Borrowing to keep up (with the Joneses): Inequality, debt, and conspicuous consumption

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Abstract

The quest for status is a powerful motivator, but does it affect inequality? This paper presents a novel lab experiment that was designed and conducted to identify the relationship between conspicuous consumption, access to credit, and inequality. We report four main findings: First, consumption increases when it is "conspicuous" (i.e., is both observable and signaling ability). Second, costly borrowing increases when consumption is conspicuous. Third, the increase in costly borrowing is driven by those at lower income levels. Finally, in the presence of conspicuous consumption, access to credit exacerbates inequality.

Under the regime of individual ownership, the most available means of visibly achieving a purpose is that afforded by the acquisition and accumulation of goods; and as the self-regarding antithesis between man and man reaches fuller consciousness, the propensity for achievement—the instinct of workmanship—tends more and more to shape itself into a straining to excel others in pecuniary achievement. Relative success, tested by an invidious pecuniary comparison with other men, becomes the conventional end of action.

– Veblen, 1899 "The theory of the leisure class"

Men do not desire merely to be rich, but richer than other men.
– John Stuart Mill

I. Introduction

The quest for status has been argued to be a powerful motivator, affecting consumption patterns, borrowing, and even happiness. Discussions about the role of social status on one's happiness and consumption go back to Veblen (1899) or even earlier.[2] Veblen details the concept of "pecuniary emulation": those at lower levels of status in a society emulate the consumption behavior of those at higher levels of status, even when they may not have the means to engage in said consumption (Veblen, 1899; chapter 2). This emulation forms the basis of "conspicuous consumption", the acquisition of goods and services to display status. Moreover, in the presence of inequality and access to credit, conspicuous consumption motives may distort personal financial decisions and create unintended macroeconomic instability. If these distortions disproportionately affect the poor, they could worsen inequality. However, causal evidence for the effects of conspicuous consumption and access to credit on financial decisions and inequality is not well established.

This paper presents a lab experiment to establish a causal relationship between conspicuous consumption, access to credit, and inequality. The experiment is set up as follows: subjects (students at the University of East Anglia) are randomly assigned to groups of four. They are provided with an endowment and descriptions of 25 real-world luxury items. Subjects are asked if they would like to purchase virtual pictures of the items. Purchasing these pictures is costly and thus, constitutes "consumption." In the baseline treatment, "consumption" decisions are not revealed to others. However, in some other treatments, "consumption" decisions are visible to others and can signal ability and income[3], making consumption "conspicuous". To facilitate the

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[2] Smith (1759), for example, wrote in the Theory of Moral Sentiments, about the pursuit of wealth being driven by one's need to avoid their financial distress being viewed by others (Luttmer, 2005).

[3] In treatments with equal endowments, subjects are provided with 20 tokens per round (common knowledge). In treatments with unequal endowments, subjects are provided with tokens based on their performance in a preceding simple real-effort task (private knowledge). Details on these features can be found in the experimental design section.

use of credit, we divide the task into 10 rounds, lasting 3 minutes each. Endowments accumulate over time, meaning that some items are immediately purchasable, while others must be purchased once enough money has been accumulated. If loans are available, individuals can borrow to purchase high-priced items in earlier rounds. The experiment varies three factors: (i) purchasing behavior is hidden or revealed (within the group); (ii) endowments are either equal or unequal (i.e., signaling ability); (iii) loans are either available or not. This variation yields a 2x2x2 between subjects' design.

We report four main findings: first, consumption increases when it is both observable and signals ability/status (which we define as "conspicuous"). Both conditions are necessary for consumption to rise, in line with results reported in Clingingsmith and Sheremeta (2018). Second, (costly) borrowing increases when consumption is conspicuous. Third, this increase is driven by subjects with the lowest income levels. Finally, we demonstrate that the availability of costly loans exacerbates inequality when consumption is conspicuous because low-income individuals borrow. These findings have a powerful implication: conspicuous consumption, inequality and access to costly credit create a vicious cycle, in which the combination of inequality and status-signaling encourages more costly loan-taking from the poorest groups. The costly borrowing, in turn, damages their financial conditions and (ultimately) exacerbates inequality. The idea of conspicuous consumption, or "keeping-up-with-the-Joneses", has been extensively applied in a large body of theories.[4] Various empirical evidence also established social status as an important factor to subjective well-being (see Frank, 1999 and Clark et al., 2008 for reviews, and Luttmer, 2005).[5] In addition, the "keeping-up-with-the-Joneses" motive has been argued to influence consumption and financial decisions in different contexts.[6] Most prominently, the 2007-2009 financial crisis is argued to be caused, at least partly, by over-borrowing and over-spending of American households with poor credit ratings in the run-up to the crisis (Mian and Sufi, 2011, 2015). In the same vein, Bertrand and Morse (2016) show that between 1980 and 2008, when exposed to higher top income and consumption levels, non-rich households consumed a larger share of their income on visible goods and services.

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[4] See Leibenstein, 1950; Bagwell and Bernhaim, 1996; and Hopkins and Kornienko, 2004 for theories on consumer demand; Basu, 1987 on price rigidity; Glazer and Konrad, 1996 on charitable giving; Gali, 1994 on portfolio choice; Carroll et al, 1997 on growth; Ljungqvist and Uhlig, 2000 on tax policy.

[5] For example, Luttmer, 2005 finds that controlling for an individual's own income, higher earnings of neighbors are associated with lower levels of self-reported happiness. This result provides *suggestive* evidence that people care about their status relative to a comparison group

[6] See among others, Bloch, Rao, and Desai, 2004; Grinblatt, Keloharju, and Ikaheimo, 2008; Charles, Hurst, and Roussanov, 2009; Kuhn et al. 2011; Bursztyn et al, 2017; Bricker, Krimmel, and Ramcharan, 2020; Agarwal et al, 2020; De Giorgi, Frederiksen, and Pistaferri, 2020.

However, one difficulty with the empirical literature is that the connection between conspicuous consumption and borrowing is largely suggestive. It is difficult to disentangle conspicuous consumption motives from other factors, such as exposure to visible (and usually high-quality) goods; or preferences for visible goods.[7] For example, one can argue that rising visible consumption is not because of status-signaling but because of exposure to, and learning about, the quality of visible goods introduced by higher-status individuals. Indeed, there may be other considerations that are not immediately observable (such as longevity or enhanced customer support to the visible goods) that could well be driving the preferences and choices in the real world.

Our paper contributes to the literature by documenting (for the first time) clear causal evidence that conspicuous consumption results in increased loan-taking, particularly in lower-income groups, leading to worsened inequality. The lab is ideal for this purpose as it can rule out competing explanations. At the same time, there is considerable debate on the generalizability of findings in the lab (see for example, Levitt and List, 2007; Falk and Heckman, 2009; Camerer, 2011; and Al-Ubaydli and List, 2013). There is concern that the controlled environment of the lab does not capture the "realism" of the field. Following Falk and Heckman (2009), however, we note that in order to isolate the effects of loan-taking for the sake of signaling ability, and its resulting effects on inequality, the superior control of the lab is necessary. To the best of our knowledge, we know of no field data that can allow us to isolate these effects.

We show that when consumption is conspicuous, access to costly credit worsens inequality. The lab environment allows us to vary access to credit exogenously. Typically, access to credit does not vary greatly within a country. Even if it does, it is usually associated with local conditions such as poverty and inequality, making it difficult to argue for the causal effects of access to credit on borrowing and inequality.

Our paper also contributes to the rich literature on access to finance by showing that access to credit in the presence of conspicuous consumption motives could cause adverse outcomes. The traditional view is that access to finance brings great benefits (see Beck and Demirgüç-Kunt, 2007; and Demirgüç-Kunt et al., 2008). While these benefits are not disputed, recent studies in the macroeconomic literature have shown some downsides. For example, Bianchi (2011) and

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[7] The literature distinguishes between more "visible" goods, which are goods that are more visible to others (Heffetz, 2011) such as cars, clothing, or furniture, and less "visible" goods, such as car insurance and underwear. Naturally, this style of categorization entails that engaging in such visible consumption could be driven by both preferences and by visibility.

Davila and Korinek (2018) examine over-borrowing driven by pecuniary externalities, in which individuals do not internalize that their borrowing could contribute to overall macroeconomic instability. Hence, individuals borrow more than the socially optimal amount. This new view highlights some drawbacks of access to finance, a point we find support for in this experiment. Finally, by pointing to a mechanism via which inequality can cause harm and create a feedback loop, our paper also relates to the debates about inequality, which is gathering steam in light of new evidence about rising inequality in the developed world (Piketty, 2014). Theoretical and empirical studies exploring the effects of income inequality upon growth tend to reach inconclusive results (see Aghion et al, 1999 for an early review; Marrero and Rodriguez, 2013 and Ferreira et al., 2018 for recent evidence).

The most important contribution of our paper is in demonstrating the mutual reinforcement between inequality and conspicuous consumption. A key question in the literature is how are inequality and conspicuous consumption related? Researchers typically focus on one of two angles: either "does greater inequality lead to greater conspicuous consumption?" or "does conspicuous consumption itself lead to greater inequality?" Our framework allows us to illustrate that they can reinforce each other, creating a vicious cycle.

Several papers use the lab to study status, particularly to disentangle preferences and motivations (Ball and Eckel, 1996, 1998; Ball et al., 2001; Pettit and Sivanathan, 2011; Charness, Masclet, and Villeval, 2014; Clingingsmith and Sheremeta, 2018). Our paper is closest to Clingingsmith and Sheremeta (2018)[8], who also use a lab experiment to show that increasing observability of consumption increases the demand of goods, but only when they signal ability (i.e., when consumption is conspicuous).[9] However, our paper differs from Clingingsmith and Sheremeta (2018) in several important ways. Most importantly, our main purpose is to establish a nexus between inequality, access to credit, and conspicuous consumption. By implementing access to credit, we demonstrate that costly borrowing increases with conspicuous consumption, and that this is driven by low-income subjects. The costly borrowing, in turn, exacerbates inequality.

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[8] Another closely related paper is that of Pettit and Sivanathan (2011), which documents a self-threat mechanism to engaging in credit for conspicuous consumption. The basic idea is that purchasing behavior contains the utility of obtaining the item as well as the disutility of paying for said item. Credit allows subjects to defer the disutility of expenditure, and those that have greater threatened self-worth are more likely to defer the disutility of expenditure. Our results are in contrast to this, however, with little possibility of any long-term deferment, we still find higher loan-taking, but cannot attribute this to those with threatened self-worth, but do attribute it to status-seeking behavior.

[9] For more on signaling behavior, see Crawford and Sobel (1982); Glazer and Konrad (1996); Feltovich, Harbaugh, and To (2002); among others.

II.   Conceptual framework

This section provides a simple conceptual framework as to why as the presence of conspicuous consumption, agents may consume more than they would otherwise. In what follows, we build a simple model of utility maximization to crystalize the intuition and also provide guidance to the empirical analyses. We consider three cases which correspond to treatments in the experiment: (i) when consumption is not observable, (ii) when consumption is observable, but cannot signal ability / wealth; and (iii) when consumption is observable and signals ability / wealth.

a. Case 1 - consumption is not observable.

An agent' utility function takes the following form:

$$U(c) = \ln(c) + a\, ln(y - pc) + f(w)$$

where c is consumption during the experiment; p is the price of a picture; y is the endowment; $y - pc$ is the takeaway payment. For simplicity, we normalize p to 1. Subjects incur utility when observing a picture of an item, reflected by $\ln(c)$[10] . However, subjects value the utility of the takeaway payment more, reflected by $a\, ln(y - c)$ (since p is normalized to 1) and $a > 1$; a is subject's preference of the takeaway payment over observing a picture within the experiment.

$f(w)$ is a desire to signal wealth/ability , but since consumption is not observable, $f(w)$ is not a function of consumption c. Hence, it drops out in the first order condition. Utility maximization (first-order conditions) gives:

$$\frac{1}{c} = \frac{a}{y - c}$$

Hence, $\frac{c}{y} = \frac{1}{a+1}$. The equation implies participants spend less than half of endowment on consumption in the experiment (because subjects prefer to earn money over observing pictures: $a > 1$, hence $\frac{1}{a+1} < \frac{1}{2}$).

b. Case 2 - consumption is observable but does not signal ability/wealth (in the case starting endowment is equal). Utility takes the form

$$U(c) = \ln(c) + a\, ln(y - c) + f(w)$$

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[10] The log utility function is standard in the literature. It is a special case of a class of utility function called CRRA (constant relative risk aversion).

$f(w)$ is the utility of signaling wealth/ability . Now consumption is observable but does not signal ability/wealth.. Since consumption involves seeing some pictures during the experiment at the cost of reduce real payoffs, consumption may be considered "wasteful". Since subjects want to signal wealth / ability, they assign a disutility of consumption: $f(w) = -sln(c)$ where $s > 0$.

$$U(c) = \ln(c) + a\,ln(y - c) - sln(c)$$

Utility maximization (first-order conditions) gives:

$$\frac{1}{c} - \frac{a}{y - c} - \frac{s}{c} = 0$$

$$\text{Hence, } \frac{c}{y} = \frac{1}{\frac{a}{1-s}+1}$$

Since $\frac{1}{\frac{a}{1-s}+1} < \frac{1}{a+1}$, participants consume less in case 2 than in case 1. This is because consumption signals a reduction in wealth because subjects earn equal endowments. If s is set very large, the "optimal" consumption (implied by the solution) can be negative. Because consumption is constrained to be non-negative, participants would choose a corner solution of zero consumption.

c. Case 3 - consumption is observable and signals ability/wealth. This is our most relevant case, matching the treatment of unequal endowment.

$$U(c) = \ln(c) + a\,ln(y - c) + f(w)$$

$f(w)$ is the utility of signaling wealth / ability. Now consumption is observable **and** signals ability/wealth: $f(w) = -sln(c) + wln(c)$. Subjects use consumption to signal ability/wealth, hence the positive term $wln(c)$. They also know consumption also signals a reduction in wealth, hence the negative term $-sln(c)$.

Utility maximization (first-order conditions) gives:

$$\frac{1}{c} - \frac{a}{y - c} + \frac{w - s}{c} = 0$$

$$\text{Hence, } \frac{c}{y} = \frac{1}{\frac{a}{1+w-s}+1}$$

Since $\frac{a}{1+w-s} + 1 > \frac{a}{1-s} + 1$, consumption is case 3 is larger than consumption in case 2.

If $w = s$ (preference to signal ability/wealth equals the worry about appearing "wasteful" from consumption) then consumption in case 3 will be the same as consumption in case 1. If $w > s$ (preference to signal ability/wealth is larger than the

worry about appearing "wasteful" from consumption), consumption in case 3 will be larger than consumption in case 1.

The simple model above allows us to make a few predictions about subject behaviour. The model predicts that consumption is highest when it is observable and carries a signal of ability or wealth, as long as the preference for signaling wealth is greater than the worry about appearing "wasteful" from consumption.

Furthermore, when loans are available, the costs of debt-financed consuming items increase, hence only those that have a greater preference for signaling wealth then continue consuming. Even if both the wealthy and the poor are equally likely to have high preference for signaling wealth, but the poor is more likely to borrow to finance consumption, the higher costs associated with borrowing increases the wealth gap between the wealthy and poor as the poor lose a greater proportion of their wealth in order to engage in signaling.

Related to our prediction, Moav and Neeman (2010) explain why conspicuous consumption may widen inequality. Their model allows conspicuous consumption to signal individual's unobservable income. For poor individuals, generating this signal is costly and requires a large fraction of their income, which may prevent further wealth accumulation, and they may eventually fall back to poverty. Wealthy individuals, however, can signal their status while maintaining their wealth, as the signal requires a smaller fraction of their income. In this paper, borrowing is also costly, which further exacerbates the poor's cost to engage in conspicuous consumption. In addition, Moav and Neeman (2012) add that when high human capital is observable, the incentive to engage in conspicuous consumption is stronger. Those with certified accomplishments have a recognizable ability (professional titles etc.) and hence relatively little need to signal success, whereas those without certified accomplishments, such as the poor, have a relatively stronger motivation to impress via conspicuous consumption.

III.   Experimental design

The experiment consists of a 2x2x2 between subjects' design varying three factors: (i) purchasing behavior is hidden or revealed (within the group); (ii) endowments are either equal or unequal (i.e., signal ability); (iii) loans are either available or not. Our subjects are undergraduate students at the University of East Anglia using the LEDR lab subject pool. Treatments are randomized within sessions, with 650 subjects participating in the entire experiment. Subjects were paid in

"tokens," which were exchanged for GBP at the rate of 16 tokens per GBP. On average, subjects earned 13.17 GBP overall.[11]

Consumption

Simulating consumption was one of the main challenges for this experiment. Subjects "consume" pictures of real-world luxury items in the main task, by spending tokens which allows them to obtain and view these pictures. Subjects receive 60% of their expenditure back at the end of the experiment, so they are certain to earn some money (there is a cost of 40% of the ticket price of the item that they incur, which may independently seem low give the total cost of the item). In addition to this, the protocol was careful to ensure that subjects did not have access to any personal items during the experiment. Sitting and staring at the screen for 30 minutes (3 minutes per round for 10 rounds) would be considered quite boring, and hence this expenditure allays boredom (which is one potential non-pecuniary benefit to consumption).

Subjects were first shown only *descriptions* of luxury items such as mobile phones, private islands, estates, paintings, and yachts. These items were chosen to be as gender-neutral as possible, hence we strove to avoid items such as high-end clothing or cars. In total, there were 25 items available (at different descriptions and price points), and it was not possible to purchase all of them with the endowments available. See Table A.1 for a complete list of items. Some examples of the description and prices of items are shown below.

- Phone: The Black Diamond is designed by Stuart Hughes. The home button is a single, rare 26-carat black diamond, back panel is 24-carat gold dressing, studded with 600 white, flawless diamonds. 11 million USD
- Island: Isla de sa Ferradura is a private island just off Ibiza. A massive 130,000 square foot hacienda that is outfitted with only the very best luxury materials for that ultimate tropical paradise. 27 million USD
- Estate: Located in Manalapan, Florida, Acqua Liana comprises 1.6 acres of luxury. It was designed according to eight key principles of human and environmental health, and with sheer opulence in mind. 19 million USD

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[11] For reference, the UK minimum wage for this age group was between 6.5 and 7.5 GBP per hour in the study period. Students on campus typically made somewhere between 9 and 10 GBP per hour depending on the type of work. Hence, subject earnings were fairly substantial, with theoretical maximums of between 15 and 18 GBP for 45 minutes depending on treatment and performance.

- Painting: Bal (Dance) du moulin de la Galette is an 1876 painting by French artist Pierre-Auguste Renoir. It is one of Impressionism's most celebrated masterpieces. 35 million USD

- Yacht: The Rising Sun is a yacht designed by Jon Bannenberg for Larry Ellison, CEO of Oracle Corporation. It has a basketball court, helicopter landing pad, movie theatre, wine cellar, and a total of 82 rooms across five floors. 155 million USD

The descriptions were taken from websites promoting the items and thus are quite attractive. Furthermore, due to the number of items available, we reasoned that it would not be possible for subjects to remember all the items and search for them online once the session was over. The protocol included strict instructions to take away subjects' mobile devices to remove the possibility of outside information contaminating the experiment. All subjects complied with giving up their mobile devices upon entering the lab.

We take a context-heavy approach by utilizing pictures and descriptions of real-world luxury items that are unaffordable for a typical subject. In all treatments, subjects were shown a description of the items but had to spend tokens (i.e., real money) to view the items. Once purchased, an item is available for the remainder of the session. One drawback to this design is that subjects have nothing else to do, and hence boredom can be a motivating factor in the purchasing decisions. However, each treatment is as boring as the other, so boredom is less of a concern for our treatment effect estimates.

It is important to note that subjects' purchasing decision was for a virtual picture of the item, with prices scaled to real-world prices. Subjects were clearly instructed that purchasing an item means viewing a picture of the item. This setup contrasts with the literature involving real goods (see studies eliciting willingness to pay for real-world objects, such as Plott and Zeiler, 2005; Isoni, Loomes, and Sugden, 2011; among others). Furthermore, the uniqueness of the objects is an important feature of our design, which everyday items would struggle to replicate. In addition, in keeping with the context of goods that signal status, it would be cost-prohibitive for us to offer anything physical to the subjects, particularly since we use a diverse range of items. Hence, we chose to use virtual goods, which have considerable evidence of consumption in the real world, particularly in the gaming and technology markets (see, for example, Huang, 2012; Hamari, 2015). Importantly, we measured real-world consumption behavior using a series of survey questions administered at the end of the experiment, which is positively and significantly correlated with behavior in the consumption task.

Since subjects can spend their entire endowment, we wanted to ensure that subjects would not walk away with just the show-up fee. For this reason, we implemented a 60% rebate on all items, such that at the end of the session, subjects retain 60% of the face value of the item purchased. Furthermore, luxury assets such as the ones we used are often resold, sometimes at even higher prices.[12] Engaging in consumption reduces subject payoffs considerably, and the income maximizing agent will not purchase any items whatsoever. Still, this method ensures that subjects will walk away with a substantial proportion of their endowment intact. The presence of the rebate was made clear to all subjects in the instructions, and we used a quiz to reinforce this design aspect and ensure understanding. Subjects could only spend up to their maximum endowment pre-rebate, and this maximum was set so that subjects could not purchase all items available.

Treatments

Table 1 displays our treatments with the associated number of subjects. The number of subjects in each treatment is unbalanced largely due to the nature of the experiment; some treatments required groups of 4, while others required individuals. Hence, we strove to target a minimum number of independent observations per treatment (20 for the treatments with groups of 4, and 50 for the individual treatments). We also conducted sessions with multiple treatments, with some sessions containing a handful of individual observations when the total number of subjects in the session was not divisible by 4 (to reduce turn-aways).

Table 1. Treatment Overview

		Baseline	Observability	Inequality	Observability X Inequality
Loans	**No**	N = 81	N = 88 (22 groups)	N = 55	N = 104 (26 groups)
	Yes	N = 66	N = 100 (25 groups)	N = 60	N = 96 (24 groups)

Baseline: The baseline treatment works as follows. Subjects are provided a standard endowment (200 tokens) over the course of 10 rounds, with each round lasting 3 minutes. Subjects are informed that in each round, they can access 10% of their total endowment, which can be used for consumption. In each subsequent round, subjects can access an additional 10% of their total endowment. The prices on the items (shown in Appendix A) are such that some items are

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[12] This effectively meant that the actual cost of the item was 40% of the face value. This was a design choice that we made to remove the possibility of zero earnings, as well as to reinforce the asset nature of the items. It also induces subjects to purchase more than they otherwise might, reasoning that 40% of the face value is a reasonable amount to pay to view the item. We are agnostic on these motivations, however, noting that whatever the motives are, they are unlikely to vary across treatments.

immediately available for purchase (11 items). As the endowment accumulates, more items become available, with some (4 items) becoming available in the last 5 rounds. Once an item is purchased, a picture of the item becomes available in the subject's viewing gallery for the remainder of the session and is accessible to the subject at any time. Each item can only be purchased a single time. At the end of the 10 rounds, subjects complete a questionnaire and are paid and free to leave. Subject purchases are not observable to other subjects. In other words, subjects know nothing about the purchases of other subjects.

Observability: In these treatments, we randomly assign subjects to groups of 4. Subjects within each group can observe other subjects' purchasing decisions. This does not mean they can view other subjects' pictures, however. It just means that they can observe the item details that other subjects in their group have purchased. It works in the following way: Subjects make purchasing decisions. Their total expenditure and a list of items they purchased are available to all group members to observe in the next round. Hence, from the second round onwards, subjects can view a table with the total expenditure of each group member. Furthermore, subjects can observe the descriptions (but not the pictures) of items purchased by their group's members. Hence, purchasing behavior is observable, but the items are not because viewing the items is considered "consumption" in our experiment.[13] Since items and descriptions are the same across all treatments, consumption preferences are held constant. Thus, differences across treatments can only be driven by observability, which is a key aspect of our experiment and is difficult to disentangle in the empirical literature. Other than this change, everything else is identical to the baseline.

Inequality: In this set of treatments, subjects engaged in a real effort task before engaging in the main consumption task. The effort task was a version of the coding task (Lévy-Garboua, Masclet, and Montmarquette, 2009; Erkal, Gangadharan, and Nikiforakis, 2011), which generated the endowment for use in the consumption task. Subjects were given 5 practice rounds, followed by 10 paid rounds of 30 seconds each.[14] As a result, this set of treatments has unequal endowments but also higher average total endowment levels (224.10 tokens per subject on

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[13] For example, suppose subject A purchases Pablo Picasso's painting, "The Weeping Woman." Subjects B,C, and D know that subject A purchased the painting, but can only view the painting if they purchase it for themselves.

[14] Note that we use a real-effort task that is common to the public goods literature and is used to generate endowments. We use this task to generate inequality and ability-signaling in the same fashion as Clingingsmith and Sheremeta (2018). However, we differ in that they use IQ tests rather than a generic effort task. As an anonymous reviewer points out, subjects may care more about signaling cognitive ability than generic ability, and hence our treatments might not capture the full effect of ability-signaling. We acknowledge that this might be the case, and while subjects caring about signaling different types of ability is an empirical question, the results show that even signaling generic ability matters.

average) than the baseline endowment of 200 tokens per subject (*p<0.01*). The higher average endowment level occurred despite our best efforts to set the piece rate in such a manner to generate an equivalent endowment to the baseline. For this reason, all analysis conducted expresses expenditure as a percentage of the total endowment available. Note, however, that subjects are informed of their own endowment; they are never informed of the endowments of other subjects in the same treatment. Hence, in these treatments, consumption carries a signal of ability in the coding task. Other than this, the treatments are identical to the baseline.[15]

Access to credit: The final factor that the experiment varies is access to credit. These treatments allow subjects to borrow funds from their future selves at a cost. As the total endowment accumulates over 10 rounds, subjects in these treatments can borrow funds from future rounds to finance purchases in earlier rounds. These loans come at a cost (5% of the borrowed amount). Defaulting is not possible because the endowment in future rounds is automatically reduced by the loan amount plus 5% divided by the remaining rounds. In addition, subjects must borrow the full cost of the item being financed (even though they might have some funds to cover part of the purchase). Thus, partial financing is not possible.[16] Overborrowing is also not possible: subjects can only borrow up to what their endowments can accommodate, and not more. Finally, borrowing activity is similarly never revealed to other subjects.

Additional measures

At the end of the consumption task, subjects engaged in a short survey before they were paid. The survey measures many subject characteristics that are pertinent to consumption behavior.

Financial literacy: One measure is financial literacy (van Rooij, Lusardi, and Alessie, 2011). This measure asks subjects to respond to five questions about:

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[15] One related question is that of our implementation of inequality, and the choice to make it effort based. As we note, Clingingsmith and Sheremeta (2018) found that unequal but randomly assigned endowments had no impact on consumption behavior. An alternate strategy we could have implemented (following them) was to implement random endowments, rather than earned endowments, in our baseline. This design choice is not critical for us, however, as we are mainly interested in the effects of loans and on inequality. That being said, implementing random but unequal endowments in our baseline would have resulted in a more closely matched replication of Clingingsmith and Sheremeta (2018), but would not affect any of our main findings.

[16] The reason for not allowing partial borrowing was to make the instructions and the interface very simple for our subjects. Borrowing partial amounts would require our subjects to engage in complex calculations. Assuming full borrowing allowed us to make all calculations explicit for the subjects. This design choice should have no impact on our estimates, however, as borrowing was implemented identically in treatment and control. However, the magnitude of the effect may well be larger relative to a partial borrowing design choice. Our data does not allow us to account for this.

- Numeracy: "Suppose you had £100 in a savings account and the interest rate was 2% per year. After 5 years, how much do you think you would have in the account if you left the money to grow?"
- Compound interest: "Suppose you had £100 in a savings account and the interest rate is 20% per year and you never withdraw money or interest payments. After 5 years, how much would you have on this account in total?"
- Inflation: "Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, how much would you be able to buy with the money in this account?"
- Time value of money: "Assume a friend inherits £10,000 today and his sibling inherits £10,000 3 years from now. Who is richer because of the inheritance?"
- Money illusion: "Suppose that in the year 2010, your income has doubled and prices of all goods have doubled too. In 2010, how much will you be able to buy with your income?"

Our measure of financial literacy is simply the sum of all correct answers to the questions. 24.5% of our sample got all five answers correct, while 57.0% for at least four answers correct.

Consumption behavior (survey): In addition to this, we also measure real-world consumption behavior. We ask four questions and simply add up the responses, with higher numbers indicating greater consumption. The four questions are:

- Thinking about this past week, how frequently did you eat out?
- Thinking about this past week, how frequently did you go for a drink?
- Thinking about this past week, how frequently did you go see a movie?
- Thinking about this past week, how frequently did you buy something and return it?

This measure of real-world consumption behavior is particularly important because it allows us to test whether real-world consumption behavior is correlated with consumption in our experiment. Across all treatments, we find that consumption in our experiment is significantly positively correlated with the real-world consumption measure ($p<0.05$), giving us some confidence that our simulated consumption reflects real-world consumption behavior.

In addition to these measures, we also use measures of competitiveness (based on the 13-item scale of Houston et al., 2002), engagement (based on the Cognitive Reflection Test of Frederick, 2005), state of personal finances, clarity of instructions, gender, and age. Table 2 displays summary statistics across treatments. Note that the control variables are balanced across treatments (joint F-test of a model with treatment dummies: $p>0.15$) except our outcome variables: consumption (expenditure) and borrowing.

Table 2. Summary statistics

Variable	No Access to Credit				Access to Credit			
	Baseline	Observability	Inequality	Observability X Inequality	Baseline	Observability	Inequality	Observability X Inequality
Observations	81	88	55	104	66	100	60	96
Independent Observations	81	22	55	26	66	25	60	24
Endowment (tokens per round)	20	20	21.95	22.82	20	20	23.78	21.38
Total expenditure (% of endowment)	63.9%	52.3%	65.1%	69.8%	59.0%	50.9%	39.5%	54.4%
Total loan (%)	--	--	--	--	20.8%	11.4%	5.0%	13.1%
Total items purchased (#)	6.21	4.47	7.31	6.99	5.77	5.22	4.37	6.05
Earnings (in £)	9.30	9.88	10.09	10.29	9.42	9.88	12.59	10.40
Consumption (self-reported)	4.93	3.86	3.85	4.46	4.47	4.14	3.98	4.46
Financial IQ	3.68	3.35	3.49	3.38	3.65	3.55	3.70	3.47
Competitiveness	2.66	2.63	2.72	2.71	2.79	2.62	2.75	2.67
State of personal finances	3.02	3.23	3.04	3.07	2.88	3.09	3.20	2.86
Cognitive Reflection Test	0.88	0.94	1.31	1.25	1.02	1.04	1.02	1.15
Clarity of instructions	3.78	3.83	4.05	4.05	3.73	3.78	4.00	3.83
Gender (Female = 1)	58.0%	51.1%	65.5%	53.8%	53.0%	54.0%	56.7%	63.5%
Age (years)	20.80	21.35	21.53	21.69	21.44	21.44	20.80	21.82

IV.   Results

IV.1 The Effects of "Conspicuous-ness" on Consumption

To set the stage, we present our first set of findings regarding the effects of consumption observability ("conspicuous-ness") under two conditions: when endowments are equal (and consumption carries no signal of ability), and when endowments are unequal (and consumption carries a signal of ability). We find that subjects consume quite substantially. In the baseline with no observability and no inequality, subjects spent an average of 61.71% of their endowment on pictures of virtual items, with 26% of the subjects spending 10% or less of their endowment and 32% spending all their endowment. The distribution is bi-modal, with a strong mode of spending nothing (9%) and another mode of spending everything (32%).[17]

The first factor is observability. We find that expenditures (as a percentage of endowment) are 10 percentage points *lower* than the baseline (two-tailed t-test using group averages *p=0.128*). This result indicates that when consumption carries no signal of ability, observability reduces consumption.[18] This behavior is consistent with the relative income hypothesis: since subjects earn the same (unconditional) endowment, higher consumption reduces earnings, and as long as subjects care about relative earnings, we expect observability to reduce expenditures overall.

The second factor is inequality. Subjects earned an average of 224.1 tokens, which was significantly higher than the 200-token equal endowment in the baseline. To account for this difference in endowment levels, we set the dependent variable to be expenditure as a percentage of the total endowment. As the third column of Figure 1 shows, subjects spent 10 percentage points less of their endowment when endowments were unequal (two-tailed t-test *p<0.10*) relative to the baseline.[19] This is consistent with the theoretical prediction of the second case in Section II.

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[17] It is possible that since subjects have nothing else to do in the 30-minute session, viewing pictures can give them some temporary satisfaction at the price of lower cash payoff at the end of the experiment. This motive is unlikely to vary across treatments, however. To the extent that the degree of temporary satisfaction is the same in these treatments, the difference in consumption comes from the varying factors (observability, inequality, and access to credit).

[18] Subjects are randomly placed into groups of 4, with no identifying information and means of communication (besides purchasing behavior). Each subject is given an equal and fixed endowment of 200 tokens (common knowledge). Subjects know what other group members purchased but cannot observe the item unless they purchased it themselves. Subjects are shown the total expenditure of each group member, along with their own.

[19] Interestingly, while expenditure is lower than the baseline, it is identical to when consumption decisions are observable, and endowments are equal (p=0.980).

When consumption is "conspicuous" (i.e., both observable and unequal/signaling ability), average expenditure increases by 10 percentage points (to 62.44%) relative to the treatment when endowments are equal and purchasing decisions are observable. This is consistent with the theoretical prediction of the third case in Section II. Columns 2 and 4 of Figure 1 illustrate the comparison visually.[20] Taken together, what these results show is that when endowments are equal, observability induces subjects to spend less. But when expenditure can signal ability (even with no possibility of reputation gains outside the lab), observability increases consumption. This finding is consistent with what was previously established in Clingingsmith and Sheremeta (2018). Figure 1 displays these results (pooled with the access to credit treatments). Separate graphs with and without access to credit are available in Appendix B - Figures B.1 and B.2.[21]
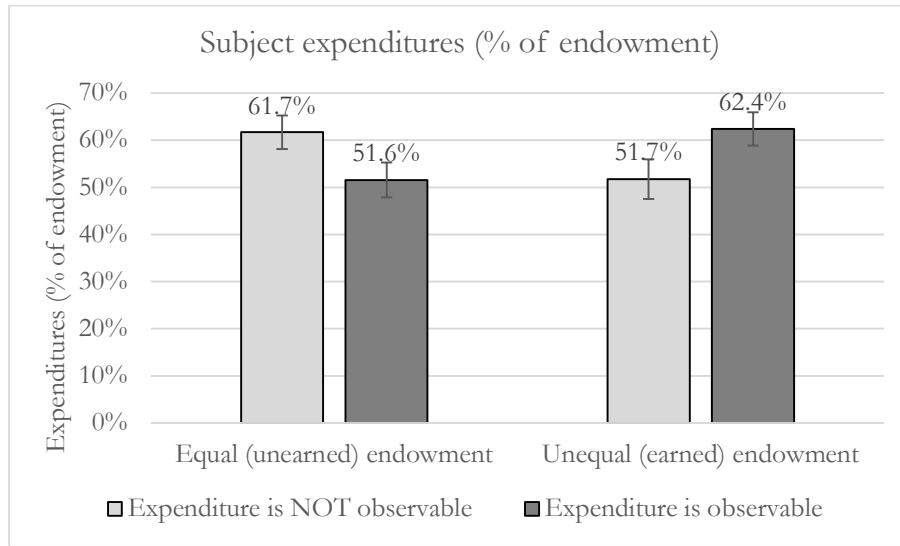
Figure 1: Subject expenditures per treatment
Note: The error bars reflect the standard error of the mean. The figure pools data from treatments with and without access to credit. For separate figures with and without access to credit, please see Appendix B.

Next, to test the effects of the treatments and particularly whether the effects of observability differ across the endowment conditions, we use a simple OLS framework with the dependent variable as the total tokens spent by the subjects expressed as a percentage of their total endowment. As mentioned above, we pool the "no access to credit" and "with access to credit" treatments to increase power. Nevertheless, we control for the "access to credit" treatments

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[20] The expenditure in this set of treatments is nearly the same amount of expenditure as the baseline treatment (see columns 1 and 4 of Figure 1).

[21] The analysis pools the treatments with and without access to credit to boost power as we get a similar pattern of results. In Appendix B, we present the same analysis broken out by the two sets of treatments. Figures B.1 and B.2 correspond with Figure 1 in the text, while table B.1 corresponds with Table 3 in the text.

(model II)[22], along with controls for self-reported consumption, financial IQ, competitiveness, and state of personal finances (model III). Finally, model IV adds controls for the score on the Cognitive Reflection Test, clarity of instructions, gender, and age.

Table 3: Subject expenditures per treatment

	I	II	III	IV
Dependent Variable: Expenditure (% of endowment)				
Treatment: Observability	-0.101**	-0.094*	-0.087*	-0.088*
	(0.05)	(0.05)	(0.05)	(0.05)
Treatment: (Effort-based) inequality	-0.100*	-0.092*	-0.085	-0.074
	(0.06)	(0.05)	(0.06)	(0.05)
Interaction: Observability X Inequality	0.208***	0.195***	0.175**	0.170**
	(0.08)	(0.07)	(0.07)	(0.07)
Access to Credit		-0.108***	-0.104***	-0.110***
		(0.04)	(0.04)	(0.04)
Consumption (self-reported)			0.013**	0.012**
16 = High			(0.01)	(0.01)
Financial IQ			-0.047***	-0.033**
5 = High			(0.01)	(0.02)
Competitiveness			0.058*	0.038
5 = Highly competitive			(0.03)	(0.03)
State of personal finances			-0.007	-0.002
5 = Very good			(0.02)	(0.02)
Cognitive Reflection Test				-0.037**
3 = High				(0.02)
Clarity of instructions				-0.019
5 = Always clear				(0.02)
Gender				0.027
1 = Female				(0.04)
Age (in years)				0.016***
				(0.00)
Constant	0.617***	0.666***	0.637***	0.394**
	(0.04)	(0.04)	(0.13)	(0.17)
R-squared	0.015	0.031	0.063	0.088
P	0.051	0.004	0.000	0.000
Observations	650	650	650	650

Notes: OLS regressions. The dependent variable is the proportion of total endowment that was spent. * 10%, ** 5%, *** 1% significance level. Clustered standard errors (by group) in parentheses. The comparator is the baseline treatment. Results are robust to using total expenditure as the dependent variable instead of the proportion (Tables C1 and C2 in Appendix C).

Model 1 in Table 3 is the simplest, controlling for treatment effects, and broadly confirms what we observe in Figure 1 above. When expenditure is observable, but endowments are equal (and

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[22] Table B.1 in Appendix B provides the results for the no access to credit and the access to credit treatments separately.

hence, expenditure carries no signal of ability), our subjects significantly reduce expenditure compared to the baseline treatment ($p<0.05$ with the coefficient of -0.101 in model I, $p<0.10$ with the coefficient of -0.088 in model IV). This finding suggests that subjects understand that consumption is "wasteful" and hence reduce consumption when it is observable, corresponding with Cases 1 and 2 in our conceptual framework.

However, when consumption is observable and endowments are unequal, consumption is significantly higher than when consumption is observable but endowments are equal. The interaction Observability X Inequality is statistically significant ($p<0.01$ with the coefficient of 0.208 in model I, $p<0.05$ with the coefficient of 0.170 in model IV). As seen in figure 1, the models confirm that the observability of consumption has an additional effect when ability signals are present relative to when they are not. We interpret this as evidence for conspicuous consumption: When consumption signals ability, expenditure increases when others can observe the signal, implying that the urge to signal ability outweighs the concern that "wasteful" consumption can be viewed by others.

In addition, our measure of (self-reported) real-world consumption[23] has a positive and significant relationship with expenditure in the lab ($p<0.05$ in model IV), indicating that our experiments are capturing real-world consumption patterns. We also find significantly less expenditure in the loan treatments ($p<0.01$ in model IV), which we discuss in the next section.[24]

IV.2 Access to Credit and Conspicuous Consumption

In this section and the next, we present our core set of results about the effect of access to credit on consumption and inequality. First, we show that loan-taking increases when consumption is conspicuous (relative to when it is not). Second, this increase is driven by subjects with the lowest endowments.[25]

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[23] This is simply a sum of responses to our four consumption questions described earlier.

[24] The effect of Financial IQ is noteworthy. Financial IQ, which counts the number of correct answers to the financial questions that demonstrate a basic understanding of money. Those that scored higher on these questions spend a significantly lower proportion of their overall endowment ($p<0.05$ in model IV). Note that this is not because of better attention or better clarity about the experiments, because we control for attentiveness using Cognitive Reflection Test (CRT) and control for subject reporting clarity of instruction. .

[25] Loans were implemented in the following way: subjects were informed that in each round they could borrow from their future earnings stream at a cost of 5% of the total amount borrowed. Clearly, loans are costly. This cost is then added to the amount taken as a loan, and then evenly divided across the remaining rounds of the game. Subject endowments are reduced by this amount in each round (no possibility of default). In addition, subjects are unable to borrow more than their endowment can (no possibility of over-borrowing). As endowments are cumulative, loans

Figure 2 displays the total amount of loans taken by treatment. Loans are expressed as a percentage of the endowment to account for differing endowment levels in the inequality treatments. The baseline contains the highest amount of loan taking, while the lowest is found when inequality is present, but expenditure is not observable. This increase is explained by the house money effect (subjects are more careful with the money they earned): (costly) loan-taking is far less prevalent when subjects earn their endowments, relative to when subjects are given equal endowments ($p<0.01$).

The pattern of loan-taking mimics that of expenditures (shown in figure 1): observability reduces loan-taking when endowments are equal ($p<0.05$), but increases loan-taking when endowments are unequal ($p<0.05$).
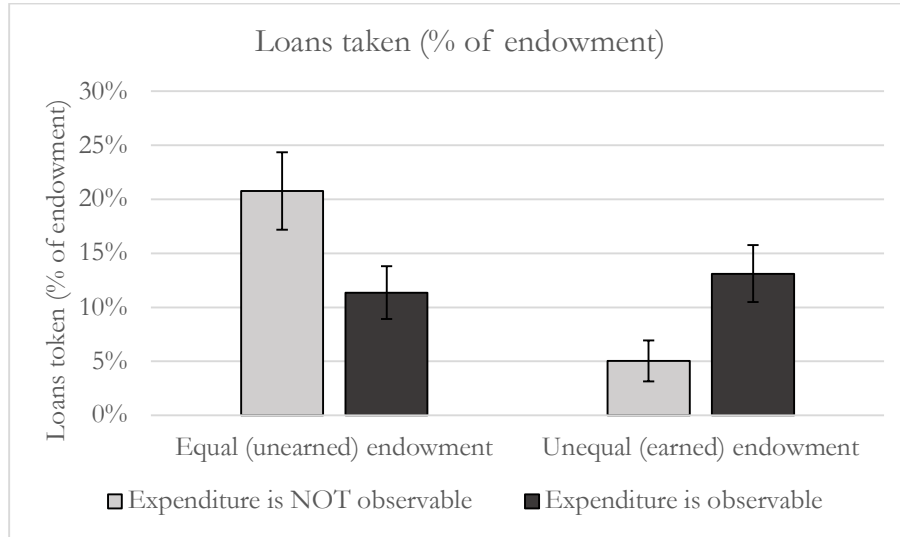
Figure 2: Borrowing by treatment
Note: The error bars reflect the standard error of the mean. The figure reports data from the treatments with access to credit.

We use a simple OLS framework with the dependent variable as total borrowing by the subject, expressed as a percentage of their total endowment. Specifically, we test the hypothesis that conspicuous consumption increases costly loan-taking. We control for self-reported consumption, financial IQ, competitiveness, and state of personal finances (Model II), the Cognitive Reflection Test, clarity of instructions (Model III), and finally, gender and age (Model IV).

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are only reasonable in the earlier rounds, when a majority of the items are not feasible for purchase. Note that borrowing is not observable.

Table 4: Loans per treatment

| Dependent Variable: Loans taken (% of endowment) - Loans Treatments				
	I	II	III	IV
Treatment: Observability	-0.094**	-0.090**	-0.090**	-0.091**
	(0.04)	(0.04)	(0.04)	(0.04)
Treatment: (Effort-based) inequality	-0.157***	-0.153***	-0.157***	-0.145***
	(0.04)	(0.04)	(0.04)	(0.04)
Interaction: Observability X Inequality	0.175***	0.165***	0.172***	0.157***
	(0.05)	(0.05)	(0.05)	(0.05)
Consumption (self-reported)		0.004	0.003	0.003
16 = High		(0.00)	(0.00)	(0.00)
Financial IQ		-0.028**	-0.021	-0.022*
5 = High		(0.01)	(0.01)	(0.01)
Competitiveness		0.035	0.032	0.033
5 = Highly competitive		(0.02)	(0.02)	(0.03)
State of personal finances		0.000	0.001	0.006
5 = Very good		(0.01)	(0.01)	(0.01)
Cognitive Reflection Test			-0.023**	-0.023**
3 = High			(0.01)	(0.01)
Clarity of instructions			0.012	0.008
5 = Always clear			(0.01)	(0.01)
Gender				-0.027
1 = Female				(0.03)
Age (in years)				0.018***
				(0.00)
Constant	0.208***	0.196*	0.156	-0.222
	(0.04)	(0.11)	(0.12)	(0.16)
R-squared	0.044	0.073	0.085	0.152
P	0.001	0.000	0.000	0.000
Observations	322	322	322	322

Notes: OLS regressions. The dependent variable is the proportion of total endowment that was spent. * 10%, ** 5%, *** 1% significance level. Clustered standard errors (by group) in parentheses. The comparator is the baseline treatment.

Table 4 displays the results of the OLS regressions. The results confirm what we observe in figure 2 and parallel the expenditure results in table 3. When endowments are equal, observability significantly reduces borrowing. The coefficient "Treatment: Observability" is statistically significant ($p<0.05$) with the coefficient of -0.094 in model I and with the coefficient of -0.091 in model IV. In addition, when subjects earn their endowments, costly borrowing is also reduced (relative to the baseline), a finding we attribute to the house-money effect. The coefficient "Treatment: (Effort-based) inequality" is significant ($p<0.01$ in models I and IV).

The coefficient "Interaction: Observability X Inequality" shows that when consumption is conspicuous, loan-taking significantly increases ($p<0.01$ in models I and IV). This pattern is

robust to a series of controls. We don't observe a significant relationship with self-reported consumption (*p=0.425* in model IV), but those with higher financial IQ borrow less (*p<0.05* in model II, *p<0.10* in model IV). In addition, those that score higher on the Cognitive Reflection Test borrow less (*p<0.05* in model IV), while older individuals borrow more (*p<0.01* in model IV). Overall, the results paint a clear picture: conspicuous consumption increases costly loan-taking.

We next ask which income group borrows more. Since some treatments had no groups (i.e., when consumption is not observable), we construct pseudo groups to compare treatments.[26] We then split subjects by income strata. The lowest endowment subjects are classified as the lowest income strata, and the highest endowment subjects are classified as the highest income strata (ties are randomly broken). We can then study expenditure patterns by treatment and income strata. This exercise yields the effect of conspicuous consumption on loan-taking by income strata.
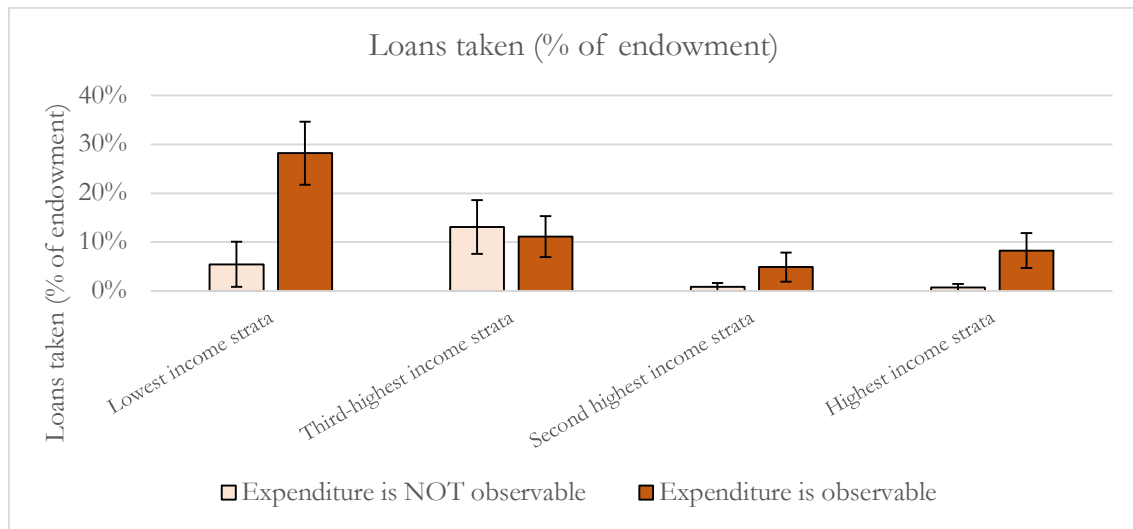
Figure 3: Borrowing by treatment and income strata – Unequal (effort-based) endowment treatments

Note: The error bars reflect the standard error of the mean. The figure reports data from treatments with unequal endowments and access to credit.

Subjects in the lowest income strata increase borrowing the most when consumption is conspicuous. Figure 3 presents these results: the lowest income strata borrowed 5% of their total

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[26] The reason for constructing pseudo groups is that groups were not constructed in the treatments where expenditure is not observable. However, we can construct the groups in the same manner as the observability treatment so as to get the closest comparison groups. What this means is that subjects are randomly assigned to groups within the same session.

endowment (10 tokens on average) when expenditure was not observable, which increases to 28% of their total endowment (44 tokens on average) when consumption is conspicuous. The difference is significant with *p<0.05*. The difference in borrowing is not statistically significant for the third-highest and second-highest income stratas (*p=0.774* and *p=0.302,* respectively). The difference is also not significant (*p=0.108*) for the highest income strata. Without observability, subjects in the highest income strata borrow about 1% of the endowment (2 tokens on average). With observability, borrowing increases to 8% of the endowment (22 tokens on average).

Our findings provide evidence to support the argument that conspicuous consumption and access to credit disproportionately affect the poor: subjects in the lowest income strata borrow more, motivated by conspicuous consumption. This finding can explain many real-life observations, for example, that poorer and lower credit U.S. households increased their borrowing in the run-up to the Great Recession (Mian and Sufi, 2011, 2015). The next section estimates the impact on inequality.

A detailed breakdown of expenditure over the 10 rounds provides a clear picture of how loans are used (Figure 4). For the lowest income strata, with no observability, subjects spend 38% of their endowments on average over the 10 rounds. With observability (conspicuous consumption), expenditure increases to 69%. The difference is statistically significant with *p<0.05*. The first few rounds contain most of the increase in expenditures, thanks to access to credit (Figure 4a). For the highest income strata, the increase in expenditure is also significant (*p<0.05*). Subjects spend 19% of their endowment without observability and 47% with observability. Again, the increases are contained within the first few rounds. In percentage terms, there are similar increases between these two stratas. However, as the previous paragraph documents, individuals in the lowest-income strata rely more on borrowing to finance their expenditure than individuals in the highest-income strata do. The increases for the middle-income strata are not significant (*p=0.653* and *p=0.688* for the third- and second-highest income strata, respectively).
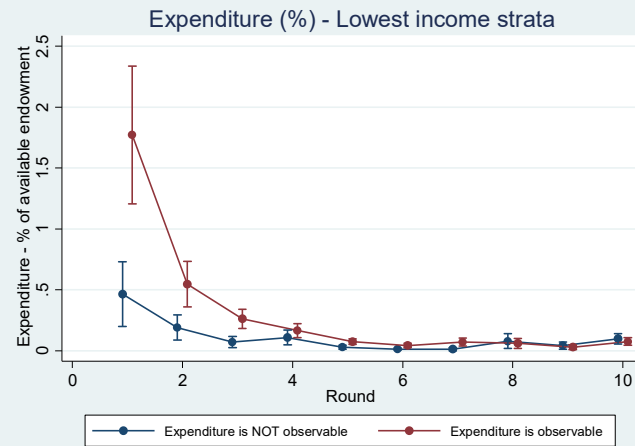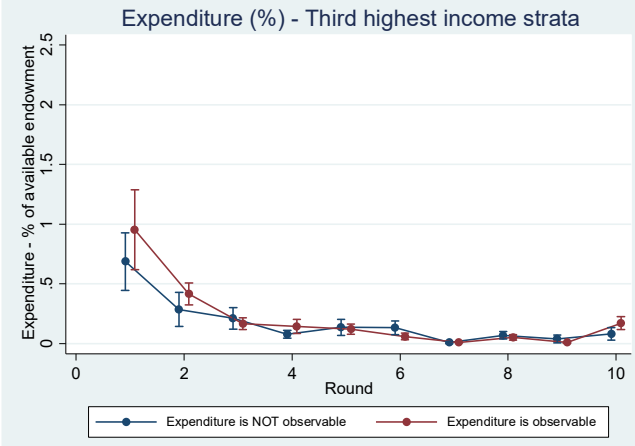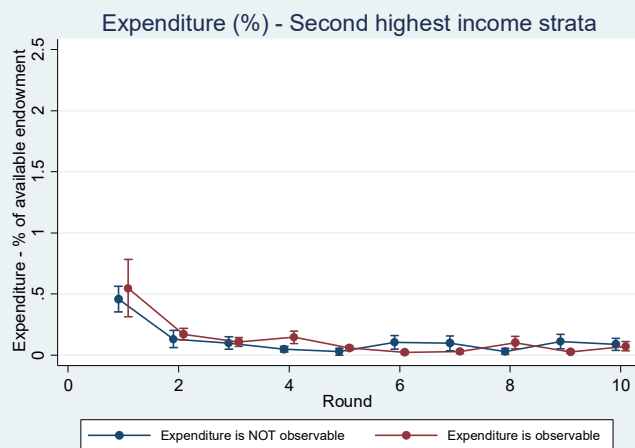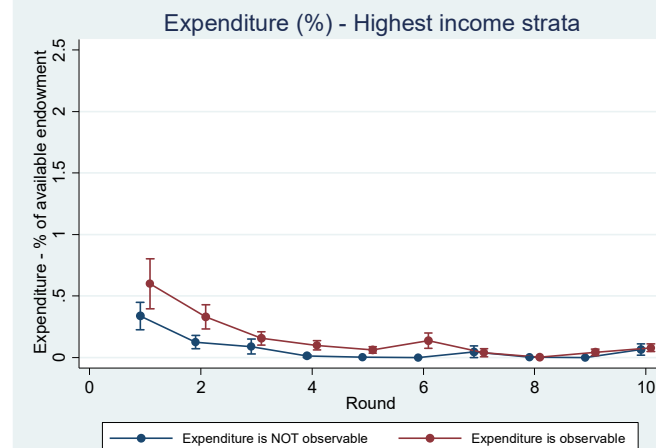
Figure 4a-d: Expenditure over rounds by treatment and income strata – Unequal endowments with access to credit

IV.3 Access to Credit, Conspicuous consumption, and Inequality

This section presents results on the impact of access to credit on inequality. We find that conspicuous consumption and access to credit create a vicious cycle in which inequality encourages more costly loan-taking from the poorest groups, which in turn damages the financial conditions of these individuals and exacerbates inequality.

We construct a measure of inequality as an individuals' income as a share of the group's total income.[27] We construct this measure in two ways, once before the main task (which reflects the initial relative income directly attributable to the effort task), and once after the main task (which reflects both the inequality due to the effort task and consumption and borrowing decisions). The difference between these two measures gives us the change in income share due to consumption. Figure 5 displays the change in income share when consumption is conspicuous, broken out by income strata, with and without access to credit.
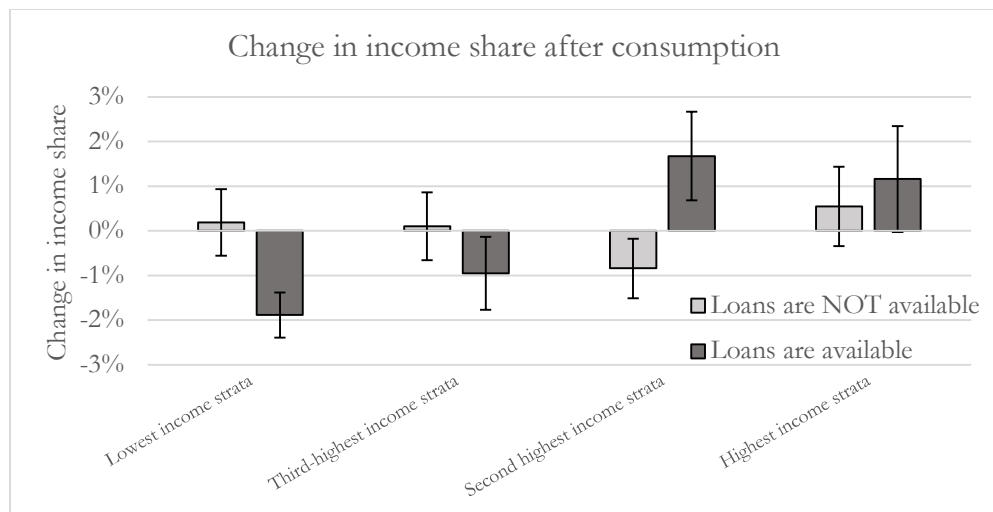
Figure 5: Change in income share with and without loans – Conspicuous consumption treatments

Notes: The bars indicate the difference in income share held by each income strata with and without consumption. The change reflects the final income share of subjects after the consumption phase, less the income share of subjects before the consumption phase. The error bars reflect the standard error of the mean.

Without access to credit, income shares of all income groups remain virtually the same. However, when loans become available, the income share of the lowest-income strata decreases

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[27] For example, persons 1 and 2 have 200 tokens each, persons 3 and 4 have 300 tokens each. Persons 1 and 2's income as a share of the whole group's income is 20%; persons 3 and 4's income as a share of the whole group's income is 30%.

(*p<0.05*). We observe no significant reductions in any other income strata, with the third-highest income strata lower, but not significant (*p=0.349*), the second-highest income group showing a significant *increase* in income share (*p<0.05*), and the highest income strata displaying an insignificant increase (*p=0.679*).

The final component of this analysis is to examine expenditure over time by treatment and income group for the two conspicuous consumption treatments (with and without access to credit). Since borrowing makes sense in the first few rounds (as subjects borrow from their future selves), the first 3 rounds are the most relevant. What is immediately clear from figure 6 is that individuals in the two lowest income stratas respond to access to credit by increasing their expenditure in the first three rounds, which explains the increase in loans analyzed earlier. For example, individuals in the lowest income strata increase their expenditure from 9.9 tokens to 27.1 tokens on average in the first round (*p<0.05*). However, similar increases are not found for individuals in the two top-income stratas. For example, the highest income strata's expenditure *decreases* from 17.7 tokens without access to credit to 15.7 tokens with loans in the first round (*p=0.737*).[28] Thus, it is clear that subjects in the lowest income stratas increase their expenditure in the first few rounds to keep up with the others in their group, but the top income stratas do not do the same.

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[28] We observe similar patterns in rounds 2 and 3 as well. For example, expenditure for the lowest income strata increases in round 2, from 9.3 tokens to 17.6 tokens, though this difference is not significant (*p=0.18*). Expenditure in round 3 is again significantly different for the lowest income strata, increasing from 4.3 tokens to 13.8 tokens (*p<0.05*). For the other income strata expenditure is not significantly different in rounds 2 and 3, with the exception of the second highest income strata who significantly reduce expenditures in both rounds (*p<0.05* and *p<0.10* respectively).
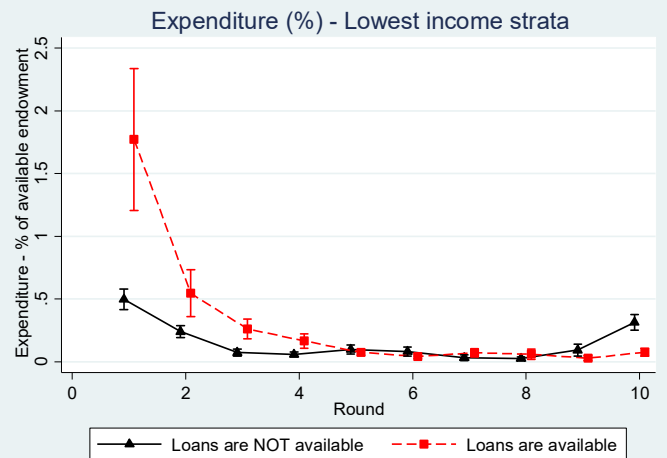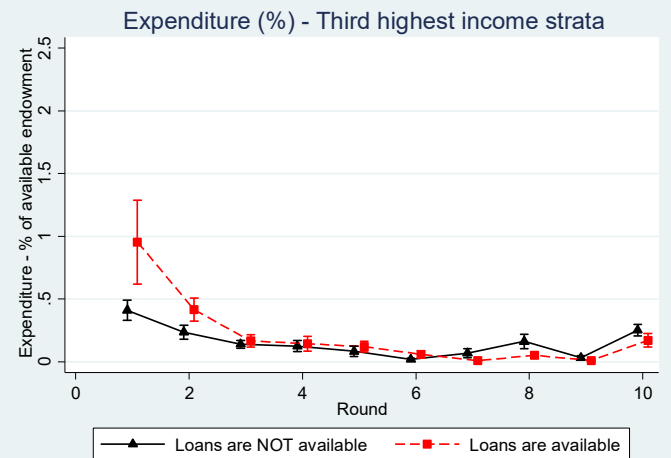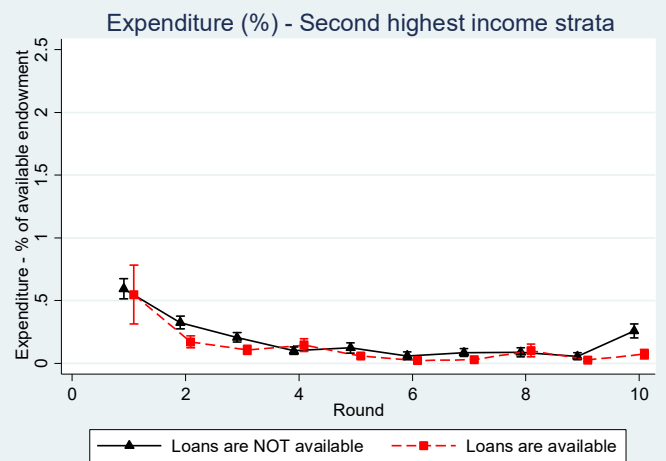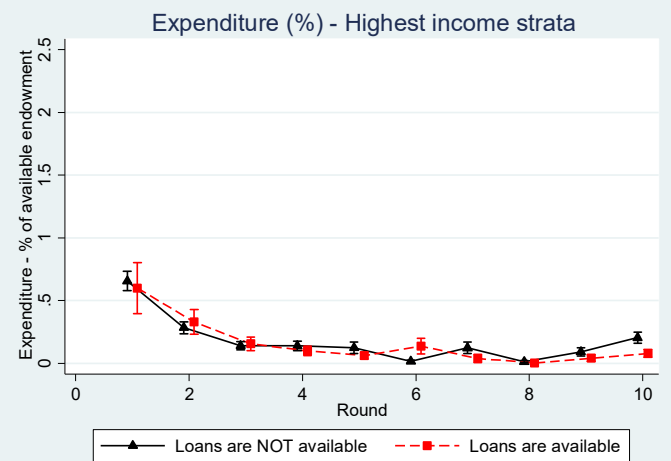
Figure 6a-d: Expenditure over rounds by treatment (Loans) and income strata – Conspicuous consumption treatments

To summarize, these results provide evidence supporting the nexus between conspicuous consumption, access to credit, and inequality. Subjects increase consumption when it is conspicuous (purchases are observable and can signal ability). Furthermore, the availability of loans allows subjects to front-load purchasing. This costly loan-taking is most pronounced among subjects in the low-income strata who borrow to signal ability. When consumption is conspicuous, access to credit exacerbates inequality because of costly borrowing by low-income groups. In other words, in an unequal world, status signalling may bring about even more inequality.

V.   Conclusion

Over a century ago, Thorstein Veblen noted the importance of pecuniary emulation: those with lower levels of status consuming more in a bid to emulate those with higher status. While there has been some empirical work seeking to document differences in consumption and borrowing patterns in line with this type of emulation, the evidence on this has been suggestive. Hence, clear evidence supporting the mechanism is largely missing in the literature. Using a novel lab experiment implementing conspicuous consumption and access to credit, we report four main findings: First, consumption increases when it is conspicuous (i.e., it can signal status and is observable by others). Second, costly borrowing increases when consumption is conspicuous. Third, this increase in loan-taking is driven by those at lower income levels. Finally, due to this increase in costly borrowing, inequality is exacerbated: those at the bottom borrow to signal status, and this costly borrowing further increases inequality. Therefore, our paper, for the first time, provides evidence for a vicious cycle between inequality and conspicuous consumption.

Our interpretation of these results is that they provide clear evidence in favor of pecuniary emulation and provide caution on access to finance, especially if accompanied by conspicuous consumption ("keeping up with the Jones"). Perhaps the most striking feature is that these results hold in an environment that has no possibility of post-game interaction or any impact outside the lab. As Veblen noted, "Among the motives which lead men to accumulate wealth, the primacy, both in scope and intensity, therefore, continues to belong to this motive of pecuniary emulation" (Veblen, 1899, pg. 27).

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Appendix A

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Table A.1: Virtual items list available for purchase
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| Item Number	Item type	Name/Brand	Actual Price in GBP	Experiment price (in millions)	Description
1	Phone	GoldVish Le Million	1,049,995.97	1.00	Goldvish "Le million" is designed by renowned designer Emmanuel Gueit and is among the world's most expensive mobile phones. This designer phone is bejeweled with 18k white gold and 20 carats of VVS1 diamonds.
2	Phone	King's Button	1,211,550.00	2.00	The renowned jeweler from Austria, Peter Aloisson is the creator of the King's Button phone. 138 diamonds are installed on this phone, with a beautiful 6.6-carat white diamond serving as the home screen button.
3	Painting	Pablo Picasso, The Weeping Woman	1,292,160.00	3.00	The Weeping Woman is an oil on canvas painted by Pablo Picasso in France in 1937. Picasso was intrigued with the subject and revisited the theme numerous times that year. This painting was the final and most elaborate of the series.
4	Phone	Amosu, Call of Diamond	2,180,760.87	4.00	The Call of Diamond smartphone is designed by luxury designer Alexander Amosu. It has an 18-carat gold-plated body, packs over 6 thousand VVS1 diamonds all over, and one big diamond cut into the shape of Apple's logo.
5	Painting	Frida Kahlo, Roots	4,521,598.76	5.00	Painted by world-renowned artist Frida Kahlo in 1943, Frida stated her faith that all life can join in a single flow. Roots depict Frida as her torso opens up like a window and gives birth to a vine. It's her dream of being able to give birth as a childless woman.
6	Island	Tavanipupu, Solomon Islands	6,055,712.62	7.00	Tavanipupu is a private resort island in the Solomon Islands. Formerly a coconut plantation, it was transformed into a dreamy island paradise back in the 1970s by a British interior decorator. It is located off the southeast coast of Guadalcanal. The island was visited by Prince William and Catherine in September 2012.
7	Island	Laucala Island, Fiji	8,076,000.00	9.00	Set upon 3,500 exclusive acres, Laucala private island resort is set amidst coconut plantations, sandy beaches, rich green mountains, and breath-taking natural beauty. Seamless transition from indoor to outdoor living creates an inspiringly relaxed yet luxurious atmosphere.
8	Phone	Black Diamond	12,354,750.00	11.00	The Black Diamond is designed by Stuart Hughes. The home button is replaced by a single, deeply cut, rare 26-carat black diamond. The back panel is made up of 24-carat gold dressing, studded with 600 white, flawless diamonds. Sapphire glass is set on the screen, and the back logo shows off 53 perfectly cut diamonds.
9	Island	Dark Island, Canada	15,338,700.00	13.00	Dark Island, a prominent feature of the Saint Lawrence Seaway, is located in the lower (eastern) Thousand Islands region, a few yards south of the Canada-United States border. A historic landmark on the island, "The Towers", was long known as "Dark Island Castle" until recently renamed "Singer Castle".

|					
10	Painting	Salvador Dalí, Portrait de Paul Eluard	18,088,000.00	15.00	Painted in 1929, the Portrait de Paul Eluard is a masterpiece of Surrealism and arguably one of the finest Surrealist portraits. Reaching deeply into the psychology of portraiture, it displays many of the most important elements that were key to Dalí's rich visual vocabulary and reflects the untamed imagination and technical virtuosity of Dalí's first mature Surrealist paintings.
11	Residence	Acqua Liana, Florida	18,572,351.65	19.00	Located in Manalapan, Florida, Acqua Liana comprises 1.6 acres of luxury. The massive private dwelling was designed and built according to eight key principles of human and environmental health: location, innovative design, sustainable site development, water savings, energy efficiency, superior indoor air quality, environmentally preferable materials, and ease of use. But it was also built with sheer opulence in mind.
12	Painting	Claude Monet, Waterlilly	31,700,000.00	23.00	Water Lilies is a series of approximately 250 oil paintings by French Impressionist Claude Monet (1840–1926). The paintings depict Monet's flower garden at his home in Giverny and were the main focus of Monet's artistic production during the last thirty years of his life.
13	Island	Isla de sa Ferradura, Spain	32,054,905.50	27.00	Isla de sa Ferradura is a private island just off Ibiza, that harmonizes architecture with nature. It is outfitted with only the very best luxury accommodations and appointments for that ultimate tropical paradise. A massive 130,000 square foot hacienda with a number of gorgeous lounges, a home cinema, and even its own Bodega is the scene for a memorable sojourn.
14	Island	Fregate Island, Seychelles	36,342,000.00	31.00	Fregate Island Private is an island in Seychelles. The island is the easternmost of the granitic Inner Islands of Seychelles. It is 2.07 square kilometers (0.80 square miles). The beach on the island, Anse Victorin, was voted "The World's Best Beach" by The Times.
15	Painting	Pierre Auguste Renoir, Dance at Moulin de la Galette	40,365,000.00	35.00	Bal du moulin de la Galette (commonly known as Dance at Le moulin de la Galette) is an 1876 painting by French artist Pierre-Auguste Renoir. It is housed at the Musée d'Orsay in Paris and is one of Impressionism's most celebrated masterpieces.
16	Painting	Gustav Klimt, Kiss	73,000,000.00	43.00	The Kiss (Lovers) was painted by the Austrian Symbolist painter Gustav Klimt between 1907 and 1908, the highpoint of his "Golden Period", when he painted a number of works in a similar gilded style. It is a symbol of Vienna Jugendstil—Viennese Art Nouveau—and is considered Klimt's most popular work.
17	Phone	Falcon SuperNova	77,125,800.00	51.00	The Supernova is a special edition phone by the US-based luxury brand, Falcon. It uses gemstones and premium materials. It is fitted either with 24-carat gold, rose gold or a platinum case. The entire collection includes 24 choices, each with eight gems mounted on the back.
18	Island	Peter Island, British Virgin Islands	80,000,000.00	59.00	Peter Island is a 720-hectare private island located in the British Virgin Islands. It is about 5 miles southwest from Road Town, Tortola. The island is predominately undeveloped but contains hiking and biking trails. The beaches face the Atlantic Ocean, the Caribbean Sea, and the Sir Francis Drake Channel.
19	Residence	Hearst Castle, California, USA	81,400,000.00	67.00	This Italian-style villa was used for iconic scenes in The Godfather, and John F Kennedy stayed here on his honeymoon with Jackie. The former home of newspaper publisher William Randolph Hearst has 27 bedrooms, its own cinema, night club and an outdoor terrace large enough for 400 guests.

20	Residence	Ellison Estate Woodside, California, USA	88,824,290.50	75.00	Ellison Estate consists of a nearly 8,000-square-foot main house with two wings, a guest home, three cottages, and a gymnasium as well as a 5-acre man-made lake, two waterfalls and two bridges. Hundreds of mature cherry, maple, and other trees were planted among nearly 1,000 redwoods, pines and oaks.
21	Residence	Dracula's (Bran) Castle, Romania	109,011,629.25	91.00	Dracula's Castle is situated near Bran and is a national monument and landmark in Romania. The fortress is situated on the border between Transylvania and Wallachia. It is considered one of the most luxurious castles in the world. It has 57 rooms and around 17 bedrooms with antique furniture.
22	Residence	Seven The Pinnacle, Montana, USA	112,241,603.45	107.00	Seven the Pinnacle is a ski lodge that may be up in the mountains of Montana, but with every floor being heated, you won't feel the cold. It also has an indoor and outdoor pool, its own private ski lift, and spectacular views.
23	Residence	Updown Court, England	121,133,814.00	123.00	Updown Court is a Californian-style residence situated in the village of Windlesham in Surrey, England. The 103-room mansion has 58 acres (230,000 square meters) of landscaped gardens and private woodland.
24	Yacht	The Seven Seas	149,350,500.00	139.00	Built by a Dutch company called Oceanco, the Seven Seas yacht can accommodate 12 guests across a series of seven spectacular suites which act as double cabins. In addition, there's an opulent owner cabin that has housed its owner, Steven Spielberg. Amenities include a movie theatre, helipad, gymnasium, and an infinity pool.
25	Yacht	The Rising Sun	161,460,000.00	155.00	The Rising Sun is a motor yacht designed by Jon Bannenberg for Larry Ellison, CEO of Oracle Corporation. It has a basketball court on it, which can also be used as a helicopter landing pad, a movie theatre, a wine cellar, and a total of 82 rooms scattered across five floors, all filled to the brim with opulence.

Appendix B

In Figure 1 and table 3, we presented the effects of observability and inequality on subject expenditures. The analysis pooled the treatments with and without access to credit as the observed patterns were broadly similar. In this appendix, we disaggregate the results by treatment set for the interested reader. Note that while the pattern of results is broadly similar, the key result replicating Clingingsmith and Sheremeta (2018) is the interaction term of Inequality and Observability, positive and varying between 13 and 23 percentage points (p=0.187 in model III – no access to credit, and p=0.057 in model VI – with access to credit.
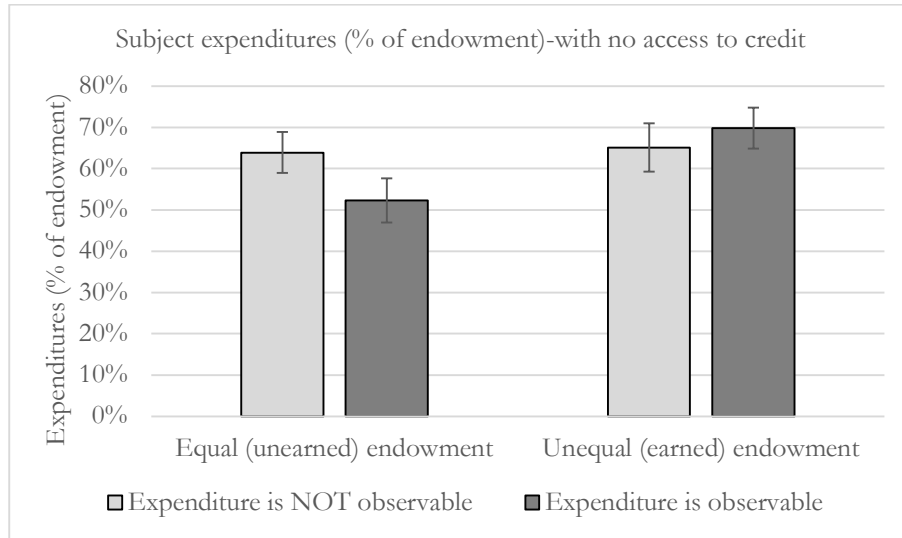
Figure B.1: Subject expenditures per treatment – No access to credit
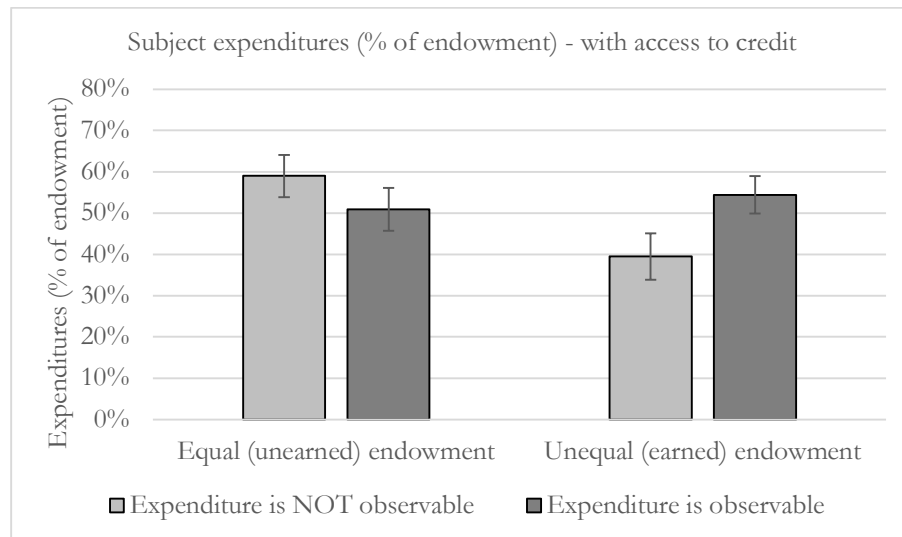
Figure B.2: Subject expenditures per treatment – with access to credit

Table B.1: Subject expenditures per treatment

Dependent Variable: Expenditure (% of Endowment)						
	No Access to Credit			Access to Credit		
	I	II	III	IV	V	VI
Treatment: Observability	-0.116	-0.109	-0.108	-0.081	-0.075	-0.077
	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
Treatment: Effort-based inequality	0.012	0.019	0.033	-0.195**	-0.190**	-0.171**
	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)
Interaction: Observability X Inequality	0.163	0.139	0.137	0.231**	0.219**	0.198*
	(0.11)	(0.11)	(0.10)	(0.10)	(0.10)	(0.10)
Consumption (self reported)		0.019***	0.018**		0.007	0.006
16 = High		(0.01)	(0.01)		(0.01)	(0.01)
Financial IQ		-0.054***	-0.040*		-0.038*	-0.017
5 = High		(0.02)	(0.02)		(0.02)	(0.02)
Competitiveness		0.060	0.043		0.053	0.025
5 = Highly competitive		(0.05)	(0.05)		(0.04)	(0.04)
State of personal finances		-0.014	-0.011		0.006	0.013
5 = Very good		(0.02)	(0.02)		(0.02)	(0.02)
Cognitive Reflection Test			-0.046**			-0.037
3 = High			(0.02)			(0.03)
Clarity of instructions			0.003			-0.041
5 = Always clear			(0.03)			(0.03)
Gender			0.017			0.044
1 = Female			(0.05)			(0.05)
Age (in years)			0.009			0.022***
			(0.01)			(0.01)
Constant	0.639***	0.624***	0.463*	0.590***	0.536***	0.22
	(0.05)	(0.17)	(0.24)	(0.05)	(0.18)	(0.24)
R-squared	0.025	0.075	0.092	0.023	0.042	0.088
P	0.107	0.001	0.001	0.071	0.062	0.000
Observations	328	328	328	322	322	322

Notes: OLS regressions. The dependent variable is the proportion of total endowment that was spent. * 10%, ** 5%, *** 1% significance level. Clustered standard errors (by group) in parentheses. The comparator is the baseline treatment.

Appendix C

Table C1: Subject Expenditure by Treatments (Tokens) – Controlling for Endowment

	Dependent Variable: Expenditure (tokens)			
	I	II	III	IV
Treatment: Observability	-20.28**	-18.13*	-16.890	-17.04*
	(10.24)	(10.40)	(10.34)	(10.28)
Treatment: Effort-based inequality	-19.02	-16.87	-15.91	-16.18
	(12.09)	(11.92)	(12.03)	(11.89)
Interaction: Observability X Inequality	45.02***	41.72***	37.67**	37.53**
	(16.22)	(15.90)	(15.98)	(15.79)
Endowment (per round)	4.050***	3.958***	4.176***	5.055***
	(1.56)	(1.52)	(1.49)	(1.51)
Loans		-25.95***	-25.15***	-26.12***
		(7.83)	(7.72)	(7.68)
Consumption (self reported)			2.743**	2.515**
16 = High			(1.14)	(1.16)
Financial IQ			-9.593***	-6.680**
5 = High			(3.00)	(3.16)
Competitiveness			11.020	6.587
5 = Highly competitive			(7.47)	(7.55)
State of personal finances			-1.746	-0.589
5 = Very good			(3.61)	(3.65)
Cognitive Reflection Test				-7.807**
3 = High				(3.71)
Clarity of instructions				-4.171
5 = Always clear				(4.00)
Gender				6.848
1 = Female				(7.75)
Age (in years)				2.850***
				(0.92)
Constant	42.41	55.90*	48.66	-10.41
	(31.91)	(31.03)	(40.97)	(49.94)
R-squared	0.037	0.056	0.085	0.105
P	0.003	0.000	0.000	0.000
Observations	650	650	650	650

Notes: OLS regressions. The dependent variable is the number of tokens spent. * 10%, ** 5%, *** 1% significance level. Clustered standard errors (by group) in parentheses. The comparator is the baseline treatment.

Table C2: Subject's Expenditure by Treatments (Tokens)- Not Controlling for Endowment

Dependent Variable: Expenditure (tokens)				
	I	II	III	IV
Treatment: Observability	-20.28**	-18.09*	-16.530	-16.430
	(10.23)	(10.40)	(10.35)	(10.30)
Treatment: Effort-based inequality	-7.26	-5.34	-3.52	-1.53
	(12.22)	(12.06)	(12.20)	(12.15)
Interaction: Observability X Inequality	41.87**	38.57**	34.02**	33.34**
	(16.38)	(16.06)	(16.15)	(16.05)
Loans		-26.42***	-25.78***	-26.71***
		(7.91)	(7.83)	(7.81)
Consumption (self reported)			2.849**	2.667**
16 = High			(1.11)	(1.13)
Financial IQ			-8.886***	-6.213*
5 = High			(3.07)	(3.24)
Competitiveness			10.930	7.101
5 = Highly competitive			(7.54)	(7.70)
State of personal finances			-2.237	-1.404
5 = Very good			(3.65)	(3.71)
Cognitive Reflection Test				-6.680*
3 = High				(3.78)
Clarity of instructions				-3.540
5 = Always clear				(4.00)
Gender				6.492
1 = Female				(7.91)
Age (in years)				2.054**
				(0.93)
Constant	123.4***	135.3***	131.0***	103.1***
	(7.12)	(8.07)	(27.15)	(35.94)
R-squared	0.021	0.041	0.068	0.082
P	0.016	0.001	0.000	0.000
Observations	650	650	650	650

Notes: OLS regressions. The dependent variable is the number of tokens spent. * 10%, ** 5%, *** 1% significance level. Clustered standard errors (by group) in parentheses. The comparator is the baseline treatment.