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## Pleasing or Fighting Future Tastes? Projection Bias versus Conflict of Selves

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# Pleasing or Fighting Future Tastes? Projection Bias versus Conflict of Selves\*

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## Abstract

Many real life choices concern consumption in future periods. Previous studies apparently demonstrate that people systematically mispredict future tastes in such situations. This evidence, however, is also consistent with the idea that people understand, but do not approve of their future tastes. To disentangle both approaches, we conducted a framed field experiment with commitment option. In our experiment, commitment was not a device against weak will. It was a judgment which a planner imposed on another planner. The results suggest that people do not always aim to please future tastes. People may sometimes experience a conflict between two far-sighted selves.

*JEL classification: C93; D03; D90*

*Keywords: State-dependent preferences; Empathy gap; Multiple selves; Commitment; Intrapersonal conflict*

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# 1 Introduction

Suppose on a Saturday morning your alarm clock rings as always at 8:00 a.m. You wake up and while you are still lying in bed, you decide to turn off the timer of your alarm clock for tomorrow morning. Since tomorrow is Sunday, you think you have every right to sleep in. At some time during Saturday afternoon, however, you change your mind even though nothing unusual happened. You now think that you should seize the day and reset the alarm clock to 8:00 a.m. for tomorrow morning. Why do your decisions regarding the same matter differ? Is it because you underestimate your desire to sleep in when you reset the alarm clock in the afternoon, whereas you are more empathetic toward yourself on Sunday morning when you are still lying in bed on Saturday? Or is it because you feel a need in the afternoon to force your sluggish self out of bed the next morning, whereas you are more sympathetic with your next morning's sluggish self when you are still lying in bed on Saturday?

Those are the questions we attempt to disentangle in the present study. The example captures a fundamental characteristic of many real life choices: the resulting consumption takes place in some future period. This is the case when we buy groceries for the upcoming weekend or a theater ticket for some future date, book a vacation trip for the upcoming summer, or order a good via the Internet or a catalog. Preferences, however, often change or systematically fluctuate over time, as the pioneering work of Loewenstein and his coauthors has shown (see, e.g., Loewenstein, 1996, 2000, for a discussion of systematic fluctuations of tastes). Optimal decision making therefore requires unbiased predictions of future tastes. This follows immediately from a widely held view in economics which holds that the relevant preferences are those that prevail at the time of consumption, not at the time of the decision (see, e.g., Read and Van Leeuwen, 1998, Loewenstein, O'Donoghue and Rabin, 2003). But when real people make choices with delayed consequences, they seem to be overly influenced by their current tastes and do not take into account their future preferences to the full extent. A common interpretation of such behavior is that people systematically mispredict their future preferences. This misprediction is sometimes referred to as an *empathy gap* (e.g., Loewenstein, 1996, 2000, Loewenstein and Schkade, 1999) or *projection bias* (e.g., Loewenstein, O'Donoghue and Rabin, 2003, Conlin, O'Donoghue and Vogelsang, 2007, Busse et al., 2014). The latter term underlines the view that current preferences are illegitimately projected to another state for which a decision is to be made. People seem to understand the direction in which their taste will change but systematically underestimate the magnitude of this change (Loewenstein, O'Donoghue and Rabin, 2003). Projection bias thus combines the concept of state-dependent preferences with systematic mispredictions of future tastes.

However, an alternative interpretation of the same behavior may be that people try to impose a better judgment on a later alter ego. People may understand their preferences in a different state well, but simply do not approve of these preferences. This imposition of a better

judgment can be understood as a *sympathy gap* or *conflict of selves*. Whereas the empathy gap is the ineffective attempt to please future tastes, the sympathy gap is the attempt to fight them. Thus, the two conceptions of state-dependent behavior basically differ in their assumption of whether real people consider their preferences at the time of consumption or at the time of the decision as more important.<sup>1</sup>

Proponents of projection bias posit that systematic mispredictions of future tastes explain a wide range of phenomena from everyday decision making to suicide (see, e.g., Loewenstein, O'Donoghue and Rabin, 2003). Their examples cover, amongst others, anger, fear, arousal, hunger, craving, curiosity, and fatigue. The scope of projection bias is explicitly not limited to once- or twice-in-a-lifetime experiences, like giving birth to a child or being interrogated. In these latter cases, one is likely to be ignorant about the intensity of the respective state beforehand simply because of lacking experience. According to Loewenstein, O'Donoghue and Rabin (2003), however, systematic mispredictions also occur in instances which we experience over and over again. But don't we know ourselves all too well in those daily or recurrent decision situations? Are those situations not primarily characterized by a dissent about rather than a misprediction of tastes?

Ultimately, whether our daily state-dependent behavior is caused by a projection bias or a conflict of selves is an empirical question. Previous studies are consistent with projection bias. But as we hope to show later, they are not sufficient to disentangle projection bias and conflict of selves since people's intentions during their choices are not clear. To learn about the intentions, we conducted an experiment with commitment option. In our experiment, commitment is in line with conflict of selves, but not with projection bias. In this context, it is important to stress that projection bias is a form of time-inconsistent behavior which is different from another time inconsistency caused by present-biased preferences. A projection-biased planner may want to impose her preferences on an impulsive doer if she wants to fight an anticipated present bias. Thus, the concept of projection bias does not generally exclude the use of commitment devices.

To the best of our knowledge, we provide the first experiment with commitment option in which a present bias is excluded by design. Commitment in our experiment is the will to promote one *advance* choice at the cost of a systematically different *advance* choice. In other words, it is a judgment which a planner imposes on another planner. In such a framework, commitment is informative as it reveals participants' intentions and can distinguish between projection bias and conflict of selves. Therefore, we want to emphasize that we do not deal with commitment against weak will or a conflict between a rational, far-sighted self and an impulse-driven short-sighted self, as it is usually done in the economic literature. Instead, the

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<sup>1</sup>Read and Van Leeuwen (1998), for instance, write that “[w]hen current decisions have delayed consequences, the preferences that should be relevant are those that will prevail when the consequences occur” [p. 189]. This statement leaves no room for a conflict of selves and implies that people solely aim to please future tastes. Essentially, we test whether people indeed behave according to this claim.

conflict we investigate here is between two far-sighted decision-making agents within a person, both following their own rationale. Hence, we look for a strategic conflict between two selves in the spirit of Thomas C. Schelling (see, e.g., Schelling, 1984*a,b*).

The paper unfolds in seven steps. In the next section, we explicate the difference between projection bias and conflict of selves in a more technical framework. In the third section, we review two paradigmatic studies on projection bias and point out why we think that their results are also consistent with conflict of selves. The fourth section explains our experiment design, while the fifth section outlines the hypotheses which a model of projection bias and a model of conflict of selves imply. The sixth section presents our findings and the last section concludes.

## 2 Two Models of Behavior

In this section, we illustrate with a simplified example how a commitment device can distinguish whether behavior is caused by a projection bias or, alternatively, a conflict of selves.<sup>2</sup> The example we consider is a situation in which a person can buy a good in period 1 which is consumed in some future period 2. This could be a situation in which a person books a vacation trip for the upcoming summer, buys a theater ticket for some future date, orders a non-durable good via the Internet or a catalog, or many others. For reasons of simplicity, we assume that the person pays for the good at the time of consumption (that is in period 2). In addition, we assume that the person's utility from the good is additively separable from the utility of other goods, and that the price  $P$  represents the utility of other goods forgone when purchasing the good in period 1 (see Loewenstein, O'Donoghue and Rabin, 2003, for similar assumptions). Most importantly, we assume that the person values the good differently in periods 1 and 2, and we use state-dependent preferences to describe those changes in tastes. Last but not least, we assume throughout this section that the person has no present bias and that she is aware of that (how we control for present-biased preferences in our experiment is discussed in section 5).

Like Loewenstein, O'Donoghue and Rabin (2003), we denote the person's instantaneous utility from consumption in period  $t$  by  $u(c_t, s_t)$ , where  $c_t$  is the person's consumption in period  $t$  and  $s_t$  is her state in period  $t$  capturing her tastes. A person trying to please her future tastes has to predict how much utility she expects from consuming  $c$  in some future period  $t$  when she is in state  $s_t$ . In our simplified example, such a person has to predict in period 1 how much utility she expects from consuming the good in period 2, and we denote this prediction by  $\tilde{u}(c_2, s_2|s_1)$ . If such a person had no projection bias, she would predict her future utility

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<sup>2</sup>The first part of this section draws heavily on the explication in Loewenstein, O'Donoghue and Rabin (2003) and uses the same notation.

correctly. That is, her predicted utility would equal her true utility:  $\tilde{u}(c_2, s_2|s_1) = u(c_2, s_2)$ . This person would buy the good in period 1 if

$$\tilde{u}(c_2, s_2|s_1) - P = u(c_2, s_2) - P \geq 0.$$

If, on the other hand, the person were exposed to a projection bias as described in Loewenstein, O'Donoghue and Rabin (2003), she would understand the qualitative direction of the taste change, but underestimate its magnitude. That is, her predicted utility would be somewhere in between her true future utility and her utility given the current state:  $\tilde{u}(c_2, s_2|s_1) = (1 - \alpha)u(c_2, s_2) + \alpha u(c_2, s_1)$ , with  $\alpha \in [0, 1]$ .<sup>3</sup> A person with projection bias would buy the good in period 1 if

$$\tilde{u}(c_2, s_2|s_1) - P = (1 - \alpha)u(c_2, s_2) + \alpha u(c_2, s_1) - P \geq 0.$$

Notice that  $\alpha = 0$  captures the case of no projection bias. A person with projection bias is a person with  $\alpha > 0$ , where the bias increases with  $\alpha$ . A person with  $\alpha = 1$  expects no changes in tastes. Also notice that projection bias may lead to an over- or underbuying of the (non-durable) good, depending on the valuation of the good in period 1. The crucial point is that in our simplified example a person with projection bias makes a systematically different choice in period 1 than if she were asked again in period 2. Or, alternatively, if projection bias is a widespread phenomenon, then people in one state in period 1 will make systematically different choices than people in a different state in period 1, even though all of them will be in the same state in period 2.

However, as already mentioned, the same choice behavior can also be captured by a multiple selves approach in the spirit of Schelling (1984*a, b*). Using our example, a person in each period would then be modeled as different selves with different preferences. That is, such a person would buy the good in period 1 if

$$u(c_2, s_1) - P = \lambda u(c_2, s_2) - P \geq 0,$$

where  $\lambda \neq 1$  captures a fundamental disagreement between the two selves regarding the value of the good. Of course, if the person is offered the same choice again in period 2, she may take a systematically different decision. Or, alternatively, if conflict of selves is a widespread phenomenon, then people in one state in period 1 will make systematically different choices than people in a different state in period 1, even though all of them will be in the same state in period 2. However, the reason here is not a misprediction of future tastes, it is a disagreement with future tastes.

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<sup>3</sup>Loewenstein, O'Donoghue and Rabin (2003) call the linear combination of  $u(c_2, s_2)$  and  $u(c_2, s_1)$  *simple projection bias*.

Thus, choice behavior alone cannot distinguish between projection bias and conflict of selves in a two-period setup. This is our main caveat with previous evidence on projection bias reviewed in the next section. One way to distinguish between projection bias and conflict of selves is a choice situation similar to our example, where people can buy a good in period 1 with corresponding state  $s_1$  which is consumed in a future period 2 with corresponding state  $s_2$  (where  $s_1 \neq s_2$ ). People know that they can remake their choice in period 2 if they would like to. However, in period 1, they can explicitly refrain from the option to revise their choice in period 2. Thus, they can use a commitment device to bind themselves to their choice in period 1.

Obviously, a person trying to maximize future utility would strictly prefer to stay flexible due to uncertainty regarding the future, if other forms of time inconsistencies (such as a present bias) are excluded.<sup>4</sup> On the other hand, a person experiencing a conflict of selves may choose to commit herself to her decision in period 1 even in the face of uncertainty, if she disagrees with the tastes of her future alter ego in state  $s_2$ . This is the general idea of the setup we used in this paper.

### 3 Previous Evidence on Projection Bias

Projection bias and its effect on choice behavior has been investigated in various situations involving, for instance, hunger (Read and Van Leeuwen, 1998), cigarette craving (Sayette et al., 2008), sexual arousal (Ariely and Loewenstein, 2006), and pain (Read and Loewenstein, 1999). Most studies used laboratory or field experiments and employed a similar procedure. Participants made an advance choice in period 1 for a predefined future period 2 with corresponding state  $s_2$ . In period 1, some participants were in the same state as in period 2 (i.e.,  $s_1 = s_2$ ) while some participants were in a different state (i.e.,  $s'_1 \neq s_2$ ). Participants were led to believe that their choice in period 1 would count, but when period 2 arrived, they could in fact remake their choice. The typical results of those studies were that participants made systematically different advance choices in state  $s'_1$  compared to  $s_1$ , and that they revised their choices more often in period 2 if the advance choice was done in state  $s'_1$ . In the following, we review the experimental setup and results of two exemplary studies in more detail.

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<sup>4</sup>A person with projection bias must, of course, be unaware of her current misprediction. But, according to Loewenstein, O'Donoghue and Rabin (2003), a person with projection bias may be aware of her future tendency to mispredict (see their footnote 13). Thus, there may be situations where projection bias does not exclude the use of commitment devices even in the absence of present-biased preferences. For instance, in a three-period setup where the good is consumed in period 3 only, a projection-biased planner may commit herself to her purchase decision in period 1 to fight an anticipated misprediction of tastes in period 2, where she could otherwise remake her choice. Since we use a three-period setup to distinguish between projection bias and conflict of selves in the present study, we discuss this point in more detail in section 5 after presenting the experiment design.

In their classical study, Read and Van Leeuwen (1998) conducted a field experiment where office workers made an advance choice between healthy (e.g., apples) and unhealthy (e.g., chocolate bars) snacks which they received at a designated time one week later when they were either hungry or satiated. Half of the participants made their advance choice in a hungry state, the other half in a satiated state. Directly before participants received the chosen snack at the designated time one week later, they were asked to remake their choice, but they did not know about this option at the time of their advance choices. Read and Van Leeuwen (1998) found that advance choices were indeed influenced by anticipated future levels of hunger. People who expected to be hungry next week chose unhealthy snacks more often than people who expected to be satiated. However, consistent with projection bias, advance choices were also affected by current levels of hunger. People who were currently hungry chose unhealthy snacks more often than those who were currently satiated. The authors therefore conclude that people erroneously projected their current tastes onto the future.

Similarly, in an experiment with smokers, Sayette et al. (2008) elicited participants' willingness to accept cigarette craving (WTAC) in a second, future session. Participants knew that they would be in a high-craving state during this second session (i.e., nicotine-deprived for at least twelve hours prior to the second session). When participants stated their WTAC, some were in the same high-craving state as in the second session and some were in a low-craving state (i.e., having smoked as usual prior to the session). During the second session, however, participants were offered a surprise possibility to revise their initial WTAC. The main results were that participants who stated their first WTAC in a high-craving state did not significantly alter their WTAC in the second session. In contrast, participants who stated their first WTAC in a low-craving state significantly increased their WTAC in the second session. Again, those results are consistent with projection bias and the authors conclude that participants in a low-craving state systematically underpredicted their urge to smoke in a high-craving state.

Our main caveat with these studies is that the intentions of participants at the time of making their advance choices remain unknown. Did participants indeed aim to please their future tastes, as assumed in those previous studies? Or did they know their tastes in a different, future state quite well, but simply disagree with them? Again, in all previous studies, participants were led to believe that their advance choices would count. After all, those choices might have been an attempt by participants to impose a better judgment on themselves in a different state. Such an imposition, however, was not enforced by the experimenters. Hence, the mere divergence of choices between different states need not mean that people mispredicted their preferences. They may have simply disagreed with them.<sup>5</sup>

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<sup>5</sup>The same argument applies to empirical studies on projection bias. For instance, Conlin, O'Donoghue and Vogelsang (2007) found behavior consistent with projection bias in catalog orders of cold-weather items: the colder the weather on the order date, the more likely was a return of that item once it was received. Likewise, Busse et al. (2014) found that buying decisions of convertibles or four-wheel-drives was affected by the weather



Interestingly, Sayette et al. (2008) also measured participants self-reported urge to smoke. Specifically, participants were asked to report their current urge to smoke in each session as well as their anticipated urge during the second session. Sayette et al. (2008) found that participants who were in a low-craving state did not do significantly worse in predicting their future urge to smoke during the second high-craving session than participants who were already in a high-craving state during the first session. The observation that participants in a low-craving state still demanded lower WTAC may therefore indicate that they understood, but did not agree with their tastes in a high-craving state.

As outlined in Section 2, one way to disentangle participants' intentions during their advance choices is the provision of an explicit commitment device. If participants aim to please future tastes, they should not commit themselves to their advance choices as long as other forms of time inconsistencies, such as a present bias, are excluded. In order to rule out commitment as a means to fight an anticipated present bias, we chose an experimental setup where each participant made two advance choices, each in a different state. In the first state, participants had the option to promote their first advance choice at the expense of their second advance choice. Thus, the first planner could use a commitment option against the second planner if they viewed things differently and the first planner was aware of that disagreement. In such a framework, commitment is informative since it reveals participants' intentions during their advance choices and allows of a distinction between projection bias and conflict of selves.

## 4 Design

Subsequently, we explain the design and procedure of our experiment. The experimental setup required participants to be informed of the entire procedure prior to their first decision. Neither deception nor any surprises were involved in the experiment.

### Course of Experiment

The course of the experiment and implemented treatments are depicted in Figure 1. The experiment took place over four consecutive Mondays. Every participant had to attend one session each Monday. Sessions on the first and last Mondays took place at the experimental laboratory of the Max Planck Institute of Economics in Jena, Germany. Sessions on the second and third Mondays were conducted online and participants could take part in those sessions from home or wherever they had Internet access.

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condition on the day of the purchase. Both of these studies seem to demonstrate that people systematically projected their current tastes onto the future. However, the findings of both studies could alternatively be captured in a multiple-selves framework as explained above.

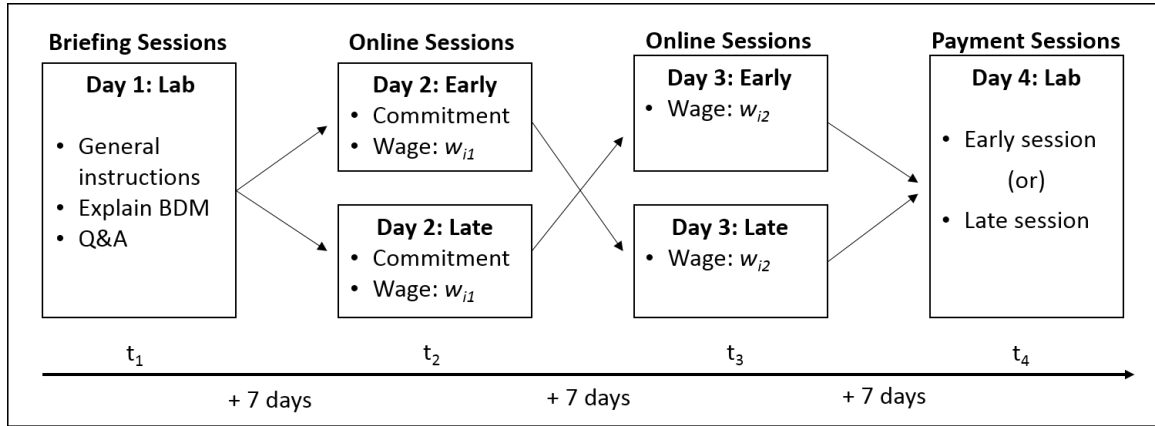


Figure 1: Course of experiment

Sessions on the first Monday were used for general instructions and questions (*briefing sessions* in the following). Sessions on the last Monday were used for payment of our participants (*payment sessions* in the following). There were two payment sessions: one between 6:15 and 7:15 a.m. (*early payment session* in the following), and one between 12:00 and 4:00 p.m. (*late payment session* in the following). Each participant had to come to exactly one payment session. Whether this was the early or late payment session was announced at the end of the second online session (i.e., on the third Monday of the experiment).

Participants who had to show up to the late payment session earned a fixed amount of 10 Euros for attending the experiment. Participants who had to show up to the early payment session earned between 0 and 40 Euros. Participants who came too early had to wait until the relevant time frame started. Participants who came late were sent away without payment. Participants who did not show up at the laboratory during the relevant time frame did not earn anything from the experiment. In both payment sessions, participants collected their earnings without making any further decision. Thus, once a participant was paid, he or she could leave the laboratory immediately.

## Decisions of Participants

All relevant decisions were made during the online sessions (i.e., on the second and third Monday). In each online session, participants were asked about their reservation wage for coming to the early instead of late payment session. We employed the Becker, Degroot and Marschak (1964, “BDM”) mechanism to elicit participants’ reservation wages. That is, participants had to state the minimum payment in Euros (a whole number between 0 and 41) they wanted to receive for coming to the laboratory during the early instead of late payment session. For each participant, the minimum payment was compared to a random number drawn from a discrete uniform distribution between 0 and 40. If the random number was equal to or higher than the

minimum payment, the relevant participant had to come to the early payment session and his or her earnings were equal to the random number. If the random number was smaller than the minimum payment, the relevant participant had to come to the late payment session and his or her earnings were the fixed amount of 10 Euros.<sup>6</sup>

Since all participants had to attend two online sessions, they were asked for their reservation wage twice. For each participant, one of the two reservation wages was chosen at random to be relevant in the BDM procedure. Participants could, however, decide whether the reservation wage from their first or second online session would be more likely to be relevant. Specifically, they could choose between the following two options: (i) the reservation wage from the first online session will be relevant with probability 0.8, or (ii) the reservation wage from the second online session will be relevant with probability 0.8. This decision was made once, namely during participants' first online session prior to stating their first reservation wage.

Notice that this decision granted each participant a stochastic commitment device.<sup>7</sup> Assigning probability 0.8 to the second reservation wage is the no-commitment or flexibility option, where a participant postpones the decisive decision to the second online session. Assigning probability 0.8 to the first reservation wage, on the other hand, is the commitment option, where a participant prepones the decisive decision to the first online session.<sup>8</sup> The stochastic commitment device ensures incentive-compatible statements of reservation wages in both online sessions, independent of the commitment choice.

## Treatments

The online sessions took place within two different time frames: either between 5:00 and 7:00 a.m. (*early online session* in the following) or between 10:00 a.m. and noon (*late online session* in the following). Each participant had to attend in one early and one late online session. We implemented two treatments. Half of the participants had to do the early online session first and the late online session the following week (*Early-Late* treatment in the following). The other half of the participants had to do the late online session first and the early online session the following week (*Late-Early* treatment in the following).

One day prior to each online session, participants received an e-mail with a personalized link to take part in the session. The link was only enabled during the relevant time frame on the following day. Participants were, of course, informed or reminded about that time frame

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<sup>6</sup>Thus, reservation wages were truncated at 0 and 41. A minimum payment of 0 made sure that the participant had to come to the early payment session. A minimum payment of 41 made sure that the participant had to come to the late payment session.

<sup>7</sup>To the best of our knowledge, a stochastic commitment device was first implemented in Uhl (2011) and also used in, e.g., Augenblick, Niederle and Sprenger (2015).

<sup>8</sup>In the experiment, the two options were presented neutrally, without any labels. Also, on the computer screen, the flexibility option was always presented above the commitment option.

in the e-mail containing the link.<sup>9</sup> During an online session they could progress at their own pace. On average, it took participants approximately 5 minutes for the first and 2.5 minutes for the second online session. However, a session had to be finished within the specified time frame. Participants who failed to do so were excluded from the experiment and did not earn anything.

## Briefing sessions

There were six 30-minute briefing sessions with approximately 32 students in each. All briefing sessions took place in the afternoon of the first Monday of the experiment. In those sessions, each participant received written instructions about the general procedure of the experiment and, as usual, the instructions were read aloud.<sup>10</sup> Participants were reminded that they have to attend one session on each of the three upcoming Mondays to be eligible for their earnings. However, they were not informed about the exact time of those sessions. They only knew that they would be informed about the time of the first online session in an e-mail one day prior.

In addition, the instructions informed participants that the experiment was to perform one of two tasks. The specific tasks would be outlined at the beginning of the first online session. In the briefing sessions, the two tasks were labeled neutrally as task A and task B. Participants were told that they would receive a fixed amount of 10 Euros for performing task A and a random amount between 0 and 40 Euros for task B. Moreover, they were informed that they would be asked about their minimum payment for doing task B instead of task A. The implemented BDM procedure was explained to them carefully and at length. In addition, the BDM procedure was demonstrated several times with a real urn containing numbered balls from 0 to 40 and hypothetical tasks A and B. Afterwards, participants could ask questions which were answered publicly. Once all questions were answered, the briefing session was over.

## Procedural details

Participants were students of all majors from Friedrich Schiller University and the University of Applied Sciences in Jena, Germany. Students were invited via ORSEE (Greiner, 2004). The invitation e-mail made clear that payment for the experiment required participation in four sessions. The invitation only specified the date of each session. Since we wanted to reduce selection effects as much as possible, they were not informed about the exact time of the sessions on the second, third and fourth Monday. Students were informed, however, that they should

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<sup>9</sup>One day prior to their first online session, participants learned of the time frame for the first time in the e-mail. One day prior to their second online session, participants were only reminded of the time frame in the e-mail, because they were informed about the entire procedure of the experiment at the beginning of the first online session.

<sup>10</sup>Instructions and screens used in the experiment are available from the authors upon request.

only participate in the experiment if they had no appointments before noon on each day of the sessions.

Besides possible selection effects when inviting participants, we were also concerned about the drop-out rate.<sup>11</sup> To reduce the drop-out rate, we added a lottery draw for all participants who took part in a session on each of the first three days of the experiment. Out of all participants, five were randomly selected to win an additional prize of 50 Euros each.<sup>12</sup> The lottery draw was announced in the invitation e-mail.

In total, 188 students took part in the briefing sessions. We had seven drop-outs before the first online session (five in treatment Early-Late and two in Late-Early) and another five before the second online session (two in treatment Early-Late and three in Late-Early). Thus, from 188 students who started the experiment, 176 completed both online sessions which is a drop-out rate of only 6.4%. The mean age of those 176 students was 24.5 years, roughly 41% of them were male and the average payment was approximately 20 Euros (excluding the lottery win of 50 Euros for five participants).<sup>13</sup>

## 5 Hypotheses

The hypotheses cover two types of decisions. First, hypotheses regarding reservation wages for coming to the early instead of late payment session are presented. Second, expected commitment choices in the first online session are discussed.

Regarding reservation wages, two things are important to note. First, the experimental procedure assured that potential present-biased preferences could not affect reservation wages. Participation in the online sessions was mandatory and, in each online session, participants were asked for their future value of getting up early (where future refers to the last day of the experiment). Thus, the elicitation of reservation wages did not involve any kind of investment problem where discounting might have played a role.<sup>14</sup> Second, since reservation wages were the

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<sup>11</sup>However, notice that drop-outs will be most likely those students who have a problem with getting up early. Thus, if we had a high drop-out rate, we may have ended up with a sample of pure early birds. Each drop-out from our experiment would therefore bias the results against a conflict of selves.

<sup>12</sup>Since all relevant decisions were made during both online sessions, we were only concerned with drop-outs until the third day of the experiment (i.e., the day of the second online session). Whether participants actually collected their payments on the fourth day of the experiment was of no peculiar interest. Also, we did not want to introduce an additional incentive for coming to the payment session besides their wage for performing the relevant task. It was therefore made clear to the participants that they could receive the lottery draw prize even if they did not come to the payment session.

<sup>13</sup>Of those 176 students, eight did not come to the payment sessions to collect their earnings (five in treatment Early-Late and three in treatment Late-Early).

<sup>14</sup>Again, both payment sessions took place on the same day: the early payment session between 6:15 and 7:15 a.m.; the late payment session between 12:00 and 4:00 p.m. So, there was a time lag of a few hours between both payment sessions. Time preferences were of no relevance for the elicitation of reservation wages as long as participants ascribed both payment sessions to one and the same consumption period. Considering that the online sessions took place one and two weeks prior to the payment sessions, we think this assumption is

minimum payment for coming to the early *instead* of late payment session, they were composed of the fixed amount of 10 Euros for coming to the laboratory during the late payment session and a mark-up for doing this task early morning.<sup>15</sup> On the last day of the experiment, however, participants could no longer choose whether they want to come to the early or late payment session. The relevant payment session was determined and announced at the end of the second online session. Thus, on the last day of the experiment, participants could only choose between collecting their earnings during the relevant time frame or not coming at all and being paid nothing. Stated reservation wages were therefore not necessarily equal to the minimum payment required for coming to the early payment session *per se*. For instance, a participant may demand 20 Euros for coming to the early instead of late payment session. But the same participant may be willing to come to the early payment session for less than 20 Euros if the late payment session is no longer available. This design feature enabled an observation of a conflict of selves, where one planning self imposes a lower mark-up for getting up early, knowing that the future, performing self will still come to the early payment session once the late payment session is excluded from the choice set. For a model of projection bias, this is of no relevance since the planner would always try to predict the desired compensation for getting up early on the last day of the experiment.

## Reservation wages for coming to the early payment session

All of the following hypotheses are based on the premise that we successfully induced state-dependent preferences. In the experiment, we made use of the natural fluctuation of fatigue and assumed that people value sleep differently depending on the time of day. Specifically, we assumed that people have a greater desire for sleep in the early morning, when they are fatigued, than in the late morning, when they are rested. Our prediction therefore was that people would, on average, state higher reservation wages for coming to the early payment session when they are asked early compared to late morning. The best way to test this conjecture is comparing average reservation wages of the first online sessions between the Early-Late and Late-Early treatments. Here, we look at treatment differences between the first online sessions only, because average reservation wages of the second online sessions may be confounded by anchoring. Our first hypothesis, where  $w_1$  denotes the average reservation wage in the first online session of either the Early-Late or Late-Early treatment, therefore is:

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innocuous.

<sup>15</sup>The mark-up can be positive, negative or equal to zero. A participant who prefers the late over early payment session should state a reservation wage greater than 10 Euros (i.e., a positive mark-up). A participant who prefers the early over late payment session should state a reservation wage less than 10 Euros (i.e., a negative mark-up). And, a participant who is indifferent between the early and late payment session should state a reservation wage of precisely 10 Euros (i.e., a mark-up of zero).

**H1 (State dependency between participants):**  $w_1(\text{Early-Late}) > w_1(\text{Late-Early})$

Note that this hypothesis is about state-dependent behavior, not only about state-dependent preferences. Participants may have state-dependent preferences regarding sleep even if reservation wages between early and late sessions do not differ. This may be the case if participants have neither a projection bias nor a conflict of selves. They would thus aim to please their future tastes (i.e., their desire for early-morning sleep on the last day of the experiment), which they predict correctly, on average. If, however, we find that average reservation wages differ between early and late sessions, then participants must have state-dependent preferences *and* be exposed to either a projection bias or a conflict of selves.

A second way to test for state-dependent behavior is by comparing reservation wages between the first and second online sessions of treatment Late-Early. Here, too, the prediction was that participants state higher reservation wages for coming to the early payment session when they are asked in the early compared to the late morning. However, this is a more conservative test of state-dependent behavior since anchoring is likely to play a role when participants state their reservation wages again in the second online session. Nonetheless, our second hypothesis, where  $w_{i1}$  and  $w_{i2}$  denote the reservation wages of participant  $i$  in the first and second online sessions of treatment Late-Early, is:

**H2 (State dependency within participants):**  $w_{i1}(\text{Late-Early}) < w_{i2}(\text{Late-Early})$

Like H1, H2 is in line with both projection bias and conflict of selves. In the case of projection bias, a systematic increase of reservation wages from the late to early online sessions is caused by an underestimation of participants' desire for early-morning sleep when they are asked in the late morning. Of course, getting up early should be a common experience for most participants. But stating a minimum compensation for getting up early may be an unusual task. Therefore, participants may systematically underestimate their desired mark-up for getting up early when they are asked in the late morning. On the other hand, when they are asked in the early morning, their estimated minimum compensation for getting up early on the last day of the experiment should be more accurate since the present and future are characterized by similar states of fatigue. In the case of conflict of selves, a systematic increase of reservation wages from the late to early online sessions would represent a basic disagreement about the mark-up for getting up early between a rested self in the late morning and a fatigued self in the early morning. This disagreement would not be based on a misprediction of the value of early-morning sleep, but rather on a dissent on what that value ought to be.

In treatment Early-Late, on the other hand, projection bias and conflict of selves make conflicting predictions regarding reservation wage differences between the early and late online

sessions. If participants experience a conflict of selves, their reservation wages in the early online session should be higher than those in the late online session, just like in treatment Late-Early. As before, the differences in reservation wages would not be based on a misprediction, but on a dissent about the value of early-morning sleep. However, if participants are exposed to a projection bias, their reservation wages should not differ between the early and late online sessions in treatment Early-Late. As long as a person aims to please future tastes, a projection bias cannot lead to systematic reservation wage differences between the two sessions of this treatment. The reason is that a person with projection bias must be unaware of her current misprediction. However, a participant in the second online session, in the late morning, cannot plausibly be unaware of her current misprediction if she wants to state a different reservation wage than one week previously in the early online session. Such a participant must recognize that the relevant states in the early online session and early payment session were identical (or at least very similar). Therefore, in the second online session, she cannot plausibly hold the belief that her current prediction of the minimum compensation for getting up early is correct while she thinks that she must have been biased in the early online session. After all, she was the expert in “predicting” the value of early-morning sleep in the early online session. Consequently, if a participant in the second online session really aims to please her future tastes, the best she can do is state the same reservation wage as in the first online session. The only reason she may state a different reservation wage is if new information became available after the first online session. But this should not cause a systematic upward or downward correction of reservation wages. Therefore, our third hypothesis, using the same notation as before, is:

**H3.0 (Projection bias):**  $w_{i1}(\text{Early-Late}) = w_{i2}(\text{Early-Late})$

**H3.1 (Conflict of selves):**  $w_{i1}(\text{Early-Late}) > w_{i2}(\text{Early-Late})$

## Commitment Choices

In the first online session, participants had to choose whether their stated reservation wage from the first or second online session would be relevant in the BDM procedure with a high probability. Thus, they could either bind themselves to their first reservation wage or they could choose to remain flexible and postpone the decisive decision to the second online session. Since the consequences of their stated reservation wages only unfolded in a future period (i.e., on the last day of the experiment, a week after the second online session), commitment could not be an attempt to fight an anticipated present bias. In our experiment, commitment is a judgment which a planner in the first online session imposes on another planner in the second online session. Therefore, if participants aim to please future tastes, commitment choices should not be observed in our experiment due to natural uncertainty about exogenous shocks. Participants



have every reason to remain flexible until the second online session to react to new information such as updated appointments. Commitment as a means of a projection-biased planner in the first online session to fight an anticipated misprediction in the second online session is not possible either.<sup>16</sup> As explained above, in treatment Early-Late, participants in the first online session have no reason to be afraid of a misprediction in the second online session. They know that they will recognize during the second online session that their first reservation wage must have been very accurate since the states in the early online session and early payment session were identical. Likewise, in treatment Late-Early, participants in the first online session cannot be unaware of their current misprediction if they believe that they will state a different reservation wage in the second online session. They, too, must recognize that they will be in a better position to judge the value of early-morning sleep during the second online session in the early morning. If anything, participants in treatment Late-Early have an additional reason to natural uncertainty to pass the baton to their expert alter ego during next week's early online session, if they aim to please future tastes.<sup>17</sup>

In contrast, if a conflict of selves underlies behavior, there is a dissent about the value of early-morning sleep between the rested and fatigued selves. If participants are aware of that conflict, they may choose to commit themselves to their first reservation wage even in the face of reduced natural uncertainty at the time of the second online session.<sup>18</sup> In treatment Early-Late, the fatigued self in the first online session fears that the reservation wage of the rested self in the second online session is too low since it values early-morning sleep less. In treatment Late-Early, the rested self in the first online session fears that the reservation wage

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<sup>16</sup>As noted in footnote 4, a projection-biased planner must be unaware of her current misprediction. But the same person may be aware of her future tendency to mispredict.

<sup>17</sup>Even in a situation without recurrent states, unlike in our experiment, commitment of a planner against another planner is difficult to reconcile with the concept of projection bias. Suppose there are three relevant periods with corresponding states  $s_t$  where  $t \in [1, 2, 3]$ . All states are different and no pair of states is more similar to each other than any other pair (i.e., there are no recurrent states). In period 1, a person can order a good which is consumed in period 3. In period 2, however, she can overrule her own choice, unless she explicitly refrained from this option in period 1. Again, projection bias requires that she is unaware of her current misprediction, but she may be aware of her future tendency to mispredict (Loewenstein, O'Donoghue and Rabin, 2003, footnote 13). Commitment in period 1 was in line with projection bias if the person knew in period 1 that she will mispredict her tastes when she can overrule her own choice in period 2. However, this requires that the person in period 1 additionally thinks that she will have forgotten about her misprediction in period 2 when she is predicting in period 2, which seems a bit odd (for a similar remark, see footnote 7 in Conlin, O'Donoghue and Vogelsang, 2007). Alternatively, the person in period 1 may be aware that she will predict differently in period 2 even though she knows in period 2 that she thought in period 1 to be biased in period 2. In other words, she knows in period 1 that she will have a different opinion about her future tastes in period 2. So, there is a dissent about predictions of tastes and the boundary between a "real" conflict of selves becomes very thin.

<sup>18</sup>So, the self in the first online session trades off commitment against flexibility. On the one hand, it values flexibility since there could be exogenous shocks such as updated appointments. On the other hand, it does not agree with the tastes of the self in the second online session. Amador, Werning and Angeletos (2006) study the optimal trade off between commitment and flexibility in a consumption-savings model when people suffer from temptation.

of the fatigued self in the second online session will be too high since it overcharges getting up early. Therefore, if participants are exposed to a conflict of selves, commitment choices should be frequently observed in either treatment. Thus, our fourth hypothesis, where  $P(\text{Commit})$  denotes the proportion of commitment choices, is:

**H4.0 (Projection Bias):**  $P(\text{Commit}) = 0$

**H4.1 (Conflict of Selves):**  $P(\text{Commit}) > 0$

## 6 Results

In the following, we present the results in order of the hypotheses. Table 1 shows average reservation wages in the first and second online sessions of each treatment. In line with H1, reservation wages in the first online session were significantly higher in treatment Early-Late than in treatment Late-Early (18.01 vs. 15.65 Euros). The difference is quite substantial as the required mark-up for getting up early on the last day of the experiment was approximately 42% ( $= 8.01/5.65 \times 100$ ) greater when participants stated their reservation wage early compared to late morning in their first online session. Clearly, participants valued sleep differently depending on the time of day and this state dependency affected their assumed opportunity costs of getting up early on the last day of the experiment. Reservation wages in the second online session did not differ between treatments. But, as mentioned before, those reservation wages are likely to be distorted by anchoring such that a treatment comparison based on the second online sessions should be treated with caution.<sup>19</sup>

The prevalence of state-dependent behavior can be confirmed through a comparison of reservation wages between the first and second online session of treatment Late-Early (H2). As anticipated, participants in this treatment significantly increased their reservation wages from the first to the second online session ( $w_{i1} - w_{i2} = -1.82$ ). Thus, on average, participants valued sleep more in the second online session, in the early morning, and asked for a 32% ( $= 7.47/5.65 \times 100$ ) higher mark-up for getting up early on the last day of the experiment than one week before in the late online session.

So far, the results indicate that participants' behavior displayed state dependency, but it is not yet clear whether this was due to projection bias or conflict of selves. The first test that distinguishes between the two models of behavior is a comparison of reservation wages between the first and second online session of treatment Early-Late. Here, projection bias predicts that

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<sup>19</sup>Some anchoring becomes visible when comparing reservation wages between the second online session in treatment Late-Early and the first online session in treatment Early-Late. Projection bias and a conflict of selves both predict an increase of reservation wages from the first to the second online session in treatment Late-Early. However, reservation wages in the second online session of this treatment are slightly (but nonsignificantly) lower than in the first online session of treatment Early-Late.

Table 1: Reservation wages

|                  | Late-Early |                 | Early-Late |                 | M.W.U.<br>Test | Unpaired<br>t-Test |
|------------------|------------|-----------------|------------|-----------------|----------------|--------------------|
|                  | Obs.       | Mean<br>(SD)    | Obs.       | Mean<br>(SD)    |                |                    |
| 1st session      | 89         | 15.65<br>(6.56) | 87         | 18.01<br>(7.99) | 0.020          | 0.017              |
| 2nd session      | 89         | 17.47<br>(8.20) | 87         | 17.57<br>(7.52) | 0.671          | 0.535              |
| Signed-rank test | <0.001     |                 | 0.022      |                 |                |                    |
| Paired t-test    | <0.001     |                 | 0.017      |                 |                |                    |

*Notes:* The table shows means (standard deviations) of reservation wages in each online session of each treatment (in Euros). The last two columns display p-values of one-sided (according to H1) Mann-Whitney U tests and unpaired t-tests, respectively. The bottom two lines display p-values of one-sided (according to H2 and H3.1) Wilcoxon signed-rank tests and paired t-tests, respectively.

reservation wages would not differ since participants in the second online session should have acknowledged their expertise in estimating the opportunity costs of getting up early during the first online session in the early morning (H3.0). Conflict of selves, on the other hand, postulates reservation wage differences due to a dissent about the value of early-morning sleep between the rested and fatigued selves (H3.1). Note that if anchoring played a role during the second online session, the test is biased against conflict of selves. Nonetheless, Table 1 shows that participants significantly decreased their reservation wages from the first to the second online session in treatment Early-Late ( $w_{i1} - w_{i2} = 0.44$ ). Thus, during the second online session, participants systematically adjusted their previously stated mark-up for getting up early downward, which points to a disagreement about the value of early-morning sleep, not a misprediction.

Further evidence against projection bias and in favor of conflict of selves is revealed in Table 2, where the number (and proportions) of commitment choices in both treatments are shown. Whereas commitment in our experiment was not in line with a model of projection bias, it was in accordance with conflict of selves (H4.0 and H4.1). In both treatments, the majority of participants chose the commitment option (62.9% in treatment Late-Early and 57.5% in Early-Late).<sup>20</sup> The proportions are significantly different from zero and the hypothesis of projection bias has to be rejected. If it was claimed that natural uncertainty played only a negligible role in our experiment, one may hold that projection bias can capture any proportion of commitment choices between 0% (i.e., a strong preference for flexibility) and 50% (i.e., indifference between commitment and flexibility). However, this hypothesis is also rejected based on our data, as the proportion of commitment choices was significantly (marginally significantly) greater than

<sup>20</sup>As mentioned in footnote 8, the flexibility option was always presented above the commitment option on participants' computer screens. Thus, if one of the two options stuck out, it should have been the flexibility option.

Table 2: Commitment choices

|                                   | Late-Early |                    | Early-Late |                    |
|-----------------------------------|------------|--------------------|------------|--------------------|
|                                   | Obs.       | #Commit<br>(Prop.) | Obs.       | #Commit<br>(Prop.) |
|                                   | 89         | 56<br>(0.629)      | 87         | 50<br>(0.575)      |
| $H_0 : P(\text{Commit}) = 0$      |            | <0.001             |            | <0.001             |
| $H_0 : P(\text{Commit}) \leq 0.5$ |            | 0.010              |            | 0.099              |

*Notes:* The table shows the number (proportion) of participants who committed themselves on their first reservation wage in each treatment. The bottom two lines display p-values of binomial tests of the specified null hypotheses.

50% in treatment Late-Early (Early-Late).

In sum, participants' behavior in our experiment exhibited profound state dependency which seemed to be caused by a conflict of selves instead of a misprediction of future tastes. Above all, participants lacked sympathy rather than empathy towards themselves in a different state.

## 7 Conclusion

We conducted a framed field experiment exploiting natural fatigue at different times of the day to investigate whether people's state-dependent behavior is better explained by projection bias or conflict of selves. All participants attended sessions in a fatigued state, in the early morning, and a rested state, in the late morning, with one week in between. We employed two treatments which differed only with respect to the order in which participants experienced those states. In each state, participants were asked about their reservation wage for coming to the laboratory in the early morning instead of later in the day at a fixed future date. Only one reservation wage was relevant for each participant, but in the first state they had to decide which reservation wage should be relevant with a high probability. Thus, in both treatments, participants were offered a commitment device to bind themselves to their decision in the first state. Since the consequences of their stated reservation wages only unfolded on a future date, commitment could not be an attempt to fight an anticipated present bias at the time of their second reservation wage. Instead, commitment in our experiment was the attempt of a first-moving planner to impose a better judgment on a second-moving planner. To the best of our knowledge, we provided the first experiment which tested for a conflict between two planners within one person in contrast to many previous experiments, where commitment was always a device against weak will (see, e.g., Ariely and Wertenbroch, 2002; DellaVigna and Malmendier, 2006; Ashraf et al., 2006).

Deception was not involved at any stage of the experiment. Participants were informed

about the entire procedure prior to making their first choice. Although this setup was likely to induce anchoring to the initial reservation wage, we identified state-dependent behavior within participants in both treatments. The finding that participants who stated their first reservation wage in the early morning systematically adjusted their second reservation wage downward is difficult to align with projection bias. If they aimed to please future tastes, their early-morning valuation of early-morning sleep should have been their obvious best guess such that they had no reason to deviate from their first reservation wage the following week, in the late morning. Furthermore, we found that commitment to the initial reservation wage occurred to a substantial degree in the rested as well as in the fatigued state. However, natural uncertainty about exogenous shocks was resolved during the week between the two reservation wages. Therefore, participants' widespread tendency to self-bind to their initially stated wage can only be explained by their propensity to fight the tastes of a later self. If the participants' aim was to please their future tastes, as projection bias suggests, they had no reason to self-restrict the possibility to adapt to exogenous shocks. It seems then that participants lacked sympathy rather than empathy for their alter ego in a different state. While we are far from claiming that projection bias does not play a role at all in human behavior, the experiment supports our conjecture that state-dependent behavior in daily or recurrent decision situations may rather be caused by a propensity to fight than a misprediction of future tastes.

The results also show that the idea of multiple selves within a person is more than just a metaphor as, for instance, claimed in Loewenstein (1996). In many situations, people may be aware of their state-dependent preferences, but they may not always agree with their tastes in a different state. People then do not aim to please future tastes, but rather try to impose their current preferences on themselves in the future. This imposition of a better judgment seems to exist beyond a mere attempt to fight an anticipated present bias. Since it is the tradition in economics to take preferences as given, there is no normative ground to judge which of those preferences represents *the* self-interest of a person. If one accepts that people have state-dependent preferences and that they do not always agree with their tastes in a different state, a multiple selves approach is the natural model of people's behavior. A priori, it seems arbitrary to declare one self as the genuine or authentic self and grant this one privileged rights over any other self.

According to Elster (1985), one way to identify the authentic self, i.e., the self we should side with as friends or policy makers, may be on grounds of the ability to engage in forward-looking and strategic behavior. For him, there is typically only one self which is capable of acting strategically in binding its later (short-sighted) alter ego. While Read (2006) explicitly agrees with Elster's empirical claim, he notes that it is problematic to infer a self's authenticity from its inclination to commit to its preferences since this view was biased against selves in pleasurable states that are incapable of acting strategically. Schelling, of course, was always

concerned about the difficulty of identifying the authentic self (see, e.g., Schelling, 1984*a,b*). For him, the “question, which is the authentic one, may define the problem wrong. Both selves can be authentic” (Schelling, 1984*b*, p. 9). Our results clearly confirm Schelling’s view. Both selves, the rested and the fatigued, acted strategically and bound their later alter ego. So, both selves are equally authentic, even according to Elster’s criterion.

Cowen (1991) argues that the rational choice approach should move in a similar direction as management science and planning theory which nowadays deemphasize the need for command and embrace self-regulating orders. Successful self-management programs should be no less based on the effective coordination of conflictive desires than firms or economies. According to Cowen, giving up the assumption of asymmetry between selves would be an important step in this direction. Ultimately, our results support this view and cast some doubts on the naturalness with which the new paternalists take sides.

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