + \gamma Clunker_i + X_i'\delta + \eta_s + \epsilon_i$$

	(1)	(2)	(3)
High IQ × Clunker	5.53**	6.12**	5.91**
	(2.58)	(2.59)	(2.59)
High IQ	2.88***	4.46***	4.45***
	(1.11)	(1.18)	(1.18)
Clunker	24.65***	23.50***	23.78***
	(2.22)	(2.24)	(2.24)
Constant	12.59***	96.68***	95.70***
	(0.95)	(14.29)	(14.29)
Nobs	7,588	7,534	7,534
Controls		X	X
District FE			X
R2	0.101	0.109	0.114

- High-IQ men 6 pp. more likely to take advantage of subsidy

IQ and Car Purchase: Unconstrained

$$ROPA_i = \alpha + \beta High\ IQ_i \times Clunker_i + \zeta High\ IQ_i + \gamma Clunker_i + X_i'\delta + \eta_s + \epsilon_i$$

	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A. Unconstrained					
	Below-median Debt-to-Income			Above-median Income		
High IQ × Clunker	10.52**	11.23***	10.34**	6.45***	6.64***	6.45**
	(4.27)	(4.24)	(4.24)	(2.35)	(2.32)	(2.75)
High IQ	1.47	3.62*	3.79*	3.15***	4.62***	4.56***
	(1.91)	(2.08)	(2.08)	(1.13)	(1.28)	(1.23)
Clunker	21.52***	19.72***	20.25***	23.33***	22.57***	22.81***
	(3.68)	(3.68)	(3.67)	(1.99)	(1.95)	(2.39)
Constant	12.93***	132.19***	135.30***	12.12***	85.98***	86.49***
	(1.66)	(25.07)	(25.15)	(0.94)	(20.50)	(17.97)
Nobs	2,683	2,680	2,680	6,997	6,988	6,988
Controls		X	X		X	X
District			X			X
R2	0.111	0.123	0.132	0.098	0.104	0.109

- Large difference by IQ within likely unconstrained

IQ and Car Purchase: Constrained

$$ROPA_i = \alpha + \beta High\ IQ_i \times Clunker_i + \zeta High\ IQ_i + \gamma Clunker_i + X_i'\delta + \eta_s + \epsilon_i$$

	(1)	(2)	(3)	(4)	(5)	(6)
	Panel B. Constrained					
	Above-median Debt-to-Income			Below-median Income		
High IQ × Clunker	1.59	2.04	1.67	4.69	4.69	4.07
	(3.75)	(3.76)	(3.77)	(8.23)	(8.23)	(9.79)
High IQ	4.40***	5.41***	5.56***	2.82	1.03	−0.77
	(1.59)	(1.66)	(1.66)	(4.51)	(4.47)	(5.50)
Clunker	27.07***	26.27***	26.78***	29.98***	28.60***	33.26***
	(3.20)	(3.24)	(3.25)	(6.38)	(6.46)	(7.54)
Constant	11.94***	74.51***	73.70***	17.27***	118.08***	128.96***
	(1.35)	(22.22)	(22.26)	(3.62)	(40.26)	(47.04)
Nobs	3,585	3,578	3,578	551	546	478
Controls		X	X		X	X
District			X			X
R2	0.095	0.100	0.106	0.119	0.166	0.323

- No difference by IQ within likely constrained

IQ and Car Purchase: Intertemporal Substitution

$$Eligible\ Car_{i,t} = \alpha + \beta_1 High\ IQ_i \times Clunker_{i,t-1} \times ROPA_t + \beta_2 High\ IQ_i \times Clunker_{i,t-1} + \beta_3 High\ IQ_i \times ROPA_t + \beta_4 Clunker_{i,t-1} \times ROPA_t + \zeta High\ IQ_i + \gamma Clunker_{i,t-1} + \nu ROPA_t + X'_{i.t}\delta + \eta_t + \eta_s + \eta_i + \epsilon_{i,t}$$

High IQ × Clunker × ROPA$_t$	0.10***	0.10***	0.10***	0.10***
	(0.03)	(0.03)	(0.03)	(0.03)
High IQ × Clunker	−0.09***	−0.08***	−0.08***	
	(0.02)	(0.02)	(0.02)	
High IQ × ROPA$_t$	0.04	0.04	0.04	0.03
	(0.03)	(0.03)	(0.03)	(0.03)
Clunker × ROPA$_t$	0.09***	0.09***	0.09***	0.09***
	(0.02)	(0.02)	(0.02)	(0.02)
High IQ	0.13***	0.04**	0.04**	
	(0.02)	(0.02)	(0.02)	
Clunker	−0.20***	−0.21***	−0.20***	
	(0.01)	(0.02)	(0.02)	
ROPA$_t$	0.04**	0.03	0.03	0.03
	(0.02)	(0.02)	(0.02)	(0.03)
Constant	0.25***	−0.76***	−0.73***	1.47*
	(0.01)	(0.07)	(0.07)	(0.79)
Nobs	1,573,190	1,521,209	1,521,209	1,521,209
Controls		X	X	X
District FE			X	X
Individ FE				X

- High-IQ men twice as sensitive during ROPA if owned clunker relative to others
- Survey evidence: plans to purchase cars change differentially

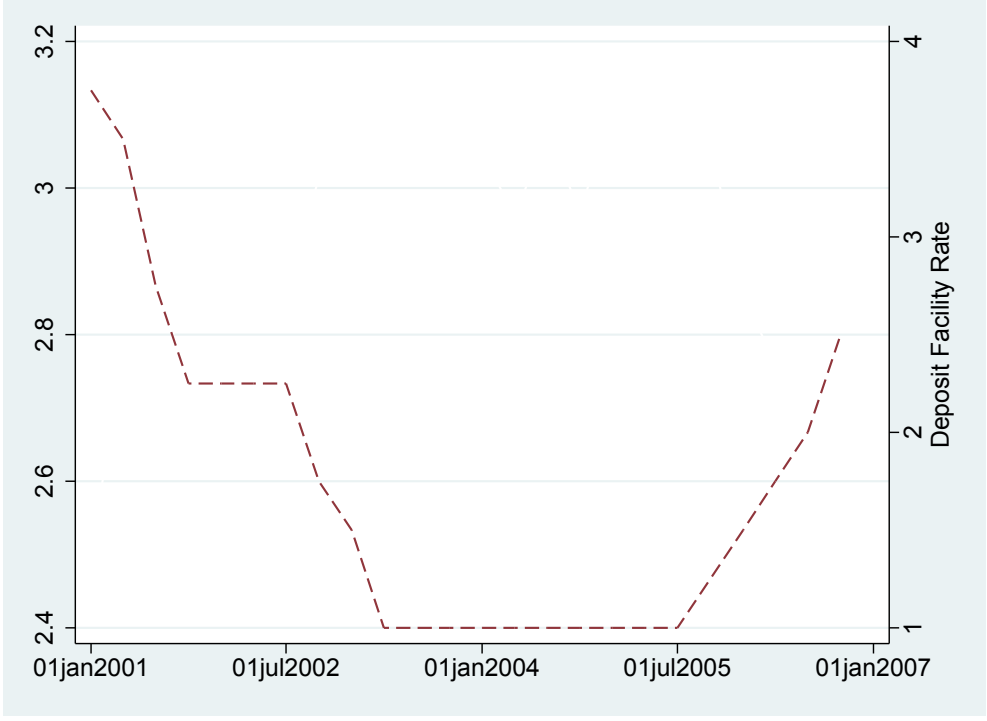
IQ and Survey Plans to Purchase Durables

$$\textit{Willingness Purchase Car}_{i,t} = \alpha + \beta \textit{High IQ}_i \times \textit{Post Announcement} + \gamma \textit{Post Announcement} + \zeta \textit{High IQi} + X'_{i.t}\delta + \epsilon_{i,t},$$

	Want Purchase Car Within 1 year		Want Purchase Non-car Vehicle		Want Purchase Other Durables	
	(1)	(2)	(3)	(4)	(5)	(6)
High IQ × Post Announcement	0.05**	0.04*	−0.00	−0.01	−0.01	−0.01
	(0.02)	(0.02)	−0.02	(0.02)	(0.03)	(0.03)
High IQ	−0.04***	−0.03**	0.03*	0.03*	0.05***	0.04**
	(0.01)	(0.02)	(0.01)	(0.02)	(0.02)	(0.02)
Post Announcement	−0.01	−0.00	0.03*	0.03*	−0.01	0.00
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Nobs	5,625	4,899	5,654	4,920	5,657	4,922
Controls		X		X		X
Expectations		X		X		X

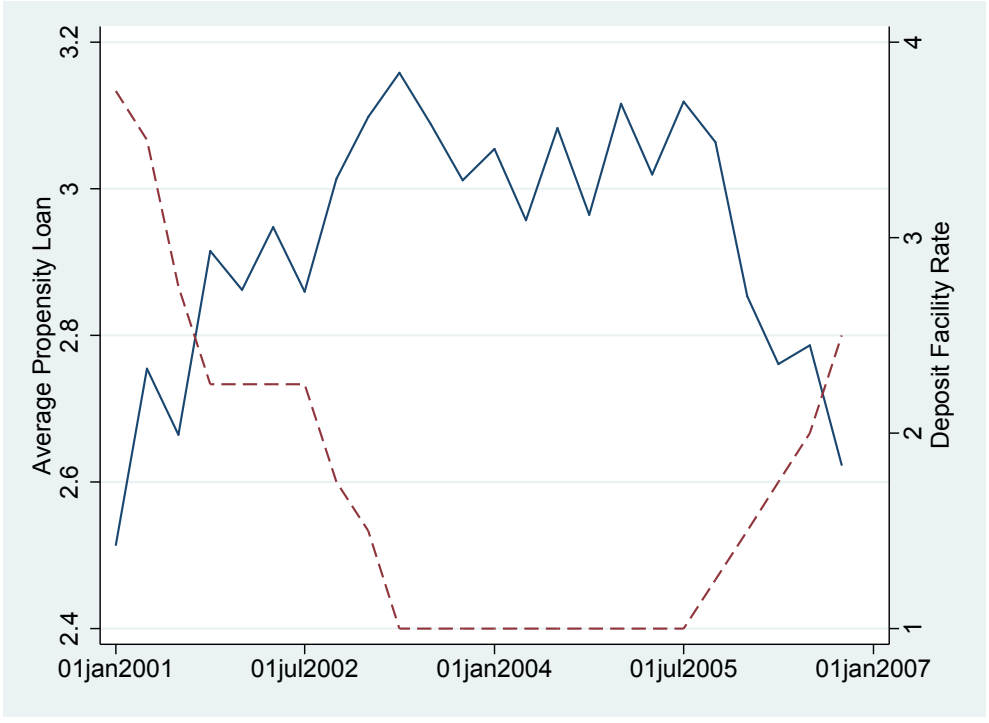
- Low-IQ men do not think good time to buy car during program
- High-IQ men no differential plan to purchase non-car vehicle or other large ticket item

Deposit Facility Rate: Beginning of Quarter



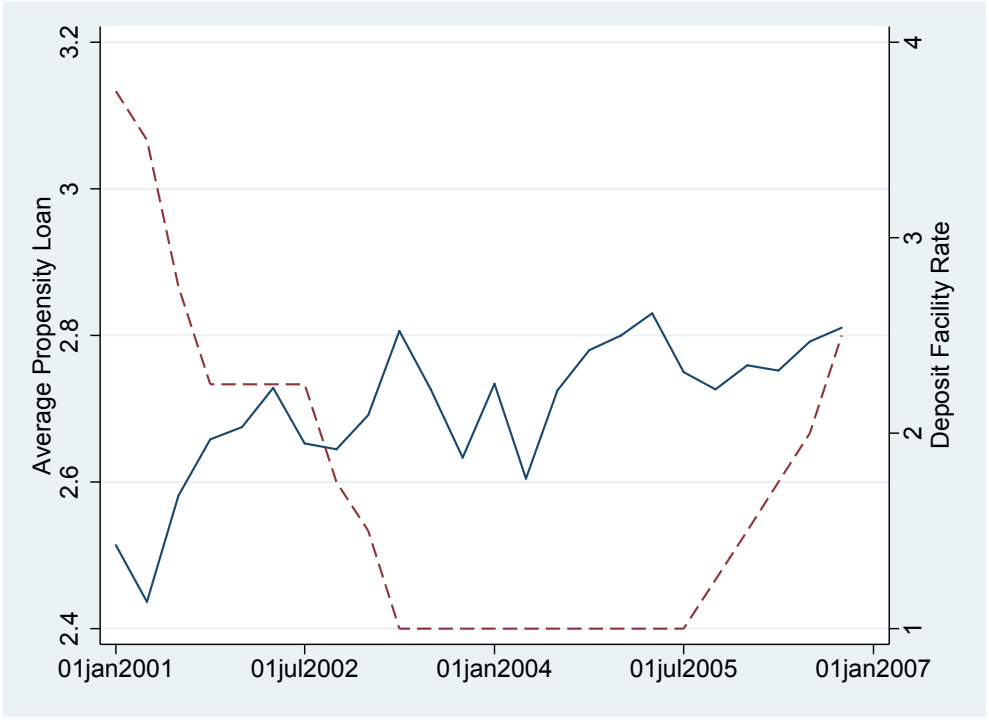
- Study propensity to take out loan by IQ
- Both for increase and decrease in rates
- Till end 2001: rate falls from 3.75% to 2.25%
- Trough of 1% in June 2003
- December 2005 rates start increasing; 2.5% end of 2006

Propensity to take out Loan: High IQ



- Early 2001: average propensity to take out loans of around 2.5
- Next 2.5 years: rates fall and propensities increase to more than 3
- Till mid 2005: rates and propensities flat
- Afterwards: rates increase, propensities fall

Propensity to take out Loan: Low IQ



- Early 2001: average propensity to take out loans of around 2.6
- Next 6 years: propensities hover around 2.8

Total Debt by IQ

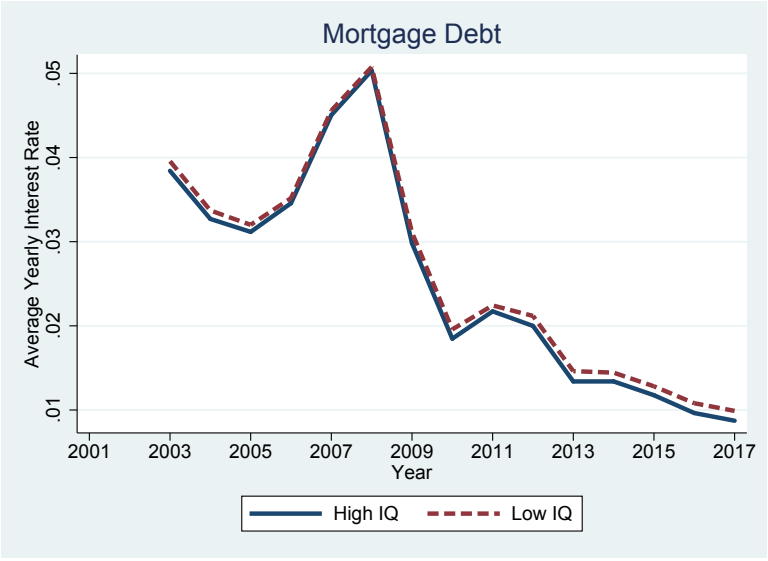
- Do low IQ men react less because cut off financial markets?
- Measure total debt by IQ from Statistics Finland

Total Debt / Taxable Income by IQ								
Low IQ	2	3	4	5	6	7	8	High IQ
0.82	0.77	0.76	0.75	0.78	0.80	0.81	0.87	0.93

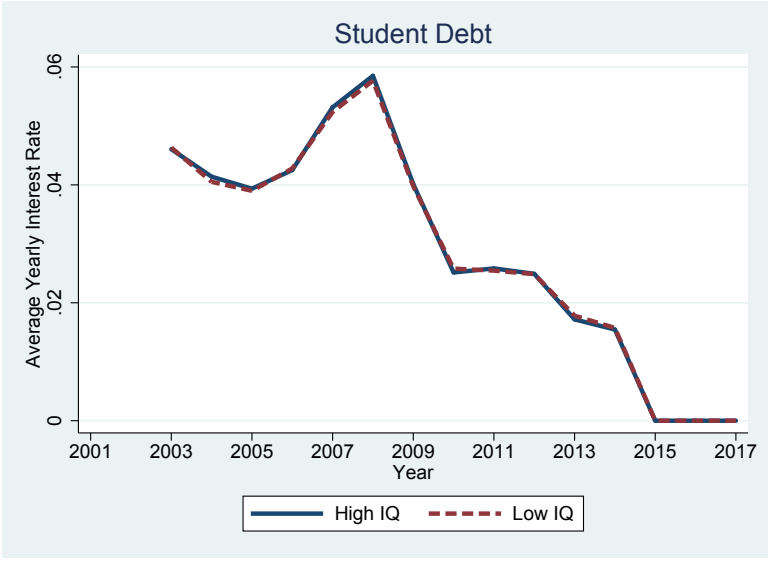
- Low IQ men and high IQ substantial amount of debt
- Restricted financial access unlikely driver of Δ propensity to Δ rate

Actual Interest Rates by IQ

A. Average Interest Rate on Mortgages



B. Average Interest Rate on Student Loans



- No differential pass through of policy rates to interest rates by IQ

Change in Debt and Changes in Interest Rates

- Family & friends or financial advisors shape actual decisions?

$$\textit{Debt Outcome}_{i,t} = \alpha + \beta \textit{High IQ}_i \times \textit{Rate}_t + \zeta \textit{High IQ}_i + \gamma \textit{Rate}_t + X'_{i.t}\delta + \eta_t + \eta_i \epsilon_{i,t}$$

	Debt Balance		
High IQ × Rate	−1,168.1***	−1,143.9***	−614.9*
	(341.0)	(341.2)	(326.2)
High IQ	6,331.8***	7,534.8***	
	(1,144.3)	(1,136.5)	
Rate	−4,496.3***		
	(231.7)		
Nobs	254,480	254,480	254,480
Controls	X	X	X
Year FE		X	X
Individ FE			X

- High-IQ men decrease debt balance by 25% more to 1% increase in rate than others

Extensive Margin and Changes in Interest Rates

$$\textit{Debt Outcome}_{i,t} = \alpha + \beta \textit{High IQ}_i \times \textit{Rate}_t + \zeta \textit{High IQ}_i + \gamma \textit{Rate}_t + X'_{i.t}\delta + \eta_t + \eta_i \epsilon_{i,t}$$

	Take New Loan			Pay Down Loans		
	(1)	(2)	(3)	(4)	(5)	(6)
High IQ × Rate	−0.008***	−0.008***	−0.007***	0.009***	0.009***	0.007***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
High IQ	−0.004	−0.006		0.002	0.004	
	(0.004)	(0.004)		(0.004)	(0.004)	
Rate	0.035***			−0.034***		
	(0.002)			(0.002)		
Nobs	213,473	213,473	213,473	213,473	213,473	213,473
Controls	X	X	X	X	X	X
Year FE		X	X		X	X
Individ FE			X			X

- High-IQ men: less likely to take out new loan & more likely to repay loan following increases in rates

Conclusion

- Low cognitive abilities:
  - Less likely to take advantage of subsidies for buying new car
  - Less sensitive debt choices to changes in interest rates
  - IQ only relevant within subset of unconstrained men
- Cognitive abilities impediment to effectiveness of policy
- Unintended consequences: redistribution from low to high IQ agents
- If IQ innate, unintended discrimination by policy institutions

Next: do for behavioral macro models what HANK is for NK model