Because I (don't) deserve it: Entitlement and lying behavior*

Tilman Fries[†] Daniel Parra[‡]

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Abstract

We study the effect of entitlement on the willingness to lie. We set up a model of lying where individuals feel more or less entitled to their endowment depending on how they earned it. When given the opportunity to lie to keep their endowment, individuals who feel more entitled are encouraged to lie while others are discouraged. To test the model predictions we use a laboratory experiment where we compare the lying behavior of participants endowed with a high endowment and participants endowed with a low endowment. In one treatment, the allocation of the endowment is decided by participants' performance, and in the other, it is determined by a random draw. Our study identifies that deservingness influences lying in an intuitive direction: when participants' performance determines income, those who earn less money lie less than those who earn more. We do not find differences in lying when participants perform the same task but lie to keep windfall endowments.

Keywords: Cheating; Dishonesty; Deservingness; Reference points; Entitlement.

JEL Codes: C91; C79; D91.

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†WZB Berlin Social Science Center, Reichpietschufer 50, D-10785 Berlin; e-mail: tilman.fries@wzb.eu.

‡WZB Berlin Social Science Center, Reichpietschufer 50, D-10785 Berlin; e-mail: daniel.parra@wzb.eu.

1 Introduction

In many situations, people benefit from lying about their private information. For instance, sellers can overstate the quality of a product, taxpayers can under-report their revenues in a tax declaration, and insured people can lie about a claim to their insurance company. This willingness to lie can generate market failures under asymmetric information, as it causes adverse selection (Akerlof, 1970). If people voluntarily tell the truth, these issues can be alleviated. Nevertheless, even if people have preferences for truth-telling (Gneezy et al., 2018; Abeler et al., 2019), truth-telling often comes with some costs, and even relatively moral people might be willing to lie in some circumstances. For example, when selling a used car, a seller might think about all of the many months they spent working extra hours to pay back the car loan. Having their effort in mind may lead the seller to misreport the car's condition when bargaining with buyers because sellers feel they deserve to retain the fruits of their labor.

In this paper, we study whether entitlement to an endowment affects the individual willingness to lie. We derive a model of lying where individuals feel more or less entitled to their endowment depending on how they earned it. We explore the relation between entitlement and lying behavior empirically in a controlled laboratory study that varies the origin of participants' endowments exogenously.

Recent evidence suggests that lying is lower than the neoclassical money-maximizing benchmark would predict (see Rosenbaum et al., 2014; Abeler et al., 2019, for a review of the literature). Consequently, it has been argued that when designing economic institutions, one should consider those institutions that rely on voluntary truth-telling even if they are not incentive-compatible because they might be cheaper and easier to put in place (Abeler et al., 2019). However, such institutions' efficacy will depend on the wider context, as a range of factors, such as social image concerns or loss aversion, influence lying behavior.[1] The role of the endowment origin has received comparatively less attention in the lying literature so far, even though it likely plays a role in many real-life situations. For instance, in a person's income tax declaration, the effort invested into earning the income might influence lying behavior through a feeling of entitlement.[2] In the same vein, a politician might have worked hard to get elected, and therefore feel entitled to their position, making it easier for them to cover-up

[1]For experiments on the connection between social image concerns and lying behavior, see Feess and Kerzenmacher (2018), Gneezy et al. (2018), and Abeler et al. (2019). These experiments show that participants care about how their action is perceived by others and dislike being suspected of lying. Experimental evidence by, e.g., Schwartz Cameron et al. (2008); Grolleau et al. (2016) and Garbarino et al. (2019) suggests that participants are more likely to lie to avoid a loss than to gain extra money.

[2]Existing research recognizes the role of loss aversion in tax compliance but largely neglects the potential impact of entitlement on it. For instance, Engström et al. (2015) and Rees-Jones (2018) present empirical evidence showing that taxpayers, on average, claim more deductions when they have a negative rather than a positive preliminary balance.

their unethical behavior to keep public office. Previous experimental studies cannot assess the impact of entitlement because, in their designs, participants receive windfall endowments.

In this paper, we consider a setting where individuals can lie to keep a part of their endowment that they earned through effort. We derive a model in which the source of the endowment influences lying. Individuals initially receive an endowment that depends on their performance in a task. They then have the possibility to lie to keep part of that endowment. Individuals evaluate their entitlement by comparing the actual final payoff they would obtain from lying and from truth-telling to a reference income. They are assumed to hold meritocratic norms, which we capture by assuming that individuals hold a higher reference income if they think that they performed relatively well in the task. If they get paid less than their reference income, individuals will incur a psychological cost because they are upset or disappointed at receiving less than they feel entitled to. On the contrary, if individuals receive more money than they think they deserve, they feel guilty because, as judged by their norms, they are not deserving of the extra money.

In our model, individuals actively seek to avoid disappointment and guilt, and these feelings influence lying decisions. An individual gains an extra incentive to lie if lying provides them with a payoff that is closer to their reference income, whereas an individual with a relatively low reference income is discouraged from lying because lying would provide them with more money than they think they deserve. If individuals strongly care about receiving their deserved income, top performers might lie more than bottom performers even if they already received a higher initial endowment. This intuitively happens because the entitlement concerns follow meritocratic norms, and the initial differences in endowments might not reflect performance differences accurately enough.

We set up an experiment of cheating in a loss context to test the model's predictions. In the experiment, we disentangle entitlement concerns from income effects and loss aversion. The possibility of manipulating the endowment's source allows us to establish a causal relation between entitlement and lying. Our experimental design has two treatments, the main treatment (DESERVE) and the control treatment (CONTROL), in which we vary the connection between participants' effort and endowment. In both treatments, participants have to perform two tasks. In the first task, they have to encrypt words (Benndorf et al., 2014). In DESERVE, those among the top half of performers in the encryption task receive a high endowment. In contrast, participants among the lower half of performers receive a low endowment. The second task follows the Fischbacher and Föllmi-Heusi (2013) paradigm. Participants have to report the outcome of a six-sided die that is rolled in private. Then, from an envelope with their first task's earnings, they have to return the value in euros equal to their reported number.

To analyze the lying behavior of more deserving and less deserving people, we first compare participants with a low endowment and participants with a high endowment in DESERVE. Then, to rule out competing explanations of the results in DESERVE, we use CONTROL, where we remove the connection between participants' performance and endowment. In particular, in CONTROL, participants face the same two tasks as in DESERVE, but we disconnect both tasks by randomly allocating envelopes with either low or high endowments before the die roll task. We also inquire whether participants lie more to keep money that they earned through effort rather than luck.

The experiment results show that when participants' performance determines their endowment, those who receive the low endowment lie less than those who receive the high endowment. The effect we estimate amounts to -0.22 standard deviations, which is a meaningful quantitative effect when compared to treatment effects found in previous cheating experiments. For example, the effect is about twice the size of the treatment effect of going from an observed to an unobserved lying game, as reported by Gneezy et al. (2018).

Comparing lying behavior across treatments, the results are more mixed. On the one hand, we find that top performers in DESERVE on average do not lie more than participants who receive a random endowment. On the other hand, we find that bottom performers in DESERVE lie less than participants who got a random endowment. The difference in lying behavior between treatments thus seems to be driven by non-deserving participants, who are less willing to lie. Our results suggest that deservingness influences lying behavior because it creates an entitlement concern that makes lying more costly for the low-performing group. Our results are in line with our model and particularly stress the role of guilt in shaping entitlement concerns.

We organize the rest of the paper in the following way: In section 2, we present the main literature related to our topic and outline our contribution to it. In section 3, we develop our benchmark model in which we study the relation between entitlement concerns and lying behavior. In section 4, we present our experimental design, where we include our hypotheses concerning lying behavior and the experimental procedures. In section 5, we present the main results of the experiment and rule out potential explanations other than deservingness. Finally, in section 6, we present our conclusions of the experiment and its relation with our theoretical model.

2 Related Literature

Our study contributes to three main branches of literature. First, our paper relates to the research concerning the entitlement effect created by an earned endowment. Cherry et al. (2002) and List (2007) show that proposers become more selfish in the dictator game when they earned their endowment. This result has been replicated by Oxoby and Spraggon (2008), who also show that dictator giving becomes more generous when receivers work for the dictator's endowment. Recently, Kassas and Palma (2019) show that the entitlement effect can arise relatively subtly. In their experiment, the role of dictator and receiver is allocated by whoever rolls the higher number on a die. In one treatment, subjects simply roll a die that was assigned to them. In a further treatment, subjects can choose the physical size of the die and the location they roll it to, which creates strong enough entitlement concerns for winners to reduce dictator giving even though the role allocation was random in both treatments.

Results in the ultimatum game have been more mixed when participants compete for the proposer role. Although Hoffman et al. (1994) initially show that proposer behavior becomes less generous, this result has been put to question in a recent study by Demiral and Mollerstrom (forthcoming), who fail to replicate the original results. The combined evidence from Cherry et al. (2002), Frohlich et al. (2004), List (2007), Cappelen et al. (2007), Oxoby and Spraggon (2008), and Barr et al. (2015) suggests that, in variants of the dictator game and ultimatum game, many subjects follow a meritocratic norm and allocate money proportional to effort. In this paper, we present experimental evidence showing the earned endowment effect in the lying domain.

Second, our paper contributes to the literature on lying (Shalvi et al., 2011; Fischbacher and Föllmi-Heusi, 2013; Kajackaite and Gneezy, 2017; Gneezy et al., 2018; Abeler et al., 2019), specifically, the study of lying in loss domains. Schwartz Cameron et al. (2008), Grolleau et al. (2016), and Garbarino et al. (2019) present evidence that suggests that loss domains may increase the willingness to lie given that loss aversion is present, a result that has not been found by Charness et al. (2019), who also study loss aversion in a lying setting. Our experimental design does not test the impact of loss frames in lying directly, yet it disentangles pure loss aversion from entitlement. We vary the source of the endowment exogenously; in one case, the endowment is determined by luck and in the other by effort. This design allows us to assess the impact of entitlement on lying, controlling for income, loss aversion, social preferences, and ability.

Third, further closely related papers are concerned with the relation between effort provision and cheating. Mazar et al. (2008) study how much people lie about their performance in a matrix task, and Gravert (2013) reports results from an experiment in which participants are more willing to steal money after absolving a matrix task than after rolling a die. Kajackaite (2018) presents a laboratory experiment in which participants have to report the outcome of a random draw or a matrix task and finds that lying is more pronounced when subjects lie about luck rather than effort. In our experiment, participants can only lie about a random draw. The role of the real effort task is to determine the endowment in DESERVE and thus to create the entitlement in this treatment. Therefore, unlike previous research, our setting assesses the causal effect of exerted effort on lying to keep earned money instead of lying about effort or stealing after exerting effort. Our experiment allows us to investigate the treatment effect of entitlement (how is lying about earned income different from lying about luck?) and the intensive effect of entitlement (do participants who performed better in the effort task lie more than participants who fared worse?). Related questions were independently explored by Grundmann (2020), whose experiment shares some of our design features. In her experiment, subjects are repeatedly endowed with an income and they can cheat to reduce their tax rate. Although the experiment also varies whether the size of income is based on performance or luck, her setting focuses on distributive justice and redistribution in a tax environment; in contrast, ours exclusively focuses on the relationship between meritocratic norms and the endowment origin. In particular, in her experiment, cheating affects public good provision in a group, whereas in our experiment, cheating only affects the participant's payoff.

3 Model

We formally investigate the effect of entitlement concerns on lying behavior in a simple binary lying game as in Abeler et al. (2019). We introduce entitlement concerns into the lying game using the framework developed by Gill and Stone (2010, 2015), who study the impact of entitlement concerns on real effort provision in tournaments and group tasks. Their theoretical framework's key innovation is that they endogenize entitlement feelings, which are the result of a game between agents.[3] In what follows, we provide an adaption of the framework developed by Gill and Stone (2015) to a lying environment.

3.1 Setup

Consider a population that consists of a continuum of individuals of size one. Individuals draw a state x (e.g., by flipping a coin or rolling a die), which can either be $\hbar$ or ℓ with equal probability. They then send a report $r \in \{\ell, \hbar\}$. When the report differs from the draw ($r \neq x$), the individual is a liar, while they are honest otherwise. Reports are associated with monetary outcomes. In particular, when reporting ℓ, individuals incur a material loss of size π. We normalize the material loss of reporting $\hbar$ to zero. Reporting ℓ is more costly than reporting $\hbar$ ($\pi > 0$).

Lying is costly for individuals who might be morally inclined to telling the truth. We

[3]To the best of our knowledge, theirs is the only framework that formally models relative entitlement concerns. An alternative theoretical approach would be to model individuals who are inequality averse net of effort costs. Gill and Stone (2015) show that their model nests this alternative as a special case. Grundmann (2020) presents a model where entitlement decreases lying costs of all individuals independently of their relative deservingness, compared to a setting without entitlement.

assume that individuals suffer a fixed cost c whenever their report differs from their draw. Individuals are heterogeneous in their lying cost, which is drawn from a cumulative distribution function $F(c)$ that is strictly increasing with full support on $[0, \infty)$.

We capture entitlement concerns in the model by assuming that individuals are endowed with an initial income y and a performance belief ρ. The initial income depends on their performance in a tournament. The top half of performers receives endowment y_τ, and the bottom half receives y_β, with $y_\tau > y_\beta$; top performers get paid more than bottom performers. Individuals hold performance beliefs about their relative rank in the tournament. Throughout this section, we work with ranks that are normalized between zero and one, with $\rho = 0$ being the bottom rank, $\rho = 1$ the top rank, and $\rho = \frac{1}{2}$ the middle rank. Individuals form their rank belief conditional on being within the top or bottom half of performers. We make the further simplifying assumption that rank beliefs follow a uniform distribution; individuals with income y_j draw a rank belief from $U[\underline{\rho}_j, \bar{\rho}_j]$, where $[\underline{\rho}_j, \bar{\rho}_j] = [0, \frac{1}{2}]$ if $j = \beta$ and $[\underline{\rho}_j, \bar{\rho}_j] = [\frac{1}{2}, 1]$ if $j = \tau$.

Individuals use their performance belief to form a reference point μ, which denotes the level of income they deem fair or deserved (and which will be endogenized below).

Assuming risk neutrality and that payoffs are additively separable, the utility function becomes:

$$u(r, x, c, y_j, \mu) = y_j - 1_{r=\ell}\pi - 1_{r \neq x}c - D(y_j - 1_{r=\ell}\pi, \mu).$$

In the equation above, $y_j - 1_{r=\ell}\pi$ denotes the material utility associated with making report r, $1_{r \neq x}c$ measures the lying cost and $D(y_j - 1_{r=\ell}\pi, \mu)$ is the entitlement payoff. We will refer to the function D as *desert function*. To capture the different forms that entitlement feelings can take, desert is a piecewise linear function of the form

$$D(y_j - 1_{r=\ell}\pi, \mu) = \begin{cases} \lambda|y - 1_{r=\ell}\pi - \mu| & \text{if } w - \mu < 0 \\ \gamma|y - 1_{r=\ell}\pi - \mu| & \text{if } w - \mu \geq 0. \end{cases}$$

In situations where individuals receive less than their reference point, we say that they experience disappointment. Conversely, we say that individuals experience guilt if they receive more than their reference point. The utility weight of disappointment and guilt is captured by two non-negative parameters, λ and γ, respectively. Note that the entitlement term enters the utility function negatively and is therefore always maximized when individuals earn precisely as much as they feel entitled to (i.e., if $y - 1_{r=\ell}\pi = \mu$). When individuals receive less than their reference point, they have to bear a disappointment cost, which reflects the psychological cost of being upset when not earning as much as one deems deserved. When individuals receive more than their reference point, they bear a cost of guilt because they feel bad for earning more than they think they deserve.

Reference point function How do performance beliefs map into reference points? We employ a simple parametric version of the reference point as a function of performance beliefs and expected average earnings $\bar{y}^e$;

$$\mu(\rho, \bar{y}^e; \alpha) = [2\alpha\rho + (1-\alpha)]\bar{y}^e,$$

where α is a number between zero and one. The reference point function has some notable characteristics that capture the properties of meritocratic entitlement considerations. First, individuals who hold higher beliefs about their performance feel entitled to a higher income and the reference income increases in the belief about expected average earnings ($\frac{\partial\mu(\rho,\bar{y}^e;\alpha)}{\partial\rho}, \frac{\partial\mu(\rho,\bar{y}^e;\alpha)}{\partial\bar{y}^e} > 0$). The function also implies that individuals who think they hold the average rank also want to claim the average income ($\mu(\frac{1}{2}, \bar{y}^e; \alpha) = \bar{y}^e$). Taken together, these two properties capture the "each according to their abilities" tenet of meritocratic norms and is formulated in a similar form in Gill and Stone (2015).[4]

The α parameter measures the intensity of meritocratic considerations. If $\alpha = 1$, individuals make their deserved income strongly dependent on performance. In this case, for example, an individual who thinks they were the worst and accordingly holds a rank belief $\rho = 0$ does not consider themselves deserving of any income. In the other extreme case, when $\alpha = 0$, individuals are perfectly egalitarian and all feel deserving of the same, average, income. Intermediate values of α represent cases where individuals' reference point depends on their performance, and where they become more accepting of inequalities based on performance as α increases.

3.2 Discussion of the Model

This section discusses some of our modeling choices before we proceed with the equilibrium analysis.

We consider a binary lying game even though in our experiment we employ a die roll task; probably the most common task to measure lying in experiments. Adding more states would not qualitatively change the analysis. In most lying models, the lying cost mainly affects the extensive margin (whether to lie or not) and has little effect on the intensive margin (how much to lie). Thus, the binary lying game can be seen as a reduced-form version of a more general model with fixed lying costs where we abstract, for analytical convenience, from further factors that plausibly influence the lying decision. Such further factors might include an aversion to

[4]They assume the reference point increases in the own effort provided and that it equals exactly the average payment if everyone provided the same effort.

being suspected of lying or a lying cost function that is increasing in the size of the lie. These further additions would lead to qualitatively similar insights as long as we maintain the assumption that the entitlement payoff enters the utility function additively separable (see Gneezy et al. (2018) and Khalmetski and Sliwka (2019) for more general models).[5]

We assume that individuals use meritocratic principles to form a reference point. Meritocratic entitlement posits that individuals are, to some extent, responsible for their behavior; individuals who perform better can thereafter more easily claim a higher deserved income. This fairness motive is in line with liberal egalitarian morals, which describe a large part of behavior in experimental distribution games (Cappelen et al., 2007). In the model, individuals endogenously form a reference point by asking themselves what amount of personal income would be just, given others' earnings and their own relative performance. This results in a game among many individuals, as individuals have to predict each others' behavior to derive an estimate about expected earnings. The endogenous reference point distinguishes the model from other models of reference-dependent preferences with exogenous reference points. The model is also different from models with endogenous reference points, like expectations-based loss and disappointment aversion, which generally require equilibrium concepts where individuals play games against themselves (see O'Donoghue and Sprenger, 2018, for a discussion of equilibrium concepts for loss and disappointment aversion).

In the model, individuals dislike receiving a material payoff that differs from their reference point. Based on the direction of the difference, the entitlement payoff is driven by either disappointment or guilt. Some evidence supporting the assumed structure comes from psychology. Feather and McKee (2009) and Feather et al. (2011) show that disappointment is amongst the most strongly rated emotions individuals experience after an undeserved negative outcome (as when receiving less than deserved) and that guilt is amongst the most strongly rated emotions individuals experience after an undeserved positive outcome (as when receiving more than deserved). Guilt in the model is best understood as a moral emotion (Tangney et al., 2007); a "pang of conscience" that individuals experience after transgressing a norm. There are a number of papers showing that disappointment after an undeserved negative outcome can have important economic consequences in other domains. For example, using observational data from New Jersey, Mas (2006) shows that disappointed police officers reduce their work effort in the months after losing an appeal for a higher wage. Hart and Moore (2008) show that entitlement and feelings of disappointment can explain why contracts are often rigid in dimensions where parties might feel entitled to (such as wage) but less rigid in other dimensions.

[5] Dufwenberg and Dufwenberg (2018) also provide a model with many states, but without intrinsic lying costs, and as such it is not directly comparable.

3.3 Equilibrium

The equilibrium payoffs depend on beliefs about average incomes. This makes the game a *psychological game* as defined by Geanakoplos et al. (1989) and Battigalli and Dufwenberg (2009) (in psychological games, beliefs are directly payoff relevant). We will focus on perfect Bayesian equilibria. In the online appendix, we further show that no individual will lie after drawing $\hbar$ as long as we assume that $\gamma < 1$. The following analysis maintains this assumption, which leads to equilibria where individuals might lie and report $\hbar$ after drawing ℓ to avoid a material loss and where all individuals are truthful after drawing $\hbar$.

Entitlement concerns make individuals feel guilty from lying whenever $\mu(\rho, \bar{y}^e) < y_j$. As the reference point increases in the performance belief, individuals with a given income y_j switch from feeling guilty to feeling disappointed from lying as their performance belief increases. Therefore, we have different belief thresholds for top and bottom performers. We can define them formally as critical beliefs $\rho_{1,j}$, $\rho_{2,j}$ that are solutions to the equations

$$\mu(\rho_{1,j}, \bar{y}^e) = y_j - \pi$$
$$\mu(\rho_{2,j}, \bar{y}^e) = y_j.$$

Individuals who drew ℓ with a belief smaller than $\rho_{1,j}$ feel guilt from lying and truth-telling: As lying moves their income further away from the reference point, entitlement discourages them from lying. Individuals with a medium belief between $\rho_{1,j}$ and $\rho_{2,j}$ feel guilt from lying and disappointment from truth-telling. Individuals with a belief higher than $\rho_{2,j}$ feel disappointed from truth-telling and from lying: As lying moves their income closer to the reference point, entitlement encourages them to lie.[6]

We can use the critical beliefs to derive a threshold lying cost function

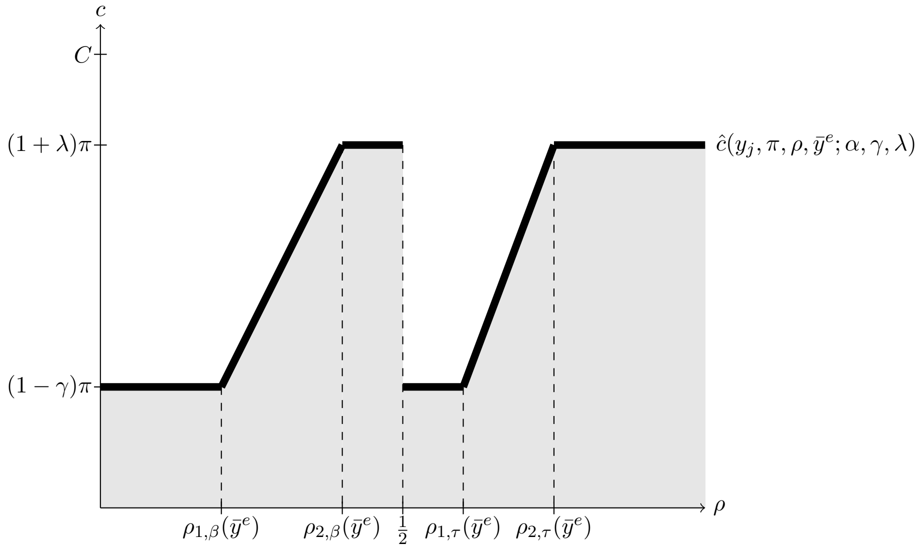
$$\hat{c}(y_j, \rho, \bar{y}^e; \alpha, \gamma, \lambda) = \begin{cases} \pi(1-\gamma) & \text{if } \rho \leq \rho_{1,j} \\ \pi(1+\lambda) - (\gamma+\lambda)[y_j - \mu(\rho, \bar{y}^e; \alpha)] & \text{if } \rho \in (\rho_{1,j}, \rho_{2,j}) \\ \pi(1+\lambda) & \text{if } \rho \geq \rho_{2,j}. \end{cases}$$

Individuals in state ℓ with a lying cost that is weakly smaller than $\hat{c}$ lie, while all other individuals tell the truth.

In the online appendix, we show how to derive equilibria and that they are unique if meritocratic entitlement concerns are not too small. Here, we close the theoretical discussion

[6] Not all belief thresholds must be interior. If α is at least as large as in part (i) of proposition 1, then $0 < \rho_{1,\beta} < 1/2 < \rho_{2,\tau} < 1$. But there can be equilibria where $\rho_{2,\beta} > 1/2$ or $\rho_{1,\tau} < 1/2$. In this case, individuals with the highest beliefs among the bottom performers might not be encouraged to lie or individuals with the lowest beliefs amongst the top performers might not be discouraged. While we discuss the model using the full range of potential entitlement motives, our results carry over to non-interior equilibria.

Figure 1. The threshold lying cost function



by informally discussing three interesting equilibrium behavior features and refer the more theoretically inclined reader to the appendix.

Lying behavior within income groups Figure 1 displays the equilibrium threshold lying function. Individuals will lie if their type falls into the grey-shaded area below the function graph. As the function is increasing within performance groups, individuals become more likely to lie if their performance belief is high relative to that of other individuals in the same income group. Intuitively, individuals with relatively high reference points are less likely to feel guilty from lying and are more likely to feel disappointed with the income they obtain from truth-telling, which then, within top and bottom performance groups, generates a positive relation between performance beliefs and lying. The model predicts that lying will increase the more positive the performance belief within income groups.

Lying behavior across income groups Individuals form entitlement concerns conditional on their income. This can lead to cases where individuals with a belief barely above the middle rank, who thus just made it into the top-performing half, count themselves lucky to have received the high payment and thus are more willing to lose money. Those with beliefs close but below the middle rank feel like they just missed the high income, making them feel entitled to more. Therefore, there will typically be some bottom performers who are encouraged by entitlement to lie and some top performers who are discouraged. Whether top performers are on average more encouraged than bottom performers depends on the extent to which entitlement is meritocratic. This can be seen by taking the derivative of the reference point with respect to α;

$$\frac{\partial \mu(\rho, \bar{y}^e; \alpha)}{\partial \alpha} = (2\rho - 1)\bar{y}^e.$$

The sign of $2\rho - 1$ determines the sign of the whole derivative. Since this term is positive for all $\rho \geq \frac{1}{2}$ and negative otherwise, top performers increase their reference point as α increases while bottom performers decrease their reference point. Meritocratic concerns therefore pull into two different directions, depending on whether individuals performed well or badly. With entitlement concerns that are sufficiently meritocratic, individuals will be dissatisfied with their initial endowment; top performers perceive it as too small and bottom performers feel undeserving of even their small endowment. Therefore, as α increases, top performers lie more and bottom performers lie less. In the appendix, we show that top performers lie more than bottom performers if α is sufficiently large.

Comparison to lying without entitlement concerns Assuming that individuals are loss averse in their entitlement would lead to the prediction that entitlement concerns mainly lead to self-serving behavior: individuals want to lie to avoid the disappointment of earning less, but are relatively less discouraged by guilt to tell the truth when they can earn more than their deserved income. Suppose we instead assume that guilt and disappointment are of similar intensity. In that case, we get the result that relatively good performers are encouraged to lie. In contrast, relatively bad performers are discouraged from lying. This assumption seems relatively reasonable in the entitlement context, because it supposes that individuals want to be morally consistent; if they sometimes feel disappointed because their income is too low, they will sometimes have to concede their undeservingness of a high income to appear credibly moral to themselves and to others.[7]

This discussion highlights the role of the different emotions – guilt and disappointment – that shape entitlement concerns. If both motives guide behavior with similar intensity, entitlement concerns will on average encourage lying among top performers and discourage lying among bottom performers, compared to the case without entitlement concerns.

The model suggests a way on how to think about entitlement and lying behavior. In the next section, we will present the experimental design and hypotheses that rely on theoretical channels highlighted by the model.

4 Experimental Design and Hypotheses

4.1 Deserved Endowment

Our experiment consists of two parts: a real effort task and a die roll game. At the beginning of each session, participants perform an encryption task in which they have to encode a three-

[7]See Falk and Zimmermann (2017) for experimental evidence that individuals have a taste to appear consistent.

letter combination into numbers (Benndorf et al., 2014). Before doing the encryption task for money, all participants take part in a trial period, where they must encrypt ten combinations of words as practice. After the trial period, participants have eight minutes to encrypt as many words as possible. Their earnings in the task depend on their performance relative to other participants in the session.

After the encryption task, we rank participants according to the number of words they encrypted. In the deserved endowment treatment (DESERVE), those who rank among the top half of performers receive an envelope with 15 euros, and those who rank among the lower half of performers receive an envelope with 10 euros.[8] The encryption task's earnings are handed out in envelopes with 1 euro coins immediately after finishing the task. This procedure allows us to generate a stronger sense of entitlement. Participants do not receive any information about their exact rank during the experiment but only get told whether they belong to the upper or lower group of performers.

After receiving the envelope with the money they earned in the encryption task, participants play a modified version of the die roll game (Fischbacher and Föllmi-Heusi, 2013), where they roll a six-sided die in private. After doing so, they are instructed to report the number they got. They lose, from their earned money, the number of euros equal to the number they report. Participants are instructed to return the amount they lost to the experimenter. Thus, the final payoff of participants will consist of the difference between the earnings in the real effort task and the reported die roll.

Arguably, in DESERVE, participants are entitlement concerned because they put effort into getting the money in their envelope. Thus, according to our model, participants with 15 euro envelopes are more likely to be disappointed if they lose money than participants with 10 euro envelopes. Conversely, participants with 10 euro envelopes are more likely to feel guilty when they lie because they are not as entitled to their income. Hence, we hypothesize that the willingness to lie will be lower in the bottom-performance group than in the top-performance group.

Hypothesis 1a. *In* DESERVE*, participants who receive 10 euro envelopes will lie less than participants who receive 15 euro envelopes.*

In addition to the encryption task and the die roll game, we elicit participants' modal beliefs about their rank in the encryption task by paying them 1 euro when they guess their rank correctly. The belief elicitation is made at the end of the experiment, before the post-questionnaire and after participants have completed the real effort and die roll tasks.[9] With

[8] In case of ties at the cutoff rank, we assign all equally ranked participants at the cutoff to the top half of performers.

[9] We elicited beliefs after the lying game, as we did not want to push participants to think about their

this measure, we can assess directly whether the belief about their rank affects the lying decision when the entitlement is present. In particular, we expect that participants who hold more positive beliefs about their performance in the real effort task will lie more and report smaller numbers in the die roll game. Put another way, if relative entitlement concerns are driving the differences between top and bottom performers, those who believe that they, conditional on their income, have a higher rank in the competition will lie more.

Hypothesis 1b. *In* DESERVE*, conditional on receiving the same initial endowment, participants with higher beliefs about their rank will lie more in the die roll game.*

4.2 Control Group

Hypothesis 1a, as such, only provides the insight that deserving the endowment (or not) makes participants more (less) likely to lie. However, one alternative explanation for not rejecting Hypothesis 1a could be that participants lie more because there is an income effect. In other words, even if there is a difference in the reports of the top performer group and the bottom performer group, the size of the initial endowment could explain this difference. Therefore, to rule out this confounding factor, we add a treatment where we change the source of the endowment but keep all other components of the experiment constant.[10]

In CONTROL, participants also first perform the real effort task. We have them do this to rule out potentially confounding factors, such as the time participants spend in the laboratory before taking part in the die roll task and ability sorting.[11] To create an incentive for exerting effort on this task, participants get 1 euro if they are in the top performers' group or 0 euros if they are in the bottom performers' group. This procedure also allows us to inform participants whether they are in the top or bottom half of performers while keeping the real effort task and the die roll game separated. The informational environment about the relative performance of participants is held constant between treatments.[12]

relative performance in the real effort task before reporting the die roll. The model does not specify the belief formation process any further and in principle, stated beliefs might not only be (ex-ante) premises but also reflect (ex-post) justifications of behavior. Section 5.2 returns to this issue.

[10]Additionally, other-regarding preferences could generate behavior that is indistinguishable from a classic income effect. Inequality aversion, for example, would predict relatively more lying of low-income participants, as they try to bring the final distribution of incomes closer to the equal split. Therefore, the random allocation in the control treatment also controls for further ways in which unequal incomes could influence behavior and that are unrelated to deservingness.

[11]A different explanation for the entitlement effect would be the social image: if participants work poorly in the real effort task, they might be more honest in the lying game to signal that even if they are low ability participants, they are at least honest. This explanation does not depend on the endowment origin and should thus predict differences in both treatments.

[12]The extra payment of 1 euro to the top-performing group is only present in CONTROL. However, we consider that this amount is low enough not to create a significant difference between treatments. More importantly, the benefits of including a real effort tournament are that we can control for more prominent confounding factors.

Once they finish the encryption task, participants draw a ball from a bag that is filled with equal proportions of white and orange balls. Drawing an orange ball endows participants with 15 euros, while drawing a white ball gives them 10 euros. In this treatment, there also are two types of envelopes that are distributed before the die roll game. However, we change the rule for the allocation in comparison to DESERVE. Any differences in lying between treatments should therefore be caused by the different allocation rules. We argue that making the endowment conditional on performance explains the difference between top and bottom performers in DESERVE. As a consequence, if we eliminate this connection, we eliminate entitlement concerns. Hence, in this situation, the lying decision of individuals is independent of their initial endowment, which leads us to the Hypothesis 2a.

Hypothesis 2a. *In* CONTROL*, there will be no difference in lying between participants with a 15 euro envelope and participants with a 10 euro envelope.*

Our central hypothesis is that through the manipulation of the endowment origin, more entitled participants lie more. Therefore, we hypothesize that once deservingness is not present, performance does not affect lying behavior. This hypothesis is motivated by the same intuition in Hypothesis 2a. Moreover, we also hypothesize that the participants' beliefs about their rank do not have any impact on their reports when they get the endowment by luck. These two hypotheses combined imply that the feeling of being better (or worse) than others in the task will not affect the report because in CONTROL, the real effort and lying tasks are separated from one another.

Hypothesis 2b. *In* CONTROL*, top performers' lying will not be different from bottom performers' lying.*

Hypothesis 2c. *In* CONTROL*, participants' beliefs about their rank will not affect their lying behavior.*

In the previous hypotheses, we presented predictions for within-treatment comparisons. However, deservingness also differs between participants with the same endowment if we compare those who get the endowment by effort and those who get it by luck. According to our model, the differences between participants with the same endowment in DESERVE and CONTROL depend crucially on whether participants feel guilt or disappointment about their income. Disappointed participants are more willing to lie to at least partly compensate for their disappointment. If participants' disappointment is strong enough, then regardless of the endowment, participants with 15 or 10 euro envelopes will lie more in DESERVE than in CONTROL. In DESERVE, participants with 15 euros should feel, on average, more disappointed if they lose part of their income than participants with 10 euros. Thus, we expect them to lie more compared to participants who receive 15 euros in CONTROL.

Hypothesis 3a. *Participants with 15 euro envelopes will lie more in* DESERVE *than in* CONTROL.

When guilt motives dominate, participants feel bad if they lie to keep their initial endowment. In contrast to the disappointment case discussed before, participants with 10 euro envelopes in DESERVE are more likely to feel guilty if they lie to preserve some money that they do not deserve compared to participants who earn 15 euros. Hence, we hypothesize that the feelings of guilt will make them less inclined to lie compared to participants with 10 euros in CONTROL.

Hypothesis 3b. *Participants with 10 euro envelopes will lie less in* DESERVE *than in* CONTROL.

4.3 Experimental Procedures

We conducted the experimental sessions in December 2018 at the WZB-TU Lab in Berlin. We ran 14 sessions with 330 participants (41.8% female),[13] and participants were recruited via ORSEE (Greiner, 2015). We usually had 24 participants per session (three sessions were conducted with 22 participants because of no-shows) and randomly decided which treatment to run in each session. In Table 1, we provide the summary statistics of gender and age by treatment. The experiment was programmed with z-Tree (Fischbacher, 2007).

In addition to their earnings in the experiment, participants received a 5 euro show-up fee. At the beginning of the experiment, they were told that the experiment would consist of two tasks. We then proceeded with the instructions for the real effort task, which participants read privately on their computer screens (An English translation of the instructions is included in Appendix B.2). Participants could ask clarifying questions throughout the experiment, which were answered in private. After finishing both tasks and the belief elicitation, they answered a short questionnaire that included questions about their age and gender. After finishing the questionnaire, participants received their payoffs in cash and left the laboratory.

[13] We conducted all the sessions in one week and did not look into the data during that time; therefore the experimental design and number of observations were set and fixed before running it.

Table 1. Summary statistics

	DESERVE	CONTROL	p-value
Age	23.337	23.543	0.682
	(3.981)	(5.045)	
Effort	34.289	33.780	0.396
	(5.722)	(5.135)	
Female	0.398	0.439	0.447
	(0.491)	(0.498)	
N	166	164	330

Note: Standard deviation in parenthesis. P-values from t-tests that test the equality of means are reported in the last column.

5 Results

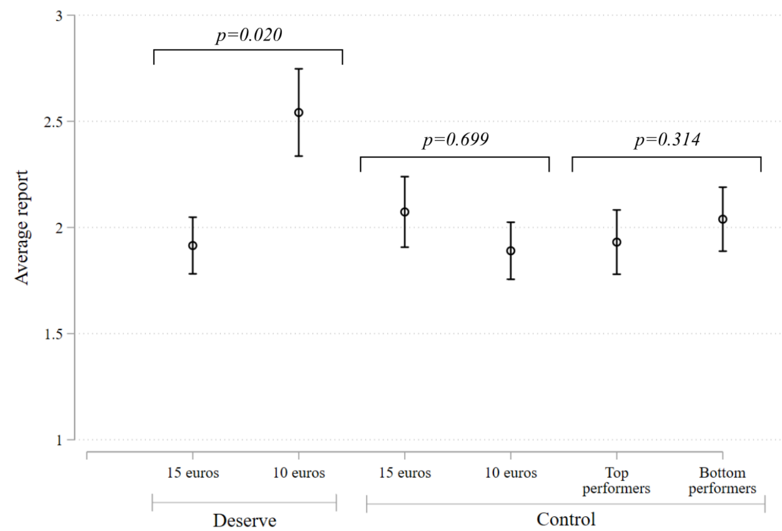
5.1 Entitlement and Lying Behavior

We test the hypotheses by focusing the analysis on the numbers reported in the die roll game. As die rolls are are generated by a uniform distribution in every group, we can attribute differences in reporting between groups to differences in lying behavior and differences between reported numbers and the underlying uniform die roll distribution to evidence for lying.[14]. As participants could keep more money when they reported lower values, we would expect lying to lead to an over-reporting of low numbers and an under-reporting of high numbers. We see exactly this pattern in our data. Figure 3 shows the distribution of reported die rolls separately for those who earned 10 euros and for participants who earned 15 euros in DESERVE. Reports of both groups are significantly different from the underlying theoretical uniform distribution of the die rolls that would be reported under complete truth-telling (Chi-squared test, $p < 0.001$ for both groups). Top performers report significantly lower numbers than bottom performers (Mann-Whitney test, $p = 0.020$),[15] leading to an average report of 1.92 for the former and 2.54 for the latter. This result speaks in favor of Hypothesis 1a; top performers lie more than bottom performers.

[14]While we do not know the actual distribution of die rolls in each group, this uncertainty is less of a concern for larger samples. We provide an extended discussion of the consequences of die roll noise in Appendix A.3. The appendix also provides simulation results which indicate that standard frequentist techniques provide accurate measures of uncertainty (in terms of confidence intervals) for the sample sizes we work with in the present experiment.

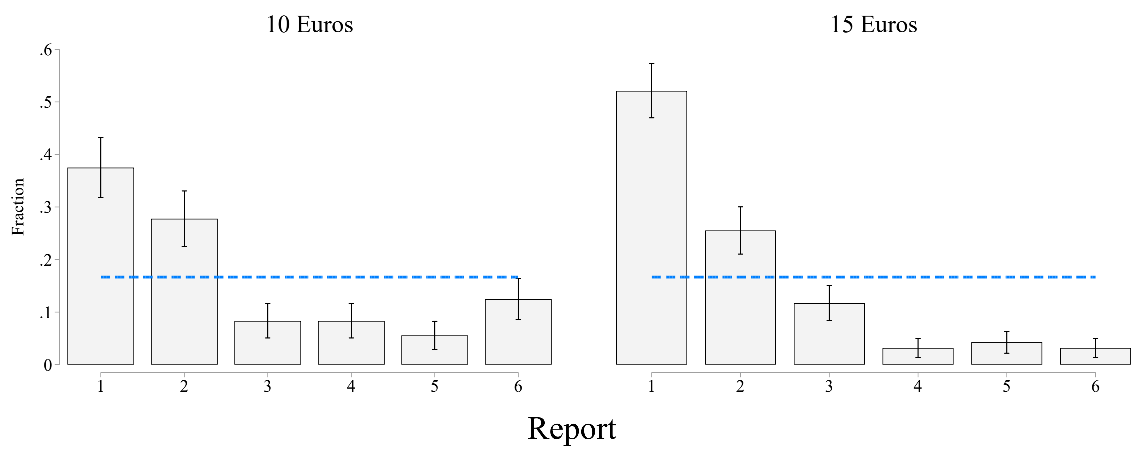
[15]In the paper, all reported p-values come from two-sided tests.

Figure 2. Average die roll reports



Note: Error bars display standard errors. We report p-values of Mann-Whitney tests.

Figure 3. Histograms of die roll reports, DESERVE

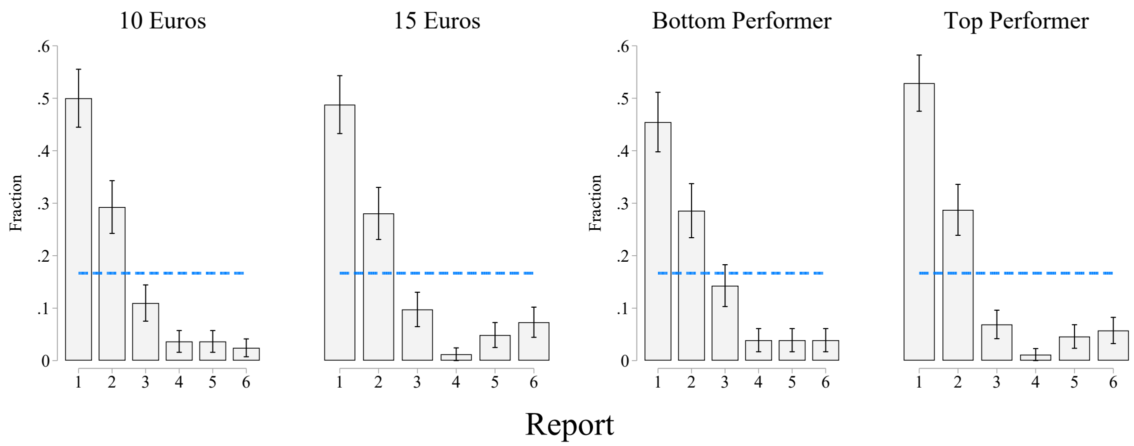


Note: The left panel displays reported die rolls of participants who received 10 euros in DESERVE. The right panel displays reported die rolls of participants who received 15 euros in DESERVE. The dashed horizontal lines display the underlying theoretical distribution under truth-telling. Error bars display standard errors.

Result 1 (Related to Hypothesis 1a)**.** *In* DESERVE*, participants who receive 10 euros lie less than participants who receive 15 euros.*

The previous result alone does not provide any strong evidence of entitlement concerns affecting lying behavior. Other factors, such as an income effect or sorting of low and high-ability participants, could be alternative explanations of the observed differences. We draw on the reported die rolls in CONTROL to establish that an entitlement effect is causing the differences. Participants also significantly lie in CONTROL (Chi-squared test, $p < 0.000$), but we do not observe significant differences in lying between participants who randomly received either 15 or 10 euros (Mann-Whitney test, $p = 0.700$). We thus find no evidence of an income effect affecting lying behavior.

Figure 4. Histograms of die roll reports, CONTROL



Note: The two left panels display reported die rolls of participants who either received 10 or 15 euros in CONTROL. The two right panels display reported die rolls of participants who were either bottom or top performers in CONTROL. The dashed horizontal lines display the underlying theoretical distribution under truth-telling. Error bars display standard errors.

Since we do not find any significant differences in reported numbers between an endowment of 10 euros and 15 euros in CONTROL, we pool the data of both groups and test whether reports differ by performance level. A Mann-Whitney test returns a value of $p = 0.314$, and thus we conclude there is no evidence of differences in lying behavior by performance group in CONTROL. As visible from Figure 2, the mean reported die rolls are very similar between the different comparison groups in CONTROL, further supporting the notion that there are no systematic income or sorting effects in CONTROL.[16]

Taken together, the evidence above implies the following:

Result 2 (Related to Hypothesis 2a)**.** *There is no difference in lying between participants who receive 10 euros and participants who receive 15 euros in* CONTROL.

Result 3 (Related to Hypothesis 2b)**.** *There is no difference in lying between top performers and bottom performers in* CONTROL.

To test whether there is a treatment effect of the difference in lying by the endowment

[16] We also find no differences when we further split up the observations in the control treatment by income and performance, even though our sample size becomes relatively small in that case. See Appendix A.2 for details.

Table 2. **OLS regressions with Report as dependent variable**

	(1)	(2)	(3)
DESERVE	0.651***	0.594*	0.641**
	(0.211)	(0.281)	(0.269)
15 Euros	0.183	0.184	0.236
	(0.163)	(0.161)	(0.171)
DESERVE×15 Euros	−0.810***	−0.701*	−0.766**
	(0.188)	(0.361)	(0.345)
Top performer		−0.110	−0.106
		(0.225)	(0.201)
Constant	1.890***	1.948***	0.649
	(0.153)	(0.241)	(0.537)
Controls	No	No	Yes
Observations	330	330	330
R^2	0.030	0.031	0.059

Note: 15 euros is a dummy equal to one if the participant received 15 euros. Top performer is a dummy equal to one if the participant was among the top half of performers in the real effort task. Controls include age and gender. Standard errors were clustered at the session level.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

group, we examine the difference in differences. Table 2 presents regressions of reported die rolls as the dependent variable and endowment and treatment interactions as independent variables. In the first model, we see that the interaction between DESERVE and 15 euros is negative and significant at the 1% level ($p = 0.001$). This estimate indicates that the average report difference between the two endowment groups significantly differs between the two treatments. In models 2 and 3, we additionally introduce controls for performance and demographics. We find that the interaction remains weakly significant when we control only for performance ($p = 0.074$) and and becomes more precise when we add the demographic controls ($p = 0.045$). This result implies that participants' perception of deservingness affects lying even after controlling for performance and endowment.

Result 4. *The difference in lying between participants who receive 10 euros and participants who receive 15 euros is larger in* DESERVE *than in* CONTROL.

In Hypothesis 1a, we conjectured that lying about earned income can be driven by a feeling of deservingness: bottom-performing participants, on average, feel more guilty and less disappointed about their income and will thus lie less than their high-performing counterparts. If this mechanism is correct, then participants with lower performance beliefs within the same

Table 3. OLS regressions with Report as dependent variable

	(1)	(2)	(3)
Belief	0.020	0.017	0.015
	(0.032)	(0.036)	(0.035)
DESERVE	−0.514	−0.506	−0.481
	(0.353)	(0.339)	(0.319)
DESERVE×Belief	0.070**	0.070**	0.068**
	(0.032)	(0.031)	(0.028)
15 Euros	0.213	0.212	0.232
	(0.162)	(0.160)	(0.166)
Top performer	0.129	0.157	0.147
	(0.257)	(0.257)	(0.260)
Encrypted words		−0.007	−0.011
		(0.025)	(0.025)
Constant	1.600***	1.866	0.783
	(0.415)	(1.086)	(0.927)
Controls	No	No	Yes
Observations	330	330	330
R^2	0.048	0.049	0.074

Note: Top performer is a dummy equal to one if the participant was among the top half of performers in the real effort task. Controls include age and gender. Standard errors were clustered at the session level.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

performance group should also lie less. We examine this relation in regressions of reported die rolls on performance beliefs that we report in Table 3.

In the table we see that the belief coefficient is only significant if interacted with the treatment dummy. When participants hold more positive beliefs about their performance, they report lower numbers from the die roll game in DESERVE.[17] Note that the interaction coefficient of belief in Table 3 is significant after controlling for the performance group. This significance gives direct evidence of relative entitlement concerns: among the top and bottom performers, those who hold more positive beliefs lie more. Furthermore, the belief coefficients barely change when controlling for the words encrypted in the real effort task, suggesting that relative, not absolute, effort considerations are driving the results.

We summarize the evidence above in the following results.

[17]Remember that belief and report are coded such that lower numbers correspond to more positive beliefs and more money kept.

Result 5 (Related to Hypothesis 1b)**.** *Participants' willingness to lie in* DESERVE *is influenced by the belief they hold about their performance in the real effort task. Participants who hold more positive beliefs about their relative performance lie more.*

Result 6 (Related to Hypothesis 2c)**.** *Beliefs about performance do not influence lying in the control treatment.*

The effect of performance beliefs on lying holds across the whole belief domain. In Figure 5, we split each of the top and bottom performing groups in the upper and lower half, based on their performance belief. We then arrive at four belief quartiles that rank participants by their relative beliefs. Quartile 1 contains participants who believe that they hold rank 1–5, quartile 2 contains ranks 6–12, quartile 3 contains ranks 13–16, and quartile 4 contains all participants with rank beliefs worse than 16.[18] Per quartile and treatment, the figure plots the average reported die roll. There is a clear downward trend in reported die rolls in DESERVE but not in CONTROL (Jonckheere–Terpstra test for descending order, $p = 0.020$ in DESERVE, $p = 0.187$ in CONTROL). However, the average reported die rolls in CONTROL are low throughout the belief distribution. Their level is reached only by participants in DESERVE who hold relatively high beliefs. These tendencies also manifest themselves in non-parametric tests.

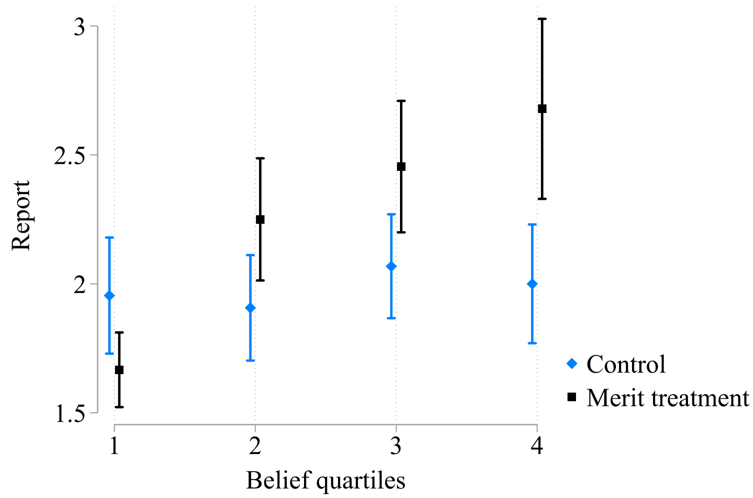
Compared with participants who randomly get 10 euros, bottom performers in DESERVE report significantly lower values (Mann-Whitney test, $p = 0.027$). There is no significant difference between top performers in DESERVE and participants who randomly get 15 euros in CONTROL (Mann-Whitney test, $p = 0.621$). As seen in Table 2, the differences remain significant even after controlling for demographics and performance groups. The treatment dummy for DESERVE is significantly positive, suggesting that bottom performers lie less in DESERVE than in CONTROL. The sum of the treatment dummy and the interaction between treatment and top performer is not significantly different from zero (F-test, $p = 0.603$). That is, we draw the same conclusions from the regressions as we drew from the non-parametric tests.

Result 7 (Related to Hypotheses 3a and 3b)**.** *Reports of participants with 15 euro envelopes do not differ significantly across treatments*

Result 8 (Related to Hypotheses 3a and 3b)**.** *Participants with 10 euro envelopes in* DESERVE *lie significantly less than participants with 10 euro envelopes in* CONTROL*.*

[18] These are the quartile borders for sessions with 24 participants. For the sessions with 22 participants, the borders of quartiles 1 and 2 slightly change, as participants with belief 6 are in the first quartile. The results do not differ qualitatively if we drop observations from 22 participant sessions.

Figure 5. Average die roll reports by belief quartile



Note: Error bars display standard errors.

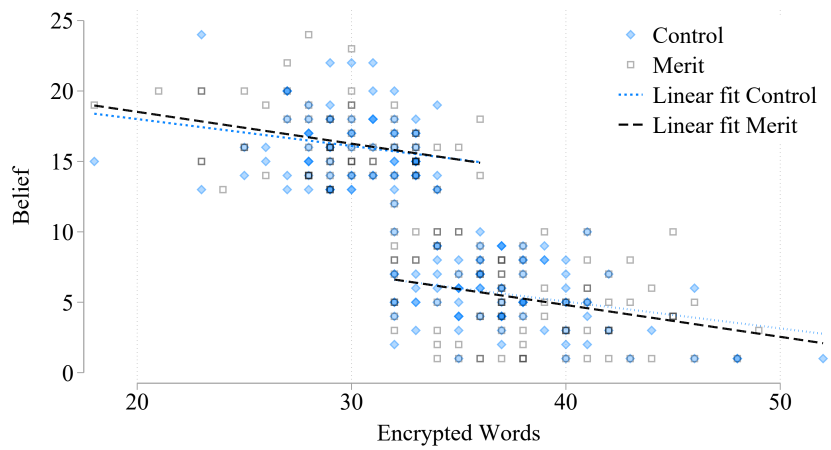
5.2 Additional Results

In this subsection, we present results that help to distinguish between different alternative interpretations of our findings. A competing explanation for the result that entitlement influences behavior in DESERVE but not in CONTROL could be that, because participants were provided with different effort incentives in both treatments, differences in absolute effort levels can explain the observed treatment effects. This is, however, not the case. Performance in the encryption task was very similar in both treatments despite the different incentives that were provided. The average number of encrypted words was 34.3 in DESERVE and 33.8 in CONTROL, and the minimum number of encrypted words was 18 in both treatments. In addition, the distributions were not significantly different.[19]

As a second concern, we address the potential endogeneity of beliefs. The evidence could be interpreted as showing that participants distort their beliefs in DESERVE to justify their lie in the die roll task. This alternative interpretation of entitlement concerns would suggest that participants distort their beliefs in DESERVE but not in CONTROL, because entitlement provides participants with a reason to ex-post justify their unethical behavior. If this were the case, we would expect beliefs to be different between both treatments. We do not, however, observe this in the data. A test on the equality of beliefs in both treatments cannot be rejected (Mann-Whitney test, $p = 0.503$). In fact, beliefs are strongly associated with performance in

[19] The finding that financial incentives do not influence effort provision is in line with experimental findings from Erkal et al. (2018) who find that monetary incentives do not affect performance in real effort tournaments unless subjects are provided with an outside option (such as an option to leave the experiment early or a paid pause).

Figure 6. Scatter plot of belief and encrypted words



Note: Lines are linear fits of OLS regressions of belief on encrypted words, at means of age and gender.

the real effort task in both treatments. Figure 6 shows a scatter plot of belief and effort provision. In both treatments, beliefs become more positive the higher individual effort was exerted. This is intuitive given that participants only knew their privately provided effort but not the effort of others when they stated their beliefs.

The straight lines in Figure 6 are the coefficient estimates of a regression of effort on beliefs. For an explanation that participants distorted beliefs after the lying task, we would expect a flatter line in DESERVE than in CONTROL, as the association between effort provision and beliefs would become weaker. The slopes are not significantly different across treatments and, if anything, are even steeper in DESERVE. Furthermore, the coefficients of regressions of beliefs on encrypted words and further controls are not jointly significantly different between treatments (Chi-squared test, $p = 0.315$), which gives further support to the claim that beliefs are not formed systematically different between treatments.[20]

6 Conclusion

Does the way a person earns income affect lying? Smith (2010) points out that, at least since Cherry et al. (2002), it cannot be assumed that the source of the endowment does not matter in experiments. He argues that researchers should systematically study the effect of earned income in experiments on a case-by-case basis. Our study identifies that deservingness influences lying in an intuitive direction: when participants' performance determines income, participants who earn less money lie less than participants who earn more money. This result

[20]See Appendix A.1 for the regression outputs.

is driven by the guilt of low performers, who lie even less than participants who randomly earn the same endowment. In other words, in our experiment, the group with the lowest levels of lying had the lowest levels of deservingness.

Deservingness matters because of relative entitlement concerns. We find evidence that, for a given income, participants with more positive beliefs lie more. Interestingly, we can establish that the underlying treatment effect does not depend on performance in the real effort task per se but on the fact that participants earn their income through effort. This speaks to the endowment origin, and not the prestige derived by belonging to the top performance group, as the channel driving our results. We do not find differences in lying when participants perform the same task but lie to keep windfall endowments. Since effort provision does not systematically differ across treatments, it is unlikely that other factors contributed to this effect, such as participants generally lying more when they previously put in more effort.

A more surprising result is that earned income does not increase lying relative to the windfall income benchmark. When comparing reporting across both treatments, the significant treatment effect we find is a decrease in lying for low-performing participants in DESERVE relative to the windfall endowment baseline. Lying is not significantly higher among top performers in DESERVE relative to the control group. This result points to the importance of guilty feelings when studying entitlement concerns. Our results imply that deservingness does not work like a self-serving justification but instead works like a social norm, where some individuals feel less deserving of behaving unethically because other people feel more deserving. In future research, it would be promising to explore why justifications are used self-servingly in some settings, whereas social norms can lead to "backfiring" effects in settings like the one studied here.

One explanation for why top performers are not lying more in DESERVE than in CONTROL might be that a demand for consistency by top performers in DESERVE attenuates the impact of earned income on lying. In particular, some evidence shows that when participants perform two sequential tasks, the initial task either encourages individuals to be consistent (do more of the same) or gives them a license to behave the exact opposite way in the second task (Gneezy et al., 2014; Blanken et al., 2015; Mullen and Monin, 2016). According to Gneezy et al. (2012), an initial task with costly (as opposed to hypothetical) decisions leads to consistency because it provides individuals with a credible signal about their identity, which they then wish to conform in the subsequent task. In our experiment, some top performers in DESERVE, who exert real effort and get rewarded for their good performance, may have a motive to be consistent and show similarly "good" behavior by remaining honest in the second task. This potential effect, outside of our model, goes in the opposite direction as the entitlement effect and might explain the null effect when comparing top performers across treatments.

Another natural progression of this work would be to analyze how results change under different real effort incentive structures. It would be interesting to see whether similar mechanisms to the one proposed here can be translated into further games. Our framework can possibly explain the positive correlations found by other researchers between real effort and lying when subjects are paid piece rates (Gill et al. 2013, Grundmann and Lambsdorff 2017, Duch et al. 2018), but it has been unclear so far whether these correlations are observed because of income effects, sorting, or because of entitlement. Our results find support for the third channel, and income effects and sorting do not seem to be driving the results of our experiment.

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A Appendix

A.1 Additional tables

Table 4. OLS regressions with belief as dependent variable

	DESERVE	CONTROL
Encrypted words	-0.226^{***}	-0.191^{***}
	(0.047)	(0.058)
Female	1.188^{***}	0.939^{**}
	(0.398)	(0.394)
Age	0.075^{*}	-0.047
	(0.044)	(0.044)
Top performer	-9.275^{***}	-9.259^{***}
	(0.573)	(0.548)
Constant	20.864^{***}	22.585^{***}
	(1.895)	(2.017)
Observations	166	164

Note: top performer dummy is equal to one if the participant was under the top performers. Encrypted words denotes the number of words encrypted in the real effort task. Robust standard errors in parenthesis. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

A.2 Further results for CONTROL

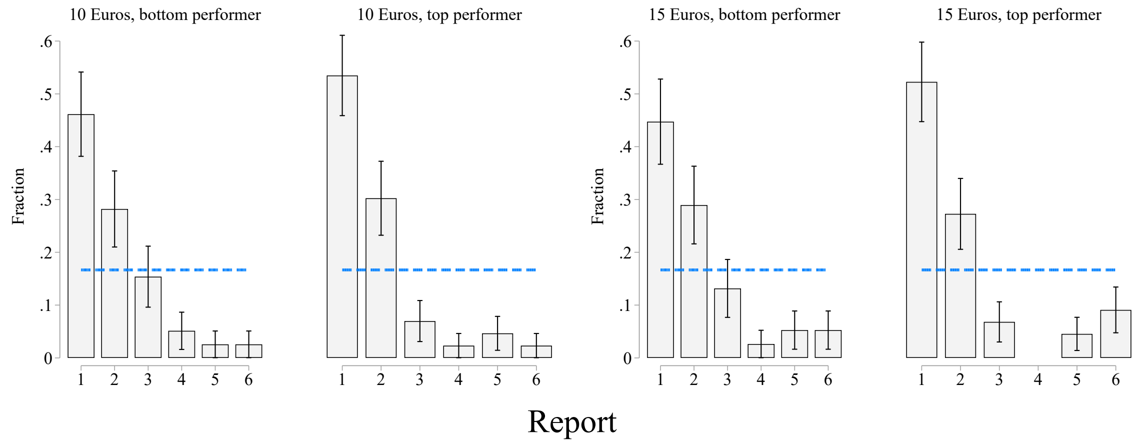
In this section we present the histograms and average die roll reports for CONTROL when split up by income and by performance group. In pairwise comparisons, they are not significantly different from one another (Mann-Whitney tests, p > 0.320).

Table 5. Average die rolls, CONTROL

	10 euros		15 euros	
	Bottom performer	Top performer	Bottom performer	Top performer
Report	1.974	1.814	2.105	2.045
	(1.224)	(1.220)	(1.429)	(1.584)
N	39	43	38	44

Note: Standard deviations in parenthesis.

Figure 7. Histograms of die roll reports split by performance and endowment, CONTROL



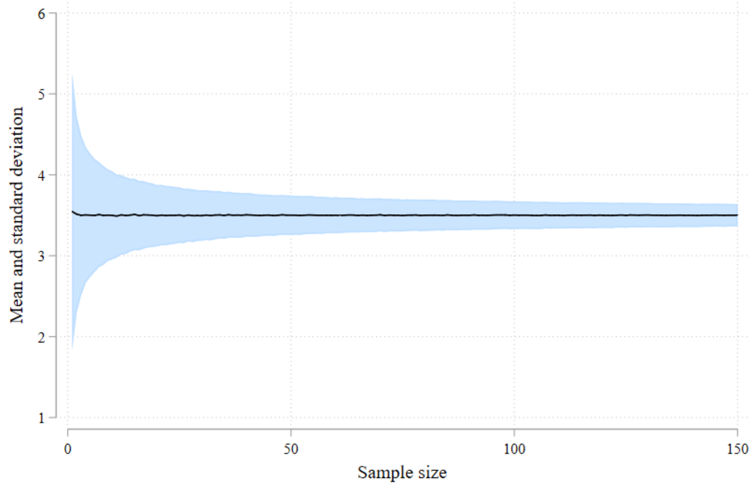
Note: The dashed horizontal lines display the underlying theoretical distribution under truth-telling. Error bars display standard errors.

A.3 On the uncertainty of the die roll distribution

Die rolls are drawn from a uniform distribution without replacement in each treatment. Since we do not observe individual rolls, all claims about lying rates, treatment differences in behavior, etc. only hold *in expectation*. The question is how important this uncertainty is and if standard inferences from the data remain valid. This is especially important in finite samples, where results may depend on the convergence rate of die rolls.

We simulated six-sided die rolls for different sample sizes ranging from 1-150. The figure below plots mean die rolls and the associated standard deviation of the mean. Unsurprisingly, the noise of the mean die roll decreases as the sample size increases. We also observe that there are decreasing returns, in terms of a lower standard deviation of the mean, to increasing the sample size.

Figure 8. Mean and standard deviation of the mean, for different sample sizes



Note: Simulations are based on 10,000 repetitions for each sample size. Shaded area gives one standard deviation above and below the mean.

To check whether frequentist inferences remain valid when the die roll distribution is unknown, we additionally simulate a die roll game. The game is conducted with a random sample of N individuals who each draw a random integer which is uniformly distributed between 1-6. We make the following assumptions about the underlying population:

- 50% of individuals are liars. If liars draw a number larger than 2, they will report either a 2 or a 1.
- Among the liars, 33.33% are partial liars. They will report a 2. The remaining liars will report a 1.

These numbers generate a report distribution which approximately matches the report distribution by bottom performers in DESERVE.

In expectation, the simulated reporting frequencies are as follows:

Number	1	2	3	4	5	6
Report frequency	0.389	0.278	0.083	0.083	0.083	0.083

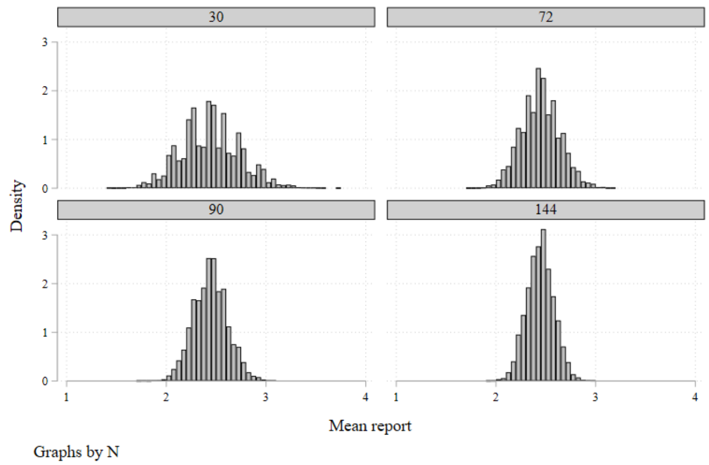
The expected report amounts to 2.444 with standard deviation 1.641.

The simulation introduces two sources of sampling variation. We would expect sampling variation because we might randomly sample more or less than 50% of liars and 33.33% of partial liars. Further, since the die roll is drawn from a distribution with replacement, it is likely that the distribution of draws in the sample will not exactly be uniform.

We simulate data for sample sizes 30, 72, 90, and 144, with 10,000 draws for each sample size. For each of the draws, we calculated the mean report.

Below, we display histograms of mean reports, by sample size.

Figure 9. Simulated mean die reports, for different sample sizes



To check the validity of using standard frequentist techniques, we calculate 90%, 95%, and 99% confidence intervals using the known expected report and standard deviation of the data generating process. We then compare the confidence intervals with the simulated data by calculating the coverage of the confidence interval. That is, we ask which fraction of the simulated means, for a given sample size, is within the range of a confidence interval. Naturally, we would expect the 90% confidence interval to contain 90% of the simulated data. The results are below.

Table 6. Coverage of confidence intervals, for different sample sizes

	Number of observations			
	30	72	90	144
90% c.i.	90.6	90.6	90.0	90.1
95% c.i.	96.1	95.4	95.2	95.1
99% c.i.	99.4	99.0	99.0	99.1

The table implies that confidence intervals seem to be too conservative for small samples (N=30) and become more precise as N increases. Deviations from the nominal value of the confidence interval are generally small.

B Online appendix

B.1 Further discussion on the model: Equilibrium existence

In this section, we show how to arrive at equilibria and derive an equilibrium existence result. We focus on cases where entitlement payoffs are not too large relative to material payoffs. This rules out cases where individuals feel so guilty of receiving a high income that they prefer to report ℓ after drawing $\hbar$.

Observation 1 (No downwards lying). *If $\gamma < 1$, an individual drawing state $\hbar$ always gains a higher utility from reporting $\hbar$ over ℓ.*

Proof. Consider the choice of an individual who drew $\hbar$. By lying and reporting ℓ, such an individual will incur a lying cost $c \geq 0$, and lose a material payoff of size π. Additionally, the entitlement payoff changes from $-D(y_j - \mu(\rho, \bar{y}^e; \alpha))$ under truth-telling to $-D(y_j - \pi - \mu(\rho, \bar{y}^e; \alpha))$ under lying. Therefore, the individual will lie if

$$D(y_j - \pi - \mu(\rho, \bar{y}^e; \alpha)) - D(y_j - \mu(\rho, \bar{y}^e; \alpha)) \geq \pi. \tag{1}$$

Consider the left-hand side, which has to be strictly positive if the individual prefers lying; i.e. the entitlement payoff under ℓ has to be higher than under $\hbar$. The left-hand side is maximized when $y_j - \pi - \mu(\rho, \bar{y}^e; \alpha), y_j - \mu(\rho, \bar{y}^e; \alpha) > 0$. In this case, (1) becomes

$$\gamma(y_j - \mu(\rho, \bar{y}^e; \alpha)) - \gamma(y_j - \pi - \mu(\rho, \bar{y}^e; \alpha)) \geq \pi,$$

which simplifies to $\gamma \geq 1$. Therefore, if $\gamma < 1$, reporting ℓ after drawing $\hbar$ never maximizes utility. ∎

In the text, we argue that individuals lie after drawing ℓ if their individuals lying cost is below a critical value $\hat{c}$. We reproduce the resulting threshold lying cost function below.

$$\hat{c}(y_j, \rho, \bar{y}^e; \alpha, \gamma, \lambda) = \begin{cases} \pi(1-\gamma) & \text{if } \rho \leq \rho_{1,j} \\ \pi(1+\lambda) - (\gamma+\lambda)[y_j - \mu(\rho, \bar{y}^e; \alpha)] & \text{if } \rho \in (\rho_{1,j}, \rho_{2,j}) \\ \pi(1+\lambda) & \text{if } \rho \geq \rho_{2,j}. \end{cases}$$

We can integrate the lying cost threshold function over the belief distribution to arrive at an aggregate lying rate

$$\begin{aligned} s(\bar{y}^e) = \sum_{j \in \{\tau, \beta\}} \Bigg[\int_{\underline{\rho}_j}^{\rho_{1,j}(\bar{y}^e)} F(\pi(1-\gamma))\, \mathrm{d}\rho + \int_{\rho_{1,j}(\bar{y}^e)}^{\rho_{2,j}(\bar{y}^e)} F(\pi(1+\lambda) - (\gamma+\lambda)[y_j - \mu(\rho, \bar{y}^e; \alpha)])\, \mathrm{d}\rho \\ + \int_{\rho_{2,j}(\bar{y}^e)}^{\bar{\rho}_j} F(\pi(1+\lambda))\, \mathrm{d}\rho \Bigg]. \end{aligned}$$

Define a function $g(s)$ which gives the average final wage, conditional on the lying rate,

$$g(s) \equiv \frac{y_\beta + y_\tau}{2} - \frac{1-s}{2}\pi.$$

In equilibrium, beliefs have to be consistent with actions. Therefore, any equilibrium is characterized by an income level $\bar{y}^*$ for which

$$\bar{y}^* = g(s(\bar{y}^*)).$$

The following proposition characterizes equilibria.

Proposition 1. *An equilibrium exists.*

(i) If $\alpha > 1 - \frac{y_\beta - \pi}{(y_\tau + y_\beta)/2}$ *then the equilibrium is unique. In any equilibrium, top (bottom) performers who hold more positive beliefs about their performance are more likely to lie than top (bottom) performers with more negative beliefs.*

(ii) If $\alpha > max\{1 - \frac{y_\beta - \pi}{(y_\tau + y_\beta)/2}, \frac{y_\tau - y_\beta}{(y_\tau + y_\beta - \pi)/2}\}$ *then in any equilibrium, top performers are more likely to lie than bottom performers.*

Proof. We first introduce some notation. Specifically, we will use the following definitions to save space:

$$u \equiv (1+\lambda)\pi,\ v(\rho, \bar{y}^e, y_j; \alpha) = (1+\lambda)\pi - (\gamma+\lambda)(y_j - \mu(\rho, \bar{y}^e; \alpha)),\ w \equiv (1-\gamma)\pi.$$

Before proceeding with the proof, we present a mathematical lemma that we will refer to later.

Lemma 1. *Consider two functions* $g(x,y)$ *and* $f(z)$*. If* $g(x,y)$ *is linear in* x*, then*

$$\int_a^b g_y(x,y) f(g(x,y))\,\mathrm{d}x = \frac{1}{g_x(y)} \times \left[F(a)g_y(a,y) - F(b)g_y(b,y) - g_{xy}(y)\int_a^b F(g(x,y))\,\mathrm{d}x\right].$$

Proof of lemma 1. This is an application of integration by parts. Consider the derivative of $F(g(x,y))g_y(x,y)$ with respect to x;

$$\frac{\partial(F(g(x,y))g_y(x,y))}{\partial x} = f(g(x,y))g_x(y)g_y(x,y) + g_{xy}(y)F(g(x,y)).$$

Taking the integral on both sides and rearranging;

$$\begin{aligned}\int \frac{\partial(F(g(x,y))g_y(x,y))}{\partial x}\,\mathrm{d}x &= \int f(g(x,y))g_x(y)g_y(x,y)\,\mathrm{d}x + \int g_{xy}(y)f(g(x,y))\,\mathrm{d}x\\ \Rightarrow F(g(x,y))g_y(x,y) &= \int f_x(g(x,y))g_x(y)g_y(x,y)\,\mathrm{d}x + \int g_{xy}(y)f(g(x,y))\,\mathrm{d}x\\ \Rightarrow \int f_x(g(x,y))g_x(y)g_y(x,y)\,\mathrm{d}x &= F(g(x,y))g_y(x,y) - \int g_{xy}(y)f(g(x,y))\,\mathrm{d}x\end{aligned}$$

Since $g(x,y)$ is linear in x, we can move the terms $g_x(y)$ and $g_{xy}(y)$ out of the integrals and divide by $g_x(y)$ to arrive at

$$\int g_y(x,y)f(g(x,y))\,\mathrm{d}x = \frac{1}{g_x(y)} \times \left[F(g(x,y))g_y(x,y) - g_{xy}(y)\int F(g(x,y))\,\mathrm{d}x\right].$$

Taking the difference between the expression evaluated at b and a gives the claim of the lemma.

Proof of proposition 1. Using the notation introduced above, the share of liars who drew state ℓ (the lying rate), $s(\bar{y}^e)$, becomes

$$s(\bar{y}^e) = \sum_{j \in (\tau, \beta)} \left[\int_{\underline{\rho}_j}^{\rho_{1,j}} F(u)\, \mathrm{d}\rho + \int_{\rho_{1,j}}^{\rho_{2,j}} F(v(\rho, \bar{y}^e, y_j; \alpha))\, \mathrm{d}\rho + \int_{\rho_{2,j}}^{\bar{\rho}_j} F(w)\, \mathrm{d}\rho \right]$$

Consider the minimum and the maximum values that $\bar{y}^e$ can take on in equilibrium. If noone lies, $s = 0$ and thus

$$\bar{y}_{min} \equiv \frac{y_\beta + y_\tau}{2} - \frac{\pi}{2}.$$

Conversely, if everyone lies, $s = 1$;

$$\bar{y}_{max} \equiv \frac{y_\beta + y_\tau}{2}.$$

A stable interior equilibrium exists if $g(s(\bar{y}^e))$ intersects the 45 degree line from above at some point on $(\bar{y}_{min}, \bar{y}_{max})$. Since $F(c)$ has support on $[0, \infty)$, some individuals will always tell the truth with positive probability and some agents will always lie with positive probability. Therefore, $s(\bar{y}^e) \in (0, 1)$ and $\bar{y}_{min} < g(s(\bar{y}_{min}))$ and $\bar{y}_{max} > g(s(\bar{y}_{max}))$. It then follows from the Intermediate Value Theorem that there is at least one stable interior equilibrium.

(i) To investigate conditions for uniqueness, take the first and second derivatives of $g(s(\bar{y}^e))$ with respect to $\bar{y}^e$;

$$\frac{\mathrm{d}g}{\mathrm{d}\bar{y}^e} = \frac{\pi}{2} s'(\bar{y}^e), \;\; \frac{\mathrm{d}^2 g}{\mathrm{d}\bar{y}^{e2}} = \frac{\pi}{2} s''(\bar{y}^e).$$

One sufficient condition for uniqueness is that $s(\bar{y}^e)$ is nondecreasing and concave in $\bar{y}^e$. The following claims show when this is the case.

Claim 1. *The function $s(\bar{y}^e)$ is nondecreasing. It is strictly increasing if at least one belief threshold value is interior.*

Proof. Take the derivative of $s(\bar{y}^e)$ with respect to $\bar{y}^e$,

$$s'(\bar{y}^e) = \sum_{j \in \beta, \tau} \int_{\rho_{1,j}}^{\rho_{2,j}} (\gamma + \lambda) \mu_{\bar{y}^e}(\rho, \bar{y}^e; \alpha) f(v(\rho, \bar{y}^e, y_j; \alpha))\, \mathrm{d}\rho, \tag{2}$$

with

$$\mu_{\bar{y}^e}(\rho, \bar{y}^e; \alpha) = (2\rho\alpha + (1 - \alpha)) > 0.$$

It follows that (2) is strictly positive as long as at least one belief threshold value is interior and zero otherwise. In the case where no belief threshold is interior, the integral above can be zero, so that s stays constant as $\bar{y}^e$ increases. ■

Claim 2. *The function $s(\bar{y}^e)$ is strictly concave if at least one belief threshold value is interior for all $\bar{y}^e \in [\bar{y}_{min}, \bar{y}_{max}]$.*

Proof. Apply lemma 1 to rewrite the derivative from (2) as

$$s'(\bar{y}^e) = \sum_{j\in\beta,\tau} \frac{1}{(\lambda+\gamma)\mu_\rho}\Bigg(F(v(\rho_2,\bar{y}^e,y_j;\alpha))(\lambda+\gamma)\mu_{\bar{y}^e}|_{\rho=\rho_2} - F(v(\rho_1,\bar{y}^e,y_j;\alpha))(\lambda+\gamma)\mu_{\bar{y}^e}|_{\rho=\rho_1}$$
$$-(\lambda+\gamma)\mu_{\bar{y}^e\rho}\int_{\rho_{1j}}^{\rho_{2j}} F(v(\rho,\bar{y}^e;\alpha)))\mathrm{d}\rho\Bigg),$$

with $\mu_\rho = 2\alpha\bar{y}^e$, $\mu_{\bar{y}^e} = 2\alpha\rho + (1-\alpha)$, and $\mu_{\bar{y}^e\rho} = 2\alpha$. If all belief thresholds are interior, we can rewrite the term as

$$\begin{aligned}
s'(\bar{y}^e) &= \sum_{j\in\beta,\tau} \frac{1}{2\alpha\bar{y}^e(\lambda+\gamma)}\left(F(u)(\lambda+\gamma)\frac{y_j}{\bar{y}^e} - F(w)(\lambda+\gamma)\frac{y_j-\pi}{\bar{y}^e} - 2\alpha(\lambda+\gamma)\int_{\rho_{1j}}^{\rho_{2j}} F(v(\rho,\bar{y}^e;\alpha)))\mathrm{d}\rho\right) \\
&= \sum_{j\in\beta,\tau} \frac{1}{\bar{y}^e}\left(\frac{F(u)y_j - F(w)(y_j-\pi)}{2\alpha\bar{y}^e} - \int_{\rho_{1j}}^{\rho_{2j}} F(v(\bar{y}^e;\alpha)))\mathrm{d}\rho\right) \\
&= \sum_{j\in\beta,\tau} \frac{1}{\bar{y}^e}\left(\rho_{2j}F(u) - \rho_{1j}F(w) - \frac{1-\alpha}{2\alpha}(F(u)+F(w)) - \int_{\rho_{1j}}^{\rho_{2j}} F(v(\bar{y}^e;\alpha)))\mathrm{d}\rho\right),
\end{aligned}$$

where the last step makes use of the fact that $\rho_{1j} = \frac{y_j-\pi}{2\alpha\bar{y}^e} - \frac{1-\alpha}{2\alpha}$ and $\rho_{2j} = \frac{y_j}{2\alpha\bar{y}^e} - \frac{1-\alpha}{2\alpha}$.

The second derivative then becomes

$$\begin{aligned}
s''(\bar{y}^e) &= \frac{-\bar{y}^e\int_{\rho_{1,j}(\bar{y}^e)}^{\rho_{2,j}(\bar{y}^e)}(\gamma+\lambda)\mu_{\bar{y}^e}(\rho,\bar{y}^e;\alpha)f(v(\rho,\bar{y}^e,y_j;\alpha))\,\mathrm{d}\rho - \bar{y}^e s'(\bar{y}^e)}{\bar{y}^{e2}} \\
&= -2\frac{s'(\bar{y}^e)}{\bar{y}^e},
\end{aligned}$$

whose sign is opposite to the sign of $s'(\bar{y}^e)$. From claim 1 it then follows that the second derivative is strictly negative if at least one belief threshold value is interior and zero otherwise. ■

The two claims taken together imply that the equilibrium will be unique if at least one belief threshold point is interior for all $\bar{y}^e \in [y_{min}, y_{max}]$ (as in this case s is increasing and strictly concave). Furthermore, if one belief threshold point for each performance group is interior then, within each performance group, some individuals are more likely to lie than others with different performance beliefs. For a candidate average income $\bar{y}^e$, the belief threshold candidates are

$$\rho_{1j} = \frac{y_j-\pi}{2\alpha\bar{y}^e} - \frac{1-\alpha}{2\alpha},\ \rho_{2j} = \frac{y_j}{2\alpha\bar{y}^e} - \frac{1-\alpha}{2\alpha}. \tag{3}$$

They are decreasing in $\bar{y}^e$. It can be further shown that $\rho_{1\beta} < 1/2 < \rho_{2\tau}$ for all $\bar{y}^e \in [\bar{y}_{min}, \bar{y}_{max}]$. We show sufficient conditions for α such that if α is large enough, $\rho_{1\beta} > 0$ and

$\rho_{2\tau} < 1$ for all $\bar{y}^e$.[21] For the former, it is sufficient that $\frac{y_\beta - \pi}{2\alpha \bar{y}_{max}} - \frac{1-\alpha}{2\alpha} > 0$, which simplifies to

$$\alpha > 1 - \frac{y_\beta - \pi}{\bar{y}_{max}}. \tag{4}$$

For the latter, a sufficient condition is that $\frac{y_\tau}{2\alpha \bar{y}_{min}} - \frac{1-\alpha}{2\alpha} < 1$, or,

$$\alpha > 1 - \frac{y_\tau}{\bar{y}_{min}}. \tag{5}$$

We can show that the right-hand side of (4) is larger than the right-hand side of (5), as

$$\begin{gathered} 1 - \frac{y_\beta - \pi}{\bar{y}_{max}} > 1 - \frac{y_\tau}{\bar{y}_{min}} \\ \Rightarrow \frac{y_\tau}{\bar{y}_{min}} > \frac{y_\beta - \pi}{\bar{y}_{max}}, \end{gathered}$$

which obviously holds as the right-hand side is larger than one and the left-hand side is smaller than one. Therefore, if $\alpha > 1 - \frac{y_\beta - \pi}{\bar{y}_{max}}$, there is a unique equilibrium with at least one interior belief threshold in each performance group.

(ii) Consider the case where $0 < \rho_{1\beta} < \rho_{2\beta} < 1/2 < \rho_{1\tau} < \rho_{2\tau} < 1$, i.e. all belief thresholds are interior. The lying rate of top performers is larger than the lying rate of bottom performers if

$$\begin{gathered} \int_{\frac{1}{2}}^{\rho_{1\tau}} F(u)\,\mathrm{d}\rho + \int_{\rho_{1\tau}}^{\rho_{2\tau}} F(v(\rho, \bar{y}^*, y_\tau; \alpha))\,\mathrm{d}\rho + \int_{\rho_{2\tau}}^{1} F(w)\,\mathrm{d}\rho > \\ \int_{0}^{\rho_{1\beta}} F(u)\,\mathrm{d}\rho + \int_{\rho_{1\beta}}^{\rho_{2\beta}} F(v(\rho, \bar{y}^*, y_\beta; \alpha))\,\mathrm{d}\rho + \int_{\rho_{2\beta}}^{\frac{1}{2}} F(w)\,\mathrm{d}\rho \end{gathered} \tag{6}$$

As $\rho_{2j} - \rho_{1j} = \frac{\pi}{2\alpha \bar{y}^*} \equiv \xi$ does not depend on j we can write

$$\int_{\rho_{1j}}^{\rho_{2j}} F(v(\rho, \bar{y}^*, y_j; \alpha))\,\mathrm{d}\rho = \int_0^{\xi} F(v(\rho_{1j} + \varepsilon, \bar{y}^*, y_j; \alpha))\,\mathrm{d}\varepsilon.$$

Observe further that $F(v(\rho_{1\beta} + \varepsilon, \bar{y}^*, y_\beta; \alpha)) = F(v(\rho_{1\tau} + \varepsilon, \bar{y}^*, y_\tau; \alpha))$ for all $\varepsilon \in [0, \xi]$. It follows that the lying rate of individuals with beliefs between (ρ_{1j}, ρ_{2j}) is the same for bottom and top performers. Therefore, we can simplify the inequality (6) to

$$(\rho_{1\tau} - \frac{1}{2})F(u) + (1 - \rho_{2\tau})F(w) > \rho_{1\beta}F(u) + (\frac{1}{2} - \rho_{2\beta})F(w),$$

which can be rearranged to

$$(\rho_{1\tau} - \frac{1}{2} - \rho_{1\beta})F(u) - (\rho_{2\tau} - \frac{1}{2} - \rho_{2\beta})F(w) > 0,$$

[21] Necessary conditions for the minimum α are more complicated to derive and harder to interpret, as they depend on the shape of $\bar{y}^*(\alpha)$, which is non-monotone (first increasing and then decreasing) in α.

and, as $\rho_{1\tau} - \rho_{1\beta} = \rho_{2\tau} - \rho_{2\beta}$,

$$(\rho_{1\tau} - \rho_{1\beta} - \frac{1}{2})(F(u) - F(w)) > 0.$$

So this equation holds if and only if $\rho_{1\tau} - \rho_{1\beta} - \frac{1}{2} > 0$. Plugging in (3) and rearranging, this condition becomes

$$\alpha > \frac{y_\tau - y_\beta}{\bar{y}^e},$$

for which it is sufficient that $\alpha > \frac{y_\tau - y_\beta}{\bar{y}_{min}}$. Now, the difference in lying rates will be larger in any equilibrium in which $\rho_{2\beta}, \rho_{1\tau}$ are not interior because in any such equilibrium a positive mass of top performers will face w as their lying cost threshold while a positive mass of bottom performers always faces u as their lying cost threshold. For example, consider the case where $\rho_{1\tau}$ is not interior. In this case, the lying rate of top performers is

$$\int_{\frac{1}{2}}^{\rho_{2\tau}} F(v(\rho, \bar{y}^*, y_\tau; \alpha))\, \mathrm{d}\rho + \int_{\rho_{2\tau}}^{1} F(w)\, \mathrm{d}\rho,$$

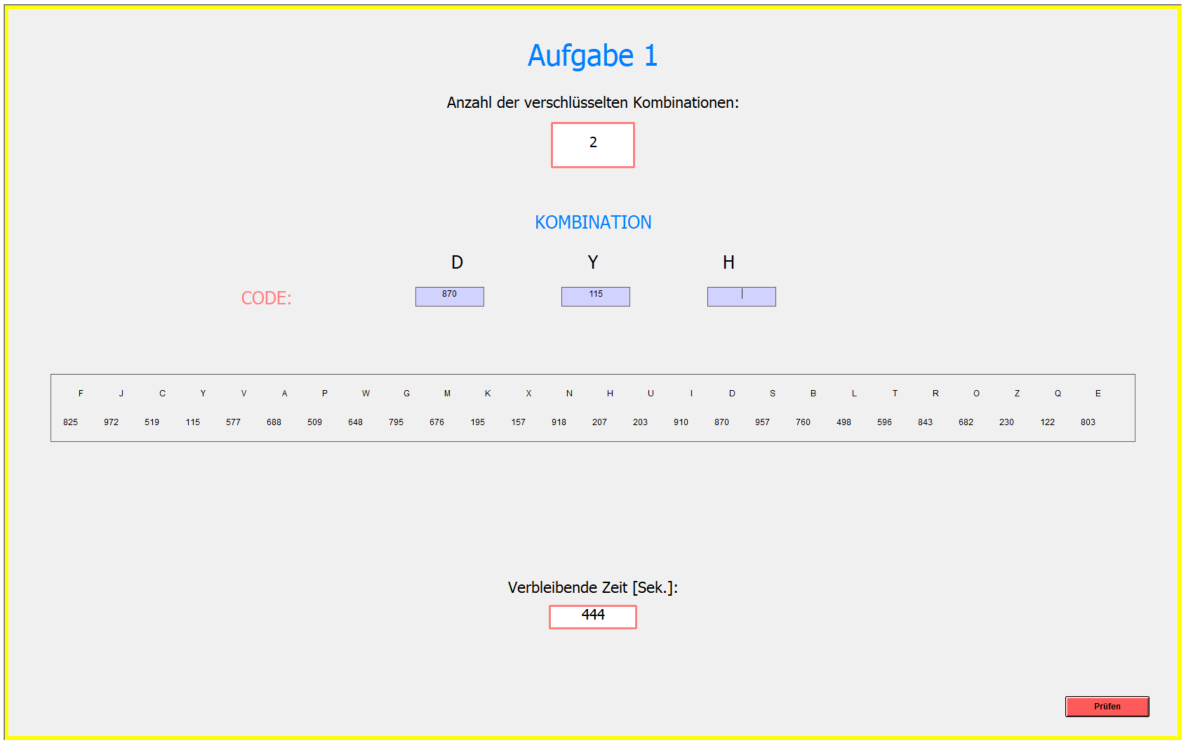
which is always larger than the lying rate of bottom performers (as a positive mass of bottom performers has threshold u, i.e. a positive mass of bottom performers is less likely to lie than any top performer.). Conversely, if $\rho_{2\beta}$ is not interior, then no bottom performer takes u as a threshold value, resulting in a lower lying rate compared to top performers.

■

B.2 Experimental Instructions

In their cubicles, participants sit in front of a computer. Additionally they have a die and a printed screen shot of the encryption task on their desk.

Figure 10. Handout to participants



B.2.1 Instructions DESERVE

[Screen 1]

Welcome to our experiment!

During the experiment you are not allowed to use electronic devices or to communicate with other participants. Please use only the programs and functions intended for the experiment. Please do not talk to the other participants. If you have a question, please raise your hand. We will then come to you and answer your question in silence. Please do not ask your questions out loud. If the question is relevant for all participants, we will repeat it loudly and answer it. If you violate these rules, we must exclude you from the experiment and the payout.

This experiment consists of two tasks. You will now immediately proceed with the first task. After you have finished the first task, you will receive the instructions for the second part.

During the experiment you will earn money. Additionally, you will get a show-up fee of 5 euros. Your total payoff for the experiment will thus consist of

5 euros show-up fee + money depending on the decisions in task 1 and task 2

All the decisions during the experiment are anonymous, and other participants will not find out about your choices.

Press OK when you are ready to start the experiment.

[Screen 2]

Task 1

The task consists of encoding combinations of letters into numbers. In the task, three capital letters always yield a "combination"; You will be given a table that for each letter contains an encryption code. You will have to encrypt each letter with its code. Your task will be to encode as many combinations as possible.

On your table you can find a sheet of paper with an example screenshot from task one.

In that example, three capital letters: "D", "Y" and "H" have to be encoded. The participant has already encrypted 2 combinations correctly. The solution follows immediately from the table:

The encryption code for "D" is 870 (already entered by the participant)
The encryption code for "Y" is 115 (already entered by the participant)
The encryption code for "H" is 207 (not entered yet by the participant)

To make an input, you have to click on the blue box below the first capital letter. To move between boxes you can use the Tab key or your mouse.

Press OK to continue.

[Screen 3]

Example

You can see in the example that there is a "Check" button in the lower right corner of the screen.

If all 3 numbers have been entered, proceed by clicking the "Check" button. The computer then checks whether all capital letters have been encoded correctly. Only then the combination is counted as successfully solved. After that a new combination (again consisting of three capital letters) is randomly drawn.

Furthermore, a new encryption table is generated in two steps: 1. The computer program randomly selects in the table a new set of three-digit numbers to be used for the encoding of the capital letters. 2. Additionally, the computer program shuffles the position of the capital letters in the table. Please note that the program always uses 26 capital letters of the German alphabet.

Please note that if a new combination appears, you have to click with your mouse on the first of the three white boxes. Otherwise, no input is possible!

Please press OK to continue.

[Screen 4]

Bear in mind, after wrong inputs:

- The current combination to encode will not change until a correct input was made.
- However, your previous inputs (in the 3 boxes below the capital letters) will all be deleted.
- Furthermore, the table stays unaltered, meaning that the allocated numbers remain identical. Also, the position of the capital letters in the table does not change.

Please press OK to continue.

[Screen 5]

Task 1 - Trial period

The task starts with a trial period in which each participant has to encrypt exactly ten combinations.

Please note:

- Correct solutions do not lead to payments in the trial period.
- The general idea of the trial period is to make you as familiar as possible with the task before the actual experiment begins.

Therefore you should take the trial period seriously and try to solve the ten combinations as fast as possible!

Please raise your hand if you still have further questions. We will come to your desk and answer them individually.

Please press OK to continue.

[Screen 6]

ENCRYPTION TASK. SEE FIGURE 10.

[Screen 7]

Task 1 - Paid period

In the paid period each participant has 8 minutes to encrypt as many combinations as possible. After the 8 minutes, you will be ranked according to the number of combinations encrypted relative to all participants.

There are 24 participants in this experiment. Participants who are ranked among the top 12 performers will get a payment of 15 euros, whereas participants who are ranked among the bottom 12 performers will get a payment of 10 euros

Please press OK to continue.

[Screen 8]

ENCRYPTION TASK. SEE FIGURE 10.

[Screen 9]

You are among the upper 12 participants [lower 12 participants] and receive an envelope with 15 [10] euros.

After you press OK we will begin distributing the money that you earned in task 1.

Press OK when you are ready to continue.

[Screen 10]

Task 2

There is a six-sided die on your desk. We ask you to roll it in private once after you read the instructions.

Please do not roll the die before you are not told to do so.

After you rolled the die we will ask you to enter the rolled number into the computer.

You will lose money equivalent to the number reported by you. If you report "1" you will lose 1 euro, if you report "2" you will lose 2 euros, if you report "3" you will lose 3 euros etc.

[Just people with 10 euros envelopes see this]

Number thrown	1	2	3	4	5	6
Money you keep	9€	8€	7€	6€	5€	4€

[Just people with 15 euros envelopes see this]

Number thrown	1	2	3	4	5	6
Money you keep	14€	13€	12€	11€	10€	9€

[Everyone sees this]

After you reported your dice roll, you will take your earnings from the envelope and give the envelope with the remaining money back to the experimenter.

Press OK to begin with task 2.

[Screen 11]

Please roll the die once now

Remember the number you rolled

Press OK when you are finished

[Screen 12]

Task 2

Enter the rolled number now: _______

Press OK when you are finished

[Screen 13]

You absolved all the tasks of the experiment.

Please fill out the survey before you leave the room for payment

Bring the envelope with the remaining [reported die roll] to the payout. We will count the remaining money.

Press OK to start the survey.

[Screen 14]

Please answer the following question:

In task 1 your task was to encrypt as many combinations as possible

You were under the upper [lower] 12 participants.

What do you think was your exact rank in task 1? ________

If you guess correctly, you will receive 1 euro in addition to your earnings.

Press OK after you have typed in your guess.

[Screen 15]

You guessed that you were ranked number X in task 1. Your actual rank was Y.

[$X = Y$]

You will receive 1 euro in addition to your experimental earnings.

[$X \neq Y$]

You will not receive any additional earnings.

[Everyone sees this]

Press OK to proceed to the last part of the survey.

[Screen 16]

Survey

Please describe briefly how you made your decisions in the experiment ________

Age ________

Gender ________

Field of study ________

Study degree ________

Semester ________

Native language ________

B.2.2 Instructions CONTROL

We only show the screens that differ from DESERVE.

[Screen 7]

Task 1- Paid period

In the paid period each participant has 8 minutes to encrypt as many combinations as possible. After the 8 minutes, you will be ranked according to the number of combinations encrypted relative to all participants.

There are 24 participants in this experiment. Participants who are ranked among the top 12 performers will get a payment of 1 euro, whereas participants who are ranked among the bottom 12 performers will not earn any money.

Please press OK to continue.

[Screen 9]

You are among the upper 12 participants [lower 12 participants] and receive 1 [0] euro.

Press OK when you are ready to continue.

[Screen 9a]

Task 2

Now, we will go around with a bag with 12 white balls and 12 yellow balls. You will draw one ball from the bag without looking, and you will keep it with you. Before doing that, we will show you that the bag contains the same proportion of white and yellow balls.

If you draw a white ball, you will get an envelope with 10 euros. If you draw a yellow ball, you will get an envelope with 15 euros.

One of the experimenters will go to your computer and will personally enter the type of envelope according to the color of your ball and give you the envelope.