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Do Casinos Pay their Customers to Become Risk-averse? Revising the House Money Effect in a Field Experiment

Maximilian Rüdisser, Raphael Flepp, and Egon Franck*

Abstract

The house money effect predicts that individuals show increased risk-seeking behavior in the presence of prior gains. Although the effect's existence is widely accepted, experimental studies that compare individuals' risk-taking behavior using house money to individuals' risk-taking behavior using their own money produce contradictory results. This experimental study analyzes the gambling behavior of 917 casino customers who face real losses. We find that customers who received free play at the entrance showed not higher but significantly lower levels of risk-taking behavior during their casino visit, expressed through lower average wagers. This study thus provides field evidence that rejects the existence of a house money effect. Moreover, as a result of lower levels of risk seeking, endowed customers yield better economic results in the form of smaller own-money losses when leaving the casino.

Keywords: House money effect · Decision making · Field experiment · Casino gambling

JEL Classification : C93 · D80 · D81

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1. Introduction

Suppose you enter a casino, and before you have the chance to gamble, a casino representative gives you free chips worth $50. Would this windfall “house money” alter your subsequent risk-taking behavior during your stay at the casino?

For one-stage gambles, the prospect theory developed by Kahneman and Tversky (1979), in which an individual’s utility depends on his or her current level of wealth as reference point, predicts risk-averse behavior in the domain of gains and risk-seeking behavior in the domain of losses. However, in multiple-stage settings such as in the introductory example, prospect theory does not predict a clear behavioral pattern, as the single decisional events could be either segregated or integrated with prior outcomes (Tversky and Kahneman 1981).

Thaler and Johnson (1990) were the first to investigate how prior gains and losses influence subsequent risk-taking in a laboratory experiment. They found that prior gains induced risk-seeking behavior, which they referred to as the “house money effect”. The authors explained this effect with a quasi-hedonic editing rule of individuals. According to this editing rule, after a prior gain, subsequent gains are segregated but subsequent losses are integrated. Thus, subsequent losses are coded as reductions in a gain, which mitigates the influence of loss aversion and facilitates risk-seeking behavior (Thaler and Johnson 1990).

The following example illustrates the intuition behind Thaler and Johnson’s (1990) house money effect: consider an initial windfall gain of $50 and the subsequent option to enter a fair coin toss to either win or lose $20. This situation is edited as “a 50% chance to win $50 and to win an additional $20 and a 50% chance to end up with a combined win of $30.” Thus, instead of considering winning or losing $20 and being loss averse, the potential loss of $20 is integrated with the prior gain of $50 and evaluated as a reduction in gains. Because the potential reduction in gains is overcompensated by the potential win of $20, which is segregated from the prior gain of $50, this evaluation leads to the acceptance of the gambling option and thus to risk-seeking behavior.

Many studies confirm the house money effect in laboratory experiments that include tasks, such as capital expenditure decisions (Keasey and Moon 1996), investments in risky assets (e.g., Ackert et al. 2006), lotteries (e.g., Battalio, Kagel and Jiranyakul 1990; Gärling and Romanus 1997; Weber and

Zuchel 2005), and trust games (e.g., Houser and Xiao 2015). Thus, the broad experimental evidence seems unambiguous. However, a major challenge when studying the house money effect is that the risk-taking behavior using house money has to be compared to the risk-taking behavior using one's own money. Because the latter is associated with the risk of real losses for subjects, such a comparison is difficult to implement in laboratory experiments due to ethical reasons (Etchart-Vincent and l'Haridon 2011).

Several experimental studies have addressed this issue by inducing real loss perceptions in different ways when studying the house money effect. Clark (2002) required subjects to bring their own money to the experiment, and he found no evidence of the house money effect in the case of voluntary contribution to a public good. Interestingly, when Harrison (2007) critically reevaluated the data of Clark (2002), he found that the provision of house money led to more free-riding in public goods. This could be interpreted as an increase in risk aversion, which is contradictive to the house money effect. Cherry, Kroll and Shogren (2005) also failed to find a house money effect when they compared the levels of contribution to a public good between subjects who had earned their endowment in a task and subjects had been directly endowed with house money.

Furthermore, Càrdenas et al. (2014) distributed an endowment amount to a treatment group well before their experiment took place to induce an own-money perception. Employing different lotteries involving losses and gains, they found that "own-money subjects" were slightly more risk-averse, which they interpreted as evidence of a small and indirect house money effect. Finally, Etchart-Vincent and l'Haridon (2011) allowed their subjects to experience real losses in one of three sessions held on different days. They compared a "losses-from-an-initial-endowment" treatment to a real loss treatment but failed to replicate the house money effect. Consequently, the evidence on the house money effect from studies simulating real losses in the laboratory is unconvincing.

Our paper adds to the literature by studying the house money effect in a randomized field experiment with real gamblers facing real potential losses.[1] A Swiss casino is an ideal setting for our experiment. Upon entering the casino, subjects were randomly selected to play a wheel of fortune. The treatment group consisted of 579 subjects who received a free play coupon worth between 5 and 50 Swiss Francs (CHF) after playing the wheel of fortune.[2] There were also two control groups. The first control group consisted of 186 subjects who received no free play coupon after playing the wheel of fortune; the second consisted of 152 randomly selected subjects who entered the casino without playing the wheel of fortune. Subsequently, the gambling behavior of all subjects was monitored using records from both slot machines and table gambling.

Our results showed that subjects who were endowed with house money became more risk-averse than subjects who only played with their own money. More specifically, treated subjects reduced their average wager – our measure of attitude towards risk – by 15% to 30%, depending on the baseline control group. Furthermore, the size of the initial endowment moderated the increase in risk aversion; higher endowment amounts led to even more pronounced risk-averse behavior. These differences in risk-taking also translated into significant economic impacts. Considering only their own money they brought to the casino, treated subjects left the casino with more money (smaller losses) in their pockets than the control groups. Thus, rather than confirming the house money effect, our results point towards a "reverse house money effect". More generally, this paper adds findings to the literature on sequential decision making under risk. Our data from the field reveal that prior gains indeed have a strong impact on subsequent decision making. However, our results suggest that a prior gain triggers an increase in risk-aversion, which challenges the existence of a house money effect and its underlying quasi-hedonic editing mechanism.

[1] Examples from real decision makers in businesses or casinos involving real losses are often used to motivate studies on the house money effect (see, e.g., Thaler and Johnson 1990; Arkes et al. 1994). However, evidence from field studies remains scarce. Two notable exceptions are Frino, Grant and Johnstone (2008) as well as Hsu and Chow (2013). Both studies use data from professional investors and find that the house money effect is present as the riskiness of investments is higher in the presence of prior gains. However, these studies do not address the fact that investors who are investing prior gains are not a random selection of the entire population of investors. Thus, their attitude towards risk might be systematically different from those investors who do not have prior gains.

[2] The experiment was conducted with CHF, and therefore, we will refer to all monetary values in CHF in the course of the paper. Fortunately, at the time of the experiment, CHF 1 exchanged for about USD 1. Thus, all CHF values can also be read as USD.

The remainder of this paper is structured as follows. In section 2, we present the experimental design and the data. In section 3, we show the results. Finally, in section 4, we discuss our findings and conclude.

2. Experimental Design

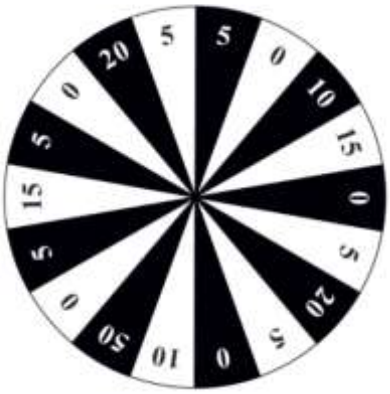
2. Experimental Design

The objective of the experiment was to investigate the house money effect in the field by comparing the sequential decision making under risk between ordinary casino customers who received a financial endowment and ordinary customers who do not receive a financial endowment. As soon as customers start gambling at a casino, they make active choices about which game they want to play and how much money they want to wager. Thereafter, gamblers experience gains and losses. At some point, they decide that they no longer want to play, and they thus leave the casino.

Casinos offer perfect monitoring possibilities and allow an accurate evaluation of decision making under risk due to the known risk characteristics of each game. Indeed, several previous studies have used experimental data collected at casinos (e.g., Croson and Sundali 2005; Narayanan and Manchanda 2012), have set experimental tasks to reconstruct a casino (Chau and Phillips 1995; Weber and Zuchel 2005), or have approached gambling from a formal perspective (Rabin 2002; Barberis 2012). Moreover, in the specific context of experiments using real gambling settings, Croson and Sundali (2005, p. 196) noted that "the participants represent a more sophisticated and motivated sample than typical students at university; gamblers have a very real incentive to learn the game they are playing and to make decisions optimally and have the opportunity to observe salient feedback from their decision." Thus, paired with their real incentive to learn the game, gamblers are likely to understand the risk characteristics of the games offered by a casino, which is an important requirement in the study of decision making.

2.1 Procedure & Design

The main part of the experiment was conducted from February to April 2015. During that time, ordinary customers of a casino were randomly selected by the staff upon entering the casino. The randomization was conducted with a random number generator.[3] The randomly selected customers were given the chance to spin a wheel of fortune immediately after entering the premises of the casino. As shown in Figure 1, the wheel of fortune had several different outcomes. A customer could win nothing or win an endowment of CHF 5, 10, 15, 20, or 50. The probability of winning a financial endowment was 72.22%. Winning an endowment of CHF 5 was the most likely outcome (33.33%), while winning an endowment of CHF 50 was the least likely outcome (5.56%) of the wheel. The expected value of the wheel was to win CHF 9.44.



Endowment	Number of fields	Probability
0	5	27.78%
5	6	33.33%
10	2	11.11%
15	2	11.11%
20	2	11.11%
50	1	5.56%
Total	**18**	**100.00%**

Figure 1: Wheel of fortune and its pay-off structure

Participants who spun a non-zero endowment received the corresponding amount from employees of the casino in the form of a free play coupon. Each customer's endowment was paid out in CHF 5 coupons – for example, an endowment of CHF 50 was given out as ten CHF 5 coupons. The employees first told the participants that the coupons were valid on any game of the casino during the next six days and could not be exchanged into actual money without wagering the money at least once.

All participants who received a non-zero endowment constituted the treatment group shown in Figure 2. For the treatment group, the employees noted each winning participant and his or her corresponding free play coupon, which was tagged with an identification number to later analyze when and where it was used. Analogously, the employees also took notes on those participants who did not win anything on the wheel of fortune. These gamblers constituted the first control group in our sample. Because one might worry that spinning the wheel of fortune and not receiving an endowment could also affect subsequent decision making, we collected further data to construct a second control group.

[3] Of all casino customers, approximately 2% were chosen to participate in the study. The only limitation was that customers who were selected on one visit were excluded from selection in any subsequent visit.

This group consisted of customers who did not play the wheel of fortune at all upon entering the casino.[4] The data collection of the second control group took place in the first two weeks of March 2016.

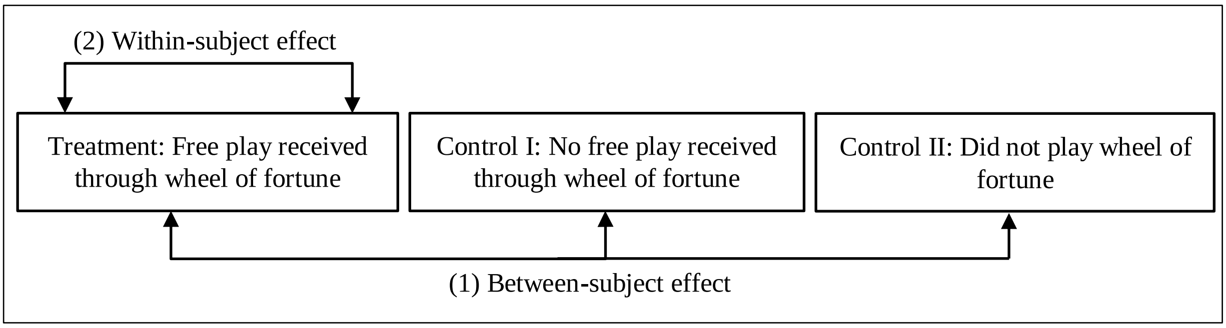


Figure 2: Experimental design

Comparing the behavior of subjects in the treatment group with that of subjects in the two control groups allowed us to examine the overall behavioral effect of providing house money on risk-taking. On the other hand, comparing how subjects within the treatment group behaved when gambling with the house money and how they played with their own money allowed us to make within-subject comparisons.

After entering the casino, the participants were monitored by the casino which provided the fully compiled data set. With their system, the casino was able to track how a participant moved around the premises and when he or she played which game.[5] Thus, with the casino's assistance, we reconstructed the casino visit of each participant by documenting the type of games that were played and the corresponding time.

Gambling at a casino typically includes two distinct types of games: slot machines and table games. If a participant played on a slot machine, data on the gambler's play was automatically fed to the reporting system of the casino. This data comprised the number of games played, the amount of money wagered, and the total time spent on a slot. For table games, such as *Roulette*, *Black Jack*, or *Texas Hold'em Poker*, the croupier of each respective game also noted the number of games played,

[4] Again, participants in the second control group were selected with the random number generator used for the initial data collection.

[5] It is important to note that all participants in our treatment and control groups were aware that their behavior could be monitored by the casino. Indeed, in Switzerland, regulation obliges casino operators to comply with social welfare provisions and to ensure that no individual gambles to the extent that he or she is at risk of going broke, i.e., risking personal bankruptcy (Meyer 2009). This reduces the risk of compulsive gambling because all gamblers in Switzerland, and thus our participants, are protected by law.

the total amount of money wagered, and the total time spent gambling at the table.[6] Thus, the casino was able to compile a merged data set that includes the information from both slot machines and table games for each participant.

2.2 Data

Our data set included 765 people who spun the wheel of fortune. The treatment group included 579 participants who received an endowment between CHF 5 and CHF 50.[7] Control group I comprised 186 participants who did not win an endowment. Control group II comprised 152 participants who did not play the wheel of fortune. Thus, our total sample consisted of 917 participants. The detailed allocation of participants and their respective endowments are shown in Table 1. The first part of Table 1 reveals that the distribution of outcomes is closely aligned with the distribution of the fields shown in Figure 1. Thus, the randomization of house money through the wheel of fortune worked.

Table 1: Allocation of participants

	Data collection with wheel of fortune		
Endowment	**N**	**%**	**Group**
0	186	24.31%	Control I
5	237	30.98%	Treatment
10	101	13.20%	Treatment
15	88	11.50%	Treatment
20	108	14.12%	Treatment
50	45	5.88%	Treatment
Total	765	100.00%	
	Further data collection		
	N	**%**	**Group**
No wheel of fortune	152	100.00%	Control II

As shown in Figure 3, the gambling data itself can be aggregated on different levels, and we are able to analyze the data for each gambler on the session level and the visit level. A session includes all games played by one gambler at one specific slot machine or table game, and the visit includes all sessions played by one gambler until leaving the casino.

[6] Because croupiers monitor gambling behavior as a regular task in their everyday work, they have sufficient experience at fulfilling this task for the data collection of this experiment. Indeed, croupiers and game floor managers typically monitor gambling behavior in order to secure an impeccable gambling flow.

[7] Only participants who received an endowment and used it on the initial day belonged to the treatment group. Our data showed that 579 (97.3%) of all participants used their endowment on the initial day. The other 16 (2.7%) were excluded from the data set.

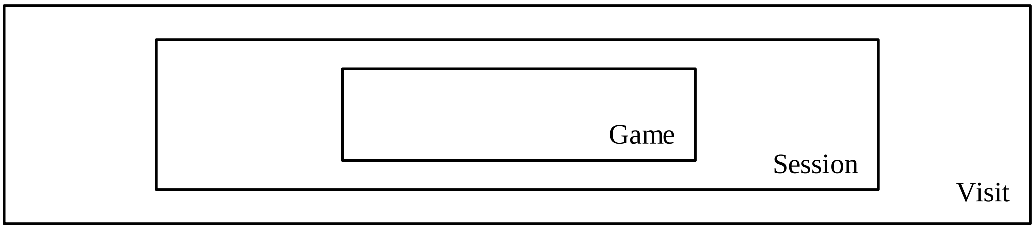


Figure 3: Different levels of data aggregation

The visit-level summary statistics of the collected data are presented in Table 2. The table shows that each participant played 843 games for approximately an hour and a half on average. Although not presented in the table, the data show that approximately 95% of all games were played at slot machines, while only 5% were played at table games. This highlights that a much larger share of games were played at slot machines, which is a general trend for casinos (American Gaming Association 2013).

Table 2: Visit-level summary statistics

Measure	**N**	**Mean**
time played (hh:mm:ss)	917	01:28:08
number of games played	917	843.09
average wager (in CHF)	917	10.97
net win (in CHF)	917	-200.35

Our measure of risk-taking is the amount wagered, which has been employed in several earlier studies (e.g., McGlothin 1956; Gertner 1993; Gneezy and Potters 1997; Haigh and List 2005).[8] We define *average wager* as the average wager of a participant within a session. For example, when a participant plays three games at one particular slot machine and wagers CHF 5, 10 and 20, the *average wager* for this session is CHF 11.66. For a similar type of gamble, e.g., *Black Jack* or a particular slot machine, higher wagers are associated with higher levels of risk-taking because higher wagers yield higher potential returns but also higher potential losses. On average, a gambler in our sample wagered CHF 10.97 per game. Finally, Table 2 shows that the *net win*, which refers to the total net amount a

[8] McGlothin (1956) used the amount wagered to investigate the risk-taking behavior of individuals at the race track. Gertner (1993) analyzed how much contestants of the game show “Card Sharks” wagered in positive expected-value gambles and constructed a measure for risk aversion. Gneezy and Potters (1997) provided their participants with an endowment which they could either keep or bet in various rounds and subsequently analyzed the average bet their participants made. Haigh and List (2005) compared the betting patterns, i.e., the average amount bet, between professional traders and undergraduate students to analyze each group’s attitude towards risk.

gambler had won or lost when leaving the casino, is CHF -200.35 on average.[9] *Net win* is linked to *average wager* because the wager per game influences the total money wagered, which in turn influences the expected net win. For example, when a gambler wagers CHF 10 per game and plays 800 games, he or she wagered CHF 8000 in total. Assuming an average house edge of 2.7%, the gambler would leave the casino with an expected *net win* of CHF -216.

3. Results

The result section is separated into two subsections. First, the data are analyzed to investigate the existence of a house money effect in the field. This analysis focuses on the variable *average wager* on both the visit and session levels and applies both univariate and multivariate analyses. Second, we move on to the overall economic impact of house money by focusing on the *net win*.

3.1 House Money Effect

To begin with, we analyze the *average wager* on the visit level. Figure 4 shows the *average wager* per visit for both control groups and the treatment group. Over the course of the entire casino visit, control group I wagered CHF 18.57, and control group II wagered CHF 14.13 on average. By contrast, the treatment group wagered CHF 7.71 on average.

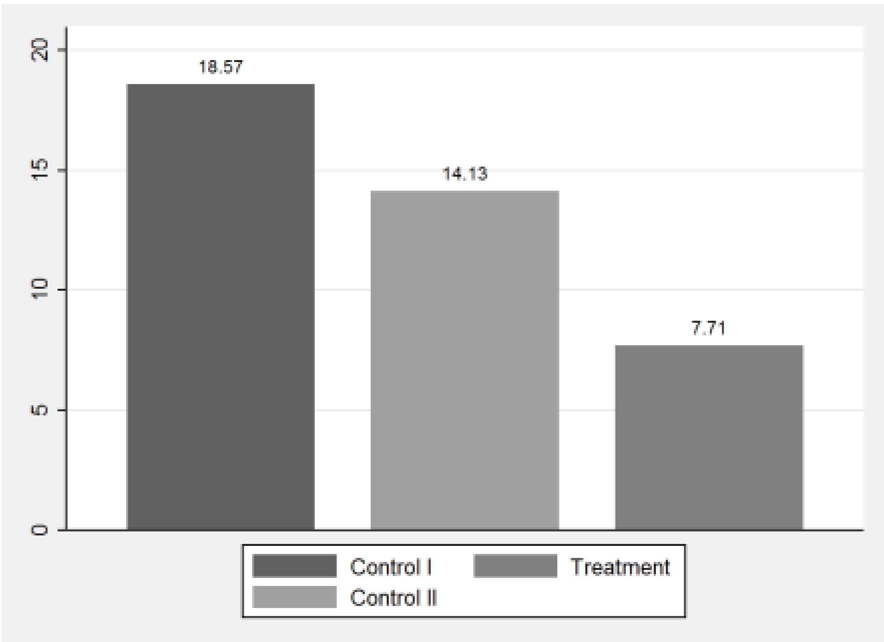


Figure 4: *Average wager* per visit

[9] The numbers shown for the variable result are also in line with reports of other institutions. The American Gaming Association (2013, p. 33) showed that a majority of casino visitors sets a budget of approximately 100 U.S. dollars per casino visit, while thirty percent gamble on a budget of 100 to 300 U.S. dollars.

The difference in the *average wager* per visit between control group I and the treatment group is statistically significant at the 1% level for both the t-test and the Wilcoxon rank-sum test. The detailed test statistics are shown in Table A.1 in the appendix. With regard to control group II, the difference is also significant at the 1% level for the t-test but insignificant for the Wilcoxon rank-sum test.[10] Thus, treated subjects show lower levels of risk-taking than those in control groups I and II. When comparing the behavior of the treatment group to control group I (control group II), the decrease in the average wager per visit is approximately 58% (45%). Thus, our univariate analysis provides a first indication against a house money effect and points towards a "reverse house money effect".

The previously discussed effects, large in magnitude and mostly statistically significant, might be driven by differences in the characteristics of the games the subjects decided to play. For example, it might hold true that subjects who were treated systematically decided to play certain slot machines or table games simply because they were treated. Furthermore, previous studies have shown that the preference towards risk is positively associated with the number of total games played due to "escalating commitment" (e.g., Whyte 1986; Aloysius 2003).[11] Thus, if the treated subjects had played fewer games, we would have also observed a lower attitude towards risk. To rule out these alternative explanations for the differences in risk-taking, we take our analysis to the session level, using multivariate OLS models. At the session level, we construct a dummy variable for each slot machine and table game and label them *game source dummies*. This allows us to compare the *average wager* given the same slot or table game. Additionally, we construct a variable that captures the *cumulative number of games* played by each subject since he or she entered the casino to control for a potential escalating commitment effect.[12]

Table 3 shows the results of our OLS estimations on the session level. Columns (1) and (2) show that the variable *treatment*, which is equal to one for subjects who received house money and zero otherwise, has a significantly negative impact on the *average wager*. In comparison to control

[10] The difference between control group I and control group II is insignificant when using a t-test but significant when using a Wilcoxon rank-sum test. Thus, playing the wheel of fortune but not winning anything might have a small effect on subsequent risk-taking.

[11] Escalating commitment refers to the irrational behavior of committing oneself to recouping losses. It was first described by Staw (1976) and later applied to prospect theory by Whyte (1993). The theory shows that decision makers tend to adopt risk-seeking behavior as a result of a negative outcome.

[12] Instead of the *cumulative number of games*, we alternatively also include the *cumulative time played* by each subject as a control variable in our OLS estimations. We find that our results remain unchanged.

group I, included in column (1), treated subjects reduce their *average wager* by CHF 4.68; in comparison to control group II, included in column (2), treated subjects reduce their *average wager* by CHF 3.29. To put the effect sizes of *treatment* into perspective, we calculate the logarithm of our dependent variable *average wager* and rerun columns (1) and (2). We find that the estimates of *treatment* remain statistically significant and change to -0.161 (1) and -0.352 (2). From these two estimates, we are able to infer the percentage changes and find that in comparison to control group I (control group II), the treatment reduces the *average wager* by approximately 15% (30%). Furthermore, we find evidence for escalating commitment as the *cumulative number of games* has a positive and significant impact on the average wager. However, the size of the effect is much smaller than the treatment effect. Even if we assume a subject plays 1,000 or 2,000 games, the impact on the *average wager* is still much smaller than the impact of the treatment. Summarizing the results from columns (1) and (2) of Table 3, we find that the provision of house money leads to an increase in overall risk aversion. This confirms our univariate results.

Table 3: Results of OLS estimation for *average wager*

	average wager					
	(1)	(2)	(3)	(4)	(5)	(6)
treatment	-4.68*** (1.76)	-3.29*** (1.02)				
treatment house money			-5.78*** (2.10)	-4.34*** (1.17)		
treatment own money			-4.22** (1.67)	-3.01*** (1.02)		
treatment house money area					-6.37*** (1.75)	-5.06*** (1.10)
treatment own money area					-3.78** (1.83)	-2.54** (1.08)
cumulative number of games	0.0004*** (0.0001)	0.0002*** (0.0001)	0.0004*** (0.0001)	0.0001** (0.0001)	0.0003*** (0.0001)	0.0001* (0.0001)
game source dummies	yes	yes	yes	yes	yes	yes
N	3265	3330	3265	3330	3265	3330
R^2	0.33	0.39	0.33	0.39	0.33	0.39

Notes: The table reports the OLS estimates for the *average wager* on session level. Columns (1), (3) and (5) include subjects from control group I, whereas Columns (2), 4) and (6) include subjects from control group II. *Game source dummies* control for different denominations across slots and table games. Heteroscedasticity-robust and clustered standard errors at the player level are reported in parentheses. ***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.

In columns (3) to (6) of Table 3, we separately investigate the risk behavior of treated subjects using house money and using their own money. Due to the identification number on each free play coupon, we are able to identify the sessions in which house money was used. Thus, we classify a session as *treatment house money* if a subject belongs to the treatment group and gambles with a free play coupon at least once within this particular session. If a subject belongs to the treatment group but gambles only with his or her own money within a particular session, this session is classified as *treatment own money*.[13] Column (3), which includes control group I, and column (4), which includes control group II, show that both *treatment house money* and *treatment own money* have a significantly negative effect on the *average wager*. In comparison to control group I (control group II), treated subjects reduce their average wager by CHF 5.78 (CHF 4.34) when wagering with the house money and CHF 4.22 (CHF 3.01) when wagering with their own money. Thus, the treatment group becomes more risk-averse when playing with house money and when playing with their own money. Thereby, the within-subject comparison shows that the treatment group is even more risk-averse when playing with house money, as the coefficient of *treatment house money* is significantly different from the coefficient of *treatment own money*.[14]

In columns (5) and (6) of Table 3, we allow a broader definition of house money. A session of a treated subject is now classified as a *treatment house money area* session until a subject lost the entire amount received in form of free play coupons and all potential winnings therefrom. Thus, a treated subject gambled in the house money area until he or she had to gamble his or her own money for the first time. Thereafter, the sessions of treated subjects are classified as *treatment own money area* sessions. Examining the results of columns (5) and (6), we find our results unchanged. The treated subjects are still significantly more risk-averse, and the within-subject comparison shows that the effect is even stronger in those sessions wagered where house money was wagered.[15]

[13] For 14 out of 579 players in the treatment group, the information on their house money wager was missing, although their record shows that they used their coupons. As 90% of the other 565 players used their coupons in the first session, we assume that the 14 players also used their coupons in the first session. However, our results do not change if we exclude these 14 players from our analyses.

[14] Wald test for equality of coefficients: column (3): $F(1,764) = 2.79$; Prob. > F = 0.10, column (4): $F(1,730) = 4.65$; Prob. > F = 0.03).

[15] Wald test for equality of coefficients: column (5): $F(1,764) = 9.10$; Prob. > F = 0.00, column (6): $F(1,730) = 10.15$; Prob. > F = 0.00).

Some earlier studies argue that the house money effect is triggered only if the prior gain is sufficiently large (Arkes and Blumer 1985; Arkes et al. 1994). Our setting allows us to analyze whether the effect depends on the amount of house money received because our treatment group received free play coupons between CHF 5 and CHF 50. Table 4 shows the results for the *endowment amount,* which is equal to the value of the house money received. Again, columns (1), (3), and (5) are calculated on the basis of control group I, and columns (2), (4), and (6) are calculated on the basis of control group II.

Table 4: Results of OLS estimation for *average wager* by *endowment amount*

	average wager					
	(1)	(2)	(3)	(4)	(5)	(6)
endowment amount	-0.08** (0.04)	-0.04* (0.02)				
treatment house money × endowment amount			-0.126*** (0.053)	-0.072** (0.028)		
treatment own money × endowment amount			-0.048 (0.035)	-0.019 (0.025)		
treatment house money area × endowment amount					-0.145*** (0.039)	-0.105*** (0.028)
treatment own money area × endowment amount					-0.016 (0.049)	-0.022 (0.035)
cumulative number of games	0.0004*** (0.0001)	0.0002*** (0.0001)	0.0003*** (0.0001)	0.0002*** (0.0001)	0.0003** (0.0001)	0.0002*** (0.0001)
game source dummies	Yes	yes	yes	yes	yes	yes
N	3265	3330	3265	3330	3265	3330
R^2	0.33	0.38	0.33	0.38	0.33	0.39

Notes: The table reports the OLS estimates for the *average wager* on session level. Columns (1), (3) and (5) include subjects from control group I, whereas Columns (2), 4) and (6) include subjects from control group II. *Game source dummies* control for different denominations across slots and table games. Heteroscedasticity-robust and clustered standard errors at the player level are reported in parentheses. ***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.

Columns (1) and (2) of Table 4 illustrate that in comparison to control group I (control group II), each additional CHF provided to the treatment group reduces the *average wager* by CHF 0.08 (CHF 0.04). The estimates are significant and thus imply that the level of risk aversion increases with higher levels of endowment. Furthermore, our findings suggest that an initial provision of CHF 5 triggers a more risk-averse behavior.[16] Columns (3) through (6) further differentiate between treated subjects playing with house money and treated subjects playing with their own money by interacting

[16] This is confirmed if we run a t-test and a Wilcoxon rank-sum test between those who received CHF 5 and both control groups. Both tests are statistically significant at the 5% level.

the *treatment house money (area)* sessions and the *treatment own money (area)* sessions with the *endowment amount*. The results of these estimations highlight that the amount of house money received has a highly significant and negative impact on the *average wager*. Thus, the more house money a subject has received, the higher his level of risk aversion when gambling with the house money. Last but not least, the endowment amount has no effect on the average wager with subjects' own money.

All in all, our analyses show that house money leads to consistently higher levels of risk aversion instead of higher levels of risk seeking, as predicted by the house money effect. Thus, in our field setting, we do not find evidence for the existence of the house money effect but rather advocate a "reverse house money effect".

3.2 Economic Impact

Generally, because of the unfavorable structure of gambles offered at casinos, we expect that a higher *average wager*, ceteris paribus, leads to a lower *net win* and that any individual will lose money in the long run. The previous section highlighted that the provision of house money leads to substantially lower levels of risk-taking. Thus, we ask whether the increase in the risk aversion of the treatment group is large enough to translate into higher net wins when leaving the casino compared to the control groups.

Figure 5 shows the average *net win* for both control groups and the treatment group. For the treatment group, we also provide the average of *net win own money,* which describes the *net win* after subtracting the received house money.[17] The average *net win* for both control groups is substantially smaller, i.e., the subjects belonging to the control group lost more money on average. We find that in comparison to the control group I (control group II), the treatment group yields *net wins* that are approximately CHF 110 (CHF 150) higher. Considering the average *net win own money*, the difference is even larger in magnitude. Testing the differences of *net win* between the control and

[17] We subtract the house money amount only for participants who left the casino with a loss. For those who left the casino with a win, the *net win* is equal to the *net win own money*. The adjustment is performed only for those participants who lost money because we are interested in the specific amount of money that came from the participants' self-earned money. Thus, in the case that a participant left the casino with a win, the adjustment is redundant.

treatment groups reveals that all t-tests but one are significant at the 1% or 5% level.[18] We thus conclude that the provision of house money has an effect that cannot be neglected from an economic perspective. Providing house money triggers risk-averse behavior, which in turn leads to better economic results for casino visitors.

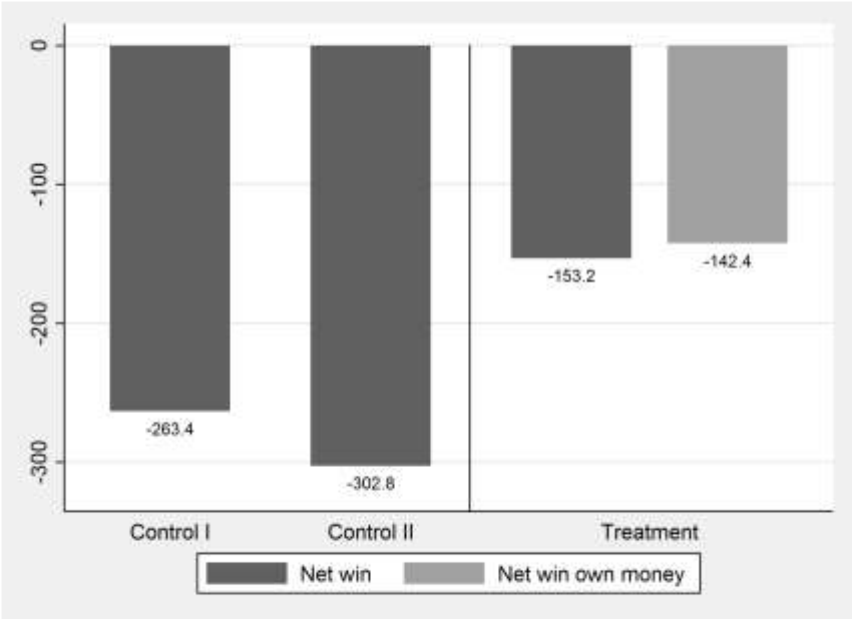


Figure 5: Average *net win* and *net win own money* per group

Next, we split up the treatment group by endowment amount to analyze how the *net win* changes with increasing amounts of house money provided. Figure 6 shows both *net win* and *net win own money* for all treatment subgroups. Indeed, we find that our previously presented results are strengthened because the statistics shown in Figure 6 suggest a linear relation between the amount of house money received and the gambling outcome. The more house money a subject receives, the better his gambling outcome is. Thus, in the most extreme cases, participants who received CHF 50 lost only CHF 61.0 on average, and considering only their own money losses, their average loss decreased to an average of CHF 23.3.

[18] Table A.2 with all standard errors, as well as t-test and Wilcoxon rank-sum test statistics, can be found in the appendix. The table further shows that the difference between both control groups is not statistically significant. If the tests are rerun on the variable *net win own money*, all tests between the control and treatment group are statistically significant.

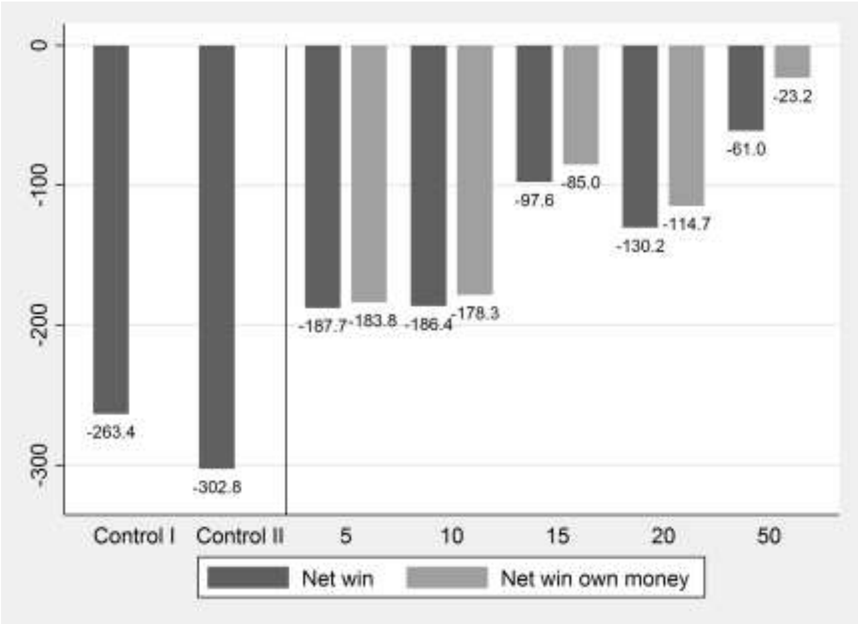


Figure 6: Average *net win* and *net win own money* per group by endowment amount

4. Conclusion

This paper investigates the existence of the house money effect in a real casino. In this unique setting that allows real losses, we find that providing house money to ordinary casino customers triggers more risk-averse behavior during the casino visit compared to non-endowed control groups. This shift to risk-averse behavior is also economically significant, as treated subjects leave the casino with smaller own-money losses. These findings provide clear evidence against the existence of a house money effect and rather point towards a "reverse house money effect". Thus, our findings also challenge the validity of the quasi-hedonic editing rule proposed by Thaler and Johnson (1990) to explain the house money effect.[19] In line with Clark (2002), Cherry, Kroll and Shogren (2005), Harrison (2007) and Etchart-Vincent and l'Haridon (2011), we conclude that the mechanisms of the house money effect are not triggered in a setting with real potential losses.

Our experimental design does not allow us to identify exactly which mechanism leads to increased risk aversion when endowed with house money. However, our findings are consistent with the "prospect-theory-with-memory" effect, where the initial endowment is kept in mind when making subsequent decisions (Etchart-Vincent and l'Haridon 2011). Thus, both subsequent potential gains and

[19] Although Peng, Miao and Xiao (2013) presented results in line with the house money effect, they also challenged the validity of the quasi-hedonic editing rule.

subsequent potential losses would be integrated into the prior gain.[20] However, further field studies on this issue are clearly required.

Although casinos offer an ideal setting to investigate the house money effect, several limitations remain. Most apparent is that our sample stems from the population of casino customers and that we cannot rule out that their reaction to house money differs from the reaction of the general public. However, as casino customers are expected to be more risk-seeking than the general population, one could think that they would be even more risk-seeking when playing with house money. This implies that the shift to risk aversion after a prior gain might be even more pronounced in the general population. Moreover, casino customers are more likely to have a good understanding of the risk characteristics of the games offered by the casino. Therefore, their decision making is less influenced by the randomness immanent in the threat of not having understood the game. A further limitation arises from the fact that the treated subjects had to wager their free coupons at least once. However, we argue that the absence of such a "forced play" with the house money would have led to even more pronounced risk-averse behavior, as subjects could have simply left the casino right after receiving the house money. Finally, the data of our second control group were not collected at the same time as the treatment group and the first control group. Nevertheless, the second control group should be a valid comparison because the data were collected one year later, which allowed us to exclude seasonal effects caused by holidays or annual casino promotions that might attract other types of gamblers.

Considering our findings, it seems irrational for casino operators to incentivize their visitors through the provision of free play for two reasons. First, providing financial means is costly, and second, the subsequent income is reduced substantially because the average losses are smaller for the endowed individuals. With that said, it is puzzling that one can observe the practice in many casinos. One explanation could be that a managerial benefit for casino operators arises because handing out the free play in form of coupons might lead to an increased usage of slot machines, which are cheaper to operate. This mechanism would reduce the costs of human capital in comparison to operating table games with at least one croupier. Another explanation might be that providing customers with free

[20] Reconsidering our introductory example, the two-stage gamble would then be evaluated as "a 50% chance to win $70 and a 50% chance to win $30", which is typically less attractive than a sure win of $50 and thus leads to risk-averse behavior.

play upon entering constitutes an implicit customer retention scheme. Customers might interpret the free play as a gift. Because customer loyalty research has stressed the positive effects of gifts in customer relationships (Beltramini 2000; Falk 2007; Haisley and Loewenstein 2011), providing free play might have a long-lasting benefit by increasing customer satisfaction and rates of return. This question remains unanswered and holds potential for future research.

Last but not least, studies could be conducted in related fields of interest, such as banking or insurance, which would further support the generalizability of the findings presented in this study. The results of this study predict that if banks incentivized their investors through financial means, these investors would in turn choose to invest in less risky assets.

Appendix

Table A.1: T-tests and Wilcoxon rank-sum tests (z) of *average wager*

	treatment			control I				
	N	Mean	SE	N	Mean	SE	t	z
average wager	579	7.71	0.54	186	18.57	3.08	5.47***	4.28***
	treatment			control II			t	z
average wager	579	7.71	0.54	152	14.13	2.78	3.63***	1.12
	control I			control II			t	z
average wager	186	18.57	3.08	152	14.13	2.78	1.05	2.17**

Notes: ***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.

Table A.2: T-tests and Wilcoxon rank-sum tests (z) of *net win*

	treatment			control I				
	N	Mean	SE	N	Mean	SE	t	z
net win	579	-153.21	30.33	186	-263.41	85.15	1.53	2.21**
	treatment			control II			t	z
net win	579	-153.21	30.33	152	-302.75	79.98	2.08**	5.35***
	control I			control II			t	z
net win	186	-263.41	85.15	152	-302.75	79.98	0.33	1.12

Notes: ***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.

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