On Individual Cursedness
- How personality shapes individuals' sensitivity to incur a winner's curse -

Nadine Chlaß[‡]

Abstract

Game theoretic models of the winner's curse such as Eyster and Rabin's (2005) Cursed Equilibria or Crawford and Iriberri's (2007) level-k auctions assume that the curse is a result of wrong beliefs. Charness and Levin (2009) falsify this assumption experimentally and suspect that the curse might be driven by individuals' inability to account for future events. Here, I define a game such that the explanations above do not apply and show experimentally that the curse is essentially unchanged. Instead, I find that the curse is rooted in individuals' personality. Personality governs the scale of the individual curse at the outset of the experimental test and determines whether individuals unlearn the curse, or instead, *acquire* the curse with experience.

JEL Classification: D03,D82,D83

Key words: asymmetric information, winner's curse, personality traits

[‡]Department of Economics, Friedrich-Schiller-University Jena, Email: nadine.chlass@uni-jena.de. Thanks to participants of the METEORITE seminar in Maastricht for a great discussion and to participants of the 6th nordic conference on behavioral and experimental economics, thanks to Willibald Ruch, Topi Miettinen, and René Levínský for comments, and to Christoph Göring for his help in running and programming the experiment. All errors are mine.

1 Introduction

In this paper, I show that the source of the winner's curse lies in individuals' personality. The winner's curse is a well known deviation from rational self-interest in decision making under information asymmetry. Bidders who do not know the exact quality of the item to be auctioned off bid more than rational self-interest implies and incur heavy losses[1]. Game-theoretic models of the curse assume that cursed bidders hold wrong beliefs about other players, for instance, that cursed bidders fail to see that, if everyone else bids less, everybody else must also value the item less (Eyster and Rabin 2005). Crawford and Iriberri (2007) assume that bidders have a different propensity to think about other bidders. However, Charness and Levin (2009) experimentally replace the seller of an auction item by a commonly known decision rule and find that the only bidder's curse subsists when there is literally nobody to be reasoned upon. Bidders even establish correct information on the expected quality of item but do not seem to react adequately. The authors speculate that individuals may fail to see how information about a future event – i.e. whether or not the bid is accepted – can be relevant for *current* decision at all.

Here, I build upon this idea and design a game where the *seller* is the potentially cursed party. A fully informed rational robot bidder makes an offer to the seller of an auction item who ignores the quality of the item he wants to sell. The game is a variant of Samuelson and Bazerman's (1983) take-over game. In particular, the bid which the seller needs to take into account has already been made and contrary to previous studies, the potentially cursed party therefore does not need to take a future, i.e. – conjectured – event into account, but one which has already taken place. In an experimental test, I do not find that the curse is affected by this intervention. Yet, I do find a means to describe individuals' sensitivity to the curse.

I further test if individuals' winner's curse is a result of personality. Given the properties of the curse, it is likely that some stable individual characteristic is at play which is not intelligence (otherwise, there would be learning, or

[1]There is field evidence from stock market investments (Miller 1977), acquisitions of baseball players (Cassing and Douglas 1980), oil lease auctions (Capen et al. 1971), and a wide range of common value auctions in the lab (Eyster and Rabin 2005).

a reaction to simplification of the task), and not risk attitudes (risk attitudes have already been controlled for and are so here). Specifically, I use Hans-Jörg Eysenck's P-E-N, the most integrative personality concept to date[2] based on Eysenck's biological theory of personality which postulates three personality traits, *Extraversion*, *Neuroticism* (Eysenck 1967), and *Psychoticism* (Eysenck et al. 1985). Empirical studies show that individuals' *load* on these traits affect how individuals react to stimulus, how they deal with information, and how much they can adapt to their environment. Eysenck's theory has a biological foundation in that each trait was theorized and confirmed to correlate with specific hormones and messengers.

At the outset of the experimental task, individuals who load low on Psychoticism – a trait which manifests in egocentricism, impulsiveness and inadaptability to new environments – *do not* incur a winner's curse on average. On average, they state acceptance thresholds very close to Bayesian Nash equilibrium. Instead, individuals who load high on Extraversion – a trait which influences whether individuals rather derive cortical arousal from preparing (low load) or from actually performing an action (high load) – incur a heavy curse. Personality also affects the dynamics of the curse. Individuals with a high load on Extraversion unlearn the curse with experience. Individuals with a high load on Neuroticism – a trait which makes individuals highly sensitive to fear, worries and bad emotions – *acquire* the curse with experience. I discuss which mechanisms might trigger the effects I observe. By the end of the experimental task, most bidder curses falls within the range of χ-cursed equilibria (Eyster and Rabin 2005). Yet, there are up to 25% of observed actions which imply more severe average losses than even the heaviest curse which can be predicted by economic theory so far[3]. I am able to show that these observations can also be predicted by individuals' personality.

I proceed as follows: section two presents the game, its Bayesian Nash, and Cursed equilibria which I use as benchmark for the Curse. Section three reviews empirical findings on Eysencks' theory of personality. Section four presents the experimental design. Section five presents my results and section six concludes.

[2]The 'Big Five'(Costa and McCrae 1995) are merely a higher factor resolution.

[3]I.e. an action implies even more average losses than the average loss made by a decision maker who does not condition the ex-ante expected value of the item on the action she observes.

2 The Game

2.1 Structure

The game varies the acquiring-a-company task (Bazerman and Samuelson 1983) by assigning private information to the party who moves first. There are two parties, an acquirer a and a seller s of a commodity, who negotiate the ownership of the seller's commodity. The commodity has quality $\overline{v}$ which is a random draw from some distribution $f(v)$. This quality is private information to the acquirer. The seller merely knows the overall distribution of qualities $f(v)$. Both parties valuate the commodity differently, acquirer a by its actual quality $\overline{v}$, and seller s by a fraction q of the actual quality, i.e. by $q\overline{v}$.

Negotiation proceeds sequentially. In round *T=1*, acquirer a makes a purchase offer p. In round *T=2*, seller s decides whether to accept or to reject the offer, i.e. $\delta_s \in \{0, 1\}$. If seller s accepts, she obtains offer p and hands in her commodity which she evaluates at $q\overline{v}$. Acquirer a in turn obtains the commodity and pays offer p. In this case, the acquirer has payoff $\Pi_a = (\overline{v} - p) \cdot \delta_s$, and the seller has payoff $\Pi_s = (p - q \cdot \overline{v}) \cdot \delta_s$. If seller s does not accept offer p, i.e. $\delta_s = 0$, neither party earns anything.

Note that every offer p made by a rational self-interested acquirer carries the information that p is smaller than the actual quality of the commodity $\overline{v}$ such that acquirers break even. A seller must condition her decision on that information if she wants to avoid average losses. Next, I apply (1) the Bayesian Nash equlilibrium which assumes that sellers use this information, and (2) Eyster and Rabin's (2005) 'Cursed Equilibria' which assume that individuals can ignore this piece of information by various degrees χ.

2.2 Bayesian Nash Equilibrium

In round *T=2* seller s expects a nonnegative payoff $E(\Pi_s) \geq 0$ iff $p \geq q \cdot E(v|v \geq p)$. Therefore, her best response writes:

$$\delta_s^{BNE} = \begin{cases} 1: & p \geq q \cdot E(v|v \geq p) \\ 0: & otherwise \end{cases}$$

In round *T=1*, acquirer a rules out dominated strategies by stating the smallest offer a rational seller would accept, i.e. $p = q \cdot E(v|v \geq p)$. The acquirer rules out losses iff $p \leq \overline{v}$. Therefore, here best response writes:

$$p_a^{BNE} = \begin{cases} q \cdot E(v|v \geq p) : & q \cdot E(v|v \geq p) \leq \bar{v} \\ d : & otherwise \end{cases}$$

where I assume that, if she cannot make an offer a rational seller would accept, the acquirer randomizes with equal probability between all offers $d \in [0,\ \bar{v}]$ where she does not make a loss. Such offers would always be rejected in Bayesian Nash Equilibrium.

In take-over games (Bazerman and Samuelson 1983; Grosskopf et al. 2007) qualities are typically assumed to be uniformly distributed ($f(v) = U(0,1)$) which implies that $E(v|v \geq p) = \frac{p+1}{2}$. In this case, the minimal offer a rational seller accepts requires $\Pi_t^0 = p - q \cdot E(v|v > p) = 0$. Solving for p one obtains the equilibrium offer $p_{\Pi_t^0} = \frac{q}{2-q}$ made by a rational acquirer who does not incur a loss in making it ($p_{\Pi_t^0} \leq \bar{v}$). Note that this is the piece of information about quality $\overline{v}$ revealed by a rational acquirer's offer which a rational seller needs to take into account to avoid average losses. The next section derive an interval of 'Cursed equilibria' whichallow for sellers who do not fully perform that step.

2.3 Cursed Equilibria

What happens if a perfectly rational acquirer[4] who believes in the seller's rationality, negotiates with a seller s who falls prey to a winner's curse? In Eyster and Rabin's (2005) framework such a seller expects with probability χ that the acquirer has *not* conditioned her offer on her private information $\overline{v}$. In the game at hand, a χ-cursed seller would only expect with probability $1 - \chi$ that the offer is smaller than quality $\overline{v}$. If χ=*1*, then the seller is said to be *fully cursed*. In round *T=2*, a χ-cursed seller supposes to rule out losses by deciding:

$$\delta_{\chi,s} = \begin{cases} 1 : & p \geq \chi \cdot q \cdot E(v) + (1-\chi) \cdot q \cdot E(v|v \geq p) \\ 0 : & otherwise \end{cases}$$

[4]This is the relevant benchmark for the experimental setting where I replace the acquirer by a fully rational robot. Otherwise, one would have to assume which kind of belief the fully informed party holds about the seller's degrees of cursedness.

A perfectly rational acquirer a who in round *T=1* believes in common rationality expects that seller s accepts only iff $p \geq q \cdot E(v|v \geq p)$. Acquirer a therefore makes the Bayesian Nash equilibrium offer:

$$p_a^{BNE} = \begin{cases} q \cdot E(v|v \geq p): & q \cdot E(v|v \geq p) \leq \bar{v} \\ d: & otherwise \end{cases}$$

Hence, seller s' s cursedness can only affect the condition under which there is trade in equilibrium but not offer p itself. In particular, a χ-cursed seller accepts offers $d \in [0, \bar{v}]$ as long as $d \geq \chi \cdot qE(v) + (1-\chi) \cdot q \cdot E(v|v \geq p)$. The condition under which we observe trade in a χ-cursed equilibrium is a weighted average between the respective trade condition in Bayesian Nash equilibrium, and a fully Cursed equilibrium where $\chi = 1$. If for $\chi = 1$, one again assumes a uniform distribution of qualities ($f(v) = U(0,1)$ there is trade iff $p \geq qE(v) = q \cdot 0.5$. For any $\chi \in]0,1]$, one has trade for $p \geq \chi \cdot q \cdot \frac{1}{2} + (1-\chi)\frac{q}{2-q}$.

2.4 Personality traits and individuals' handling of information

'Cursed Equilibria' assume that parties who incur a winner's curse do not see the information disclosed by *others' actions* (Eyster and Rabin 2005). In the game at hand, an acquirer has private information $\bar{v}$. A rational acquirer avoids losses and always bids $p \leq \bar{v}$. If the seller correctly reasons about the acquirer decision, every offer discloses an upper bound of quality $\bar{v}$ to her. In an experimental test, Charness and Levin (2009)[5] replace the privately informed party by a commonly known decision rule carried out by a computer. Hence, the potentially cursed party has the information she needs to take into account right in front of her eye and need not reason about how the other player makes her decision. However, the winner's curse subsists. The authors even find that the cursed party has correct information about the quality of the item – per offer,

[5] In this study, an original acquiring-a-company game is played with only two types of quality (good and bad). There is no future opponent's move to be reasoned upon which is why neither level-k thinking nor cursed equilibrium applies. Individuals are actually found to collect accurate information (i.e. rank qualities accurately conditional on different offers in the buy-in case), but are either unaware of the information they have gathered, or do not see why or how to respond to such information.

individuals correctly rank the qualities they can expect. Here, I therefore suspect that the winner's curse could be rooted in some individual characteristic which affects how and to what extent we incorporate information – i.e. the commonly known decision rule – into our actions. At the same time, this individual characteristic must somewhat hinder that the curse vanishes with experience (Grosskopf et al. 2007). Therefore, whatever drives the curse must also affect *how we react to feedback* and consequently, how we learn.

One individual characteristic which affects how individuals handle information is personality. In this paper, I use H.J. Eysenck's concept which postulates three dimensions, or *traits* of personality (Eysenck 1967, 1985), *Psychoticism*, *Extraversion*, and *Neuroticism* P-E-N. In order to explain why personality might be at the source of the winner's curse, I specifically point out how these traits affect individuals' reaction to information. Eysenck's concept is the result of a theory validated by extensive empirical testing and has a biological foundation which I refer to occasionally.

Neuroticism as opposed to emotional stability describes a first dimension. Load on neuroticism reflects a heightened degree of emotionality and a propensity to experience negative emotions (Busato et al. 2000). Typical symptoms for a high load on neuroticism count anxiety, nervosity, and low stress tolerance (Eysenck and Eysenck 1975). It inhibits an individual's adaptability to environmental change (Hennig et al. 1998) and may fully intercept the link between intelligence and task performance (Moutafi et al. 2006). In summary, Neuroticism impacts the overall activity of the affective system. Thereby, it may inhibit the deliberate rational system (Fudenberg and Levine 2006) and thus affect the rational assessment of information.

Extraversion as opposed to intraversion defines how one interacts with one's environment. Typical symptoms for a high load on extraversion are activeness, conviviality, assertiveness, or the seeking for sensations. Extraverts exhibit low cortical arousal thresholds and therefore require intense external stimulation. They are highly sensitive to potential rewards (Depue and Collins 1999), spend little time on stimulus analysis, and respond to stimulus even when unnecessary (Brebner and Flavel 1978). Extraverts derive cortical arousal from preparing reactions to stimulus while introverts derive cortical arousal from the analysis of stimulus itself (Rammsayer and Stahl 2004)[6]. In sum, extraversion may predispose an agent to respond, but indispose her to properly prepare that response by a careful assessment or inference of information.

Psychoticism as opposed to high impulse control measures alleviated attributes of schizophrenia in healthy individuals. Typical symptoms count agressiveness, egocentrism, antisociality, low empathy, impulsiveness, nonconformity, and creativity (Eysenck et al. 1985). Psychoticism goes along with high dopamine levels (Colzato et al. 2009) and manifests in low conditionability (Lester 1989). Load on psychoticism may inhibit an agent to condition her behaviour adequately on the information she receives. However, psychoticism seems a controversial dimension of personality. Some studies find it a reliable (Ortet et al. 1999), some an unreliable (Caruso et al. 2001) scale.

3 Experimental Design

I ran a computerized experiment of three sessions with altogether 96 participants[7]. To date, I have performed several robustness checks with other games. The common value parameter q which rules the extent of the potential winner's curse under information asymmetry was set to $q = 0.6$. Qualities were drawn from a uniform distribution $f(v) = U(0, 10)$ with a cognitively simplified [0,10]-interval of qualities[8].

In the beginning of each session, subjects completed the standardized German Eysenck personality inventory 'EPQ-R' developed by Willibald Ruch (1999). It elicits Eysenck's personality dimensions *Extraversion*, *Neuroticism*, and *Psychoticism*. Then, subjects started out with an elicitation of subjects' risk preferences where subjects would chose between lotteries and sure payoffs. Thus, subjects started out with an endowment of €5 plus expected €2.50. Feedback on risk preferences was only given in the end of the experiment such that all participants started out with an equal expected endowment. This endowment

[6] This relation was conjectured by Eysenck, but could only be identified empirically by Rammsayer and Stahl's (2004) design

[7] Undergraduates from the Friedrich-Schiller-University of Jena, randomly drawn from different fields of study. Participants were recruited using ORSEE (Greiner 2004), the experiment was programmed in z-Tree (Fischbacher 2007).

[8] Values between 0 and 1 result in very small numbers for seller valuations and offers, and hence, very small absolute differences.

was intended to compensate the negative payoffs of cursed participants from the game[9]. Subsequently, subjects played the game presented in section two for twenty rounds (instructions are available from the author upon request). The buyer was replaced by a preprogrammed robot whose decision rule was commonly known[10], and who played the Bayesian Nash acquirer strategy derived in section 2.2. This amounted to overall 96 independent series of 20 seller choices. In each round, my main interest was in subjects' degree of cursedness and therefore, in the smallest offer a subject would still accept. To identify that offer, I divided the range of offers into five equally sized steps, and asked subjects to decide at which offer they would switch from accept to reject. (strategy method). Afterwards, the step between the last offer a subject was still willing to accept and the first offer she did not accept anymore was redivided twice into five equally sized steps. Thus, the smallest offer a subject was still willing to accept identifies subjects' acceptance threshold at a precision of two decimals. Subjects' *degree of cursedness* χ would unfold as the difference in subjects' actual break even point and subjects' acceptance threshold. Feedback was given on the payoffs for each round, but not on overall earnings. Thus, subjects had an opportunity to learn in an environment where the only element of the utility function which varied was nature's random draw.

Throughout each task, subjects proceeded at their own speed. Neither did they need to wait for others' decisions to be made nor were they pressed to make their own decisions by others' decisions having been made[11]. Average earnings were 7.40 €, and the experiment lasted approximately an hour.

4 Results

4.1 Descriptives

Do individuals who differ in their load on Eysenck's personality traits exhibit visibly different degrees of cursedness? If so, individuals with a high load on a

[9]The amount of €7.50 equals the show-up fee that participants receive in experiments where a winner's curse usually occurs.

[10]It said: The computer makes offers such that on average, you will not incur a loss. The computer makes such offers as long as it does not make a loss itself. Otherwise, the computer randomly chooses an offer amongst all offers where it does not make a loss.

[11]Note that this is important to see uncensored differences between introverts and extraverts.

given trait and individuals with a low load on the same trait should state visibly different acceptance thresholds.

Extraversion. Figure 1 depicts violin plots (Hintze et al. 1998) of individuals' acceptance thresholds given high[12] (Extraverts), and given low load (Intraverts) on Extraversion for all periods, the first period only, early, and late periods. Violin plots show the distribution of acceptance thresholds (grey shaded area), which is centered around the interquartile range (black line) with the median (white point). Two dotted lines depict the interval between a fully cursed equilibrium where the degree of cursedness is $\chi = 1$, and a Bayesian Nash equilibrium where $\chi = 0$. Overall, Intraverts and Extraverts differ little in their acceptance thresholds, except that Intraverts state more often higher-than-Nash equilibrium thresholds than Extraverts do. Visible difference occur at the outset. In period 1, only some 25% of all Intraverts fall within $\chi \in [0, 1]$ and classify as cursed with residual 50% of Intraverts who state higher-than Nash-thresholds. In contrast, 50% of all Extraverts classify as cursed.

In the early periods, Intraverts' acceptance thresholds become substantially

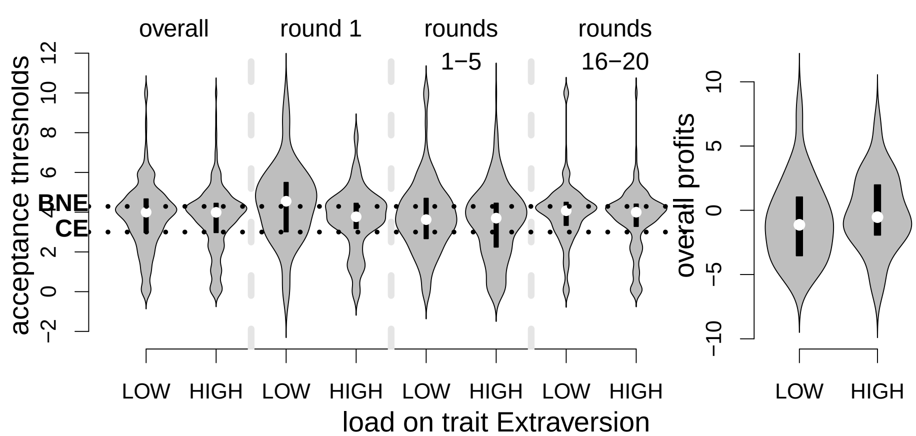


Figure 1: Violin plots for high and low loads on Extraversion (median split).

more cursed. Extraverts' thresholds decrease in the lower quartile, but are less affected by first experience. In the last five periods, Extraverts' and Intraverts'

[12]'high' indicates a load higher than the median load over all participants, and 'low' a load smaller than the median load.

do not differ much *within* the interval of cursedness. However, we see that the lower tail of Extraverts' thresholds is visibly fatter than for Intraverts. Throughout all cases, some 25% of all thresholds fall *outside* the interval $\chi \in [0,1]$. Extraverts have higher overall profits than Intraverts do, because their thresholds increase more quickly after the fifth round than those of Intraverts do (see section 5.2).

Neuroticism. Violin plots in Figure 2 depict acceptance thresholds given high and low load on Neuroticism. Overall, emotionally stable Nonneurotics, and Neurotics show little difference in their acceptance thresholds. However, Neurotics' acceptance thresholds seem to have a fatter left tail than Nonneurotics' who have more often a tresholds below a fully cursed equilibrium. At the outset, only 25% of emotionally stable individuals classify as (moderately) cursed with a median at $\chi = 0$. Neurotics are more cursed in the median threshold, and cover the entire range of cursedness. In the early rounds, ex-

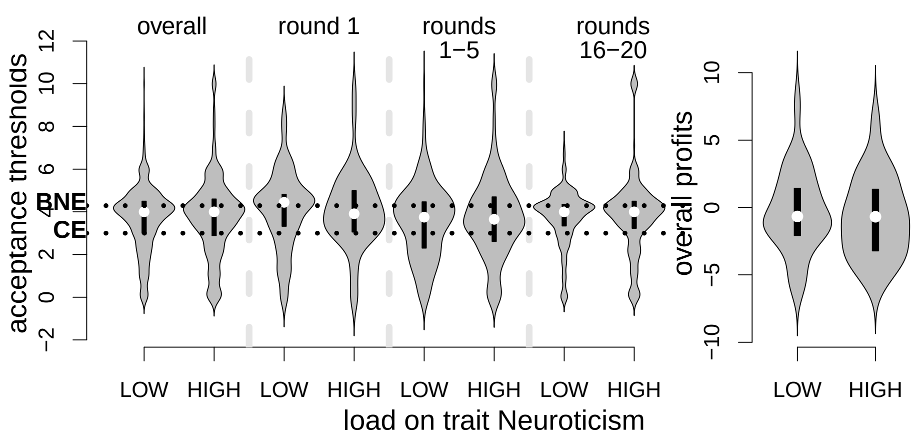


Figure 2: Violin plots for high and low loads on Neuroticism (median split).

perience increases the curse for either load, and in the final rounds, only the lower tails of the distributions continue to differ. The fat left tail of Neurotics' acceptance thresholds indicates frequent heavily cursed thresholds. A substantial part of Neurotics' acceptance thresholds falls below a fully cursed threshold.

This pattern makes that earnings differ only in the 25% quantiles: highly neurotic individuals incur the heaviest losses.

Psychoticism. Figure 3 depicts acceptance thresholds given high and low load on Psychoticism. Overall, individuals with a high impulse control who have a low load on Psychoticism, and individuals with a high load on Psychoticism differ little in their acceptance thresholds. At the outset, 25% of nonpsychotic individuals fall within the range a cursedness $\chi \in [0, 1]$ whereas 50% of individuals with a high load classify as $\chi-$ cursed. However, nonpsychotic individuals become visibly cursed in the first rounds whereas the 75% quantile of Psychotists' acceptance thresholds starts to cross the Bayesian Nash equilibrium line. In the last five rounds, som 50% of all individuals with a low load on Psychoticism still classify as cursed whereas Psychotics' thresholds continue to increase and for the last five rounds, only 25% still classify as (moderately) cursed. Overall earnings reflect these dynamics in that individuals with a low load earn less than individuals with a high load.

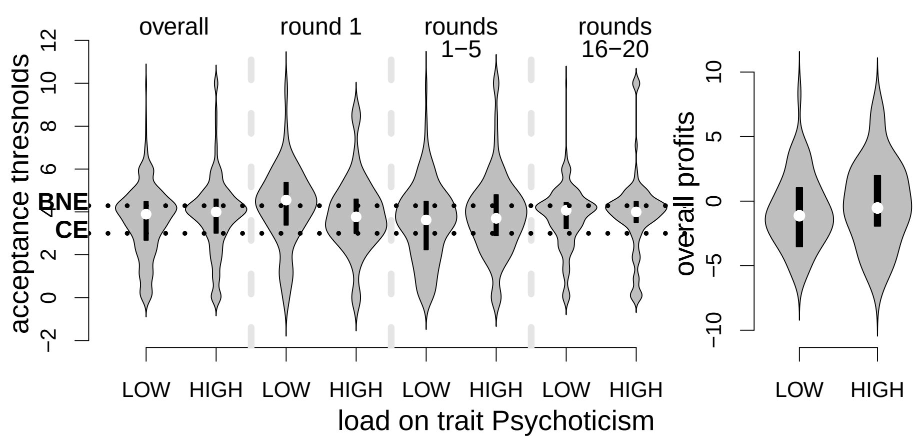


Figure 3: Violin plots for high and low loads on Psychoticism (median split)

5 Treatment Effects

5.1 Initial Cursedness

Here, I quantify to what extent the 'natural treatments' load on *Neuroticism*, load on *Extraversion*, and load on *Psychoticism* explain individuals' acceptance thresholds at the outset. Table 1 depicts OLS results of a linear regression where the dependent variable are individuals' acceptance thresholds, and the independent variables are individuals' personality traits, and their risk attitude. Residuals would neither correlate with the fitted values from the regression, nor with single regressors, and hence, there is no latent variable which drives the results in question. Standard errors are heteroscedasticity robust, and the R^2 was 0.17.

	Estimate	*Std. Error*	*t-Value*	*p-Value*
Intercept	8.74	1.19	7.35	0.01
Ex	-2.47	0.82	-3.02	0.01
P	-2.78	1.26	-2.21	0.03
N	-0.59	0.84	-0.71	0.48
R	-3.72	1.50	-2.48	0.02

Table 1: Acceptance thresholds, first period.

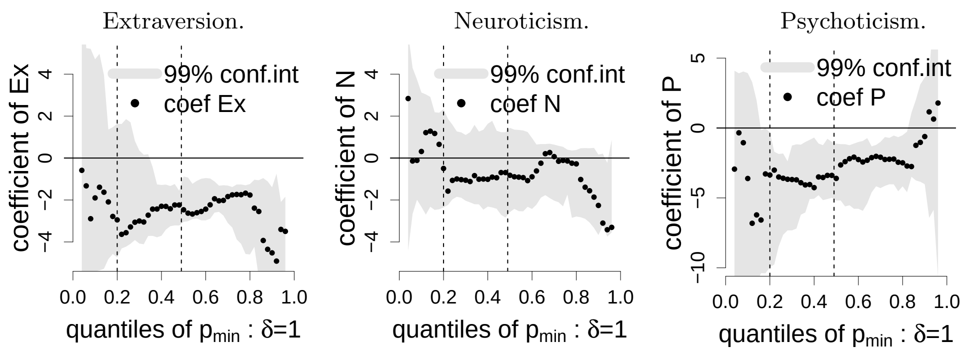
Overall, individuals have a tendency to state very high acceptance thresholds in the first round as indicated by the size of the intercept. There are two personality traits, *Extraversion* Ex, and *Psychoticism* P which significantly relate to acceptance thresholds in the first period. The higher the load on the respective trait, the lower the acceptance threshold. Risk attitudes also play a role in the first period. The more risk averse an individual, the lower the acceptance threshold in the first period. Note that there are two types of risks in this game: the risk of making a loss; but also the risk of rejecting a potentially beneficial offer, and to earn Zero. The negative coefficient makes sense for the latter, in particular if one considers the size of the intercept. Altogether, to reach the interval of cursedness which is $p_{min:\delta=1} \in [3, 4.29[$, a risk-neutral individual would need to have some 50%[13] load on Extaversion, and Psychoticism, or load

[13]This means that 50% of the circumstances elicited in the P-E-N-L questionnaires which load on the respective scale apply.

extremely high on one of these traits.

To shed some light on the heterogeneity of these effects, I repeated the regression above for various quantiles of individuals' overall acceptance thresholds in period One[14]. Fig. 4 depicts the impact of each personality trait for various quantiles of acceptance thresholds $p_{min} : \delta = 1$.

Figure 4: Impact of personality traits on quantiles of acceptance thresholds in period 1.



Each graph in Fig. 4 shows, to what extent an increasing load on a specific trait changes a respective quantile of the overall distribution of acceptance thresholds. Two dotted vertical lines delimit the interval of χ-cursed acceptance thresholds. The lower (leftward) boundary marks a fully cursed acceptance threshold, i.e. $\chi = 1$, the upper (rightward) boundary marks a Bayesian Nash acceptance threshold, i.e. $\chi = 0$. The shaded region consists of 99% confidence intervals for the effect/coefficient of a personality trait on the respective quantiles[15]. *Extraversion* does not show a significant impact on threshold quantiles which signal high cursedness. The impact turns significant halfway from a fully Cursed to a Bayesian Nash equilibrium. Hence, individuals with a higher load on Extraversion are more often more cursed initially, but not beyond a certain intermediate level of cursedness. Outside the range of cursedness, individuals with a higher

[14]Hence, for each quantile of $p_{min} : \delta = 1$, the regression equation is : $p_{min:\delta=1,\tau,i} = \beta_0 + \beta_1 Ex + \beta_2 N + \beta_3 P + \beta_4 R + u_i$

[15]Whenever this shaded region does not include Zero, i.e. does not include the x-axis, the coefficient/impact of the respective personality trait on the respective quantile is significant at $p \leq 0.01$

load on Extraversion less often make inefficient above-equilibrium thresholds ($p_{min} : \delta = 1 > 4.29$) in the first period.

Neuroticism does not show a significant impact on any quantile, and hence, the non-existence of an effect on the mean in table 1 is homogeneous, i.e. holds for the entire distribution of acceptance thresholds. *Psychoticism* affects the entire range of χ-cursed acceptance thresholds. The higher the individual load on Psychoticism, the more cursed the individual acceptance threshold over all χ. Similarly to Extraversion, an increasing individual load on Psychoticism makes inefficient acceptance thresholds above the Bayesian Nash equilibrium less likely. In summary, the effects on the mean acceptance threshold observed in table 1 turn out to be quite homogeneous for the entire distribution of acceptance thresholds. In particular, the effects exist within the range of cursedness χ.

5.2 Dynamics

Now, I analyze to what extent load on *Neuroticism*, *Extraversion*, and *Psychoticism* affect the evolution of individuals' acceptance thresholds with experience. Table 2 depicts OLS results of a linear fixed effects regression. The dependent variable are individuals' acceptance thresholds, and the independent variables individuals' personality traits, and their risk attitude. Again, I made sure residuals would not correlate with fitted values from the regression, or with single regressors, to avoid any spurious relation. Standard errors are heteroscedasticity robust, and the R^2 was 0.87. Individual intercepts (fixed effects) are not displayed.

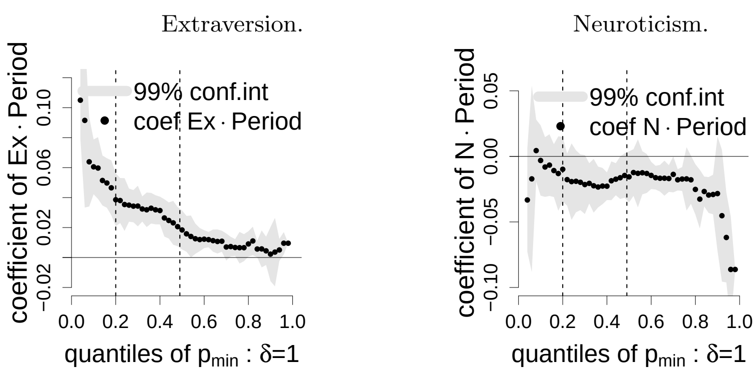
	Estimate	*Std. Error*	*t-Value*	*p-Value*
$Ex \cdot Period$	0.04	0.01	3.27	0.01
$N \cdot Period$	-0.04	0.02	-2.21	0.03

Table 2: Acceptance thresholds, all periods.

There were no significant interactions of risk attitudes, or Psychoticism with experience (periods). The only two personality traits which turned out to affect individuals' potential (un)learning of the curse, were load on *Extraversion*, and load on *Neuroticism*. Thereby, extraversion would increase the mean acceptance threshold with experience, and hence, extraverts would unlearn the curse. Load on Neuroticism which was not found to affect the mean, or any quantile of individuals' acceptance thresholds in the first period, turns out to decrease the mean acceptance threshold throughout periods. By how much can acceptance thresholds hence differ in the experiment? Loads on personality traits fall within [0,1], period counts from 1 to 20, and hence, Extraversion would increase the predicted acceptance threshold by 0.04 from one round to another, or, by 0.8 over the entire experiment. For Neuroticism, we have a similar sized effect, but it is negative. Hence, over the entire experiment, an individual with a fully cursed threshold, i.e. $\chi = 1$ at the outset, could state a less severely cursed threshold in the end, i.e. $\chi = 0.38$[16].

Fig. 5 repeats this regression for various quantiles of acceptance thresholds. Each graphs in Fig. 5 shows, how much a respective predictor changes a given

Figure 5: Impact of personality traits on the dynamics of acceptance thresholds.



quantile of acceptance thresholds. As before, two dotted vertical lines delimit the interval of χ- cursed acceptance thresholds, and the shaded region depicts 99% confidence intervals for the effect of a predictor on the respective quantile. The interaction of *Extraversion* with *Period* significantly increases nearly all quantiles of acceptance thresholds, and in particular, the range of χ-cursed

[16]Bayesian Nash threshold is $p_{min}^{BNE} : \delta = 1 = 4.29$, fully cursed threshold is $p_{min}^{BNE} : \delta = 1 = 3$, the degree of cursedness if the fully cursed acceptance threshold of 3 rises to 3.8, is $1 - (0.8/(4.29 - 3)) = 0.38$

acceptance thresholds. Hence, Extraverts seem to homogeneously unlearn the curse. The size of the effect differs, however: unlearning is the stronger, the lower the initial acceptance threshold (the smaller the quantile of the distribution). The interaction of *Neuroticism* with *Period* nearly always reduces the respective quantile of acceptance threholds. It is a little more heterogeneous in significance. However, we find that Neuroticism significantly lowers initially cursed acceptance thresholds (the coefficient turns highly significant halfway from a fully Cursed, to a Bayesian Nash equilibrium). Hence, those individuals who initially incur losses, will incur more losses throughout rounds. In particular, Neuroticism unfolds the fatal dynamics that also individuals who would *not* classify as cursed in the beginning, will lower their acceptance thresholds with time, and therefore, will move toward, and into the interval of χ- cursed acceptance thresholds.

6 Conclusion

This paper finds that individuals' sensitivity to incur a winner's curse is rooted in individuals' personality. The winner's curse is a well-known deviation from rational self-interest in decision making under asymmetric information. Field evidence dates back as long as (Capen et al. 1971; Miller 1977), laboratory evidence counts numerous studies on take-over games (Bazerman and Samuelson 1983), common value auctions (Eyster and Rabin 2005), and other games (Ivanov et al. 2010). Substiantial effort has been made to model the winner's curse theoretically, such as the 'Cursed equilibrium' (Eyster and Rabin 2005) or Crawford and Iriberri's (2007) level-k auctions. The central assumption of those models – that the curse is a result of wrong beliefs about other players – has been falsified experimentally. Charness and Levin (2009) show that the curse subsists when there is nobody to be reasoned upon. Similarly, all other conjectured reasons for the curse, i.e. that it is the result of inexperience, or cognitive restrictions (Charness and Levin 2009) did not show in the laboratory. The origin of the phenomenon is - by today - a mystery.

Charness and Levin (2009) speculate that the curse might reflect that individuals do not see how a future event can be relevant for a current decision.

Here, I design a game to test this idea. I develop a task where an acquirer who holds private information on the value of a commodity makes an acquisition offer to a seller who ignores the exact quality of her commodity. Hence, the potentially cursed party moves last, and needs to account for a *past*, rather than a future move. In an experimental test, the acquirer's move is replaced by a commonly known decision rule (Charness and Levin 2009) to rule out any belief driven sources for a curse. The curse persists to all manipulations and I conclude that it is not the futurity of a payoff-relevant event which is at the source of the curse.

Instead, individuals' winner's curse strongly depends on their personality. Using the framework of Hans-Jörg Eysencks P-E-N[17] which describes three fundamental personality traits – *Psychoticism*, *Extraversion*, and *Neuroticism* – , initial (first-period-) cursedness links to high loads on *Extraversion*, and by a somewhat less significant but equally sized extent, to *Psychoticism*. Extraverts are active, convivial individuals who derive extensive cortical arousal from preparing reactions to stimulus. Psychoticism manifests in agressiveness, egocentrism, and impulsiveness. Neuroticism which results in a sensitivity to fear, heightened emotionality, negative emotions, and low stress tolerance is not able to explain any part of the initial winner's curse.

Eysenck's P-E-N also explains how individuals (un)learn the curse. While extraverts incur a strong winner's curse at the outset of the experimental task, they quickly unlearn it with experience. This might result from extraverts being individuals who are highly sensitive and reactive to feedback. High load on *Neuroticism* in turn seems to trigger a reverse dynamic. Neurotic individuals do not show an initial winner's curse but acquire the curse with experience. Even in Bayesian Nash equilibrium, rational parties only avoid losses on average. If a Neurotic who is not cursed at the outset makes a loss now and then and, if she increases her acceptance threshold, often gets a no-trade feedback, she might start to worry and, over time, become more and more emotional and stop acting rationally. This might explain why some individuals *acquire* the curse

[17]It is the parent version of Costa and McCraes Big Five. The latter does not rely on Eysenck's theory, and most biological findings on individuals' handling of information have been established with P-E-N

with experience.

My results point out, first, that the winner's curse links to stable characteristics of a decision maker, i.e. her personality traits, which are distinct from mere intelligence. Second, personality traits govern how the curse evolves with experience. Thereby, the curse can be stable itself – if an individual is at the same time extraverted or psychotic *and* neurotic. Such an individual could be cursed at the outset of the task, and cursed in the end. My results provide, third, a concept which explains behaviour under information asymmetry which was previously left unexplained, namely outside the interval of Bayesian Nash, and a fully cursed equilibrium (Eyster and Rabin 2005).

References

Akerlof, G. (1970), The Market for Lemons: Quality Uncertainty and the Market Mechanism, Quarterly Journal of Economics, 84, pp. 488-500.

Bazerman, M.H., Samuelson, W.F. (1983), I Won the Auction But Don't Want the Prize, Journal of Conlict Resolution, 27(4), pp. 618-634.

Brebner, J. (1999), Comment "The Personality Theories of H. J. Eysenck and J. A. Gray: a Comparative Review." G. Matthews and K. Gilliland (1999), Personality and Individual Differences, 26, pp. 583-626.

Brebner, J., Cooper, C. (1974), The Effect of a low Rate of regular Signals upon the Reaction Times of Introverts and Extraverts, H. J. Eysenck (Ed.), Reprinted in the Measurement of Personality, Lancaster: Medical Technical Publishing Company.

Brebner, J., Flavel, R. (1978), , The Effect of Catch-Trials on Speed and Accuracy among Introverts and Extraverts in a simple RT Task, British Journal of Psychology, 69, pp. 9-15.

Busato, V.V., Prins, F.J, Elshout,J.J., Hamaker, C. (2000), Intellectual Ability, Learning Style, Achievement Motivation and Academic Success of Psychology Students in higher Education. Personality and Individual Differences, 29, pp. 1057-1068.

Capen, E.C., Clapp, R.V., Campbell, W.M. (1971), Competitive Bidding in High Risk Situations, Journal of Petroleum Technology, 23, pp. 641-653.

Cassing, J. Douglas, R.W. (1980) Implication of the Auction Mechanism in Baseball's Free Agent Draft, Southern Journal of Economics, 47, pp. 110-121.

Caruso, J.C., Witkiewitz, K., Belcourt-Dittloff, A., Gottlieb, J.D. (2001), Reliability of Scores from the Eysenck Personality Questionnaire: A Reliability Generalization Study, Educational and Psychological Measurement, 61(4), pp. 675-689.

Charness, G., Levin, D. (2009), The Origin of the Winner's Curse: A Laboratory Study, American Economic Journal: Microeconomics, 1(1), pp. 207-36.

Chlaß (2010), The Impact of Procedural Asymmetry in Games of Imperfect Information, Beiträge zur Jahrestagung des Vereins für Socialpolitik 2010: Ökonomie der Familie - Session: Experimental Game Theory F13-V1.

Crawford, V. P., Iriberri, N. (2007), Level-K Auctions: Can a Nonequilibrium Model of Strategic Thinking Explain the Winner's Curse and Overbidding in Private-Value Auctions?, Econometrica, 75(6), pp. 1721-70.

Colzato, S., Slagter, H.A., van den Wildenberg, W.P.M, Hommel, B. (2009), Closing one's Eyes to Reality: Evidence for a Dopaminergic Basis of Psychoticism from Spontaneous Eye blink Rates, Personality and Individual Differences, 46, pp. 377-380.

Costa, P. T., McCrae, R. R. (1995)Primary traits of Eysenck's P-E-N system: Three- and five-factor solutions. Journal of Personality and Social Psychology. 69(2), 308-317.

Depue, R.A., Collins, P. F. (1999), Neurobiology of the Structure of Personality: Dopamine, Facilitation of Incentive Motivation, and Extraversion, Behavioral and Brain Sciences, 22, 491-517.

Eysenck, H.J. (1967), The Biological Basis of Personality, Springfield, IL: Thomas Publishing.

Eysenck, S.B.G., Eysenck, H.J., Barret, P. (1985), A Revised Version of the Psychoticism Scale, Personality and Individual Differences, 6 (1), pp. 21-29.

Eysenck, H.J. (1990), Biological Dimensions of Personality, Pervin, A. (Ed.), Handbook of Personality: Theory and Research, New York: Guilford, pp. 244-276.

Eysenck, H.J., Eysenck, S. (1975), Manual of the Eysenck Personality Inventory, London: Hodder and Stoughton.

Eysenck, H.J., Eysenck, S. (1985), A Revised Version of the Psychoticism Scale, Personality and Individual Differences 6, pp. 21-29.

Eyster E., Rabin , M. (2005), Cursed Equilibrium, Econometrica, 73 (5), pp. 1623-1672.

Fischbacher, U. (2007), z-Tree: Zurich Toolbox for Ready-made Economic Experiments, Experimental Economics, 10(2), 171-178.

Fudenberg D. (2006), Advances Beyond Advances in Behavioural Economics, Journal of Economic Literature, 44 (3), pp. 694-711.

Fudenberg, D., Levine, D.K. (2006), A Dual-Self Model of Impulse Control, American Economic Review, 96(5), pp. 1449-1476.

Greiner, B. (2004), An Online Recruitment System for Economic Experiments, in: Kremer, K., Macho, V. (Eds.) (2004), Forschung und wissenschaftliches Rechnen 2003, GWDG Bericht 63, Ges. f. Wiss. Datenverarbeitung, Göttingen.

Grosskopf, B., Bereby-Meyer, Y., Bazerman, M. (2007), On the Robustness of the Winner's Curse Phenomenon, Theory and Decision, 63(4), pp. 389-418.

Gustavsson, J.P., Weinryb, R.M., Göransson, S., Pedersen, N.L., Åsberg, M. (1999), Stability and Predictive Ability of Personality Traits Across Nine Years, Personality and Individual Differences, 22(6), pp. 783-791.

Hennig, J., Kieferdorf, P., Moritz, C., Huwe, S., Netter, P. (1998), Changes in Cortisol Secretion During Shiftwork?, Ergonomics, 41, pp. 610-621.

Hintze, Jerry L., and Nelson, R.D. (1998), Violin Plots: A Box Plot-Density Trace Synergism, The American Statistician, 52(2), pp. 181-184.

Ivanov, A., Levin, D., Niederle, M. (2010), Can Relaxation of Beliefs Rationalize the Winner's Curse?: An Experimental Study, Econometrica, 78(4), pp. 14351452

Lester, D. (1998), A Neurotransmitter Basis for Eysenck's theory of Personality, Psychological Reports, 64, 189-190.

Miller (1977), Risk, Uncertainty, and Divergence of Opinion, Journal of Finance, 32, pp. 1151-1168.

Moutafi, J., Furnham, A., Tsaousis, I. (2006), Is the Relationship between Intelligence and Trait Neuroticism mediated by Test Anxiety?, Personality and Individual Differences, 40, pp. 587-597.

Ortet, G., Ibeza, M.I., Moroa, M., Silvab, F., Boylec, G. (1999), Psychometric Appraisal of Eysenck's revised Psychoticism scale: a Cross-Cultural Study, Personality and Individual Differences, 27 (6), pp. 1209-1219.

Rammsayer, T., Stahl, J. (2004), Extraversion-Related Differences in Response Organization: Evidence from lateralized Readiness Potentials, Biological Psychology, 66, pp. 35-49.

Ruch, W. (1999), The Eysenck Personality Questionnaire Revised and the Construction of German Standard and Short Versions(EPQ-R and EPQ-RK), Zeitschrift für Differenzielle und Diagnostische Psychologie, 20(1), 1-24.