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Behavioral biases: how markets can outperform paternalism

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Behavioral Biases:

How Markets Can Outperform Paternalism[*]

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Abstract: Decisions in laboratory experiments often reveal departures from the rational decision maker framework. These findings have been employed to legitimize a paternalistic approach for the government calling for policies that protect citizens from their own behavioral biases. This paper argues against such an approach. First, we review experimental evidence showing that, if they are given the chance, subjects delegate some complicated decisions to other agents. Second, we develop a framework in which individuals who suffer from a behavioral bias may delegate some decisions to other individuals who have the ability/technology to help them solving this bias. We show that introducing a market for solutions to behavioral biases reduces the likelihood of biased behavior. Finally, we explore more standard government remedies (i.e., taxes) and show that market solutions can dominate such government interventions.

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I. INTRODUCTION

The behavioral revolution in economics started in the late 1970s. Since then we have witnessed the accumulation of experimental evidence showing that humans beings are not pure *homines oeconomici*.[1] Many laboratory experiments have found significant departures between the observed behavior of the subjects and the behavior predicted by a self-interested, rational decision maker model. Humans make errors and show systematic biases in their choices. Almost shockingly, the departures have been also observed in extremely simple economic games and validated many times. For example, in dictator games, subjects tend to be excessively altruistic towards strangers while the pure *homines oeconomici* should not give anything (if they are altruistic, they should better give to charity instead).[2] Such results have been frequently interpreted as clear indications that human actions cannot be explained by incentives, information or uncertainty as the observed *systematic biased behavior* persists in many experimental settings.

Based on these results, some scholars and especially policymakers started criticizing rational choice theory. They suggest that in order to improve human welfare, people must be protected from their own biases, e.g., seeming overconsumption of certain goods should be restricted. Thus, in their view, evidence of systematic biased behaviors automatically implies a paternalistic approach to government intervention in modern societies. In this paper we explore a different approach to deal with behavioral biases that often leads to reject paternalistic interventions even if humans err systematically.

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[1] While this insight may be no surprise to classical economists versed with the works of Adam Smith (e.g. "The Theory of Moral Sentiments") the systematic shift to experiments in economics can be seen as revolutionary.

[2] In simple ultimatum game a Nash equilibrium in pure dominant strategies is usually not observed, etc.

Our main argument rests on two simple insights: First, while experiments show anomalous actions when compared to a pure rational decision maker, there is overwhelming evidence that a relative price effect persists. This is key because it means that any potential bias can be corrected by focusing on incentives. Indeed, even paternalistic solutions need to rely on incentives too. For example, tax incentives could only correct for a potential bias if humans react on such incentives in a systematic way. Second, real-life is strikingly different to experiments. People face many potentially good and bad choices opportunities in their daily lives,[3] different types of biases may counteract each other, and, most importantly, people can delegate some of their choices to agents who can promise to act in the self-interest of the principal, even in the fullest, rational self-interest (e.g. Eichenberger 2019, Hamman et al. 2010). These two insights are central as they imply that real-life actions in situations where humans can delegate decisions differ systematically from laboratory experiments.[4]

In this paper, we first discuss experimental evidence from an emerging literature which shows that if offered the possibility, humans delegate decision making even at a cost. While the literature is still comparatively small and mostly about fairness, it strongly suggests that delegation has relevant consequences (Hamman et al. 2010). Delegation may transform biases and anomalies in a such way that outcomes become relatively more consistent with self-interests. We extend this literature by providing a basic framework of how to think about political economic consequences of delegation. We then transfer our framework to a simple model of delegation where humans are biased regarding their consumption choices and explore decentralized market solutions to bias correction. We also contrast the market solution to

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[3] E.g. at any point during a day, could they give away relevant amounts of money to a trusted charity of their choice but they do not, let alone do they give substantial amounts to strangers as simple dictator games might suggest.

[4] Alternatively, some laboratory settings may be viewed as a biased situation. Indeed, if you are given an endowment for no reason and can send parts of the endowment to somebody else within the next 60 seconds, you may ask yourself "why not".

different forms of government interventions ("paternalistic approaches") such as a benevolent social planner, a leviathan government, and the median voter model. We show that delegation reduces the frequency of behavioral biases. Competition to provide delegation services is helpful because it reduces the costs that principals have to pay to correct their behavioral bias. We also find that, in many circumstances what we consider realistic, decentralized market solutions based on delegation dominate government interventions.

Overall, our framework and model point to a neglected path in the literature of overcoming behavioral biases. Allowing market solutions to deal with behavioral biases and promoting competition among providers of delegation services by removing entry barriers is likely to increase overall welfare. The marekt solution could also avoid the substantial risks associated with the paternalistic approach, both when policy makers behave rationally and when they are prone to behavioral biases as well.

The remainder of the article is organized as follows. Section 2 reviews the experimental literature on delegation. Section 3 presents a framework which is developed into a simple model of delegation and characterizes the decentralized market solution. Section 4 studies different forms of government solutions and compares those solutions with the decentralized market delegation. Short conclusions are offered in Section 5.

II. LITERATURE REVIEW

Laboratory experiments put individuals into situations with very limited possibilities. The laudable aim of such experiments is to investigate a specific behavior in simple decision situations, isolating the choices from other influencing factors. Many experiments try to investigate deviations from self-interest by introducing decision possibilities that may be

related to *seemingly* biased behavior.[5] For example, an equity interpretation has been given to dictator game experiments (Bolton and Ockenfels, 2000), as the findings suggest that allocators pass on between 10% to 30% of their endowment and many subject split their endowment equality (Hoffman et al., 1994, Hoffman et al., 1996). Such results emerge systematically and have been validated in many settings.

More importantly for the purpose of this paper, there is also an experimental literature that tries to explore how such potential biases might be explained and when self-interest prevails. For example, the equity bias decreases, and self-interest increases in dictator games if proposers get more action alternatives. Oberholzer-Gee and Eichenberger (2008) show that in experiments in which dictators can either keep the money, transfer it to a recipient or buy an unattractive lottery, median transfers fall to zero. Thus, introducing another *unattractive* and erroneous choice matters. Xiao and Houser (2005) report for ultimatum games that costly punishment might be used to express negative emotions. If responders in these games can react to unfairly perceived offers by expressing negative emotions to the proposers without having to forgo the offer, rejections of such offers tend to decrease, i.e., giving responders a choice to express themselves has significant behavioral consequences.[6] Smith (2020) argues that impulses from which actions proceed may matter too, i.e., it is not only that actions imply outcomes and outcomes determine utility. More generally, introducing more choice options does not necessarily lead to fully rational behavior but it reduces bias, equity considerations, and concern for seemingly desirable social outcomes. This is very important because, in their

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[5] We employ the term "bias" to describe a derivation from a rational, self-interested behavior under the assumption that the individual in question is not (too) altruistic.

[6] Johnson (2016) suggests that the possibility for unrestricted feedback in ultimatum games only seems to matter in the laboratory but not in online experiments.

daily lives, humans face many possible bad opportunities and the literature tends to suggest that they do not necessarily pick the worst out of them.

Common alternatives to making choices in real-life situations are to walk away from decisions altogether, try to dilute potential responsibility by linking decisions to others, or specifically delegate the decision to an agent. Indeed, there is an experimental literature that explores how decision makers can dilute their responsibility from difficult decisions. Dana, Cain, and Dawes (2006) find that when giving subjects the opportunity to cut the link between their actions and the resulting outcome, dictators in dictator games become less generous, i.e., they tend to be more self-interested. The authors argue that subjects may only behave generous because they intrinsically dislike appearing unfair. Subjects may even forgo some of their endowments if they can avoid having to take actions in a dictator game, i.e., if the experiment allows subjects the possibility of costly but quiet withdrawal from dictator games, some will take this opportunity (Dana, Weber, and Kuang 2007). In the same vein, Lazear, Malmendier, and Weber (2012) find that sorting matters. They show that if subjects can avoid sharing situations, sharing significantly decreases such that it can be argued that some subjects prefer to have the opportunity not to engage pro-socially. Subjects who are not able to avoid sharing situations would rather withdraw from the game and not share. Thus, if there is a possibility to walk away from a potentially biased decision, some people take this opportunity. This suggests that humans know how they would react in different decision environments (especially if these environments are awkward), namely they would react in a biased way.

Similarly, humans seem to prefer not to decide themselves in certain situations and several experiments have documented that the feeling of responsibility can be diluted by involving others in the decision process. A commonly known example for such a dilution strategy is the so-called "bystander effect", where personal responsibility is perceived to be lower when other individuals are present (for a meta-analysis of this effect in psychology, see,

for example, Fischer et al. 2011). Falk and Szech (2013) report that subjects behave more selfishly in market games where decisions usually involve multiple decision makers, suggesting that when decisions cannot be pinned down to a single individual, responsibility for the outcomes might be diluted. Bartling, Fischbacher, and Schudy (2015) highlight the relevance of being pivotal in decisions. As pivotal voters are blamed more for an unpopular outcome than non-pivotal voters there is a tendency observed in some voters to cast their vote in a way to avoid being pivotal. Ellman and Pezanis-Christou (2010) also highlight the importance of decision-making structures in groups for diluted responsibility. In vertical organizations, responsibility is easily shifted towards the top while in horizontal organizations, responsibility is shared and compromises between all members of the group tend to induce worse outcomes for outsiders.[7] For a dictator game with a joint decision-making the frequency of unbiased, selfish choices is higher when the decision is shared (Kirchkamp and Strobel 2018). A meta study of dictator games by Engel (2011) concludes that dictators give less, among other factors, when groups decide. Thus, the tendency to dilute potential responsibility by linking decisions to others or engaging in joint decisions may help individuals to overcome a potential bias.

Delegation is also an important way to deal with difficult decisions. Countless examples exist in real-life where decisions are delegated and there are even cascades of delegation. Once reason for delegation seems to be that principals rather prefer to avoid difficult, uncommon decisions partly because they know what they would like to choose but they also know how they would decide if they do not delegate their decisions. Fershtman and Gneezy (2001) study

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[7] Relatedly, Dana, Weber, and Kuang (2007) introduce a treatment in the dictator game where two dictators jointly decide whether to enact a fair outcome that would also benefit a recipient or an unfair one that would just benefit the dictators. Only if both agree, the selfish option is implemented. 65% of subjects jointly decided on the selfish outcome while only 26% of single dictators did so in the baseline.

an ultimatum game in which players assign to an agent the authority to bargain on their behalf. When the agents are incentivized to propose unfair offers, they will do so, maximizing the principal's payoff. Hamman, Loewenstein, and Weber (2010) show similar findings in a non-strategic setting. They study a dictator game where dictators must choose either to decide themselves how much money they want to share with a recipient, or to delegate the decision to an agent. Sharing declines considerably when agents were employed, leaving receivers much worse off. Coffman (2011) observes that the subjects in experiments are aware of this and expect the receiver to get less when an agent is employed. Oexl and Grossman (2013) find that almost 40% of dictators prefer to delegate the decision, even though delegation eliminates the option of implementing a "fair" outcome entirely by design. Moreover, they show that subjects playing the dictator game expect to maximize their profits via delegating and that delegation does not entail the risk of the agent choosing low-paying outcome for them. This suggests that the agent sees it as her responsibility to represent the principal. An extreme form of delegation involves lying on one's behalf. Lying for once own benefit may involve moral costs but having somebody else lie for one's own benefit leads to different results. Erat (2013) shows that a significant part of subjects delegate the acting of lying to an agent to lie and the share of subjects delegating the lying increases the more the lie hurts the person being lied to.

Finally, some laboratory experiments even suggest that in dictator games with delegation, not only responsibility can be shifted onto an agent, but blame and punishment, too (see e.g. Coffman 2011, Bartling and Fischbacher 2012, Oexl and Grossman 2013, Bartling, Fischbacher, and Schudy 2015). Bartling and Fischbacher (2012) experiment with a dictator game with delegation but give receivers the opportunity to also punish the dictator or her agent if an "unfair" allocation is enacted by either of them. They find that few dictators make an unfair allocation decision themselves and most of them decide to delegate the choice. Moreover, if the agent enacts the unfair choice, he is punished, while the dictator herself gets

off almost unharmed. Decisions can even be delegated to a computer but Gogoll and Uhl (2016) find that only a small number of subjects are willing to delegate the decision to the computer instead of a human. In a dictator game where either two humans or a human and a computer jointly decide on the outcome the number of selfish choices is lowest when deciding alone, higher when deciding jointly with a computer and highest when deciding jointly with another human (Kirchkamp and Strobel 2018).

III. FRAMEWORK AND EXAMPLES

In most laboratory experiments, subjects do not have any chance of protecting themselves from their own behavioral biases. Once they are given more opportunities to behave differently and protect themselves, they tend to do so. If they can delegate their decisions to an agent, they tend to do so too, and potential biases tend to play a smaller role. These insights are relevant in real-life situations. In well-functioning market economies people often have the chance to deal with their biases through (costly) delegation. In fact, in real-life situations, people regularly delegate decision making and rely on trusted agents (Stadelmann and Torgler 2013). Evidently, in democratic countries, elections are a way of temporarily delegating some collective decisions to agents (politicians).

Our basic framework is simple. Individuals have a broad idea what they want, i.e., they know their preferences. They also know that, in some situations, they are prone to certain biases; especially if these situations are uncommon, involve difficult choices or lead to moral costs for themselves. People know that they tend give money to beggars although they do not want to. They know that they have a tendency to eat too much at a buffet although they do not want to. They know that they should not smoke another cigarette but what harm can one more cigarette do. That is, it is often the case that people know rationally what they would actually

want but they feel internally constrained to follow their path, i.e., they suffer from some bias, inclination towards something, or a certain predisposition that do not allow them to implement their desired choices.

Crucially, individuals would like to correct their bias. Some follow strict rules and make no exceptions (even if such exceptions could make sense in some circumstances). Others turn to help offered by others. Thereby, they may avoid taking a decision themselves and, instead, delegate decision making power to an agent. A person anticipating an overly altruistic behavior on her part may prefer to delegate the decision on a trusted agent or representative. Such an agent might be found on a market. If this is the case, the agent will require a certain fee for taking the decision on behalf of the principal. It is advantageous for the principal to pay this fee if he thinks that he is comparatively likely to be biased in his decision making, if the fee is not too high and if he has enough money to pay the fee.

The bias can be solved by the agent in different ways. In a market economy, individually tailored solutions may emerge for some bias. Delegation is possible to an agent who asks for a certain amount of money for providing her service. Competition between agents brings down the costs for the principals and increases choice possibilities between agents who may target the bias in different ways. An alternative to the market, may be a collective solution whereby individuals delegate decision making power to an agent who decides for the collective of individuals. Importantly, in both situations, decision making is delegated to another individual or group of individuals and the bias may be solved. Hamman, Loewenstein, and Weber (2010) find that principals acting individually feel responsible for the outcomes, while principals acting through agents do not. Agents, on the other hand, reported they were merely doing the job they were incentivized to do.

Some behavioral biases matter more, others less. Some biases could be corrected easily, while others are far more difficult to correct. However, by delegating decisions to agents and

asking agents to act rational and in the (selfish) interest of the principal, some of biases may be overcome.

Next, we briefly discuss a few examples that illustrate how people try to correct their biases by taking their decision-making power partly away from themselves.

1. People typically hire lawyers when it is likely that they are facing relevant decision where they would tend to yield quickly to the other side because of uncertainty, fear, social constraints, personal conscience, etc. Lawyers are supposed to act on the behalf of their principals and make hard decisions in the interest of their principals.

2. Often it is hard to be tough to ones' own children. However, sending them to a boarding school known to be strict may still be performed by parents who would, otherwise, give a lot of leeway to their children.

3. Politicians who promise to be tough on crime may also receive votes by people who would excuse many misdemeanors if they had to decide themselves. Similarly, politicians who restrict migration may receive votes by people who welcome refugees as these people may be skeptical that too many refugees can be integrated at the same time. More generally, voters may not want to make hard decisions by themselves, but they may support candidates who promise to be hard.

4. Trying to lose weight would seem to be very easy. The only thing that needs to be done is to reduce calory intake. In practice, this does not seem so easy. However, people constantly look for advice on diets, employ mobile apps, use online coaching, and attend in-person meetings, among other strategies. These can be seen as different ways to delegate some of the decisions regarding calorie intake. Moreover, some people are in favor of a sugar tax, hoping that the government will implement some of these strategies on behalf of citizens.

5. Gambling can be fun, but many people know that risks of addiction and loss are involved. Some casinos and online gambling sites allow people to self-restrict themselves by setting maximum time limits of gambling or maximum amounts that can be transferred to the online gambling account. This is not only done to fulfill legal requirements but may help to attract customers that are worried to get addicted.

6. Many people feel uncomfortable if a beggar approaches them to ask for some coins. A common solution nowadays is to keep all cash in the trusted bank and to go out only with credit card, so that one can (unfortunately?) not give any money to a beggar.

7. Instead of drinking any wine or spirit, people may self-impose a rule to only buy from wine dealer that they trust and only purchase expensive wine. Doing so, they drink less and, hence, appreciate the wine more. A more extreme form of a market provided treatment is Antabuse which is a medication for the treatment of alcoholism. It works by producing a negative reaction if you drink alcohol. Here the market solution is a technology to avoid drinking.

8. Sometimes market participants provide solutions to biases directly without any requirement of an intermediating agent. An example are cash machines. When people need cash, they often go to a cash machine. Their focus of attention is on getting cash, i.e., they are partly biased because they do not focus on anything else. They enter their card into the cash machine, then their pin and, finally, the card comes out. Once the card is taken out of the machine, the money arrives. This simple sequence of events is to avoid costs for banks and their clients because if the money came out prior to the card, there would be an increased tendency to forget the card in the cash machine.

All these examples show that by relying on some market solution and by avoiding to explicitly take a decision in a specific circumstance, people can try to mitigate some of their biases. Thus, well-functioning markets may help to correct certain biases.

IV. A MODEL OF BIAS CORRECTION

Consider a decision maker who faces a behavioral bias that skews his decision-making ability and impairs his wellbeing since his biased choices do not lead to his truly desired outcomes. What at a first glance seems an abstract situation is extremely common in real-life. All of us are experienced decision makers, but we are very much human and, therefore, tend to be heavily influenced by conscious or unconscious biases, whether it is watching too much TV, eating unhealthily, drinking, or smoking too much. Everyone is affected by these types of biases, but everyone is affected to a different degree. For many, drinking too much is not a problem and they are able to moderate themselves. Others face more serious forms of these biases, i.e., addiction and the choices they make end up hurting them more severely.

There are ways to deal with all kinds of biases, but it is unlikely that people can do so effectively on their own, especially when they face large biases. As discussed above, delegation may be an option to solve the consequences of biases. However, it is not trivial to determine how to correct a bias and which option is suitable for whom and in which situation. Next, we model and compare different scenarios where decision makers delegate actions.

We start by considering an individual who must choose how much to consume of two goods and derives utility according to

$$u = (c_1)^\alpha (c_2)^{1-\alpha},$$

where $c_l \geq 0$ is the amount consumed of good $l = 1,2$ and $\alpha \in (0,1)$. Let $c_1 + c_2 \leq y$ be the budget constraint, where $y > 0$ denotes disposable income. We assume that the prices of both goods are given and equality to unity. Then, the individual would like to spend his income as follows: $c_1 = \alpha y$ and $c_1 = (1 - \alpha)y$. Now suppose that the individual faces a behavioral bias

that distorts choices in favor of one of the goods. In particular, when making decisions, the decision maker behaves as if he had preferences

$$\tilde{u} = (c_1)^{\alpha(1-\beta)} (c_2)^{1-\alpha(1-\beta)},$$

where $\beta \in [0,1]$ measures the behavioral bias. [8] If there is no bias, i.e., $\beta = 0$, the individual will select $c_1 = \alpha y$ and $c_1 = (1-\alpha)y$, which coincide with the quantities that the individual intent to choose. If the individual is completely biased, i.e., $\beta = 1$, he will spend all his income in c_2, which implies that $c_2 = y$. Actual utility achieved in this case will be zero.

We explore several ways to deal with such a behavioral bias. To do so, it is useful to begin studying an environment in which there is nothing the individual can do to manage his bias. Then, we consider decentralized market solution as well as centralized solutions and compare them.

No Correction of the Bias

It may be the case that the individual finds no way to correct for the bias. Alternatively, the individual may prefer not to correct the bias, because possible alternatives would reduce his utility even more than accepting his skewed consumption. The bias may thus not be corrected for or mitigated in any way and takes its full effect on the decision maker's consumption and payoff. We denote the situation without bias correction as n for no correction. In this case, the decision maker will select

$$c_1^n = \alpha(1-\beta)y \text{ and } c_2^n = [1 - \alpha(1-\beta)]y.$$

This implies that due to the bias, the decision maker will consume more of good 2 than it would be desirable for him according to his unbiased preferences u.

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[8] In Stadelmann and Torrens (2020) investigate settings where there is heterogeneity in the bias.

His payoff will be given by

$$u^n = [\alpha(1-\beta)]^\alpha \, [1 - \alpha(1-\beta)]^{1-\alpha} y,$$

which is different to $u = \alpha^\alpha \, (1-\alpha)^{1-\alpha} y$ in the case of no bias.

A Market Solution to Bias Correction

Since it is hard, or in most cases impossible to correct a bias on his own, the individual may opt avoid taking a decision himself. He may, in fact, delegate the decision task to an agent. The agent may be a political representative but also a firm or another individual active in the market.

People tend to know, for example, that they likely smoke too much and that doing so will lead to health problems down the line but due to the addictive nature of nicotine, it may be hard to simply stop. One option they have is to choose from several different competing commercial products or services offering help, e.g., E-Cigarettes, nicotine patches, nicotine gum, etc. Others may be faced with eating too much. Nowadays, there are different commercial solutions available. Some may even turn to implanted devices that curb their feeling of hunger or restrict food intake into the stomach. Examples of biases with market solutions range from rather exotic ones like stomach rings to every-day situations, like preferring to drink alcohol-free beer if one is the designated driver. All of them, however, do not come free of charge.

Suppose that the decision maker can delegate his consumption decision to an agent in the market capable of fixing the bias for a fee f to be paid from the principal's income. We denote a delegation by d. Then, the principal will consume

$$c_1^d = \alpha(y - f) \text{ and } c_2^d = (1 - \alpha)(y - f),$$

where d indicates that the decision is corrected via a decentralized market solution. His payoff will be given by

$$u^d(f) = \alpha^\alpha (1 - \alpha)^{1-\alpha}(y - f).$$

When $f = 0$ the bias would be fully solved by the market. One may assume that the decision maker and the agent bargain over the fee f.[9] Then, the resulting fee f^* will depend on the bargaining power of each party and the opportunity cost of the agent. Indeed, f^* will split the gains from trade between the decision maker and the agent. For example, if competition between different agents is perfect, the fee naturally drops to the opportunity cost which then corresponds to the marginal cost of delegation and correcting the bias. In any case, delegation will maximize the join surplus between the parties.

Comparing u^n and u^d it is evident that there is a range of fees that make both the decision maker and the agent better off. This entails that there are fees such that the decision maker's payoff is higher when removing the bias through delegation, despite having to pay for the service, while it is also feasible for the agent to offer such a service rather than using her time and resources in her best alternative use.

Summing up: the individual chooses whether to delegate his biased consumption decision. If the individual does not delegate, he will choose the biased consumption bundle (c_1^n, c_2^n) introduced in the "No Correction of the Bias" case and he will obtain a payoff of u^n, while the agent will not take on the business and instead she will attend to other business. On the contrary, if the decision maker delegates, he will end up with a payoff of $u^d(f^*) > u^n$. The agent will simply earn the fee f^* which is at or above her opportunity cost.

The decision maker is more likely to delegate when:

1. The opportunity cost for the agent is low, i.e. if the fee f is low.

2. The decision maker's income is high.

3. The behavioral bias is high.

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[9] Stadelmann and Torrens (2020) explore such a setting and present a fully closed model.

The intuition behind these results is simple. The opportunity cost of the agent is the amount she could be making by offering a different service or attending to a different principal. Thus, if her earning potential elsewhere is lower, it will be cheaper to use her delegation services. Consequently, it is more likely that the principal relies on an agent to solve his behavioral bias. On the contrary, if the agent's opportunity cost is high, it is more desirable for her to attend to other business and the principal will need to make it worthwhile for her to offer her delegation services. That is, the decision maker needs to pay more and thus be less likely to use the service at all.

The richer the principal, the more likely he is to use delegation. First, richer decision makers are more likely to be able to afford a fee that is worth the agent's time. Hence, they will be able to use delegation in more situations and still benefit (e.g., even when the agent's opportunity cost is high). Second, if the decision maker is richer, he stands to lose more from the bias skewing his consumption. Hence, the more valuable it is for him to correct his bias and, hence the more willing he is to delegate his decision. According to this, we would also expect to observe that biases in richer countries are more frequently corrected using a market solution than in poorer countries. It is worthwhile to note that, in richer countries, we should also observe more opportunities to correct for biases than in poorer countries.

Finally, the more intense the behavioral bias of the individual, the more heavily skewed his consumption is. This entails that he would be willing to pay more to get rid of his bias. However, the agent is paid a fixed fee for the service, regardless of the size of the decision maker's bias. Therefore, the willingness to pay for individuals with large biases is not fully siphoned. Fixing his bias will yield the decision maker a substantial utility gain while only having to pay a relatively small fee. For individuals with lower biases the fee will make up relatively more of what they gain from having the bias fixed. Decision makers with high biases therefore profit relatively more from correcting their biases via private delegation. If holding a

bias were negatively correlated with income, poor people may particularly profit from the possibility of delegating.

Having the option to freely delegate a decision subject to a behavioral bias is of value. If individuals have the chance to delegate and the opportunity cost of the agents are sufficiently low, individuals will employ delegation services, making them better off than in the case where biases distort their consumption behavior. As countries with more economic freedoms also tend to be richer, it is likely that these countries offer more opportunities to correct for potential biases. Moreover, we would also expect that due to more economic freedoms, competition for the supply of delegation services is more intense and, therefore, agents tend to charge lower fees. This should allow even people with relatively small biases to correct them. As a consequence, substantial negative consequences of any behavioral bias should be relatively modest in countries where economic freedoms are high. Interestingly, this also means that the probability of discovery of relevant biases is more likely in poorer countries and for poorer individuals. This may explain why many proponents of paternalistic approaches focus their attention on poor individuals and on poor countries. However, it could be the case that the key barrier that poor individuals face to correct their biases is the lack of access to affordable delegation services in a market.[10] If paternalistic interventions restrict access to delegation services, the likelihood of observing biases may even increase. In well-functioning market economies, entrepreneurs have incentives to develop and offer technologies that help people deal with their behavioral biases.

In a market economy, not only a single agent will offer a way to deal with biases and an individual will rarely bargain with an agent over the price of her services. Instead, we will

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[10] For the same reason laboratory experiments may overestimate the prevalence of behavioral biases. In real life, people find ways to protect themselves from their own behavioral biases; for example, using agents to delegate their decisions.

observe many agents offering E-cigarettes, non-alcoholic beer, or stomach-altering implants, which are competing in their respective markets. This competition will drive down prices for delegation services. In the limit, the equilibrium fee in a perfectly competitive market will be equal to the agent's opportunity cost. In our simple model, this could be viewed as a situation in which the agent has no bargaining power.

Not only does competition reduce the price of getting rid of one's biases, yielding higher outcomes for decision makers already using delegation services, but it also opens up market solutions for more people, those who were previously unable to afford them. Furthermore, competition may help matching decision makers with suitable agents capable of solving their biases and spurs innovation, further reducing the price of fixing a bias. New and improved solutions for biases could become available to more people more quickly as there are many different providers competing for market shares.

Paternalistic Solutions to Bias Correction

Instead of exploring market solutions to bias correction, there is a tendency to see behavioral biases as a reason and justification for government intervention in otherwise working markets. Paternalistic solutions are then mostly envisaged.

A typical paternalistic solution with an economic touch is to envisage a tax τ. Such a tax might be levied on good 2 to fix the behavioral bias.[11] This paternalistic solution corresponds to a "sin tax" used by governments to deal with demerit goods, i.e., goods deemed "undesirable" and having negative effects on consumers. Well-known examples are

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[11] A quantitative restriction on consumption of certain goods may also be modelled as a tax. In the extreme, an interdiction to consume a good may be modelled as an infinite tax.

exceptionally high taxes on alcohol, tobacco or gambling that aim at discouraging consumption by significantly increasing the prices of the goods in question.

Our basic model allows to explore such a paternalistic solution. The size of the tax depends on the size of the bias β. If the bias is high, so is the tax rate on good 2 to counter over-consumption of it. In such a setting it is central to investigate different assumptions regarding the behavior of government as the proceeds of this tax can be used to pay transfers T to taxpayers, they can be used to finance the administration, or they may simply be wasted. In other words, since taxes are typically not tied to a specific purpose, they fund the public budget, they are wasted, or find their way back into the pockets of taxpayers which usually involves costs of taxation or redistribution.

The individual's biased consumption decision is therefore subject to a different setting: On one hand he faces a possibly steep tax on the good that is affected by the bias, but on the other he might be able to afford more as he receives additional income from government transfers. Accordingly, our decision maker's behavior is represented by the following utility maximization problem:

$$\max_{c_1, c_2} \tilde{u} = (c_1)^{a(1-\beta)}(c_2)^{1-\alpha(1-\beta)}, s.t. y + T = c_1 + (1+\tau)c_2$$

where $\tau \geq 0$ is the tax rate on good 2 and T are the transfers received from the government. The solution to the maximization problem yields the following consumption choices:

$$c_1 = \alpha(1-\beta)(y+T) \text{ and } c_2 = \frac{[1-\alpha(1-\beta)](y+T)}{1+\tau}.$$

Thus, under a bigger bias (larger β), less of the income is used to consume c_1 and more to consume c_2. Also note that the transfer increases the consumption of both goods, while the "sin tax" only reduces the consumption of good 2.

Benevolent Social Planner

We first investigate the most abstract case of paternalistic government solutions, a benevolent, fully informed social planner with no waste, i.e., no transfers going to waste or the costs of administration. Such an entity has only its citizens in mind and adjusts its policies accordingly.

Here, the benevolent social planner chooses a tax rate and transfers in a way that is most beneficial to the decision maker The government budget constraint is represented by $T \leq \tau c_2$, which reflects the "no waste" assumption. The government operates efficiently using all the tax revenue from the c_2-tax for transfers to taxpayers.

This optimistic form of a paternalistic solution leads to a better outcome than private/ decentralized delegation, given that delegation involves some costs f, whereas, by assumption, taxation, bureaucracy and all the action of the social planner does not. The bias is countered selecting the right tax rate. Granted, the individual will have to pay taxes on part of his consumption, but the tax revenue is returned to him as a transfer from the government. Since in this scenario, government operates without waste, none of his tax revenue is lost in the process. Overall, this is equivalent to the decision maker choosing his consumption bundle without a bias. Thus, the decision maker obtains utility (sp denoting the social planner scenario):

$$u^{sp} = \alpha^\alpha (1 - \alpha)^{1-\alpha} y.$$

Comparing this to the outcomes discussed so far, we have $u^{sp} > u^d (f^*) > u^n$. Note that this also requires that the social planner to be fully informed about the size of the bias and the bias is not heterogenous, i.e., all people suffer the same bias. If individuals had different biases, the social planner would have to find the optimal tax rate and transfer for every individual without generating any waste in the process. This is a complicated (or unrealistic)

task to accomplish. Even in the best of cases, a "sin tax" solution requires a well- functioning bureaucracy, which it is definitely are not costless. Therefore, next we introduce the cost of government to the analysis and explore different assumptions on its objective function.

Suppose the government is a benevolent, fully informed social planner but the administration is costly. In particular, assume that the bureaucracy costs a fraction of $\lambda \in [0,1]$ of the tax revenue obtained from tax on the consumption of the biased good. The decision maker faces the same utility maximization problem and the government again chooses the tax rate and transfers to maximize the individual's utility. The only difference is that the government budget constraint is now given by $T \leq (1 - \lambda)\tau c_2$. In other words, the government transfer to the decision maker is now lower, since it corresponds to the part of the tax revenue that is not used for the costs of administration. The individual will not have as much income from the government transfer at his disposal as in the "no waste" condition. Therefore, he will be worse off if the bureaucrats take even the smallest amount for themselves.

The dynamics of the "waste" condition and its comparison with a market solution warrant a closer look. If the bureaucracy keeps more than a critical fraction of the tax revenue, a benevolent, fully informed social planner prefers not to solve the behavioral bias of the individual. The reason is simple. When the administrative costs are too high, the marginal gain of moving the consumption pattern closer to the optimal is lower than the marginal cost associated with the income loss generated by the government intervention. In other words, if the administration costs too much, the benevolent social planner, who has only the decision maker in mind (i.e. maximizes his utility) will opt not to fix the consumption bias, because the decision maker would stand to lose more than gain by (partially) correcting his consumption.

Bureaucracies tend to perform comparatively well in richer countries with extensive economic freedoms. However, in such countries the market solution to bias correction is also likely to work well and the bias itself is thus, prior to any government intervention already low

such that it is likely that the administrative costs of the social planner of bias correction are higher than the benefits. This reasoning would imply that "sin taxes" are less relevant in countries where economic freedoms are secured.

On the other hand, if the bureaucracy keeps only a relatively low fraction of the budget, the social planner selects a positive tax on good 2 to partially correct the bias of the decision maker. Note here that the tax rate and the portion of the tax revenue going to the administration have a negative relationship. That is, as the bureaucracy extracts less, the social planner chooses a higher tax on good 2, offsetting more of the effect of the bias and making the decision maker better off. This leads to the rather intuitive implication that the less the costs of the administration the more effective the government intervention is going to be. However, it need not be as effective as the market solution depending on the costs of delegation.

Leviathan government

Leviathan governments can come in different forms. Assume for the purpose of comparison that the Leviathan is committed to induce the pattern of consumption desired by the decision maker, but it can appropriate as much as it wants from the generated revenue. In other words, we consider a government in form of a Leviathan that solves the behavioral bias, but in doing so, faces no restriction on how much it can appropriate from the public budget.

This is not an unrealistic case. Intervention with a tax may be justified by referring to an actual problem, such as some bias in consumption that individuals would actually want to correct. However, it often remains unclear what is done with the collected tax. A Leviathan is innately self-serving, maximizing its own utility, thus taxing excessively. It will, however, not take everything as doing so would eradicate its source of revenue.

According to this setting, consider again the government selecting a tax rate τ on good 2 and setting up transfers T to the decision maker. Unlike above, where the government choses

τ and T to maximize the decision maker's utility, the Leviathan will set taxes and transfers that maximize the rents accruing to itself. The rent to the Leviathan is therefore simply the difference of tax revenue and transfers to the decision maker $R = \tau c_2 - T$. The rents depend on the decision maker's biased consumption decision $c_1 = \alpha(1-\beta)(y+T)$, $c_2 = \frac{[1-\alpha(1-\beta)](y+T)}{1+\tau}$, his ideal consumption ratio $\frac{c_1}{c_2} = \frac{\alpha}{1-\alpha}$ and the government's budget constraint $T \leq \tau c_2$.

The Leviathan faces a delicate task. Choosing a high tax rate could increase the rent, but perhaps discourage the individual much from buying the biased good. Therefore, the Leviathan may even have an incentive not to completely solve the decision maker's bias.

The Leviathan taxing only good 2 is not necessarily a product of our model design. It is in the Leviathan's own interest to tax good 2, thereby partially solving the behavioral bias of the decision maker, because it will generate a higher tax revenue. Governments generally have an incentive to tax goods affected by a consumption bias, because these goods may have low price elasticities of demand. That is, even if the price of such an inelastic good is rising due to increased taxation, consumption will only decrease by a bit. This enables governments to extract more tax revenues from these goods than from more elastic ones which would show large reactions to price changes induced by taxation. For example, many European countries enact high fuel taxes that make up a big portion of fuel prices. However, most people still drive cars, partially because they depend on it. The government profits off this reliance on personal transport by being able to set high fuel taxes without very large drops in demand. Of course, part of the reasoning for high fuel taxes include environmental concerns due to externalities, but the self-serving part of the explanation is sufficient to illustrate our case since a Leviathan is decidedly not benevolent.

Similarly, taxes on cigarettes are high but not sufficiently high to incentivize smokers to give up smoking completely. If this were the case, tax revenue would be zero. It is likely that there is an incentive for government to keep revenue from such taxes, i.e., the Leviathan assumption can be justified. Smoking is a particularly interesting case as many people would like to stop smoking but cannot do so due to their biases. A Leviathan may use their wish to stop smoking to impose a tax on cigarettes, but the actual aim is to collect tax revenues. Indeed, it is quite profitable for governments to extensively tax smoking. While part of the argument is to discourage smoking, the demand for cigarettes may be comparatively inelastic to price changes, owing partially to the addictive nature of nicotine. This makes cigarettes a welcome candidate for governments to generate tax revenue. People will still smoke, even if the price of a pack of cigarettes is high due to heavy taxation. It is interesting to note that a benevolent government may act similarly to a Leviathan with the only exception that the tax revenue is redistributed instead appropriated.

In our basic model we do not consider price elasticities and assume the Leviathan is able to completely fix the behavioral consumption bias of the individual with the tax. Thus, it sets the tax rate such that the decision maker's bias vanishes but will not provide any transfers back to the decision maker, keeping the entire tax revenue as rent. Accordingly, the decision maker consumes

$$c_1^L = \alpha(1 - \beta)y \text{ and } c_1^L = (1 - \alpha)(1 - \beta)y$$

and obtains

$$u^L = (\alpha)^\alpha (1 - \alpha)^{(1-\alpha)}(1 - \beta)y.$$

The Leviathan induces the individual to consume the desired *rate* of goods 1 and 2, but in exchange it takes a proportion $(1 - \beta)$ of the individual's income. In other words, the decision maker is fully exploited by the Leviathan, but only the biased good is affected, so the decision maker can consume his optimal desired ratio of goods 1 and 2.

It is easy to verify that $u_P^l < u_P^n$. From the perspective of the decision maker, a Leviathan is worse than not solving the bias at all due to large parts of income going directly to the Leviathan and not being refunded as transfers. Therefore, it is also much worse than delegation in a market. This entails a relevant corollary: If poor countries are poor because they have self-serving governments, a paternalistic approach in such countries could be far worse than a market solution to bias correction.

Political Economy: Median Voter

Both the benevolent government and the Leviathan scenarios feature dictatorial governments in the sense that voters do not play a direct role. We now extend the analysis to a simple democratic solution represented by the Downsian model of electoral competition. Suppose a two-party system holding a general election with a simple majority voting rule. There is a continuum of voters, all of whom are decision makers with individual behavioral biases, and the distribution of biases among the population is known. For simplicity, assume that the bias follows a uniform distribution among all decision makers, i.e., there are equally many decision makers with a low bias, a medium bias, a high bias, and everything in between.

Both parties simultaneously and independently announce their planned tax rate on good 2. This is the only policy considered in the voting decision Thus, based exclusively on the knowledge about proposed tax rates, decision makers cast their ballot. The candidate with the greater number of votes wins the election and implements its tax rate as announced. Furthermore, each decision maker obtains a lump sum tax rebate (the equivalent to the transfer in previous scenarios) equal to $T_i = (1 - \lambda)\tau c_{2,i}$. Thus, the size of the tax return depends on the tax rate on good 2 τ, the amount of good 2 consumed by decision maker i, and the proportion of government revenue kept by bureaucrats $\lambda \in [0,1)$. Note that bureaucrats can choose to extract nothing but are not able to extract the entire amount.

Consumption decisions are identical to the previous cases. However, since there is now a continuum of individuals, it is indexed. Thus, decision maker i will consume

$$c_{1,i} = \alpha(1 - \beta_i)(y + T_i) \text{ and } c_{2,i} - \frac{[1-\alpha(1-\beta_i)](y+T_i)}{1+\tau}$$

and obtain the payoff

$$u_i = \left(c_{1,i}\right)^{\alpha} \left(c_{2,i}\right)^{1-\alpha}.$$

Intuitively, all decision makers who have a relatively low bias oppose a tax on good 2 entirely since their bias is small enough. A government intervention where even part of the tax revenue is lost to bureaucrats would hurt them more than no solution to the bias at all. On the other hand, decision makers with rather large biases (above the threshold) are in favor of a positive tax on good 2, since their utility gains from a corrected consumption are larger than the negative effect of a part of the tax revenue going to bureaucrats. Summing up, the tax rate preferred by each individual decision maker is larger, the greater the bias of the individual, since highly biased individuals gain most from having the bias removed.

The tax preferences of the decision makers are single-peaked, i.e., each individual prefers exactly one tax rate over all possible other tax rates (depending on the size of his behavioral bias) and his utility is strictly decreasing the further away the alternatives get from his preferred tax rate. This has a quite intuitive implication. Each decision maker will vote for the party that proposes the tax rate closest to their preferred rate. In an effort to win over the most voters, the proposals of both parties will converge, and they will eventually propose the same positive tax rate that corresponds to the median behavioral bias. Due to the heterogeneity of the bias, the tax according to the median behavioral bias is not optimal. Decision makers with particularly high or low biases prefer tax rates quite far from the median voter tax rate. If they do not have a choice, they will vote for the median voter tax rate, since it is still closest to their own

preference, but for both there are decidedly better options available if the paternalistic solution was not implemented.

Individuals with a low bias prefer no tax and would therefore be better off not delegating at all and not having any paternalistic solution. For them, accepting the utility associated with their biased consumption pattern is a better option than facing the non-zero tax preferred by the median voter. As mentioned in our discussion of private delegation in markets, decision makers with high biases can benefit a lot from delegating to an agent in the market, since they gain a lot of utility from having their bias removed for a relatively small fixed fee. Indeed, decision makers with large biases would often be better off with private delegation than with the median voter tax since the latter imposes more costs on them. Only decision makers with an intermediate bias might prefer the government solution to private delegation.

Thus, depending on the distribution of the size of biases within the population, a market solution may overall be better for the whole population since individuals with a low bias could choose not to delegate without having to pay taxes on the consumption of the biased good, whereas individuals with high biases would be free to contract an agent to fix the bias for a relatively low fee.

V. CONCLUSIONS

Biased behavior is commonly observed in laboratory experiments. However, this does not mean that new paternalistic approaches are required as the bias found may be overrated and miscredited. Overrated because in real-life situations people may find ways to protect themselves from their own biases. This is especially the case when markets work well, and delegation of decision making is possible such that the biased principals delegate decision making power to agents who help them solving their biases. Importantly, in many

circumstances, market-based solutions for these biases work better than government remedies and they are open for innovation. Thus, the paternalistic push is misdirected because it calls for more restrictions and centralization of decision making when the required policy is more competition in the market for delegation services.

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