

Human Frictions in the Transmission of Economic Policy*

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Abstract

We document that a large fraction of a representative population of men—those below the top of the distribution by cognitive abilities (IQ)—barely reacts to measures of monetary and fiscal policy that aim at influencing their leverage and durable spending decisions. To the contrary, high-IQ men respond to these measures in line with policy makers’ assumptions. Heterogeneity in observables such as income, education levels, economic expectations, or financial constraints do not drive these patterns. Our unique microdata include administrative information on cognitive abilities, economic expectations, consumption and borrowing plans, as well as actual debt levels and interest paid by debtholders in Finland. Limited cognitive abilities might represent *human frictions* in the transmission and effectiveness of fiscal and monetary policies that operate through household borrowing and spending decisions.

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I Introduction

In particular, low interest rates encourage households to bring forward durable consumption, and firms' investment, through credit.

Mario Draghi (2016)

A growing theoretical and empirical literature in macroeconomics investigates the frictions that limit the transmission of fiscal and monetary policy to the real economy. In particular, researchers have studied the role of financial intermediaries in reducing the effectiveness of policy through incomplete pass-through of changes in interest rates, inefficiencies in the design of the financial sector, and the financial sector's limited ability to screen and monitor firms and households.¹

In this paper, we document an additional type of friction, which we label *human frictions*. We argue that limited cognitive abilities might act as human frictions to the effectiveness of measures of fiscal and monetary policy that target households. Even agents that have the possibility to react to policies by changing their levels of debt or by moving forward their durable purchases, barely do so if they have limited cognitive abilities, possibly because they do not understand the implications of these policies for their economic choices (Agarwal and Mazumder (2013); Agarwal et al. (2009); Agarwal et al. (2017); D'Acunto et al. (2019b)). Because of human frictions, policies that aim to trigger a reaction by all non-financially-constrained households in the economy might be less effective than policy makers predict, consistent with a recent strand of the macro literature that models the importance of limited cognition for the transmission of fiscal and monetary policy.²

In a representative sample of Finnish men for whom we observe administrative data on cognitive abilities (IQ), we find that, after controlling for income, education, other demographics, and a broad set of aggregate and individual economic expectations, high-IQ men are twice as sensitive to changes in interest rates when making borrowing decisions relative to low-IQ men, at times of both increases and decreases of policy rates.

¹For instance, see Di Maggio et al. (2017), Drechsler et al. (2017), Wang et al. (2018), and Wang (2019).

²See, e.g., Woodford (2018), Farhi and Werning (2017), and Angeletos and Lian (2017).

We also find that, *ceteris paribus*, only high-IQ men respond to the incentives of “cash-for-clunkers” programs aimed at subsidizing the purchase of cars (Mian and Sufi (2012)). And, high-IQ men’s inflation expectations are 50% more sensitive to pre-announced changes in value-added tax (VAT) when forming their inflation expectations relative to low-IQ men’s (Correia et al. (2013); D’Acunto et al. (2018b); D’Acunto et al. (2018a)). Whereas high-IQ men’s expectations react to predictable future increases in inflation, low-IQ men’s expectations do not react. At the same time, inflation perceptions after the VAT changes are implemented do not differ across these two groups, which suggests high- and low-IQ men do not face systematically different inflation rates which drive the differences in sensitivities after the announcement and before the implementation.

Differences in income, education levels, borrowing constraints, or other expectations such as household income expectations do not explain the heterogeneity in borrowing, saving, and durable consumption choices by IQ levels. We do not argue that the optimal reaction to policy should be the same for all households in the economy, but that in our setting we can control directly for a broad set of demographics as well as, uniquely, for a large set of aggregate and individual economic expectations, which are typically unobserved determinants of consumption, saving, and borrowing choices. The different sensitivities of policy reactions across the IQ distribution are virtually unchanged even when we compare the reactions of households that are similar across all these observed characteristics.

The choices of men with low cognitive abilities are economically relevant in our setting, because high-IQ men represent less than 50% of the individuals and about 50% of the income in our sample. Any non-response to policy changes by other men might be material to explaining the limited effectiveness of policy interventions implemented under the assumption that most unconstrained households would react.

We base our analysis on administrative individual-level data from Finland. Around age 20, Finnish men take a standardized test of cognitive abilities when entering the mandatory military service at the Finnish Defence Forces (FDF). We observe the scores of all test takers between 1982 and 2001, which are provided as a standardized variable

that follows a stanine distribution (integers from 1 to 9, with 9 being the highest) to allow cross-cohort comparisons. We match these test scores with the individual-level answers to the monthly harmonized European Commission Consumer Survey from 2001 to 2015. This survey elicits inflation expectations, propensities to consume and borrow, as well as a rich set of demographics such as age, education, marital status, income, household size, and employment status for a set of repeated representative cross sections of Finns. In addition, we observe the total debt outstanding and the amount of interest paid at the end of each fiscal year from 2000 to 2017 at the household level based on tax records.

We build on these data to assess the relationship between cognitive abilities and individuals' responsiveness to economic policy. In earlier research, D'Acunto, Hoang, Paloviita, and Weber (2019b) found that cognitive abilities are an important determinant of the formation and updating of inflation expectations, whereas in this paper we focus on households' reaction to policy measures, which do not depend on inflation expectations except for pre-announced VAT changes.

The first policy measure we consider is a cornerstone of conventional monetary policy—the management of nominal interest rates. Central banks commonly lower nominal interest rates to stimulate consumption through household borrowing, whereas they increase rates to avoid overheating and reduce household borrowing, as the introductory quote by former European Central Bank (ECB) President Draghi suggests.

We assess the heterogeneity of individuals' responses to changes in interest rates when forming borrowing plans and making actual borrowing choices based on cognitive abilities. An advantage of our setting is that the sample period includes two significant changes in policy rates in opposite directions. The ECB, which has been responsible for the monetary policy of Finland since 1999, lowered its policy rate substantially during and subsequent to the stock-market turmoils of 2001. It kept rates low until 2005, and then increased rates steeply throughout 2007.

Effective transmission of these monetary-policy interventions requires that households increase their demand for loans when nominal rates drop, and decrease their demand for loans when nominal rates increase, after controlling for households' income levels, debt capacity, as well as other demographics and individual and macroeconomic expectations,

which would predict a different sensitivity of borrowing to changes in interest rates. We find high-IQ men behave in line with this conventional monetary policy transmission mechanism, because their propensity to take out loans increases when rates fall, stays constant while interest rates do not move, and decreases when interest rates rise. To the contrary, low-IQ men are barely sensitive to changes in nominal interest rates when forming their borrowing plans, irrespective of the direction of the rate change. These results hold for the full sample as well if we limit the analysis to households that are unlikely to be financially constrained and hence should be most reactive to changes in interest rates, *ceteris paribus*.

We also find high-IQ men's spending and saving plans are sensitive to changes in nominal rates. By contrast, low-IQ men's spending and saving plans do not react to rate changes, even after we account for the large set of demographics and economic expectations that might determine a heterogeneous sensitivity to changing nominal rates across households.

One might worry a differential pass-through of policy rates to low- and high-IQ men through financial intermediaries could explain our results. We can tackle this concern directly, because we do observe the interest rates individuals pay on their outstanding debt in our administrative data. We find the pass through of policy rates to the actual average interest rates Finnish households pay on their outstanding debt does not differ across high-IQ and low-IQ men throughout our sample period.

Alternatively, low-IQ men might not access financial markets for reasons beyond their demographic characteristics and economic expectations, which we observe directly. In this case, low-IQ men would not care about changes in interest rates when asked about their borrowing plans because they do not borrow in the first place. We can directly rule out even this alternative explanation in our setting, because we find that individual leverage ratios—outstanding debt to income—are almost flat across the IQ distribution.

Even though low-IQ men might not adjust their propensities to take out loans to changes in interest rates based on survey responses, they might still do so in their actual borrowing decisions. Supply-side forces such as financial advisers might alert low-IQ men about cheap rates to finance cars or mortgages or low-IQ men might observe the choices

of family, friends, and neighbors and imitate them (D’Acunto et al. (2019)). Contrary to this possibility, we find that high-IQ men do adjust their actual total outstanding debt balances significantly more to changes in interest rates relative to low-IQ men. This result also serves as a validation that the borrowing plans respondents report in our survey are consistent with their actual behavior we observe from administrative data.

We then move on to assess the role of human frictions for a form of traditional fiscal policy that became popular around the world to incentivize households’ durable spending—“cash-for-clunkers” programs (Mian and Sufi (2012)). Cash for clunkers programs consist of a government subsidy provided to individuals who trade in their existing “clunker” and purchase new fuel-efficient cars. The aim of these programs is to stimulate aggregate demand at times of low economic growth by incentivizing households to bring forward their durable spending. Although the implications of the government subsidy should be simpler to grasp than those of changing interest rates also to non-economic experts, awareness of the program and understanding of its functioning might vary systematically across individuals based on their cognitive abilities, after controlling for demographics and economic expectations that capture individual’s ability to move their durable spending intertemporally.

We consider the announcement of the first such program implemented by the *Finnish Transport Safety Agency* (Trafi), in 2015, which is towards the end of our sample period. We compare low-IQ and high-IQ men’s plans to purchase cars after the announcement of the program and until the end of the program, relative to the period before the announcement. We do find high-IQ men were more willing to purchase cars after the program’s announcement relative to before, whereas we detect no difference in the intention to purchase cars for low-IQ men. To corroborate this result, we propose a set of placebo tests. We show that, during the same period, high-IQ men did not change their willingness to purchase non-car vehicles such as motorcycles—which were not part of the Trafi program—or other durable goods, such as electric appliances or furniture, differently relative to low-IQ men. Hence, financial constraints or an unconditionally higher willingness to buy durable goods for high-IQ men during this sample period cannot explain the differential sensitivity across high- and low-IQ men to the announcement of

the Trafi program.

In the last part of the paper, we consider the scope for human frictions to reduce the effectiveness of changes in national sales taxes (VAT) in managing households' inflation expectations (Feldstein (2002), Correia et al. (2013), D'Acunto et al. (2018b)). In the Finnish context, we can isolate two sizable drops in VAT during our sample period—a decrease from 17% to 12% for generic food items implemented in October 2009 and a decrease from 22% to 13% for restaurants implemented in July 2010. Although these specific events were not aiming specifically at managing households' expectations, but might have been determined by other reasons, assessing the reaction of households' expectations to such changes can inform policy-makers about the reactions they should expect when implementing changes in VAT as an expectations-based policy.

When we compare the inflation expectations of our respondents after the announcement of the cuts in VAT (and before the actual implementations of the cuts) relative to before, we find that the inflation expectations of all agents decrease, but those of high-IQ agents are 50% more sensitive to the announcement of the VAT cut.

Because the cut happened at the same time as the Global Financial crisis, one might worry that our test captures high-IQ men's higher awareness of the potential consequences of the crisis on macroeconomic variables, even though we control directly for economic expectations. We find that after the VAT cut was implemented, the inflation expectations of all respondents increased again and those of high-IQ men increased by more. Moreover, we find that after the implementation of the cut, the inflation perceptions of high-IQ men and low-IQ men did not differ at all, which dismisses the possibility that low-IQ men experience a different level of inflation in their spending bundles relative to high-IQ men, possibly because of a systematic difference in the composition of their consumption bundles (D'Acunto et al. (2019)).

An implication of our results is a potential unintended redistributive role of monetary and fiscal policy. Because low-IQ men do not adjust their borrowing to changes in interest rates and do not take advantage of government subsidies when making durable-spending choices, policy interventions might result in redistribution from men with low cognitive abilities to men with high cognitive abilities. These potential unintended consequences

call for the design of salient policies and more targeted communication strategies that aim to affect all households in the economy, with a special focus on households that might be less aware of the effects of policy on economic incentives (see D’Acunto et al. (2018a) and Coibion, Gorodnichenko, and Weber (2019)).

A. Related Literature

Our findings stress the importance of cognitive abilities in shaping individuals’ response to economic incentives. Earlier research has documented the role of IQ for financial decisions, for instance, see Grinblatt, Keloharju, and Linnainmaa (2011), Grinblatt, Keloharju, and Linnainmaa (2012), and Grinblatt, Ikäheimo, Keloharju, and Knüpfer (2015). Agarwal and Mazumder (2013) relate cognitive abilities to suboptimal use of credit cards and home-equity loan applications. D’Acunto et al. (2019a,b) show that cognitive abilities matter for the formation and updating of inflation expectations and the mapping of inflation expectations into economic choice. We contribute to this research by assessing the extent to which the variation in decision-making by IQ relates to the transmission of measures of fiscal and monetary policy. To the best of our knowledge, this is the first paper that proposes such assessment using field data and covering a representative population and their real-stake economic decisions.

Household leverage is a central driver of economic booms and busts (Mian and Sufi (2011); Mian and Sufi (2010); Mian, Sufi, and Verner (2017); Di Maggio and Kermani (2017)) and changes in policy rates transmit to household consumption (Di Maggio et al. (2017)). In this paper, we contribute to this literature by assessing the extent to which limited cognitive abilities might hinder the transmission of policies that target the borrowing, saving, and spending plans of households.

Our findings also inform the literature on the take-up of economic programs. In the Great Recession, the US administration initiated programs for underwater homeowners to refinance their mortgages, but the take-up rates were surprisingly low. Agarwal et al. (2017) study the effects and take-up rates of the 2009 Home Affordable Modification Program, which provided intermediaries with sizable financial incentives to renegotiate mortgages. They find a take-up rate of just one-third of the overall target population of

indebted US households. Moreover, Keys et al. (2016) show 20% of households that are unlikely to be constrained fail to refinance their mortgages when interest rates decline. Our findings suggest low cognitive abilities might contribute to explain the limited take up of these programs, above and beyond financial constraints and households' debt capacity.

II Data

Our analysis uses three micro data sets that include individual-level information on macroeconomic expectations, consumption and borrowing plans, and cognitive abilities, as well as administrative information on household-level income, debt levels, and the amount of interest paid on debt.

A. Cognitive Abilities Data

Finland has general conscription for men, which means that all Finnish men between the ages of 18 and 60 are liable for military or non-military service. The share of men who do non-military service is only about 3% of all men who start military service.³ Within the first weeks of the mandatory military service, Finnish men typically around the age of 19-20 have to participate in a series of tests. The FDF administers these tests and uses the results to select candidates for possible officer training. Because ranking well in the IQ test provides a set of advantages in terms of quality of training and access to elite social networks, men have an incentive to perform as well as possible on the test (Grinblatt et al. (2011)).

The test consists of 120 questions that attempt to test cognitive abilities in three areas – visuospatial, mathematical, and verbal cognitive abilities. The FDF aggregates those scores into a composite measure of cognitive abilities, which we label collectively as IQ. The FDF standardizes IQ to follow a stanine distribution year by year. Stanine (STANDARD NINE) is a method of scaling test scores on a 9-point standard scale with a mean of 5 and a standard deviation of 2. The respondents in the lowest 4% of test scores are at least 1.75 standard deviations from the mean and are assigned a standardized IQ

³Please see <https://puolustusvoimat.fi/en/conscription> for these and additional details.

of 1 and the 4% with the highest test scores are assigned a standardized IQ of 9. We have test results for all participants from January 1, 1982 until December 31, 2001.

Finland is a homogeneous country in terms of cultural background and opportunities. Access to education, including college education, is virtually for free. The country is also racially homogeneous (Grinblatt et al. (2011)). These features make the Finnish setting a desirable laboratory because our measures of IQ are unlikely to proxy for differences in cultural or environmental factors individuals could manipulate, but are more likely to reflect differences in innate abilities across individuals.

B. Borrowing and Spending Plans

Our main source of information on borrowing and consumption propensities is the confidential micro data underlying the Consumer Climate Survey of Statistics Finland. Statistics Finland conducts the survey on behalf of the Directorate General for Economic and Financial Affairs of the European Commission as part of the European Commissions' harmonized consumer survey program. Every month, they ask a representative repeated cross section of approximately 1,500 Finnish individuals questions about general and personal economic conditions, inflation expectations, and willingness to spend on consumption goods. Statistics Finland also collects additional information through supplementary questions about households' plans to save and borrow.

The samples are drawn from the total population of 4.4 million individuals and 2.6 million households residing in Finland. The survey is run through phone interviews. In advance of the phone interview, Statistics Finland notifies all target individuals with a letter that contains information about the contents and logistics of the survey.

We obtained access to the micro data underlying the survey for the period starting in January 2001 and ending in March 2015.

We use the answers to the following question to study the propensity to take out loans in response to changes in nominal interest rates:

Question 22 *In view of the general economic situation in Finland, do you think that at the moment ...*

Respondents can answer, “It is a very bad time to borrow,” “It is a pretty bad time to borrow,” “It is a pretty good time to borrow,” or “It is a very good time to borrow.”⁴

To study the association between cognitive abilities and the reaction to the cash for clunkers program, we use the answer to the following question:

Question 10 *In view of the general economic situation in Finland, do you think that now it is the right moment for people to purchase a car?*

Respondents can answer, “It is neither the right moment nor the wrong moment,” “No, it is not the right moment now,” or “Yes, it is the right moment now.”

We use similar questions for non-car vehicles and for other durable goods for placebo tests to corroborate that only the spending plans on the durable goods that are covered by the cash for clunkers program change.

In addition, we use questions regarding expectations about general macroeconomic variables, such as inflation and unemployment, household-level income, and a rich set of socio-demographics from the Statistics Finland survey, which include gender, age, marital status, household size, income, employment status, number of children, region of residence, and education levels.

C. Income and Debt Data from Registries

We also have access to administrative income, debt levels, and interest paid on outstanding debt for all Finnish full-time residents at the end of each calendar year through Statistics Finland. The data cover the period from December 2000 to December 2017. We can link this information through individual anonymised identifiers to the data on men’s cognitive abilities from the FDF as well as the answers to the Consumer Climate Survey.

These administrative data contain information on individuals’ labor and business incomes, received and paid income transfers, as well as overall household liabilities, which are split by types: mortgage debt, student-loan debt, first-buyer mortgage debt, and total debt. For each category of debt, we observe the total amount of debt outstanding at the end of the year as well as the total amount of interest paid throughout the year.

⁴The question is not part of the harmonized EC survey.

The information is collected from underlying sources across various agencies, which include the Finnish Tax Administration, the National Institute for Health and Welfare, Statistics Finland, and *Kela*, as well as administrative registers.

D. Descriptive Statistics

Table 1 contains the descriptive statistics for the main variables in our analysis. The median income is EUR 21,000 and the median respondent is 30 years old. 61% of respondents are single, 6% are unemployed, 78% have children, 34% have a college degree, about a third lives in urban areas, and 28% live in Helsinki. 51% of respondents think it is a good time to buy durables, 20% think it is a bad time, and the other respondents think it is neither a good nor a bad time.

Table 2 reports the distribution of normalized IQ in Panel A, the average household leverage ratio by IQ bins in Panel B, and the share of income in total income that accrues to the individual IQ bins in Panel C.

We see in Panel A the number of observations is not symmetric around bin 5, but we observe systematically lower mass in the left tail of the distribution than in the right tail. In some of our analyses, we split our sample between groups 1 to 5 (low-IQ mean) and groups 6-9 (high-IQ men) to obtain subsamples of similar size. The asymmetry of the distribution of the survey responses by IQ might raise concerns about sample selection, because the underlying distribution of IQ we obtain from the FDF is symmetric around 5. Only after merging the IQ data with the consumer survey do we observe the asymmetry. Conversations with survey experts at Statistics Finland suggest a nonnegligible fraction of Finns who are contacted to complete the survey decline to do so. Low-IQ men might be more likely to decline to participate in the survey relative to high-IQ men. If the low-IQ men who decline are those who have severe cognitive problems or know they have a limited knowledge of their surroundings, we would expect these men would perform even worse, on average, than the surveyed low-IQ men in making forecasts and economic choices. In this case, the empirical effects we estimate in this paper might be a lower bound of the actual effects we would expect if everybody in the population provided expectations and plans.

Panel B shows little variation in household leverage ratios by IQ. Specifically, low-IQ men have a ratio of total debt to taxable income of 82%, which is slightly higher than the ratio for all bins up to a normalized IQ of 7. High-IQ men, instead, have a slightly higher leverage ratio of 0.93. In the bottom panel, we see the share of income that accrues to the individual bins. Later in our empirical analysis, we will often split the sample into low and high IQ, with the latter defined as having a normalized IQ of 6 or higher. Note this implies low-IQ men make up 49.2% of total income and are therefore a large share of aggregate income in the economy.

D’Acunto et al. (2019b) show the measure of cognitive abilities has a correlation of only 0.15 with income and that IQ and forecast errors for inflation are negatively correlated. Variation in observables such as income or education does not drive the correlation between IQ and inflation expectations.

III Changes in Interest Rates, Borrowing Plans, and Borrowed Amounts

As the introductory quote by former ECB President Draghi highlights, conventional monetary policy uses short-term interest rates in an attempt to stabilize household consumption and investment in durable goods. In this section, we study the propensity to take out loans over time—which we observe in our survey—in response to changes in nominal interest rates by cognitive abilities. Moreover, we study the variation in the actual changes in household debt over time using administrative data.

The time period our survey covers includes a full cycle of decrease and increase in short-term nominal interest rates by the ECB from 2001 until 2006. Central banks often lower nominal interest rates during crises to stimulate consumption through loans. At the same time, central banks might increase nominal interest rates at times of sustained growth and inflationary pressure to avoid overheating, again through lower credit. We do not consider the second part of our sample, in which policy rates declined dramatically and were mostly at their effective lower bound, so that measures of conventional monetary policy were not available.

Panel A and Panel B of Figure 1 depict the cycle in ECB policy rates (red dashed line).⁵ On May 31, 2001, the ECB lowered its deposit facility rate from 3.75% to 3.50% (right y-axis) and continued lowering the rate until it reached a trough of 1.00% on June 30, 2003. Recessionary pressure in France and Germany mainly drove the cuts in nominal rates. In times of low interest rates, financing conditions become more favorable and individuals have an incentive to borrow more. In our setting, we can control directly for individual expectations regarding future income and employment status, which absorbs the effects of potentially concurrent recessionary pressures on Finnish households' willingness to borrow. The ECB kept the deposit facility rate stable from June 30, 2003, until June 30, 2005, when the ECB started to tighten monetary policy and increased rates throughout 2006. We do not extend the analysis beyond the start of the Global Financial Crisis and the Great Recession, because policy rates dropped dramatically and stayed unchanged and close to zero throughout the rest of our sample period.

A. Borrowing Plans

We first focus on survey responses, which allow us to study the demand side of credit and to abstract from possible financial constraints. Below, we also study the changes in actual household debt over time, which instead could be influenced by changes in credit supply and financial constraints.

Starting with the raw data, we compare the average responses over time for high-IQ men in Panel A and low-IQ men in Panel B of Figure 1. The average propensities to take out loans (blue solid lines) are about 2.5 for both groups of men at the beginning of the period. For this propensity, respondents can pick a number between 1 and 4, where 4 means they think it is a very good time to borrow and 1 means they think it is a really bad time to borrow.

During the period 2001-2003, as the ECB decreased short-term rates, high-IQ men increased their propensity to borrow, with a peak at 3.1 exactly when the deposit facility rate reached its lowest point for the 6-year period we consider. During the same period,

⁵The figure plots the beginning of the quarter deposit facility rate. Other short-term policy rates such as the rate on the main refinancing operations move in parallel to the deposit facility rate.

low-IQ men’s propensity to borrow increased only slightly, peaking at 2.8 in January 2003. Overall, the increase in the propensity of high-IQ men to borrow (0.6) in the raw data was 100% higher than the increase in the propensity of low-IQ men to take out loans (0.3).

Moreover, high-IQ men reduced their propensity to borrow from 3.1 at the end of June 2005 to 2.6 in the third quarter of 2006. By contrast, low-IQ men did not change their propensity to borrow over the same period, despite the higher nominal interest rates.

These raw-data results suggest a potential difference in the sensitivity of the propensity to borrow to changes in nominal interest rates across men with different levels of cognitive abilities. This analysis, though, cannot rule out that low-IQ men are insensitive to changing interest rates when forming borrowing plans due to systematic differences in financial constraints, economic expectations, or unobserved variation.

To dig deeper into this result, we thus perform the analysis in a multivariate setting that allows us to absorb systematic heterogeneity across low-IQ and high-IQ men other than cognitive abilities. We estimate specifications of the following type:

$$Loan_{i,t} = \alpha + \beta High\ IQ_{i,t} \times Post_t + \gamma Post_t + \zeta High\ IQ_{i,t} + X'_{i,t} \delta + \eta_t + \epsilon_{i,t}, \quad (1)$$

where $Loan_{i,t}$ is a dummy variable that equals 1 if respondent i in month t said it was a very good or pretty good time to take out a loan, and zero otherwise; $High\ IQ_{i,t}$ is a dummy variable that equals 1 when the standardized IQ score of individual i is 6 or above; $Post_t$ is a dummy variable that equals 1 in the months after the ECB decreased or increased the facility rate, and zero in the months before the changes; and X is a vector of individual level controls including age, age², marital status, log of income, employment status, number of children, urban versus rural classification, college dummy, and a dummy that equals 1 if the respondent lives in Helsinki. We estimate this specification with a linear probability model (OLS) as well as using non-linear Probit and Logit models. For the latter, we directly report marginal effects.

Panel A of Table 3 reports the results for estimating equation (1) for the period of January 2001 to June 2003, during which the ECB cut the deposit facility rate. The $Post$ dummy takes on the value of 1 starting in June 2001. Across all estimation methods

(columns (1)-(3)) and when absorbing variation in demographic characteristics (columns (4)-(6)), we find that (i) on average, all respondents are more likely to think it is a good time to borrow after the cut in interest rates, but (ii) the propensity to borrow increases significantly more for high-IQ men than for low-IQ men. High-IQ men increase their propensity to take out loans by 100% and up to 150% more than low-IQ men, as can be seen by comparing the estimated coefficients $\hat{\beta}$ to the estimated coefficients $\hat{\gamma}$ across all specifications.

Panel B of Table 3 reports the results for estimating equation (1) for the period July 2003 to December 2006, during which the ECB increased the deposit facility rate. In this test, the *Post* dummy takes on the value of 1 starting in January 2006. Consistent with the conjecture that high-IQ men react more to changes in policy rates, the estimated coefficients $\hat{\beta}$ are negative and statistically different from zero; that is, high-IQ men are less likely than low-IQ men to claim it is a good time to take out a loan once nominal interest rates increase. Once we control for demographic heterogeneity, high-IQ men are about 4 times less likely to claim it is a good time to take out a loan compared to low-IQ men and compared to the period before the interest-rate increase.

B. Actual Borrowed Amounts

So far, we have studied exclusively the association between policy rates and survey responses. Even though low-IQ men might not adjust their survey-elicited willingness to take out loans to changes in interest rates, it could still be the case high- and low-IQ men would adjust their *actual* decisions in similar ways for several reasons. For instance, financial advisers might contact low-IQ men and suggest that they adjust their debt exposure based on the dynamics of interest rates. Alternatively, low-IQ men might observe the financial decisions of neighbors, family members, colleagues, or friends and imitate their behavior (D’Acunto et al. (2019)).

We thus move on to consider actual leverage choices based on registry data. For any debtholder in Finland, we observe the amount of total debt outstanding at the end of the fiscal year. This registry sample differs from the sample of men we observe in the Consumer Climate Survey of Statistics Finland. First, we observe the debt outcomes

of a substantially larger cross-section of Finnish men—all men for which we have IQ information and who have any debt outstanding at the end of each fiscal year. Moreover, the registry sample is a panel, that is, we observe end-of-year debt outstanding for the same individual over time. This feature allows us to estimate any effect while absorbing individual time-invariant characteristics, which we cannot do in the survey sample due to the lack of repeated observations for the same individual over time.

Building on the panel nature of the registry sample, we estimate the following pooled OLS specification:

$$\begin{aligned} Debt\ Outcome_{i,t} = & \alpha + \beta High\ IQ_i \times Mg\ Lend\ Rate_t + \zeta High\ IQ_i \\ & + \gamma Mg\ Lend\ Rate_t + X'_{i,t} \delta + \eta_t + \eta_i + \epsilon_{i,t}, \end{aligned}$$

where $Debt\ Outcome_{i,t}$ is the end-of-year total debt balance of individual i in year t or a dummy variable that equals 1 if the individual took out a new loan in year t or a dummy variable that equals 1 if the individual fully paid back at least one existing loan in year t ; $Mg\ Lend\ Rate_t$ is the average level of the marginal lending facility rate set by the ECB in year t ; and all other variables are defined as above. Crucially, we can estimate specifications that absorb a full set of individual fixed effects (η_i) due to the panel nature of these data.

In columns (1)-(3) of Table 4, the outcome variable is the level of debt outstanding at the end of the year for individual i in year t . Column (1) shows the average low-IQ man has a lower level of debt outstanding in years in which the average marginal lending rate is higher, as captured by the coefficient attached to $Mg\ Lend\ Rate_t$. At the same time, this negative association is larger for high-IQ men, who on average have $2,131/9,249 = 23\%$ lower debt outstanding when the marginal lending rate is 100 basis-points higher.

Note high-IQ men tend to hold more debt unconditionally relative to low-IQ men. One might be concerned low-IQ men do not decrease their debt outstanding by as much as high-IQ men simply because they might not hold as much debt to begin with. But the average debtholder in the low-IQ group though has 26,075 Euros in debt outstanding. Columns (2)-(3) of Table 4 repeat the analysis when absorbing common

business-cycle shocks to all men in the sample by adding year fixed effects, as well as time-invariant systematic differences across individuals by adding individual fixed effects to the specification. Even in this last specification, we detect a substantial larger drop in high-IQ men's debt balance by \$1,443 Euros more than low-IQ men's debt balance per 100 basis point higher average marginal lending rates.

In addition to debt levels, we construct two dummy variables for whether individuals in our sample took out a new loan during fiscal year t or they paid back fully any existing loans during the same period. We report the linear probability model estimates for these specifications in columns (4)-(9). We find high-IQ men are about 6% less likely to take out a new loan for a 100-basis point higher average marginal lending rate, and at the same time they are 6% more likely to pay down at least one existing loan in full, relative to low-IQ men. The size of the estimates is quite stable as we restrict the variation we use in the regressions with year and individual fixed effects.

The baseline likelihood of taking out new loans is higher at times in which the marginal facility rate is higher, which is consistent with the notion that the ECB tends to increase interest rates at times of positive economic conditions and outlook to avoid an overheating of the economy. This result also suggests low-IQ men are less sensitive to the pricing of debt relative to high-IQ men at times in which they can plausibly afford to take out new loans due to the positive economic outlook.

C. Alternative Explanations: Financial Constraints, Financial Inclusion, and Differential Debt Pricing

One drawback of using observational data is that we do not observe directly whether respondents face financial constraints. The fact low-IQ men are less likely to state that it is a bad time to take out loans when interest rates increase reduces this concern, because financial constraints do not hinder agents from abstaining to take out new loans.

To assuage this concern more directly, in the Online Appendix we estimate equation (1) separately for men excluding the bottom 25% of the income distribution, which includes high-IQ and low-IQ men who are less likely to face financial constraints. As

we report in Table A.1 of the Online Appendix, we replicate our baseline results in this subsample.

Another alternative explanation could be low-IQ men are shut off from financial markets and therefore do not care about changes in interest rates when forming their spending plans, simply because they cannot borrow. But Panel B of Table 2 shows total debt to taxable income is quite stable across the IQ distribution, and debt capacity seems sizable at all IQ levels. The average amount of debt outstanding for low-IQ men is 26,075 Euros.

Moreover, a differential pass-through of policy rates to individual borrowing rates for low-IQ and high-IQ men might explain our findings. For example, banks might systematically change interest rates more slowly for men with low cognitive abilities than for men with high cognitive abilities in response to changes in policy rates. This differential pass-through is an unlikely explanation because 95% of all mortgages in Finland are adjustable-rate mortgages with a spread on the 12-month EURIBOR, and mortgages represented 74% of all consumer debt at the end of 2014.

To assess this explanation more directly, Figure 2 plots the average interest rates paid on different types of debt by high-IQ and low-IQ men. We compute the average interest rates by dividing the overall amount of interest paid by each individual in the registry data throughout the year by the average of the beginning and end of year debt amount outstanding. Panel A of Figure 2 only considers outstanding mortgage debt; Panel B focuses on student loans; and Panel C considers the overall amount of debt outstanding and overall amount of interest paid, irrespective of the type of debt. Across all types of debt, the average interest rates are similar for high-IQ and low-IQ men. The rates are almost identical for student loans, whereas for mortgages and total debt we find a systematically lower rate for high-IQ men, although the economic magnitude of the difference is small at each point in time. Crucially, we do not detect differential changes over time in the pricing of loans across cognitive abilities for any type of loan, which is direct evidence against the concern that a differential pass through of policy rates to household borrowing rates might drive the different responses of high-IQ and low-IQ men.

D. How Do Individuals Use the Resources that Free Up After a Drop in Interest Rates?

The idea of the traditional household credit channel is that households might ultimately spend more at times of lower interest rates, either because they can finance consumption with cheaper new loans or because they can employ the financial resources they would have needed to pay interest on their outstanding debt to increase consumption (Di Maggio et al. (2017)).

If high-IQ men are really more aware of the effects of changing debt pricing on the amount of resources that are available to them, high-IQ men might be more likely to change their saving and spending plans at times of lower interest rates relative to low-IQ men. In this case, the household credit channel would transmit more through high-IQ individuals than low-IQ individuals, that is, low-IQ individuals would represent a friction to the transmission of this channel of monetary policy.

In the last part of this section, we aim to assess how high-IQ and low-IQ men plan to use the resources that free up after decreases in interest rates—the lower amounts of interest they will need to pay keeping constant the amount of debt outstanding. To do so, we move back to the sample of men in the Consumer Climate Survey, for whom we observe saving and spending plans.

Specifically, we observe whether respondents state that it is a good time to save to pay down outstanding loans and if they think it is a good time to purchase durable goods. Under our conjecture, we would expect high-IQ men with debt outstanding are less willing to save to pay down their loans at times of lower interest rates, because such loans become cheaper, and they might instead plan on using the financial resources that free up to purchase durable goods.

In Table 5, for both saving and spending plans, we split the sample into two groups—men who have a mortgage outstanding and men who have no mortgage debt outstanding. Mortgage debt is the most common form of debt for Finnish individuals and almost all mortgage debt is adjustable rate, and hence we expect to see larger disposable income when interest rates fall in this subsample of men.

We also consider non-mortgage debt holders, who act as a falsification sample, because drops in interest rates should not affect the saving and spending plans of those who hold no debt under the household credit channel. If we found an effect for this group, our test would likely capture unobserved variation that correlates with lower interest rates and explains individual plans.

In columns (1)-(2) of Table 5, the outcome variable is a dummy that equals 1 if the individual declares that it is a good time to save in order to pay down existing loans. *Drop Lending Rate_t* is computed as the negative change of the average yearly marginal lending rate from year $t - 1$ to year t . We compute the change because in this sample we do not observe multiple observations for the same respondent. We therefore study individual plans after interest rates have declined, relative to periods after interest rates have increased or stayed constant.

Consistent with a stronger transmission of the household credit channel through high-IQ men, we find that high-IQ men who hold debt are 2.3 percentage point less likely to think it is a good time to save to pay down loans when interest rates have decreased, relative to low-IQ men. Low-IQ men are insensitive to changes in interest rates when forming their savings plans, as captured by the insignificant coefficient attached to *Drop Lending Rate_t*. Importantly, this difference does not exist in the sample of respondents who do not hold any mortgage debt (column (2)).

Also, in column (3) high-IQ men are 1.5 percentage point more likely to think it is a good time to purchase durable goods after a drop in interest rates if they are mortgage holders,⁶ whereas we detect no economically or statistically significant difference in the spending plans of high-IQ and low-IQ men when focusing on those individuals with no mortgage debt. Even in this case, the spending plans of low-IQ mortgage debt holders appear completely insensitive to changes in interest rates.

Overall, we interpret the results in Table 5 as consistent with the notion that the traditional household credit channel of monetary policy is likely to transmit more easily through high-IQ men than low-IQ men. Low-IQ men with outstanding mortgages appear insensitive to changes in interest rates when forming both saving and spending plans.

⁶Note that in this case we only reject the null hypothesis of no difference at the 10% level of significance

IV Conventional Fiscal Policy: Subsidies to Durable Spending

We move on to study Finnish men’s reaction to a measure of traditional fiscal policy that became popular around the world to incentivize households’ durable spending—cash for clunkers programs (Mian and Sufi (2012)). Cash for clunkers programs consist of a government subsidy provided to individuals who trade in their existing cars and purchase new, more fuel-efficient cars. The aim of these programs is to stimulate aggregate demand at times of low economic growth by incentivizing households to move their durable spending forward. Although the implications of the government subsidy should be simpler to grasp than those of changing interest rates also to non-economic experts, awareness of the program and understanding of its functioning might vary systematically by cognitive abilities.

In the case of Finland, the *Finnish Transport Safety Agency* (Trafi) announced the first such program in November 2014 to be implemented in January 2015, which is towards the end of our sample period (March 2015). The program consisted of a 1,500 Euro subsidy for every registered car that was traded in for the purchase a new or used car emitting less than 120 grams of carbon dioxide per kilometer. Trafi spent about 8 million Euros on this program and estimated that about 60% of the cars would have not been purchased absent the program.⁷

In our double-differences analysis, we consider the interview months after the announcement of the program, from December 2014 to March 2015. The 12 months before the Trafi program announcement, during which respondents were not aware of the future possibility of obtaining a subsidy to purchase cars when forming their purchasing plans, act as the control period.

We exploit the richness of our survey data, which include questions about households’ plans in terms of the purchase of new or used cars over the following 6-month and 12-month horizon. To compare the change in the willingness of purchasing cars between high-IQ

⁷These figures and estimates are self-reported by the Trafi agency, which designed and oversaw the program. We do not have access to independent data to assess these figures.

men and low-IQ men after the program was announced, relative to before the program announcement, we estimate the following specification:

$$\begin{aligned} \text{Want Purchase Car}_{i,t} = & \alpha + \beta \text{High IQ}_{i,t} \times \text{Trafi}_t + \gamma \text{Trafi}_t + \zeta \text{High IQ}_{i,t} \quad (2) \\ & + X'_{i,t} \delta + \eta_t + \epsilon_{i,t}, \end{aligned}$$

where *Want Purchase Car*_{*i,t*} is a dummy variable that equals 1 if respondent *i* in month *t* says it is a very good or good time to purchase a car, and zero otherwise; *High IQ*_{*i,t*} is a dummy variable that equals 1 when the standardized IQ score of individual *i* is 6 or above; *Trafi*_{*t*} is a dummy variable that equals 1 in the months after Trafi announced the cash for clunkers program, and zero in the months before the announcement; and *X* is the vector of individual level controls from before.

An advantage of this test is the availability of a natural placebo design, because at each point in time respondents are asked not only about the willingness to purchase cars, but also about the willingness to purchase non-car motorized vehicles as well as other durable goods, such as electronic items and furniture. None of these goods were subsidized under the Trafi program. We can thus compare the change in the willingness to purchase non-car durable goods, including other vehicles, between high-IQ men and low-IQ men, under the null hypothesis that this change should be on average zero unless our baseline test on car purchases captures unobserved heterogeneity across IQ levels. To implement the placebo test, we estimate versions of equation (2) in which the outcome variable is respondents' willingness to purchase non-car vehicles or other durable goods.

Table 6 reports the results of this analysis. Columns (1)-(4) estimate equation (2) when the outcome variable is respondents' willingness to purchase a car over the next 6 months or over the next 12 months. High-IQ men are about 4 to 5 percentage points more likely than low-IQ men to state they think it is a good time to purchase cars in Finland after the announcement of the Trafi program, relative to before. Because the average readiness to purchase cars during our test period is about 18%—that is, about 18 out of 100 respondents think it is a good time to purchase cars across all months—the size of the higher reaction of high-IQ men amounts to between 22% and 27% of the average

willingness to purchase car in the sample, which is sizable.

The estimated effect is similar when we absorb the set of demographic characteristics and other economic expectations we observe. At the same time, low-IQ men do not seem to change their willingness to purchase cars at all around the *Trafi* announcement, as captured by the insignificant estimated coefficient on the *Trafi* dummy. This result suggests that low-IQ men are almost completely insensitive to the cash for clunkers program in their car purchase plans, which might be due to their lack of awareness of the program or to the lack of understanding of the advantages of this program.

One concern is low-IQ men might face financial constraints and hence are in general not willing to purchase cars. But the evidence in Table 6 goes against this interpretation, because the coefficient on *High IQ* is negative and statistically different from zero in almost all specifications. If anything, high-IQ men are *less* willing to purchase cars than low-IQ men in normal times.

Columns (5)-(8) of Table 6 report the results for the placebo tests. In columns (5)-(6) we consider respondents' willingness to purchase non-car motorized vehicles. Consistent with our interpretation of the baseline result, we fail to detect any differences in high-IQ and low-IQ's willingness to purchase motorized non-car vehicles after the *Trafi* program was announced, relative to before. The estimated coefficients are not only statistically but also economically insignificant. Similarly, in columns (7)-(8) we do not detect any differential willingness to purchase other durable goods between the two groups of men. In this case, the outcome variable is a dummy that equals one if the respondent reports that he is willing to purchase at least one electronic appliance, at least one other home appliance, or at least a piece of furniture over the next 12 months.

Overall, the results in Table 6 suggest high-IQ men react more than low-IQ men when forming their car purchasing plans after the announcement of a cash for clunkers program. In fact, low-IQ men do not appear to react at all. We detect no difference in purchasing plans over the same period and for the same respondents when asked about their non-car motorized vehicles or other durable goods, which were not subsidized under the *Trafi* program.

V Unconventional Fiscal Policy: Pre-announced Changes in VAT

The third and last policy measure we consider is a form of fiscal policy—changes in the national sales taxes (VAT). Changes in sales taxes, which are homogeneous at the national level in Finland, are a traditional measure of fiscal policy that vary the extent of taxation of consumption relative to income and capital. When a change in VAT is pre-announced, it might fall under the category of unconventional fiscal policy measures (D’Acunto et al. (2018b)). One main aim of unconventional fiscal policy announcements is to manage households’ expectations. Indeed, if the government pre-announces a future increase in VAT, households’ inflation expectations should increase at the time of the announcement, which might stimulate spending during the period between the announcement and the actual implementation based on the consumer Euler equation. D’Acunto et al. (2018a) study one such episode of unconventional fiscal policy in Germany and show that households increase their inflation expectations after the announcement of a delayed increase in VAT.

In the Finnish context, over the sample period we have available, we could not detect any sizable pre-announced increase in VAT. Instead, we could isolate two sizable decreases in VAT that were pre-announced—a decrease of the baseline VAT rate for generic food items from 17% to 12%, announced in June 2009 and implemented in October 2009, and a decrease of the VAT applied to restaurant services from 22% to 13% implemented in July 2010.

Of course, the theoretical and empirical implications of a pre-announced decrease in VAT are not the same as the implications of a pre-announced increase, and hence our setting cannot be considered a measure of unconventional fiscal policy because the VAT drop had no intention to stimulate spending via an increase in households’ expectations. At the same time, our setting allows us to assess the extent to which pre-announced changes in VAT can manage households’ inflation expectations, and hence the potential of unconventional fiscal policy as an expectations management tool.

Armed with this setting and caveat, we assess whether the reaction of inflation

expectations around the announcements of VAT changes vary by cognitive abilities. We estimate the following specification by ordinary-least-squares:

$$\begin{aligned} \text{Inflation Expectations}_{i,t} = & \alpha + \beta \text{High IQ}_{i,t} \times \text{Post}_t + \gamma \text{Post}_t + \zeta \text{High IQ}_{i,t} \quad (3) \\ & + X'_{i,t} \delta + \eta_t + \epsilon_{i,t}, \end{aligned}$$

where *Inflation Expectations*_{*i,t*} is a categorical variable that obtains values from 1 to 5. A value of 5 implies that the respondent expects higher inflation over the next 12 months relative to the previous 12 months, whereas a value of 1 implies the respondent expects deflation over the next 12 months; *High IQ*_{*i,t*} is a dummy variable that equals 1 when the standardized IQ score of individual *i* is 6 or above; *Post*_{*t*} is a dummy variable that equals 1 in the months after the future drop in VAT was announced and before the actual drop was implemented, and zero in the months before the announcement of a future drop in VAT, in the specifications we label as “Just Before Cut;” it is a dummy variable that equals 1 in the months after the implementation of the decrease in VAT and zero in the months leading to the implementation in the specifications we label as “After Cut.” We estimate this specification with a linear probability model (OLS).

Table 7 reports the results for estimating equation (3). Columns (1)-(2) report the results for comparing the period after the announcement and just before the actual cut in VAT (*Post*=1, June 2009—September 2009) to the 12 months before the announcement. Over this period, relative to before, all respondents expect lower inflation once the drop is implemented as the negative coefficient on the indicator *Post* suggests. At the same time, though, high-IQ individuals are about 50% more likely to expect lower inflation going forward relative to low-IQ individuals, because the estimated interaction coefficient is about half of the size of the coefficient on *Post* and both are economically and statistically different from zero.

The higher sensitivity of high-IQ men’s inflation expectations to pre-announced changes in VAT is similar in terms of magnitude if we absorb the usual set of demographics and expectations about other macroeconomic variables.

The announcement of the VAT cut we consider happened at the same time as

the Global Financial Crisis. One might worry the test captures high-IQ men's higher awareness of the potential consequences of the crisis on macroeconomic variables, including inflation. The specification of column (2) helps to address this concern, because it controls directly for income expectations. If high-IQ respondents were more likely to expect large negative price pressure due to slack in the economy during the Great Recession, so that inflation expectations and income expectations were highly correlated, we should observe that our baseline effect disappeared in this specification.

As a second test to assuage this concern, we consider the change in inflation expectations after the implementation of the VAT change relative to before. If depressed macroeconomic expectations were driving our results, we would not expect a reversal of inflation expectations after the VAT change. On the other hand, if high-IQ men were responding to the upcoming cut in VAT, we should observe a mechanical rebound of inflation expectations, because once the drop in VAT has resulted in an adjustment in the price level, the pre-announcement inflation trends should prevail again.

Consistent with the second interpretation, columns (3)-(4) of Table 7 document a reversal of inflation expectations after the VAT tax drop was implemented. Even here, all men increase their inflation expectations, as captured by the positive coefficient on *Post*, but high-IQ men increase their inflation expectations by about 100% more relative to low-IQ men. This result corroborates the interpretation that the inflation expectations of high-IQ men are more sensitive to the pre-announcement of VAT changes relative to low-IQ men's inflation expectations.

An alternative interpretation of these results is that high-IQ men and low-IQ men might face different consumption bundles and for this reason they have different inflation expectations over time (D'Acunto et al. (2019)). This interpretation would be a concern in our setting if two conditions are satisfied. First, both high-IQ and low-IQ men should think about the inflation of the specific bundles they consume instead of the inflation of the representative bundle in the economy, which is the actual object of the survey question. Second, and crucially, the prices of the goods and services in the bundles high-IQ men typically consume should be more sensitive to changes in the inflation of generic food items relative to the bundles low-IQ men consume.

Although the second condition seems rather implausible, ideally we would want to rule out this alternative interpretation in the data. Unfortunately, we do not observe the actual consumption bundles our respondents consume, and hence we cannot compute the individual-level inflation high-IQ and low-IQ men face in their actual bundles. At the same time, we do observe elicited inflation perceptions for the previous 12 months at each point in time. Inflation perceptions are important, because if the two conditions discussed above are true, high-IQ men should perceive systematically different inflation in their consumption bundles relative to low-IQ men after the VAT tax change relative to before. By contrast, if we detected no differences in the inflation perceptions of high-IQ and low-IQ men, then the two conditions discussed above would not hold jointly in our setting.

In columns (5) of Table 7, we estimate a version of equation (3) in which we replace the outcome variable with the perceived inflation of respondents over the previous 12 months. We compare the perceived inflation throughout the year after the drop in VAT, relative to the year before the drop. As expected, all respondents, irrespective of their level of IQ, perceived lower inflation after the VAT drop, which corroborates the validity of our test in terms of lower inflation expected and perceived by Finnish men around the drop in VAT. Crucially, though, this change in perception is not different between high-IQ and low-IQ men, neither economically nor statistically. This evidence is inconsistent with the possibility high-IQ men's expectations were more sensitive to the drop in VAT because their consumption bundles were more exposed to changes in VAT. In column (6), we absorb demographic characteristics and other expectations and find again no differential sensitivity of the perceptions of inflation after the drop in VAT relative to before, although in this case the baseline perception of lower inflation for all respondents, despite being lower after the VAT drop, is no longer statistically different from zero.

Assessing whether the expectations and ex-post perceptions of high-IQ men and low-IQ men are consistent or inconsistent with different models of expectations formation goes beyond the scope of this paper, because we do not have a panel dimension that we can exploit around the changes in VAT to study the updating of beliefs over time.

Overall, we interpret the results in this section as consistent with the notion that

pre-announced changes in VAT might allow governments to manage households' inflation expectations, but high-IQ individuals, *ceteris paribus*, react more to such measures in terms of changing their beliefs relative to low-IQ individuals.

VI Conclusion

In a representative sample of Finnish men, we find that high-IQ men are two times more responsive than low-IQ men to changes in interest rates when forming their borrowing plans. High-IQ men are also more responsive in their actual debt choices, and are more likely to change their saving and spending plans around changes in interest rates. Moreover, high-IQ men change their willingness to purchase cars to government subsidies and adjust their inflation expectations to measures of unconventional fiscal policies. Low-IQ men barely adjust their consumption plans, their economic expectations, and their willingness to take out loans to these policy interventions. Financial constraints, income, other expectations or constraints are unlikely explanations for the low sensitivity of low-IQ men.

Our findings suggest that cognitive abilities might be *human frictions* that can limit central banks' and governments ability to stabilize demand both in recessions and expansions. This human friction might inform future theoretical and empirical advances in the recent literature on heterogeneous agents in economics and finance.

Even if central banks are successful in changing long-term rates by guiding financial markets regarding the future path of short-term interest rates, if a substantial fraction of the population does not react to these changes in rates, the policy might be ineffective. Future research should also study which type of communication tools policymakers can use to reach the overall population instead of only a small fraction of it. Coibion, Gorodnichenko, and Weber (2019) show solely relying on newspapers and the media might not be sufficient in this respect and that policymakers have to consider novel strategies to communicate with the public.

More broadly, combining economic policies with limited cognitive abilities is likely to result in redistributive effects from low-IQ individuals to high-IQ individuals, because only

high-IQ individuals adjust their behavior in response to changing economic fundamentals. This redistribution could be interpreted as a form of undue discrimination of low-IQ individuals on the part of policymakers to the extent that cognitive abilities are an innate individual characteristic or are largely determined by early-life environmental factors individuals can barely control. Future empirical and theoretical research should delve into the unintended redistributive effects of economic policies based on individuals' cognitive abilities.

References

- Agarwal, S., G. Amromin, I. Ben-David, S. Chomsisengphet, T. Piskorski, and A. Seru (2017). Policy intervention in debt renegotiation: Evidence from the home affordable modification program. *Journal of Political Economy* 125(3), 654–712.
- Agarwal, S., J. C. Driscoll, X. Gabaix, and D. Laibson (2009). The age of reason: Financial decisions over the life cycle and implications for regulation. *Brookings Papers on Economic Activity* 2009(2), 51–117.
- Agarwal, S. and B. Mazumder (2013). Cognitive abilities and household financial decision making. *American Economic Journal: Applied Economics* 5(1), 193–207.
- Angeletos, G.-M. and C. Lian (2017). Dampening general equilibrium: From micro to macro. Technical report, National Bureau of Economic Research.
- Coibion, O., Y. Gorodnichenko, and M. Weber (2019). Monetary policy communications and their effects on household inflation expectations. *Working Paper*.
- Correia, I., E. Farhi, J. P. Nicolini, and P. Teles (2013). Unconventional fiscal policy at the zero bound. *American Economic Review* 103(4), 1172–1211.
- D’Acunto, F., D. Hoang, M. Paloviita, and M. Weber (2019a). Cognitive abilities and inflation expectations. In *AEA Papers and Proceedings*, Volume 109, pp. 562–66.
- D’Acunto, F., D. Hoang, M. Paloviita, and M. Weber (2019b). IQ, expectations, and choice. *Unpublished manuscript, University of Chicago*.
- D’Acunto, F., D. Hoang, and M. Weber (2018a). The effect of unconventional fiscal policy on consumption expenditure. *Working Paper*.
- D’Acunto, F., D. Hoang, and M. Weber (2018b). Unconventional fiscal policy. *American Economic Association Papers and Proceedings* 108, 519–23.
- D’Acunto, F., U. Malmendier, J. Ospina, and M. Weber (2019). Exposure to daily price changes and inflation expectations. *Working Paper*.
- D’Acunto, F., A. Rossi, and M. Weber (2019). Crowdsourcing financial information to change spending behavior. *Chicago Booth Research Paper* (19-09).
- Di Maggio, M. and A. Kermani (2017). Credit-induced boom and bust. *The Review of Financial Studies* 30(11), 3711–3758.
- Di Maggio, M., A. Kermani, B. J. Keys, T. Piskorski, R. Ramcharan, A. Seru, and V. Yao (2017). Interest rate pass-through: Mortgage rates, household consumption, and voluntary deleveraging. *American Economic Review* 107(11), 3550–88.
- Drechsler, I., A. Savov, and P. Schnabl (2017). The deposits channel of monetary policy. *The Quarterly Journal of Economics* 132(4), 1819–1876.
- Farhi, E. and I. Werning (2017). Monetary policy, bounded rationality, and incomplete markets. Technical report, National Bureau of Economic Research.
- Feldstein, M. (2002). The role for discretionary fiscal policy in a low interest rate environment. Technical report, National Bureau of Economic Research.
- Grinblatt, M., S. Ikäheimo, M. Keloharju, and S. Knüpfer (2015). IQ and mutual fund choice. *Management Science* 62(4), 924–944.
- Grinblatt, M., M. Keloharju, and J. Linnainmaa (2011). IQ and stock market participation. *The Journal of Finance* 66(6), 2121–2164.
- Grinblatt, M., M. Keloharju, and J. T. Linnainmaa (2012). IQ, trading behavior, and performance. *Journal of Financial Economics* 104(2), 339–362.
- Keys, B. J., D. G. Pope, and J. C. Pope (2016). Failure to refinance. *Journal of Financial Economics* 122(3), 482–499.
- Mian, A. and A. Sufi (2010). Household leverage and the recession of 2007–09. *IMF Economic Review* 58(1), 74–117.

- Mian, A. and A. Sufi (2011). House prices, home equity-based borrowing, and the us household leverage crisis. *American Economic Review* 101(5), 2132–56.
- Mian, A. and A. Sufi (2012). The effects of fiscal stimulus: Evidence from the 2009 cash for clunkers program. *The Quarterly Journal of Economics* 127(3), 1107–1142.
- Mian, A., A. Sufi, and E. Verner (2017). Household debt and business cycles worldwide. *The Quarterly Journal of Economics* 132(4), 1755–1817.
- Wang, O. (2019). Banks, low interest rates, and monetary policy transmission. *Working Paper*.
- Wang, Y., T. M. Whited, Y. Wu, and K. Xiao (2018). Bank market power and monetary policy transmission: Evidence from a structural estimation. *Working Paper*.
- Woodford, M. (2018). Monetary policy analysis when planning horizons are finite. *NBER Macro Annual* (forthcoming).

Figure 1: ECB Deposit Facility Rate and Propensity to Borrow by IQ

Panel A. Borrowing: High-IQ Men



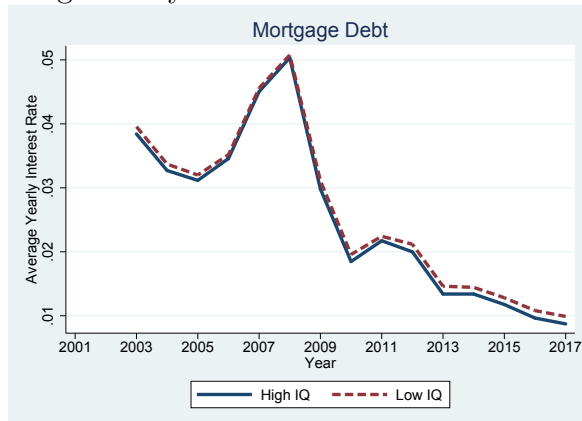
Panel B. Borrowing: Low-IQ



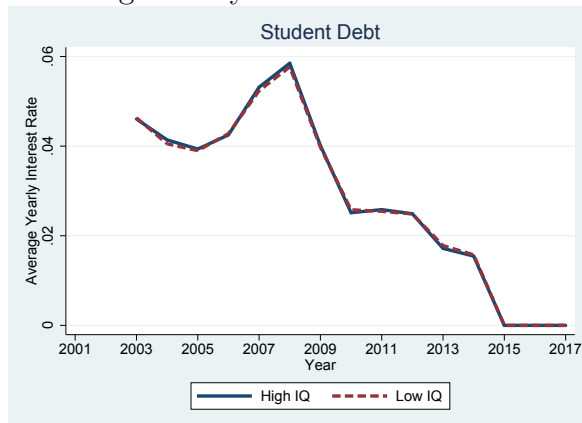
Panel A and Panel B of this figure plot the cross-sectional mean of whether individuals think it is a good time to take out a loan in Finland (solid blue line) for high-IQ and low-IQ men against the beginning-of-quarter ECB Deposit Facility Rate from quarter 1 2001 to quarter 4 of 2006 (red dashed line). Individuals can answer that now is a “very good time to borrow” (4), a “pretty good time to borrow” (3), a “pretty bad time to borrow” (2), or a “really bad time to borrow” (1) to the question, “If you think about the general economic situation in Finland, then do you think that at this time it is ...” High-IQ men are all men with the highest 3 scores of the 9-point distribution. Low-IQ men are all men with the lowest 3 scores of the 9-point distribution. We use the confidential micro data underlying the official European Commission consumer confidence survey to measure the propensity to take out a loan. IQ is the standardized test score from the military entrance exam test for all men in Finland. IQ obtains integer values between 1 and 9 with 9 being the highest score. The sample period is January 2001 to December 2006.

Figure 2: Average Interest Rates by Type of Debt: High-IQ and Low-IQ Borrowers

Panel A. Average Yearly Interest Rate on Outstanding Mortgages



Panel B. Average Yearly Interest Rate on Student Loans



Panel C. Average Yearly Interest Rate on Overall Debt Outstanding



Each Panel in this Figure plots the average yearly share of interest paid on overall outstanding debt across three types of debt and separately for high-IQ borrowers (solid blue line) and low-IQ borrowers (dashed red line). Panel A considers mortgage debt, Panel B considers student loans, and Panel C considers the overall amount of debt outstanding, irrespective of its type. High-IQ men are all men with the highest 3 scores of the 9-point distribution. Low-IQ men are all men with the lowest 3 scores of the 9-point distribution. We use the confidential micro data underlying the official European Commission consumer confidence survey to measure the propensity to take out a loan. IQ is the standardized test score from the military entrance exam test for all men in Finland. IQ obtains integer values between 1 and 9 with 9 being the highest score. The interest and debt balance data are from the Finnish administrative wealth tax registry, which is available from December 2002 to December 2017.

Table 1: **Descriptive Statistics**

This table reports descriptive statistics for the variables we use in the paper. We use the confidential micro data underlying the official European Commission consumer confidence survey to construct these variables. We measure normalized IQ using data from the official military entrance exam in Finland. The sample period is January 2001 to March 2015.

Statistic	Inflation Perception	Inflation Expectation	Total Debt	IQ Dummy	Age	Income
Nobs	27,544	27,566	27,828	27,856	27,856	27,856
Mean	3.00	2.47	38,510	0	31	22,516
Std	4.63	3.76	53,734	0	7	14,247
p1	-5.00	-5.00	0	0	19	900
p10	0.00	0.00	0	0	21	6,800
p25	0.00	0.00	0	0	25	13,100
p50	2.00	2.00	14,400	0	30	21,000
p75	5.00	3.50	62,200	1	36	28,850
p90	7.00	5.00	102,200	1	40	38,200
p99	20.00	15.00	242,400	1	46	74,200
Single	no yes	38.75% 61.25%	Urban		no yes	64.59% 35.41%
Unemployed	no yes	94.11% 5.89%	Helsinki		no yes	72.28% 27.72%
Kids	no yes	22.43% 77.57%	College		no yes	66.06% 33.94%
Durables	Good time Neutral Bad time	50.84% 28.69% 20.47%	Loan		Good time Bad time	70.71% 29.29%

Table 2: **IQ, Income, and Total Debt**

This table reports the distribution of IQ in Panel A, the household leverage ratio in Panel B, and the share of income in total income in Panel C. IQ is the standardized test score from the military entrance exam test for all men in Finland. IQ obtains integer values between 1 and 9 with 9 being the highest score. Income and debt data come from the registry of Statistics Finland. The sample period is January 2001 to March 2015.

	Low IQ	2	3	4	5	6	7	8	High IQ
Panel A. Distribution of Normalized IQ									
Nobs	1,785	3,921	4,701	10,907	13,797	11,162	7,849	4,043	3,298
Panel B. Total Debt / Taxable Income by IQ									
	0.82	0.77	0.76	0.75	0.78	0.80	0.81	0.87	0.93
Panel C. Income Share by IQ									
	1.86%	4.52%	6.28%	15.38%	21.16%	17.79%	16.11%	8.83%	8.07%

Table 3: Change in the Propensity to Borrow around Interest Rate Changes

This table reports the coefficient estimates from the following specification:

$$\text{Loan}_{i,t} = \alpha + \beta \text{High IQ}_i \times \text{Post}_t + \gamma \text{Post}_t + \zeta \text{High IQ}_i + X'_{i,t} \delta + \epsilon_{i,t},$$

where $\text{Loan}_{i,t}$ is a dummy variable that equals 1 if the respondent answers it is a good time to take out a loan, and zero otherwise; and Post_t is a dummy variable that equals 1 in the months in which the ECB changes the deposit facility rate, and zero in the months before the change. We estimate this specification with a linear probability model (OLS) as well as using non-linear estimators. We use the confidential micro data underlying the official European Commission consumer confidence survey to construct these variables. We measure normalized IQ using data from the official military entrance exam in Finland. IQ is the standardized test score from the military entrance exam test for all men in Finland. IQ obtains integer values between 1 and 9 with 9 being the highest score. High IQ equals 1 if normalized IQ is larger than 5. Demographic controls are age, age², sex, marital status, log of income, employment status, number of children, urban versus rural classification, college dummy, and a dummy that equals 1 if the respondent lives in Helsinki. The sample period is January 2001 to December 2006.

	OLS (1)	Probit (2)	Logit (3)	OLS (4)	Probit (5)	Logit (6)
Panel A. Rate Cut: Jan 2001 – June 2003						
Post × High IQ	0.095*** (0.032)	0.091*** (0.029)	0.092*** (0.030)	0.088** (0.035)	0.088*** (0.031)	0.088*** (0.033)
High IQ	−0.028 (0.029)	−0.024 (0.027)	−0.025 (0.028)	−0.048 (0.033)	−0.045 (0.030)	−0.045 (0.031)
Post	0.062*** (0.022)	0.059*** (0.022)	0.060*** (0.023)	0.065*** (0.025)	0.060** (0.026)	0.062** (0.026)
Demographics				X	X	X
R ²	0.012	0.010	0.010	0.051	0.046	0.046
Nobs	5,850	5,850	5,850	4,070	4,070	4,070
Panel B. Rate Increase: July 2003 – December 2006						
Post × High IQ	−0.075*** (0.020)	−0.086*** (0.023)	−0.083*** (0.023)	−0.082*** (0.022)	−0.094*** (0.026)	−0.095*** (0.026)
High IQ	0.079*** (0.011)	0.081*** (0.011)	0.081*** (0.011)	0.036*** (0.012)	0.041*** (0.013)	0.041*** (0.013)
Post	0.005 (0.014)	0.0046 (0.013)	0.0047 (0.013)	−0.033** (0.016)	−0.031** (0.015)	−0.034** (0.016)
Demographics				X	X	X
R ²	0.007	0.007	0.007	0.044	0.047	0.048
Nobs	8,601	8,601	8,601	5,937	5,937	5,937

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4: Sensitivity of Debt Outcomes to Marginal Lending Rate Facility by IQ

This table reports the coefficient estimates from the following pooled OLS regression based on a balanced panel of individual-year observations:

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

where $\text{Debt Outcome}_{i,t}$ is the end-of-year total debt balance of individual i in year t in columns (1)-(3); a dummy variable that equals 1 if the individual took up a new loan in year t in columns (4)-(6); a dummy variable that equals 1 if the individual pay down at least one existing loan in year t ; Mg Lend Rate_t is the average level of the marginal lending facility rate set by the ECB in year t ; We measure normalized IQ using data from the official military entrance exam in Finland. IQ is the standardized test score from the military entrance exam test for all men in Finland. IQ obtains integer values between 1 and 9 with 9 being the highest score. High IQ_{*i*} equals 1 if normalized IQ is larger than 5. Demographic controls (X) are age, age², sex, marital status, log of income, employment status, number of children, urban versus rural classification, college dummy, and a dummy that equals 1 if the respondent lives in Helsinki; η_t and η_i are full sets of year and individual fixed effects. The debt outcomes information is obtained from the Finnish registry data discussed in Section II. The data set is a full balanced panel in which we observe outcomes for any debt holders in Finland at the end of each year. This structure allows restricting the variation within individual in columns (3), (6), and (9). The sample period is December 2000 to December 2013.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Debt Balance			Take New Loan			Pay Down Loans		
Marginal Lending Rate × High IQ	-2,131.1*** (476.0)	-2,122.9*** (476.2)	-1,442.7*** (495.5)	-0.006*** (0.002)	-0.006*** (0.002)	-0.006*** (0.002)	0.006*** (0.002)	0.006*** (0.002)	0.005*** (0.002)
High IQ	15,809.9*** (1,985.5)	16,403.6*** (1,982.9)		0.002 (0.005)	0.001 (0.005)		-0.002 (0.005)	-0.001 (0.005)	
Marginal Lending Rate	-9,248.6*** (326.9)			0.031*** (0.001)			-0.030*** (0.001)		
Demographics	X	X	X	X	X	X	X	X	X
Year FE		X	X		X	X		X	X
Individual FE			X			X			X
R-sq	0.049	0.066	0.715	0.019	0.020	0.171	0.019	0.020	0.173
Nobs	254,534	254,534	254,534	254,534	254,534	254,534	254,534	254,534	254,534

Table 5: Saving and Spending Plans After Drops in Marginal Lending Facility by IQ

This table reports the coefficient estimates from the following OLS specification:

$$Intention_{i,t} = \alpha + \beta High\ IQ_i \times Drop\ Lend\ Rate_t + \zeta High\ IQ_i + \gamma Drop\ Lend\ Rate_t + X'_{i,t} \delta + \eta_t + \eta_i \epsilon_{i,t},$$

where $Intention_{i,t}$ is a dummy variable if respondent i interviewed in year t declares he plans on saving more to pay down outstanding debt in columns (1)-(2); a dummy variable that equals 1 if the individual think it is a good time to purchase durable goods when interviewed in year t ; $Drop\ Lend\ Rate_t$ is the opposite of the change in the average marginal facility rate from year $t - 1$ to year t ; We measure normalized IQ using data from the official military entrance exam in Finland. IQ is the standardized test score from the military entrance exam test for all men in Finland. IQ obtains integer values between 1 and 9 with 9 being the highest score. $High\ IQ_i$ equals 1 if normalized IQ is larger than 5. Demographic controls (X) are age, age², sex, marital status, log of income, employment status, number of children, urban versus rural classification, college dummy, and a dummy that equals 1 if the respondent lives in Helsinki; η_t and η_i are full sets of year and individual fixed effects. Data about individual intentions is from the Survey of Consumer Climate run by Statistics Finland as discussed in Section II. The data set is cross section in which we observe one observation per individual, and individuals are interviewed at different points in time. The sample period is December 2000 to December 2013.

	Save to Pay Down Loans		Willing to Buy Durables	
	Mortgage Holder (1)	Non-mortgage Holder (2)	Mortgage Holder (3)	Non-mortgage Holder (4)
Drop Lending Rate × High IQ	-0.023** (0.011)	-0.007 (0.023)	0.015* (0.008)	0.005 (0.014)
High IQ	0.062*** (0.012)	0.025 (0.024)	0.012 (0.009)	0.004 (0.015)
Drop Lending Rate	0.011 (0.018)	0.019 (0.035)	-0.004 (0.012)	-0.012 (0.019)
Demographics	X	X	X	X
Year FE	X	X	X	X
Nobs	5,416	2,251	14,834	5,550

Table 6: Willingness to Purchase Cars After Cash for Clunkers (Trafi) Announcement

This table reports the coefficient estimates from the following specification:

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

where *Willingness Purchase Car*_{*i,t*} is a dummy variable that equals 1 if the respondent answers it is a good time to purchase a car, and zero otherwise; and *Post*_{*t*} is a dummy variable that equals 1 in the months after the announcement of the cash for clunkers program by the government agency Trafi (December 2014), and zero in the months before the announcement. We estimate this specification with a linear probability model (OLS). We use the confidential micro data underlying the official European Commission consumer confidence survey to construct these variables. We measure normalized IQ using data from the official military entrance exam in Finland. IQ is the standardized test score from the military entrance exam test for all men in Finland. IQ obtains integer values between 1 and 9 with 9 being the highest score. High IQ equals 1 if normalized IQ is larger than 5. Demographic controls are age, age², sex, marital status, log of income, employment status, number of children, urban versus rural classification, college dummy, and a dummy that equals 1 if the respondent lives in Helsinki. The sample period is August 2013 to March 2015.

	Want Purchase Car Within 6 months (1)	(2)	Want Purchase Car Within 1 year (3)	(4)	Want Purchase Non-car Vehicle (5)	(6)	Want Purchase Other Durables (7)	(8)
High IQ × Trafi	0.051** (0.022)	0.043* (0.023)	0.047** (0.022)	0.038* (0.023)	-0.001 -0.022	-0.008 (0.023)	-0.007 (0.026)	-0.013 (0.028)
High IQ	-0.041 (0.014)	-0.034** (0.016)	-0.041*** (0.014)	-0.034** (0.016)	0.028** (0.014)	0.029* (0.016)	0.054*** (0.017)	0.038** (0.018)
Trafi	-0.014 (0.015)	-0.005 (0.016)	-0.012 (0.015)	-0.002 (0.016)	0.025* (0.015)	0.028* (0.016)	-0.006 (0.018)	0.004 (0.019)
Demographics		X		X		X		X
Expectations		X		X		X		X
Obs	5,634	4,906	5,625	4,899	5,654	4,920	5,657	4,922

Table 7: **Change in Inflation Expectations Around Unconventional Fiscal Policy Announcement**

This table reports the coefficient estimates from the following specification:

$$\text{Inflation Expectations}_{i,t} = \alpha + \beta \text{High IQ}_i \times \text{Post}_t + \gamma \text{Post}_t + \zeta \text{High IQ}_i + X'_{i,t} \delta + \epsilon_{i,t},$$

where *Inflation Expectations*_{*i,t*} is an ordered categorical variables that obtains values from 1 to 5, where 1 means the respondent expect deflation and 5 means the respondent expects higher inflation over the following 12 months relative to the previous 12 months; *Post*_{*t*} is a dummy variable whose value differs across columns. In columns (1)-(2) (“Just Before Cut”), it equals 1 in the months after the announcement of a future cut in VAT and before the actual cut is implemented (July 2009 to September 2009), and zero in the 12 months before the announcement; in columns (3)-(6) (“After Cut”), it equals 1 in the 12 months after the implementation of the VAT cut, and zero in the 12 months before the implementation of the VAT cut. We use the confidential micro data underlying the official European Commission consumer confidence survey to construct these variables. We measure normalized IQ using data from the official military entrance exam in Finland. IQ is the standardized test score from the military entrance exam test for all men in Finland. IQ obtains integer values between 1 and 9 with 9 being the highest score. High IQ equals 1 if normalized IQ is larger than 5. Demographic controls are age, age², sex, marital status, log of income, employment status, number of children, urban versus rural classification, college dummy, and a dummy that equals 1 if the respondent lives in Helsinki. The sample period is July 2008 to October 2010.

	Inflation Expectations				Inflation Perception	
	Just Before Cut		After Cut		After Cut	
	(1)	(2)	(3)	(4)	(5)	(6)
High IQ × Post	-0.183** (0.083)	-0.157* (0.095)	0.293*** (0.092)	0.248** (0.103)	-0.003 (0.062)	-0.048 (0.070)
High IQ	0.097*** (0.036)	0.132*** (0.043)	-0.086 (0.076)	-0.074 (0.088)	-0.068 (0.052)	0.013 (0.061)
Post	-0.298*** (0.057)	-0.294*** (0.068)	0.241*** (0.063)	0.354*** (0.073)	-0.108** (0.043)	-0.066 (0.051)
Demographics		X		X		X
Expectations		X		X		X
Obs	4,689	3,525	2,889	2,256	2,892	2,258

Online Appendix: Human Frictions in the Transmission of Economic Policy

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Not for Publication

Table A.1: **Change in the Propensity to Take out Loan to Rate changes: unconstrained**

This table reports the coefficient estimates from the following specification:

$$Loan_{i,t} = \alpha + \beta High\ IQ_i \times Post_t + \gamma Post_t + \zeta High\ IQ_i + X'_{i,t} \delta + \epsilon_{i,t},$$

where $Loan_{i,t}$ is a dummy variable that equals 1 if the respondent answers it is a good time to take out a loan, and zero otherwise; and $Post_t$ is a dummy variable that equals 1 in the months in which the ECB changes the deposit facility rate, and zero in the months before the change. We estimate this specification with a linear probability model (OLS) as well as using non-linear estimators. We use the confidential micro data underlying the official European Commission consumer confidence survey to construct these variables. We measure normalized IQ using data from the official military entrance exam in Finland. IQ is the standardized test score from the military entrance exam test for all men in Finland. IQ obtains integer values between 1 and 9 with 9 being the highest score. High IQ equals 1 if normalized IQ is larger than 5. Demographic controls are age, age², sex, marital status, log of income, employment status, number of children, urban versus rural classification, college dummy, and a dummy that equals 1 if the respondent lives in Helsinki. The sample period is January 2001 to December 2006.

	OLS (1)	Probit (2)	Logit (3)	OLS (4)	Probit (5)	Logit (6)
Panel A. Rate Cut: Jan 2001 – June 2003						
Post × High IQ	0.0663* (0.0348)	0.0693** (0.0305)	0.0688** (0.0319)	0.0789** (0.0361)	0.0805** (0.0317)	0.0808** (0.0333)
High IQ	0.0005 (0.0319)	0.0004 (0.0284)	0.0004 (0.0299)	−0.0361 (0.0335)	−0.0339 (0.0299)	−0.0342 (0.0315)
Post	0.1002*** (0.0238)	0.0936*** (0.0250)	0.0951*** (0.0253)	0.0753*** (0.0257)	0.0685*** (0.0265)	0.0708*** (0.0271)
Demographics				X	X	X
R ²	0.0179	0.0158	0.0158	0.0468	0.0439	0.0437
Nobs	4,422	4,422	4,422	3,804	3,804	3,804
Panel B. Rate Increase: July 2003 – December 2006						
Post × High IQ	−0.0847*** (0.0216)	−0.0997*** (0.0259)	−0.0963*** (0.0250)	−0.0858*** (0.0221)	−0.0987*** (0.0268)	−0.0986*** (0.0261)
High IQ	0.0676*** (0.0116)	0.0731*** (0.0119)	0.0720*** (0.0117)	0.0363*** (0.0125)	0.0427*** (0.0129)	0.0415*** (0.0129)
Post	−0.0269* (0.0147)	−0.0247* (0.0144)	−0.0252* (0.0147)	−0.0396** (0.0157)	−0.0369** (0.0156)	−0.0398** (0.0160)
Demographics				X	X	X
R ²	0.011	0.0115	0.0115	0.0433	0.0451	0.0459
Nobs	6,548	6,548	6,548	5,650	5,650	5,650

Statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$