Debt of high-income consumers may reflect leverage rather than poor cognitive reflection

Da Silva, Sergio and Da Costa Jr, Newton and Matsushita, Raul and Vieira, Cristiana and Correa, Ana and De Faveri, Dinorá

Federal University of Santa Catarina

2017

Debt of high-income consumers may reflect leverage rather than poor cognitive reflection

Sergio Da Silva[a*], Newton Da Costa Jr[a], Raul Matsushita[b], Cristiana Vieira[a]
Ana Correa[a], Dinorá De Faveri[a]

[a] *Department of Economics, Federal University of Santa Catarina, Florianopolis, S.C., 88049-970, Brazil*
[b] *Department of Statistics, University of Brasilia, Brasilia, D.F., 70910-900, Brazil*

[*] Corresponding author. Tel.: +55 48 3721 9901; fax: +55 48 3721 9901. Email address: professorsergiodasilva@gmail.com (S. Da Silva).

Abstract

A recent population-wide study for Germany, where credit lines on current accounts are available to 80 percent of the population, finds that overdraft debt is more likely for people who give intuitive but incorrect answers on a cognitive reflection test. This suggests those consumers in debt have poorer cognitive reflection and, thus, lack of self control. The Germany study finds that "surprisingly, the level of income does not play a central role." Here we discriminate the consumers in terms of their income by considering two experiments. In the first (pilot) experiment we do not discriminate consumers in terms of income and, as result, replicate the Germany study. In a follow-up experiment, which assembles a high-quality sample of high-income consumers, we find debt can no longer be explained by poor cognitive reflection. Apparently, high-income consumers treat debt as mere leverage, as companies do.

Subject areas: behavioral economics, cognitive psychology

Keywords: consumer behavior, consumer indebtedness, debt, overdraft, cognitive reflection

Forthcoming: Review of Behavioral Finance

1. Introduction

Most cognitive psychologists currently favor a dual-system approach to higher cognition processes [1] [2]. Two systems compete for control of our inferences and actions. "System 1" refers to a large set of subsystems that operate autonomously in response to their own triggering stimuli and are not under control of the analytic processing system, which is called "System 2." The subsystems of System 1 include input modules related to specific-domain knowledge. Each module is evolutionarily adapted for solving a different problem so that System 1 is similar to a Swiss army knife. However, not all modules are inate and some are the result of overpractice. Intuitive decisions are fast and automatic, and use System 1. Modular input processes (System 1) feed information to the analytic processing system (System 2), which is nonmodular and responsible for abstract reasoning and the use of hypotheses. System 2 is deliberative but slow as it is limited by its working memory capability. Automatic decisions work well most of the time, but they also lead to predictable biases and heuristics (simple procedures that help find adequate, though often imperfect, answers to difficult questions) [3].

System 1 is evolutionarily older and we share it with other animals. System 2 is evolutionarily more recent and distinctively human. The early evolution of System 1 suggests its logic is related to an "evolutionary rationality" from the gene's-eye view, while the logic of the lately evolved System 2 refers to the rationality of the individual vehicle who carries the genes [4]. Evolutionary psychologists like to show that many decisions based on System 1 that seem irrational from the vehicle perspective ultimately have an evolutionary logic from the gene's-eye view [5]. Put another way, while the vehicle maximizes utility, the genome profits from maximizing inclusive fitness. The late emergence of System 2 occurred under a lapse of direct genetic control. As the world became more complex to predict, in particular because of the need for interpersonal interaction, natural selection favored a general goal system (System 2) in addition to the domain-specific modules (System 1). In a useful anthropomorphic description, "The genes gave up direct control and instead said (metaphorically, by the types of phenotypic effects that they created) 'things will be changing too fast out there, brain, for us to tell you exactly what to do—you just go ahead and do what you think is best given the general goals (survival, sexual reproduction) that we have inserted'" [4]. One dramatic consequence was that this allowed individuals to alternatively pursue their own objectives and not exclusively those of their genes [4]. This potential conflict of interests between genes and their vehicles can possibly be the basis of the human psychology of self-deception [6].

A simple test—the cognitive reflection test (CRT)—can gauge how individuals differ in cognitive ability [7] in terms of the relative powers of their Systems 1 and 2. Individuals scoring higher on the CRT show enhanced ability for using their System 2 to override System 1, whenever this is necessary to prevent heuristics and biases. The CRT is correlated with other measures of cognitive ability. However, it is not an IQ test. Because it measures the ability to resist reporting the response that first comes to mind (cognitive reflection), it is arguably better than the other measures in terms of predicting decision making [7] [8]. After all, better decision making depends more on broad rationality (which is what the CRT actually tracks) than on instrumental rationality or algorithmic intelligence (which is what conventional measures of intelligence assess) [4]. Thus, the CRT may successfully predict, for example, risk attitudes and intertemporal preferences [7].

Males score significantly higher on the CRT than females do [8]. Males are more likely to reflect on their answers and less inclined to go with their intuitive responses.

Females are more automatic. This brings them advantages in those tasks that require domain-specific knowledge, although it also exposes them more to predictable biases and heuristics, especially in context-free environments. In this study, we replicate the finding that males score higher on the CRT.

There is a large volume of literature linking analytic processing to inhibitory control [9]-[16]. This means an individual ability to use his or her System 2 to override System 1 can be associated with his or her self-control [17]-[19]. System 2 is in charge of self-control. In particular, self-control has been linked to financial debt. Self-control considerations play a role in individuals' indebtedness and its consequent repayment difficulties [20]. When self-control reflects dynamically inconsistent preferences, overextending debt occurs because the availability of credit increases consumers' perceived liquidity and thus spending, irrespective of their budget constraints [21]. Moreover, when consumers make decisions based on the immediately available resources, they exhibit a bias in how they perceive interest rates. They tend to underestimate the interest rates associated with a loan principal and payment stream because of their inability to perceive changes in exponential series [22]. Self-control problems are a possible explanation for high levels of credit card borrowing [23]-[26], and are indeed related to time inconsistent preferences [25] [27].

In a study that considers data for Germany [28], where credit lines on current accounts are available to 80 percent of the population, excessive usage of costly credit lines is more likely for people who give intuitive but incorrect answers on the CRT. This suggests consumers in overdraft debt have poor cognitive reflection and then a lack of self control. Here, we ask whether such a result is nuanced as one considers the distinction between low-income and high-income consumers. Arguably, one should expect high-income consumers to be only a tiny minority in the population-wide Germany study.

Thus, we set up two experiments. First, one pilot experiment that is similar to the Germany study in that income is not an issue. The pilot experiment is able to replicate the finding of the Germany study, that is, consumer indebtness is related to lack of self control. Secondly, we also devise a follow-up experiment to assess how this result is nuanced by the effect of income. We purposefully assemble a sample of high-income consumers and apply the CRT to them. Then we assess performance on the CRT by considering both those in debt and those who are debt free. Based on CRT performance, we find the reason for debt of high-income consumers is unlikely to be related to a lack of self control.

2. Materials and methods

Three simple questions made up the cognitive reflection test [7]. They are conceived to elicit automatic responses that are compelling but wrong. They are as follows.

CRT

1. A bat and a ball cost $1.10 in total. The bat costs $1.00 more than the ball. How much does the ball cost?
   _____ cents

2. If it takes 5 machines 5 minutes to make 5 widgets, how long would it take 100 machines to make 100 widgets?
   _____ minutes

3. In a lake, there is a patch of lilypads. Every day, the patch doubles in size. If it takes 48 days for the patch to cover the entire lake, how long would it take for the patch to cover half the lake?
_____ days

The correct answers are 5, 5 and 47 respectively. The intuitive answer that springs quickly to mind in question 1 is "10 cents." However, this is wrong. The difference between $1.00 and 10 cents is only 90 cents, not $1.00 as the problem stipulates. Let x be the ball cost. Then, $(1.00+x)+x=1.10 \rightarrow x=0.05$. The automatic answer to question 2 is 100. This is wrong because taking the first sentence and multiplying the number of machines (5) by 20, it would take the same 5 minutes to make 100 widgets. In question 3, the intuitive answer is 24. This is also wrong. Let exponential d^n represent the function where n is the number of days it takes the patch to cover the entire lake. Thus, half is always $n-1$ and the patch will cover half the lake in $48-1=47$ days. In both experiments we devise here, we ask the participants to respond to the three questions above in less than 30 seconds to make sure an automatic choice is given. We also ask the participants whether he or she already knew one or all of the three questions. If one participant knew at least one question, he or she was removed from the sample in the pilot experiment. If someone reported to know at least one of the questions in the follow-up experiment, we then asked him or her to answer the alternative CRT [29] as follows.

CRT (alternative questions)

4. If John can drink one barrel of water in 6 days, and Mary can drink one barrel of water in 12 days, how long would it take them to drink one barrel of water together?
_____ days.
[Correct answer: 4 days; intuitive answer: 9 days]

5. Jerry received both the 15th highest and the 15th lowest mark in the class. How many students are in the class?
_____ students.
[Correct answer: 29 students; intuitive answer: 30 students]

6. A man buys a pig for $60, sells it for $70, buys it back for $80, and sells it finally for $90. How much has he made?
_____ dollars.
[Correct answer: $20; intuitive answer: $10]

Frederick observes that the questions on the CRT are easy because their solutions are easily understood when explained [7]. However, reaching one correct answer requires overriding an erroneous answer that springs impulsively to mind. In his own study, Frederick reports that those who answered "10 cents" to Question 1 also estimated that 92 percent of people would correctly solve it, whereas those who answered "5 cents" estimated that 62 percent would. In other words, those who performed poorly were also those overconfident.

In the pilot experiment, the experimenter (CV) sent Google Docs questionnaires containing the CRT (Questions 1 to 3 above) and further questions related to information on the participant's age, gender, whether he or she had debt, and whether he or she had been using a bank's overdraft service. This service is called "special check" and is provided by Brazilian banks exclusively for invididual customers, not for companies. The amount overdrawn is within an authorized overdraft limit, and then interest is normally charged at an agreed rate. The questionnaires were sent via the Internet (through email

messages and Facebook postings) to undergraduates from the Federal University of Santa Catarina (located at Florianopolis in southern Brazil) and to the general public possibly from the Florianopolis area and possibly unrelated to the university. In total, 126 respondents participated in this pilot experiment. Thus, each respondent provided his or her answers to the questionnaire suposedly through desktopts, laptops and smartphones. The questionnaires were sent during three different time spans in 2014: the beginning of October; October 27 and 28; and November 3 and 4.

In the end, we considered only 109 participants from the initial 126 respondents of the pilot experiment. Fifteen failed to answer one of the CRT questions within 30 seconds and two already knew at least one of the first set of CRT questions (1 to 3).

As for the follow-up experiment, we took advantage of the fact that a different experimenter (AC) was also a personal banker in a large private bank in Brazil. She deals exclusively with high-income customers (with monthly earnings greater than 10,000 Brazilian real). Questionnaires considering questions similar to the pilot experiment were created using Eval & Go (www.evalandgo.com/) and sent to customers who were previously approached by the experimenter on a one-to-one basis. She received oral consents from the part of the participants. The link for the questionnaires sent to each customer could be accessed through desktops, laptops, tablets or smartphones. Eval & Go allowed for a chronometer to be set for each of the CRT questions. After 30 seconds, one page was closed and participants were redirected to the next. The link for the questionnaires were sent through messages using email, Facebook, Linkedin and WhatsApp. Only 13 participants knew the original questions of the CRT (1-3) and thus responded to the alternative CRT (4-7).

The questionnaires were sent from March 30, 2016 to April 29, 2016. In total, 329 customers participated, 212 completed the questionnaires, but only 149 provided valid answers. The dataset is available at https://figshare.com/s/ff9353c0814944131d99.

3. Results

Table 1 shows the number of scores 0, 1, 2 or 3 on the CRT distinguished by gender for the pilot experiment. Males score higher, a result that replicates Frederick's results [7]. A chi-square value of 25.106 calculated using the appropriate degrees of freedom (three) is statistically significant (p-value < 0.001). We also compute a correlation coefficient. Because the involved variables refer to counts (scores), Pearson's rho more powerfully detects any hidden dependence. We find a negative Pearson's linear correlation, which confirms females score lower.

Table 1. Pilot experiment: CRT scores, by gender

	Percentage scoring 0, 1, 2 or 3			
Gender	0	1	2	3
Male_{48}	22.92_{11}	14.58_{7}	37.50_{18}	25.00_{12}
Female_{61}	44.26_{27}	39.34_{24}	11.47_{7}	4.92_{3}

Notes:
(1) subscripts show the number of respondents
(2) $\chi^2(3) = 25.106;\ p\text{-value} < 0.001$ (Fisher's exact p-value < 0.001)
(3) Pearson's linear correlation $\rho = -0.41;\ p\text{-value} < 0.001$

Table 2 shows the scores for the pilot experiment considering reports of debt whithout discriminating the exact type of debt involved. A pattern emerges (Figure 1). Those participants who report to have any type of debt show relatively poorer cognitive

performance than those with no debt. Although the chi-square test is nonsignificant, a significant, negative correlation is found between the variables CRT and indiscriminate debt.

Table 2. Pilot experiment: CRT scores, by indiscriminate debt

	Percentage scoring 0, 1, 2 or 3			
In debt?	0	1	2	3
Yes$_{56}$	41.07_{23}	32.14_{18}	17.85_{10}	8.93_{5}
No$_{53}$	28.30_{15}	24.53_{13}	28.30_{15}	18.87_{10}

Notes:
(1) subscripts show the number of respondents
(2) $\chi^2(3) = 5.078$; p-value = 0.166 (Fisher's exact p-value = 0.173)
(3) Pearson's linear correlation $\rho = -0.20$; p-value = 0.032

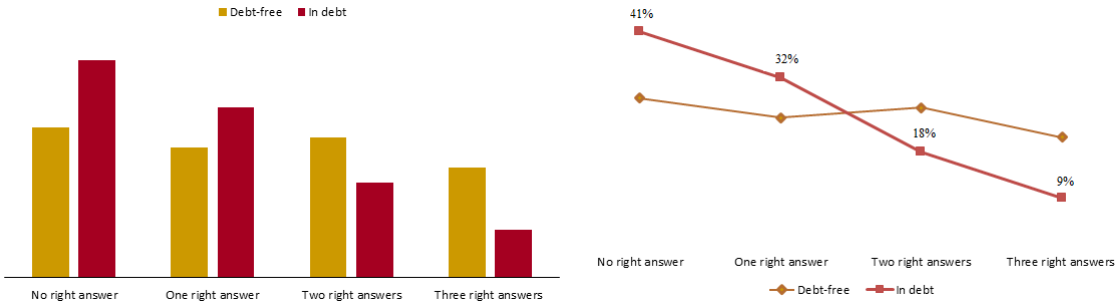

Figure 1. Pilot experiment: CRT scores and indiscriminate debt. Those in debt (negatively sloped curve) perform poorly relative to those who are debt free (flat curve).

As for CRT and overdraft debt, although a negative correlation is found, it is nonsignificant. This result may be related to the fact that a non-negligible part of the sample in this pilot experiment is made up of students with bank accounts that do not allow for overdraft facilities.

Table 3. Pilot experiment: CRT scores, by overdraft debt

	Percentage scoring 0, 1, 2 or 3			
Overdraft?	0	1	2	3
Yes$_{42}$	33.33_{14}	30.95_{13}	26.19_{11}	9.52_{4}
No$_{37}$	32.43_{12}	24.32_{9}	18.92_{7}	24.32_{9}

Notes:
(1) subscripts show the number of respondents
(2) $\chi^2(3) = 3.390$; p-value = 0.335 (Fisher's exact p-value = 0.345)
(3) Pearson's linear correlation $\rho = -0.11$; p-value = 0.346

Overall, our pilot experiment gives support to the Germany study [28]. People in debt are more likely to have poor cognitive reflection in that they tend to give intuitive but incorrect answers on the CRT. The Germany study refers to the overdraft type of debt. Our pilot experiment considers reports of indiscriminate debt in addition. Though overdraft debt in our sample seems to follow the same pattern as indiscriminate debt does, the result for overdraft debt is nonsignificant. As in our pilot experiment, the Germany study does not discriminate consumers in terms of income. Arguably, in the massive database of the Germany study one should expect only a tiny minority of high-income

consumers. As observed, this fact prompted us to conceive a follow-up experiment by purposefully assembling a sample of high-income consumers.

Table 4 shows the number of scores 0, 1, 2 or 3 on the CRT distinguished by gender in the follow-up experiment. As expected, males score higher again.

Table 4. Follow-up experiment: CRT scores, by gender

	Percentage scoring 0, 1, 2 or 3			
Gender	0	1	2	3
Male$_{94}$	54.28$_{51}$	29.79$_{28}$	12.77$_{12}$	3.19$_{3}$
Female$_{55}$	74.55$_{41}$	16.36$_{9}$	9.09$_{5}$	0.00$_{0}$

Notes:
(1) subscripts show the number of respondents
(2) $\chi^2(3) = 6.997$; p-value $= 0.072$ (Fisher's exact p-value $= 0.076$)
(3) Pearson's linear correlation $\rho = -0.19$; p-value $= 0.021$

Table 5 shows the scores considering reports of indiscriminate debt in the follow-up experiment. The pattern seen in Figure 1 for the pilot experiment vanishes. Those participants who report to have any type of debt do not show relatively poorer cognitive performance than those who are debt free. Unfortunately, this result is nonsignificant.

Table 5. Folow-up experiment: CRT scores, by indiscriminate debt

	Percentage scoring 0, 1, 2 or 3			
In debt?	0	1	2	3
Yes$_{29}$	65.52$_{19}$	20.69$_{6}$	13.80$_{4}$	0.00$_{0}$
No$_{120}$	60.83$_{73}$	25.83$_{31}$	10.83$_{13}$	2.50$_{3}$

Notes:
(1) subscripts show the number of respondents
(2) $\chi^2(3) = 1.236$; p-value $= 0.744$ (Fisher's exact p-value $= 0.888$)
(3) Pearson's linear correlation $\rho = -0.03$; p-value $= 0.678$

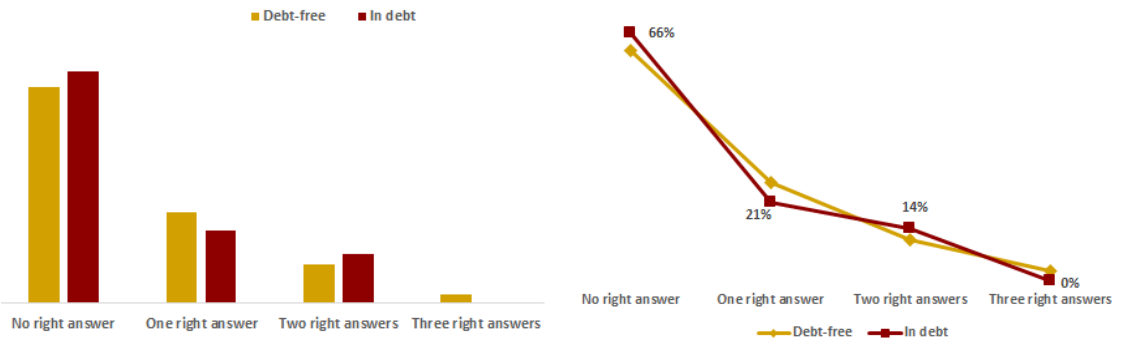

Figure 2. Follow-up experiment: CRT scores and indiscriminate debt. Indiscriminate debt does not seem to matter for the CRT performance of high-income consumers. The performances on the CRT for both those in indiscriminate debt and those who are debt free follow negatively sloped curves.

As debt is considered as overdraft, the same result obtained for indiscriminate debt appears. Table 6 allows one to make a direct comparison with the Germany study, which reports a negative relationship between performance on the CRT and overdraft debt. Unlike the Germany study, Figure 3 suggests there is no difference in CRT performance between those who use the overdraft service and those who do not. However, this still remains to be proved conclusively because the result is statistically nonsignificant.

Table 6. Follow-up experiment: CRT scores, by overdraft debt

	Percentage scoring 0, 1, 2 or 3			
In debt?	0	1	2	3
Yes$_{29}$	48.27$_{14}$	27.58$_{8}$	24.14$_{7}$	0.00$_{0}$
No$_{97}$	61.85$_{60}$	25.77$_{25}$	10.31$_{10}$	2.06$_{2}$

Notes:
(1) subscripts show the number of respondents
(2) $\chi^2(3) = 4.491$; p-value = 0.213 (Fisher's exact p-value = 0.246)
(3) Pearson's linear correlation $\rho = -0.126$; p-value = 0.161

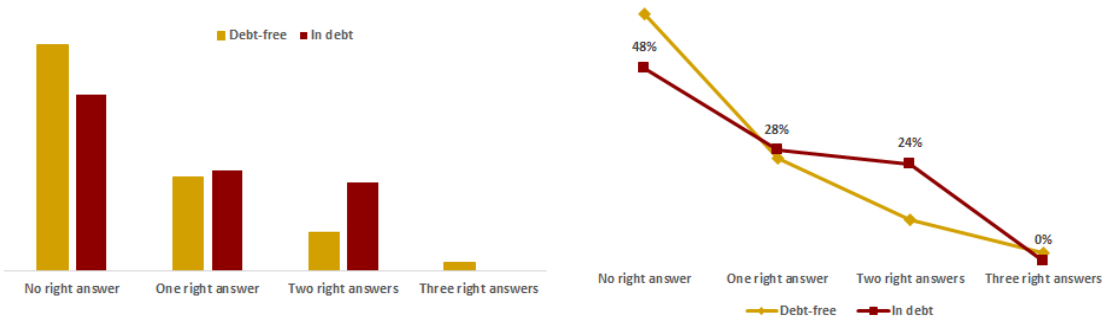

Figure 3. Follow-up experiment: CRT scores and overdraft debt. Overdraft debt does not seem to matter for the CRT performance of high-income consumers. The performances on the CRT for both those in overdraft debt and those who are debt free follow negatively sloped curves.

Figues 3 and 4 suggest that owing a debt does not matter for the CRT performance of high-income consumers, because the performances for both the indebted and the debt free follow negatively sloped curves. The fact that this visual inspection suggests a reverted pattern as one compares Figures 3-4 with Figure 1, we decided to go on and consider the new variable "overall debt" by merging the two kinds of debt considered here: indiscriminate and overdraft. This is justified because the previous results in Table 5 and 6 are nonsignificant. Table 7 shows the findings for overall debt = indiscriminate debt × overdraft debt. Of note, there is significant reversion of the correlation, from negative to positive.

Table 7. Follow-up experiment: CRT scores, by overall debt

	Percentage scoring 0, 1, 2 or 3			
In debt?	0	1	2	3
Yes$_{11}$	36.36$_{4}$	27.27$_{3}$	36.36$_{4}$	0.00$_{0}$
No$_{115}$	60.87$_{70}$	26.08$_{30}$	11.30$_{13}$	1.74$_{2}$

Notes:
(1) subscripts show the number of respondents
(2) $\chi^2(3) = 5.896$; p-value = 0.117 (Fisher's exact p-value = 0.364)
(3) Pearson's linear correlation $\rho = 0.167$; p-value = 0.062

To reinforce the finding of reversion in the correlation between CRT performance and debt across the pilot and follow-up experiments, we adjusted regressions in the search for a best model. Table 8 shows CRT performance and indiscriminate debt in the pilot experiment are negatively correlated. The best model in Table 8 thus replicates the findings reported in Tables 1-3.

Table 8. Best adjusted model for the pilot experiment

Variable	*Estimate*	*Standard error*	*t ratio*	*p-value*
Intercept	1.785	0.1601	11.15	< 0.001
Gender (1 = female; 0 = male)	–0.822	0.1863	–4.47	< 0.001
Indiscriminate debt (1 = yes; 0 = no)	–0.319	0.1851	–1.72	0.087

Note:
(1) Overdraft debt was again nonsignificant

Strikingly, Table 9 shows the variables CRT performance and overall debt in the follow-up experiment become positively correlated. Moreover, the correlation coefficients in both Tables 8 and 9 are strong.

Table 9. Best adjusted model for the follow-up experiment

Variable	*Estimate*	*Standard error*	*t ratio*	*p-value*
Intercept	0.642	0.0869	7.40	< 0.001
Gender (1 = female; 0 = male)	–0.297	0.1426	–2.09	0.039
Overall debt (1 = yes; 0 = no)	0.519	0.2432	–2.14	0.035

Note:
(1) Overall debt = indiscriminate debt × overdraft debt

Of note, the estimates in Tables 8 and 9 show a low R^2 and thus cannot be used for predicting. However, the results do establish a tendency between CRT performance and the regressors gender, indiscriminate debt and overdraft debt. The sample size is expected to be "large enough" to detect a difference if it exists. However, "large enough" does not necessarily mean a big sample. What matters is getting an amount of data that is sufficient enough to correctly reject a null hypothesis. Moreover, the probability of rejection in large samples tends to increase due to the power function of the test. Considering this fact, Fisher's exact test was explicitly designed for small samples [30].

To sum up, those high-income consumers in overall debt do not show relatively poorer cognitive performance than those who are debt free. This suggests another cause for high-income consumer indebtness. When one does not discriminate consumers in terms of their incomes, consumers seem to contract debts due to lack of self control (poor cognitive reflection). This is what the Germany study finds. While that study remains valid (as our pilot experiment seems to suggest), when one focuses on high-income consumers (as in our follow-up experiment) consumer indebtness can no longer be explained by poor cognitive reflection. We speculate this may be explained by the fact that high-income consumers have higher financial literacy, and this is related to lower indebtdeness [31]. In the end, high-income consumers treat debt as mere leverage, as companies do. And banks seems to perceive that. The bank where the participants of our follow-up experiment came from definitely treats high-income consumers differently regarding overdraft debt. They usually wait until 10 business days have passed before beginning to charge the use of the overdraft service, a treatment similar to that dispensed to companies using working capital. Thus, banks sometimes consider overdraft debt of high-income consumers as leveraged loans.

Polonius in Shakespeare's *Hamlet* advises, "Neither a borrower nor a lender be." Is that reasonable? Irving Fisher [32] thinks the correct advice should be: "Both a borrower and a lender be." To buy a house one usually has to contract a huge debt (mortgage). However, contracting such a debt is a way to save resources for retirement. To get an academic degree that will increase one's future income, one may contract a debt. Current debt is then justified when it translates into freeing up future resources and expanding opportunities. This type of debt is leverage. However, there is no guarantee that all motivations for leverage are related to such rational calculations. One may incur leverage motivated by overconfidence and excessive optimism, for example. Our study did not disentangle such possible types of leverage and we leave this for future research.

4. Conclusion

A recent study using massive data for Germany, where credit lines on current accounts are available to 80 percent of the population, finds that excessive usage of costly credit lines is more likely for people who give intuitive but incorrect answers on a cognitive reflection test. This suggests in-debt consumers who use overdraft services have poorer cognitive reflection and, thus, lack of self control. The Germany study finds that the level of income does not matter. Here, we discriminate consumers in terms of income. In a first (pilot) experiment we do not discriminate consumers considering their incomes as in the Germany study where income is not an issue. Overall, our pilot experiment replicates the finding of the Germany study. However, in a follow-up experiment using a high-quality sample of high-income consumers, we find debt can no longer be explained by poor cognitive reflection and lack of self control. Apparently, high-income consumers treat debt as mere leverage, as companies do.

References

[1] Evans JSBT (2003) In two minds: Dual-process accounts of reasoning. *Trends in Cognitive Sciences* 7 (10), 454-459.

[2] Evans JSBT (2008) Dual-processing accounts of reasoning, judgment, and social cognition. *Annual Review of Psychology* 59, 255-278.

[3] Kahneman D (2011) *Thinking, Fast and Slow*. New York: Farrar, Straus and Giroux.

[4] Stanovich KE (2004) *The Robot's Rebellion: Finding Meaning in the Age of Darwin*. Chicago: Chicago University Press.

[5] Cosmides L, Tooby J (1994) Better than rational: Evolutionary psychology and the invisible hand. *American Economic Review* 84 (2), 327-332.

[6] Trivers R (2011) *The Folly of Fools: The Logic of Deceit and Self-Deception in Human Life*. New York: Basic Books.

[7] Frederick S (2005) Cognitive reflection and decision making. *Journal of Economic Perspectives* 19 (4), 25-42.

[8] Toplak ME, West RF, Stanovich KE (2011) The Cognitive Reflection Test as a predictor of performance on heuristics-and-biases tasks. *Memory & Cognition* 39 (7), 1275-1289.

[9] Barkley RA (1998) Behavioral inhibition, sustained attention, and executive functions: Constructing a unifying theory of ADHD. *Psychological Bulletin* 121 (1), 65-94.

[10] Case R (1992) The role of the frontal lobes in the regulation of cognitive development. *Brain and Cognition* 20 (1), 51-73.

[11] Dempster FN, Corkill AJ (1999) Interference and inhibition in cognition and behavior: Unifying themes for educational psychology. *Educational Psychology Review* 11 (1), 1-88.

[12] Dienes Z, Perner J (1999) A theory of implicit and explicit knowledge. *Behavioral and Brain Sciences* 22 (5), 735-755.

[13] Harnishfeger KK, Bjorklund DF (1994) A developmental perspective on individual differences in inhibition. *Learning and Individual Differences* 6 (3), 331-355.

[14] Kane MJ, Engle RW (2002) The role of prefrontal cortex in working-memory capacity, executive attention, and general fluid intelligence: An individual-differences perspective. *Psychonomic Bulletin & Review* 9 (4), 637-671.

[15] Norman DA, Shallice T (1986) Attention to action: Willed and automatic control of behavior. In Davidson R, Schwartz R, Shapiro D (eds.), *Consciousness and Self-Regulation*. New York: Plenum Press, pp. 1-18.

[16] Zelazo FP, Frye D (1998) Cognitive complexity and control: II. The development of executive function in childhood. *Current Directions in Psychological Science* 7 (4), 121-126.

[17] Mischel W, Ebbesen EB (1970) Attention in delay of gratification. *Journal of Personality and Social Psychology* 16 (2), 329-337.

[18] Mischel W, Shoda Y, Rodriguez MI (1989) Delay of gratification in children. *Science* 244 (4907), 933-938.

[19] Eigsti IM, Zayas V, Mischel W, Shoda Y, Ayduk O, Dadlani MB, Davidson MC, Lawrence Aber J, Casey BJ (2006) Predicting cognitive control from preschool to late adolescence and young adulthood. *Psychological Science* 17 (6), 478-484.

[20] Nurcan NA, Bicakova A (2010) Self-control and debt: evidence from data on credit counselling. *Oxford University Department of Economics Discussion Paper* No. 504.

[21] Wertenbroch K (2003) Self-rationing: Self-control in consumer choice. In Baumeister RF, Loewenstein G, Read D (eds.), *Time and Decision: Economic and Psychological Perspectives on Intertemporal Choice*. New York: Russell Sage Foundation, pp. 491-516.

[22] Stango V, Zinman J (2011) Fuzzy math, disclosure regulation, and market outcomes: Evidence from truth-in-lending reform. *Review of Financial Studies* 24 (2), 506-534.

[23] Gathergood J (2012) Self-control, financial literacy and consumer over-indebtedness. *Journal of Economic Psychology* 33 (3), 590-602.

[24] Fehr E (2002) Behavioural science: The economics of impatience. *Nature* 415, 269-272.

[25] Heidhues P, Koszegi B (2010) Exploiting naiveté about self-control in the credit market. *American Economic Review* 100 (5), 2279-2303.

[26] Laibson D (1997) Golden eggs and hyperbolic discounting. *Quarterly Journal of Economics*, 112 (2), 443-477.

[27] Laibson D, Repetto A, Tobacman J (2007) Estimating discount functions with consumption choices over the lifecycle. *NBER Working Papers* No. 13314.

[28] Dick CD, Jaroszek L (2014) Knowing what not to do: Financial literacy and consumer credit choices. *German Economic Association Annual Conference 2014* No. 100383.

[29] Toplak ME, West RF, Stanovich KE (2014) Assessing miserly information processing: An expansion of the Cognitive Reflection Test. *Thinking & Reasoning*, 20 (2), 147-168.

[30] Van Belle G, Fisher LD, Heagerty PJ, Lumley T (2004) *Biostatistics: A Methodology for the Health Sciences, 2nd ed.* New York: John Wiley & Sons.

[31] Lusardi A, Tufano P (2015) Debt literacy, financial experiences, and overindebtedness. *Journal of Pension Economics and Finance*, 14 (4), 332-368.

[32] Fisher I (1930) *The Theory of Interest*. New York: Macmillan.