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by

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

Nadine Chlaß[‡]

Abstract

The winner's curse is a well-known deviation from rational self-interest in decision-making under asymmetric information. Yet, most prominent explanations for the curse have experimentally been ruled out so far. In particular, the curse did neither seem to emanate from a lack of experience with a given task (Grosskopf et al. 2007), nor from the complexity of the decision task, nor level-k thinking, nor a disability to infer information from others' actions (Charness and Levin 2009), (Ivanov et al. 2010).

This paper elicits individuals' sensitivity to incur a winner's curse in a common-value auction where the explanations above do not apply, tracks down the potential source of the curse, and tests to what extent individuals' cursedness evolves (Fudenberg 2006). It finds that the curse is tightly associated with a relatively stable individual characteristic – *individuals' personality traits*. Personality traits explain individuals' initial cursedness, and also govern whether individuals unlearn, or instead, *acquire* the curse. I review biological evidence on how personality influences individuals' handling of information to explain why personality matters here.

JEL Classification: D03,D82,D83

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

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1 Introduction

This paper links individuals' sensitivity to incur a winner's curse to Hans-Jörg Eysenck's theory of personality. Individual cursedness, as for instance, conceptualized by Eyster and Rabin's (2005) degree of cursedness χ is such a frequent experimental phenomenon, that it has been used to characterize so-called 'χ - cursed' equilibria. By treating the winner' curse as an equilibrium phenomenon, Eyster and Rabin (2005) organize a substantial body of experimental data. The authors build their χ-cursed equilibria upon the assumption that the curse arises because parties fail to infer the information hidden in others' actions by some degree χ. Consequently, parties would fail to anticipate the selection effect under information asymmetry (Akerlof 1970), and incur losses.

Thus, a cursed equilibrium relies on an individual ability to detect information in other parties' actions. Abilities, however, can be subject to experience, learning, and task simplification – properties which are inconsistent with the notion of an equilibrium[1] (Fudenberg 2006). Yet, the winner's curse persists to experience and learning (Grosskopf et al. 2007), and occurs in strongly simplified settings where the opponent is replaced by a simple, commonly known decision rule (Charness and Levin 2009). Hence, the winner's curse does not seem to vanish if the piece of information 'hidden' in an action, is extracted and pointed out to a cursed individual. She continues to ignore this information even when she correctly anticipates its respective payoff consequences[2]. If one is to understand the origin, or the exact nature of the cursedness parameter χ which organizes a lot of experimental data quite convincingly, one seemingly needs to look out for a stable individual characteristic which persistently blinds individuals to information put right in front of their eyes.

Here, I elicit individual degrees of cursedness and test whether they link to Hans-Jörg Eysenck's three individuals' personality traits (Eysenck 1967),

[1] Therefore, Cranford and Iriberri (2007) provide a non-equilibrium-foundation for the winner's curse via *level-k thinking*. If a party does not reason about the opponent, she thinks at level zero and might not even search for information in her opponents' move.

[2] Individuals correctly predict the unknown state of the world for each of their actions, but do not condition their play on these payoff consequences (Charness and Levin 2009)

(Eysenck 1990) *Psychoticism*, *Extraversion*, and *Neuroticism* which are relatively stable, individual characteristics of biological origin[3]. Degrees of cursedness are elicited in a sequential common-value auction which I design such that all conjectured reasons for the winner's curse are ruled out. An acquirer who holds private information moves *first*, such that the potentially cursed seller does not need to account for any *future*[4] move in her decision-making (Charness and Levin 2009). Furthermore, the opponent is replaced by a commonly known decision rule such that thinking about the other player is not required. Thus, I rule out belief-dependent explanations, such as level-k thinking (Crawford and Iriberri 2007), or a strictly interpreted cursed equilibrium (Ivanov et al. 2010). In an experiment, I elicit[5] individuals' acceptance thresholds by asking which offers they would accept, and which they would reject. The difference between the acceptance threshold in Bayesian Nash equilibrium and an individuals' actual acceptance threshold reveals her 'cursedness'.

I find the curse at the typical frequency of some 22% though no opponent need be reasoned upon, and no future move need be accounted for. However, I am able to discriminate individuals' degrees of initial (first-period) cursedness via individuals' load on trait *Extraversion*, and individuals' load on trait *Psychoticism*. For low loads on the latter which signals that the respective individuals have high impulse control, I do not observe cursedness at all. Personality traits also rule which dynamics of the game unfold throughout altogether 20 periods. Extraversion triggers convergence toward fully rational play. Neuroticism yields a dynamics toward more cursed play. I review a number of neurological, and biological findings which might explain these patterns.

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.

[3]Eysenck's personality traits correlate with specific hormones and messengers. Costa and McCrae's (1995) Big Five are a data-driven higher factor resolution of Eysenck's concept.

[4]Charness and Levin (2009) conjecture that the winner's curse might occur because individuals cannot imagine how a *future* event can be relevant for a *current* decision.

[5]The association between winner's curse and personality carries over to other experimental procedures, see (Chlaß 2010).

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. The game involves two parties, an acquirer a, and a seller s of a commodity. Both negotiate over the seller's commodity which has quality $\overline{v}$. This quality is a random draw from some distribution $f(v)$ and 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 offer p, she obtains offer p and yields her commodity which she evaluates at $q\overline{v}$. Acquirer a obtains the commodity and pays offer p. If seller s vetoes an offer, i.e. $\delta_s = 0$, neither party earns anything. The acquirer's payoff hence writes $\Pi_a = (\overline{v} - p) \cdot \delta_s$, and the seller's payoff is $\Pi_s = (p - q \cdot \overline{v}) \cdot \delta_s$.

Note that every offer p of a rational self-interested acquirer hides the information that it must be smaller than $\overline{v}$, the actual quality of the commodity, such that acquirers break even. A seller must condition her decision on accepting the offer on that information if she wants to avoid losses. The two solution concepts Bayesian Nash and Cursed Equilibrium which I apply now, differ in their assumptions on how individuals handle this piece of information.

2.2 Bayesian Nash Equilibrium

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

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

In round *T=1*, acquirer a rules out dominated strategies by stating the smallest offer an acquirer accepts, i.e. $p = q \cdot E(v|v \geq p)$. She 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 acquirer would accept, she 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.

For a uniform distribution U(0,1) of qualities v, we have $E(v|v \geq p) = \frac{p+1}{2}$. In this case, the minimal offer a target accepts, requires $\Pi_t^0 = p - q \cdot E(v|v > p) = 0$ which is satisfied by $p_{\Pi_t^0} = \frac{q}{2-q}$. This offer is the equilibrium offer made by an acquirer who does not incur a loss in making it, i.e. iff $p_{\Pi_t^0} \leq \bar{v}$. Note this to be the piece of information hidden in an acquirer's move upon which a rational seller conditions her move such as to avoid losses on expectation. Let us now see how parties behave if they they do not fully perform that step and play in Cursed, rather than Bayesian Nash equilibrium.

2.3 Cursed Equilibria

Let me solve the game for the case of a perfectly rational robot acquirer[6] who assumes a rational seller, and a seller s who is cursed by χ. If so, she expects with probability χ that acquirer a does *not* condition her offer on her private information $\overline{v}$. Specifically, she does not expect that any offer must be smaller than the quality $\overline{v}$ of the commodity. If probability χ*=1*, then she is fully cursed. In round *T=2*, a χ-cursed seller supposes to rule out losses by deciding:

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

A perfectly rational acquirer a who in round *T=1* believes in common rationality, expects seller s to comply with rational self-interest. Acquirer a makes the Bayesian Nash equilibrium offer:

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

[6] This is the experimental setting. Otherwise, one would have to assume that the informationally advantaged party holds a belief about the second mover's degrees of cursedness when making the offer.

Hence, seller s' cursedness can only affect the condition under which trade occurs in equilibrium. In particular, offers $d \in [0, \bar{v}]$ will be accepted by a χ-cursed seller s 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 we assume a uniform distribution of qualities, i.e. $v \sim U(0,1)$, we have a trade condition $p \geq qE(v) = q \cdot 0.5$ for $\chi = 1$.

2.4 Personality traits and individuals' handling of information

Cursed agents are supposed to systematically neglect information disclosed by *others' actions* (Eyster and Rabin 2005). In the game at hand, buyers hold private information on nature's move which determines the quality $\bar{v}$ of a seller's commodity. A rational buyer's offer will be such that she does not incur a loss and every offer made by such a buyer will reveal a lower bound of quality $\bar{v}$, namely $p_{\Pi_t^0} \leq \bar{v}$. A seller needs to identify this information in a buyer's offer. If understood as an ability, an individual's performance in detecting this piece of information might be subject to experience, learning, and change and would not be suited to define an equilibrium (Fudenberg 2006).

In sequential common value auctions however, the phenomenon survives learning and experience (Grosskopf et al. 2007), and persists under strongly facilitated inferability (Charness and Levin 2009)[7]. 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 (Charness and Levin 2009). If cursedness can be stable in such a setting, then either it does not reflect an ability, or it reflects an ability which cannot be acquired. If it persists under strong simplification, cursedness cannot reflect mere intelligence. Instead, we require some other individual specificity.

One such specificity which shapes an individual's handling of information

[7]Therein, the buy-out case in an acquiring-a-company game is tested for two types of quality only. There is no future opponent's move to be reasoned upon which is why level-k thinking would not apply.

is *personality*. The following reviews H.J. Eysenck's three dimensions of personality (Eysenck 1967, 1990) and their impact on an individuals' handling of information. Eysenck's concept P-E-N is substantiated by both theory and empiricism. It has a biological foundation which vouches for its stability.

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)[8]. 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.

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

3 Experimental Design

I ran a computerized experiment of three sessions with altogether 96 participants[9]. The Common value parameter q which rules the extent of the potential winner's curse[10] 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[11].

In the beginning of each session, subjects completed the standardized German Eysenck personality inventory 'EPQ-R' developed by 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[12]. Thus, subjects started out with an endowment of €5 plus expected €2.50. Feedback on the risk preferences was only given in the end of the experiment such that all participants started with an equal expected endowment. This endowment was intended to compensate the negative payoffs of cursed participants from the game[13]. Subsequently, subjects played the game presented in section two for twenty rounds. The buyer was replaced by a preprogrammed robot whose decision rule was commonly known, 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 last offer they were still

[9] 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).

[10] Or the corresponding social dilemma if one assumes full rationality of either party.

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

[12] Risk preferences were elicited in the beginning to generate some initial payoff. The personality questionnaire is rather lengthy, and was administered in the end.

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

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. If subjects got more aware of the information described in the decision rule, the winner's curse would disappear with the experience of twenty rounds.

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[14]. Average earnings were 7.40 €, and the experiment last 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 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[15] (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.

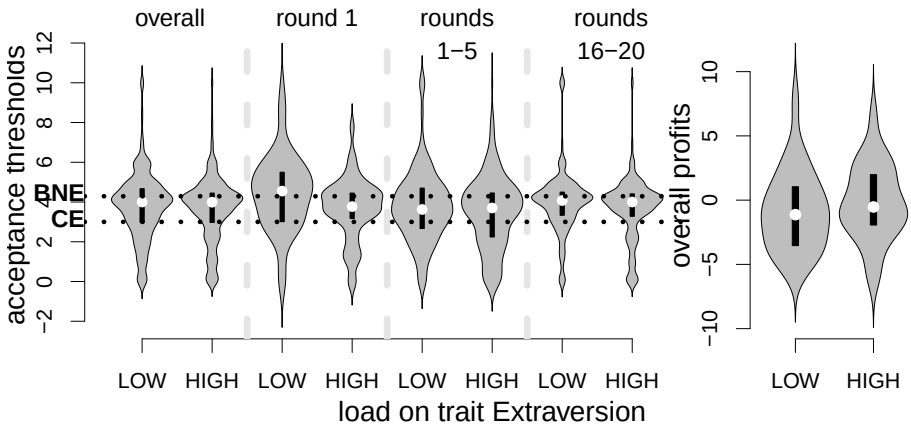


Figure 1: Violin plots for high and low loads on Extraversion (median split).

In the early periods, Intraverts' acceptance thresholds become substantially more cursed. Extraverts' thresholds decrease in the lower quartile, but are less affected by first experience. In the last five periods, Extraverts' and Intraverts' 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, experience increases the curse for either load, and in the final rounds, only the

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

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

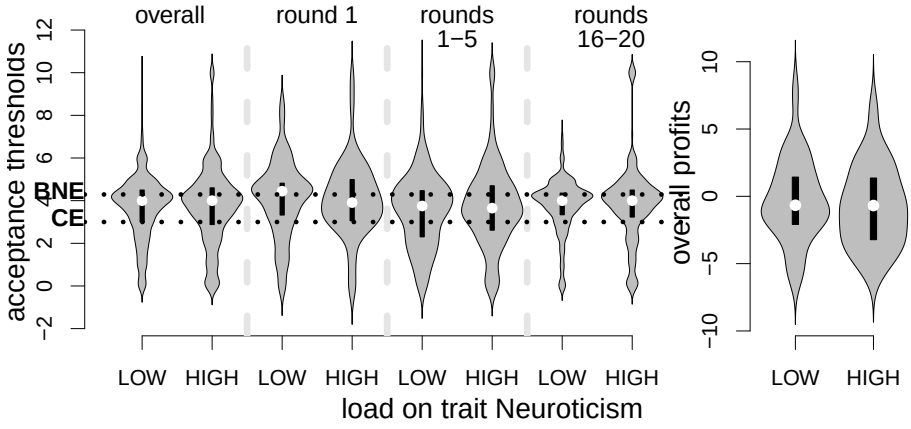


Figure 2: Violin plots for high and low loads on Neuroticism (median split).

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.

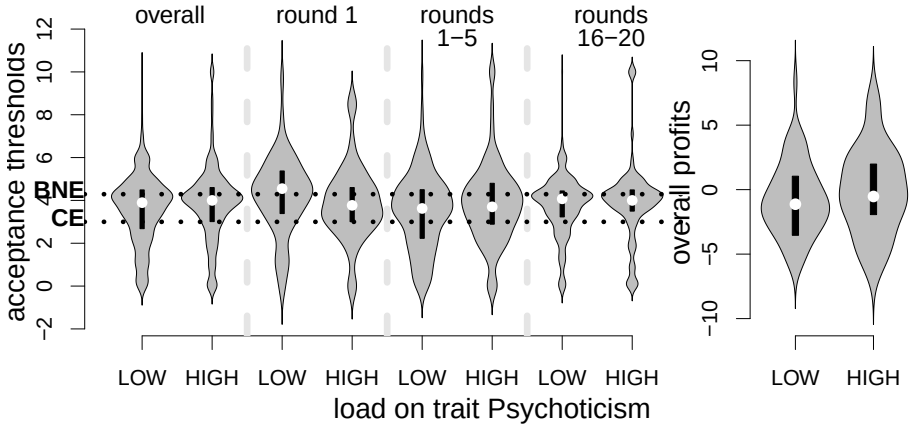


Figure 3: Violin plots for high and low loads on Psychoticism (median split)

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.

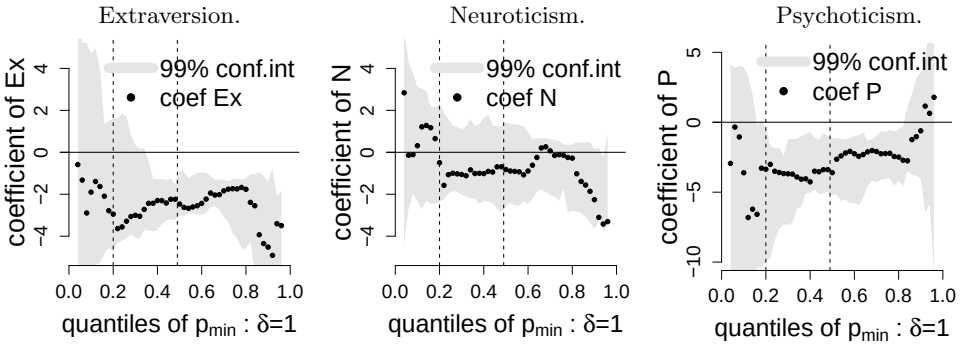
	Estimate	*Std. Error*	*t-Value*	*p-Value*
Intercept	8.74	1.19	7.35	0.01
Ex	-2.47	0.82	-3.02	0.01
P	-2.78	1.26	-2.21	0.03
N	-0.59	0.84	-0.71	0.48
R	-3.72	1.50	-2.48	0.02

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%[16] load on Extaversion, and Psychoticism, or load 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[17]. 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

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

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

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[18]. *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 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

[18] 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 $p \leq 0.01$

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

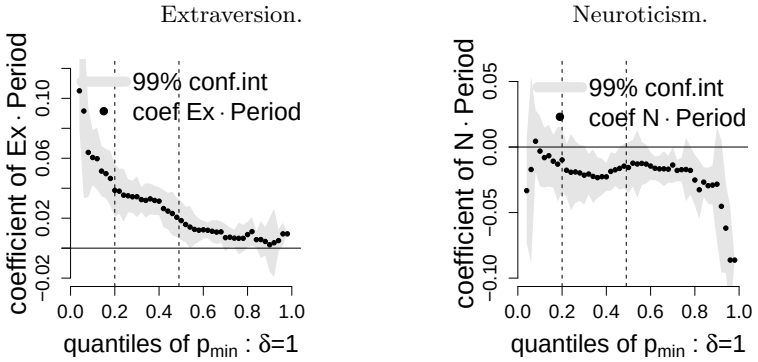
Table 2: Acceptance thresholds, all periods.

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. $\chi = 0.38$[19].

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 quantile of acceptance thresholds. As before, two dotted vertical lines delimit the interval of χ- cursed acceptance thresholds, and the shaded region depicts

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

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



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 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 a strong association between individuals' sensitivity to experience a winner's curse, or individuals' *cursedness*, and Hans-Jörg Eysenck's theory of personality. Cursedness is such a stable phenomenon, that it has been

conceptualized by Eyster and Rabin's degree of cursedness χ to derive a new solution concept for games of imperfect information. Therein, χ is intended to describe in how far individuals infer information from others' actions about others' private information. Yet, to characterize an equilibrium, the source of the curse must be stable, a property which is not likely to be fulfilled if the curse arises from an (in)ability which can evolve (Fudenberg 2006). While previous experimental studies affirm, however, that the curse persists to experience (Grosskopf et al. 2007) and cognitive simplification, these studies also find that teh curse exists when there is no other player to be reasoned upon (Charness and Levin 2009). Hence, while a curse might show equilibrium-like stability, it does not seem to emanate from individuals' beliefs. Hence, Eyster and Rabin's assumption is wrong. Instead, Charness and Levin suggest that individuals might fail to see how a *future* event per se can be relevant for a current decision.

Here, I adapt the acquiring-a-company task (Bazerman and Samuelson 1983) to the case of an expert buyer who holds private information on the value of a commodity and 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) such as to abstract from level-k thinking (Crawford and Iriberri 2007). I find that the curse persists, and conclude that it is not the futurity of the event to be taken into account which drives the curse.

Instead, individuals' propensity to experience a winner's curse strongly depends on their personality traits. Using the framework of Hans-Jörg Eysencks P-E-N[20] 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. Their proneness to an initial winner's curse might result from quick decisions after only a short

[20]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

analysis of the situation. Psychoticism manifests in agressiveness, egocentrism, and impulsiveness. Psychotists' initial winner's curse could be a result of impulsiveness. Neuroticism 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 have a propensity to experience an initial winner's curse, 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. Neurotics are emotional individuals with a high propensity to experience negative emotions and low stress tolerance. Hence, for some individuals, the winner's curse *emerges* with experience, a possibility which has theoretically been explored in (Miettinen 2009).

My results point out, first, that an individual's curse links to stable characteristics of that individual, i.e. her personality traits, which are distinct from mere intelligence. This sheds light on why individuals persistently fail to account even for correct information on the selection effect under information asymmetry (Charness and Levin 2009). Second, personality traits govern how the curse evolves with experience. The persistence of the phenomenon seems to merely exist at the aggregate level: initially cursed Extraverts unlearn the curse, whereas initially uncursed Neurotics acquire the curse – overall, the share of cursed agents remains the same. It is questionable whether Extraverts start to see more of the information contained in the decision rule which generates the offer, or whether they simply react sucessfully to feedback without knowing why they initially made losses. However, feedback on profits in stochastic environments is usually not that easy to interpret - a Nash equilibrium bid prevents losses *on average*, but not in every interaction. My results provide, third, a concept which explains behaviour under information asymmetry which was previously left unexplained, namely bidding outside the interval of expected quality, and the quality conditional on another party's move. Overall, I conclude that individuals' predisposition to incur a winner's curse is found in their personality traits, and that Eyster and Rabin's χ is a one-dimensional representation of the latter.

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