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Luis Roberto Martínez
Christian Jaramillo
Nicolás de Roux
Juan Camilo Cárdenas

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Calle 19A No. 1 – 37, Bloque W.
Bogotá, D. C., Colombia
Teléfonos: 3394949- 3394999, extensiones 2400, 2049, 3233
infocede@uniandes.edu.co
http://economia.uniandes.edu.co

Ediciones Uniandes
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infeduni@uniandes.edu.co

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Abstract

The house-money effect –people's tendency to be more daring with easily-gotten money– is a behavioral pattern that poses questions about the external validity of experiments in economics: to what extent do people behave in experiments like they would have in a real-life situation, given that they play with easily-gotten house money? We ran an economic experiment with 66 students to measure the house-money effect on their risk preferences. They received an amount of money with which they made risky decisions involving losses and gains; a treatment group got the money 21 days in advance and a control group got it the day of the experiment. We find that, when facing possible losses, people in the treatment group showed a lower tolerance to risk than people in the control group. If the players are assumed to have a CRRA utility function and to behave according to expected-utility theory, the risk-attitude adjustment corresponds to an average increase of 1 in their risk aversion coefficient. While the exact pattern of this house-money adjustment differs by gender, it is not possible to determine the sign of this gender effect unambiguously. In any case, it is advisable to include credible controls for the house-money effect in experimental work in economics.

Key words: House-money effect, risk aversion, prospect theory, economic experiment, external validity.

JEL Classification: C91, D03, D81.

ESTE NO ES MI DINERO: UN EXPERIMENTO SOBRE AVERSIÓN AL RIESGO Y EL EFECTO DE 'DINERO DE LA CASA'

Luis Roberto Martínez

Christian Jaramillo

Nicolás de Roux

Juan Camilo Cárdenas

Resumen

El efecto de 'dinero de la casa' es la tendencia de las personas a ser más osadas con dinero obtenido sin dificultad. Este patrón de conducta genera interrogantes sobre la validez externa de los experimentos económicos, dado que los participantes en experimentos suelen recibir dinero suficiente para cubrir cualquier pérdida: ¿Hasta qué punto se comportan las personas igual en el experimento y en la vida real? Nosotros realizamos un experimento con 66 estudiantes para medir el efecto de 'dinero de la casa' en sus preferencias sobre riesgo. Los participantes recibieron una suma de dinero con la que tomaron decisiones riesgosas que incluían posibles pérdidas y ganancias. El grupo de tratamiento recibió el dinero 21 días antes de la sesión experimental mientras que el grupo de control recibió el dinero ese mismo día. Encontramos que en el escenario con posibilidad de pérdidas el grupo de tratamiento mostró menor tolerancia hacia el riesgo que el grupo de control. Si suponemos que los participantes tienen una función de utilidad CRRA y que se comportan acorde a la teoría de la utilidad esperada, el ajuste en el coeficiente de aversión al riesgo por efecto de 'dinero de la casa' tiene una magnitud promedio de 1. También encontramos que el efecto de 'dinero de la casa' no parece afectar por igual a hombres y mujeres, aunque es difícil establecer de manera precisa el sentido de esta heterogeneidad. En todo caso, es recomendable incluir controles para el efecto de 'dinero de la casa' en el trabajo experimental en economía.

Palabras clave: efecto de dinero de la casa, aversión al riesgo, teoría de perspectivas, experimento.

Clasificación JEL: C91, D03, D81.

Introduction

The house-money effect –people's tendency to be more daring with easily-gotten money– is a behavioral pattern (Thaler and Johnson, 1990) that finds theoretical support in Prospect Theory (Kahneman and Tversky, 1979). Since experiments in economics usually start by handing out money to the subjects so that they never stand to suffer any net monetary losses, the participants' behavior could be modified as a result of the house-money effect. This poses questions about the external validity of experiments in economics: to what extent do people behave in the experiment like they would have in a real-life situation, given that they play with easily-gotten house money? (Guala, 2005; Levitt and List, 2006)

The experimental literature has addressed this question in the context of public goods (Clark, 2002), auctions (Ackert et al., 2006) and capital expenditure (Keasey and Moon, 1996). The general idea of windfall gains has been also explored in the psychology and economics literatures (Arkes et al., 1994; Keeler et al., 1985).

This paper studies the effect of house money on the risk preferences of a group of 66 undergraduate students within an age range of 16 to 28. The students were randomly assigned to a control or a treatment group and given money to participate in the experiment, which they were told involved risky choices and possibly losses. As usual, the money handed out for participating was enough to cover the potential losses. However, while the control group received this initial money just before they made their choices, the treatment group received the money three weeks in advance so that they had time to spend it before making their choices (And so they did.) This experimental design, inspired in Bosch-Domenech and Silvestre (2006), is as close as we can get to having them gamble with their own money.

We find clear evidence that people increase their risk aversion when playing with their own money (the treatment group) in a game with losses. If the players are assumed to have a CRRA utility function, the adjustment corresponds to a revealed average increase of around 1 in their risk aversion coefficient.

Such a strong effect does indeed question the external validity of experimental studies of or involving risk. Empirical evidence from survey work from a developing country suggests **risk aversion coefficients** between 0 and 5 (Azam et al., 2002). It is therefore advisable to include credible controls for the house-money effect in experimental work in economics.

The experiment

Our subjects were students of an undergraduate psychology course at the Universidad de los Andes in Bogotá (Colombia). The students in the class were randomly assigned to a treatment or control group and then asked to consent to participate in an economic experiment that involved risky choices. 66 of them accepted, 32 in the treatment and 34 in the control group. Students in both groups belonged to more than 12 different majors and no more than 20% of the participants in any of the groups belonged to any particular major. Table 1 shows the average characteristics of each group.

Table 1: Demographic Characteristics of Treatment and Control Groups

Variable		**Mean value or percentage**		**P-value**	
		Control	**Treatment**	**Rank sum test**	**T-test**
Gender (%female)		41%	50%	0.475	0.480
Age		20.0	18.8	0.103	0.036
Single*		97%	100%	0.332	0.336
Siblings		1.55	1.47	0.608	0.685
Semester		3.15	2.72	0.279	0.394
Risk attitude at new restaurant	Asks waiter	18%	13%	0.540	0.712
	Known dish	18%	33%		
	Tries new	65%	53%		
Monthly expenses** (COP)		422000	414000	0.755	0.880
Housing stratum		4.82	4.63	0.317	0.445
Money in pocket (COP)		47386	70754	0.000	0.047
Money in pocket *** (COP)		87386	70754	0.096	0.154

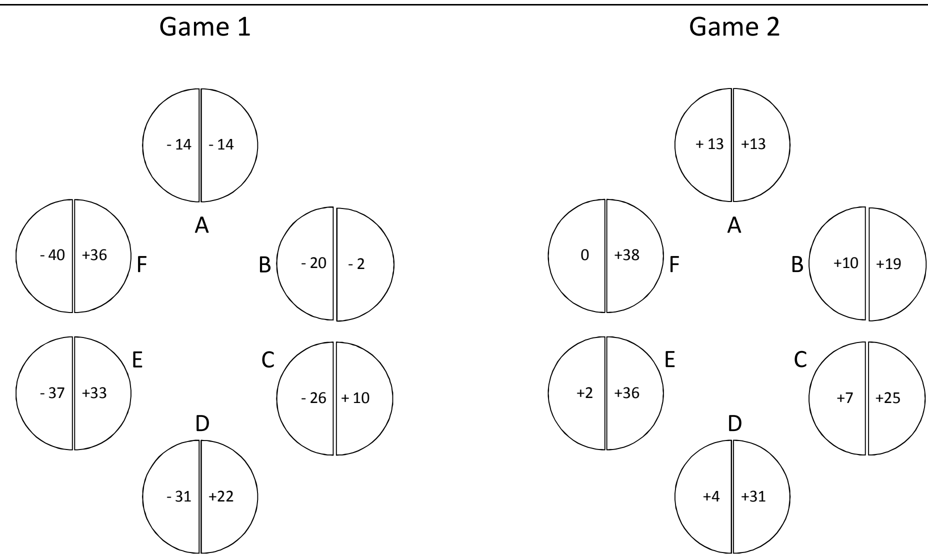
*only one participant (control group) reported "other" as marital status.
**using midpoint of reported range.
***amount of money at time of making decisions (pocket + $40,000 for participants in control group)

Treatment subjects were then given COP 40000 in small change (roughly USD 20 given an exchange rate of COP 1971 on the day of the experiment. The minimum monthly wage in Colombia is COP 497000). Three weeks later, again in class, the decision-making session took place. One half of the treatments reported to have spent all of their endowment and only 28% claimed to have kept it all. The control group was given their respective COP 40000 and everybody proceeded then to make their choices.

All participants were handed a piece of paper with six different uniform-probability lotteries involving possible losses (left panel, Figure 2) depending on a coin toss. They were then asked to choose one lottery to play. At that point they didn't know they would have further choices to make.

After collecting their choices, they were handed a second set of six lotteries (right panel, Figure 2). None of these involved losses and they were told that the outcome would depend on another coin toss and that their payments would be computed using the sum of results of both lotteries. After collecting their new choices, they were asked to fill out a brief socioeconomic survey. Only then did both coin tosses take place. (The first one went their way; the second didn´t.)

Figure 2: Games and Payoffs



In each game, both risk and expected return increase clockwise from the top. However, lotteries E and F have the same expected return.

Payoffs in thousands of Colombian Pesos (COP) (Exchange rate: COP 1971).

Results

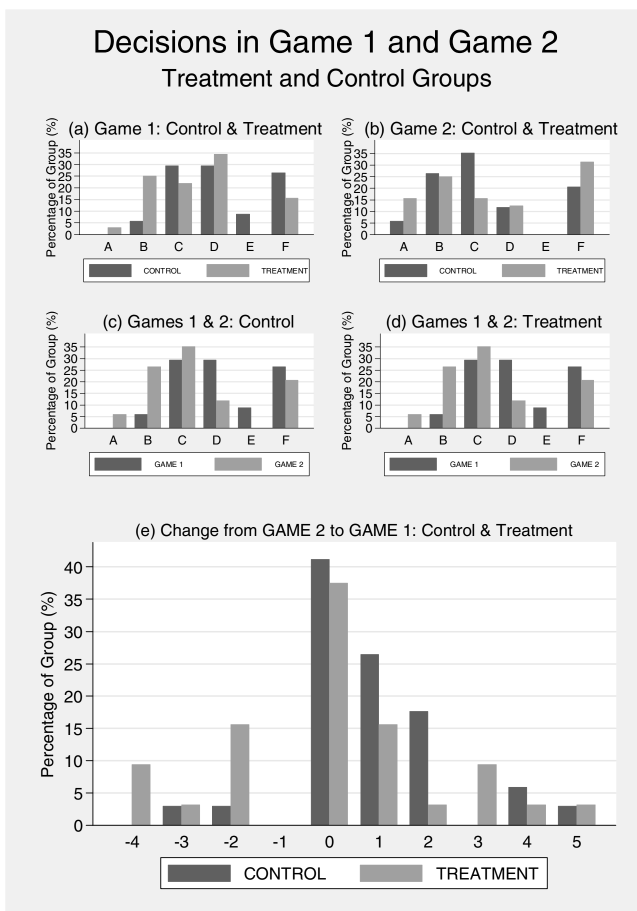
Table 3 shows the means of choices in each game for treatments and controls. GAME1 and GAME2 indicate the choice in each game. In both games, lotteries A through F of Figure 2 are coded 1 through 6: GAME1 = 1 means the subject chose lottery A in game 1, and a larger value indicates the choice of a riskier lottery. On average, the difference in mean choice between treatments and controls was not significant in GAME2 (no losses), but treatments chose less risky lotteries in GAME1 (possible losses). The result is not due to cash constraints since MONEY IN POCKET*** is similar for both groups. In fact, the differences between the treatment and control groups would appear to be driven by the behavior of males. The full distribution of choices is shown in panels (a)-(d) of Figure 4.

Table 3: Experimental Results by Treatment and Gender

Variable	All			Male			Female		
	Treatment	Control	P-Value	Treatment	Control	P-Value	Treatment	Control	P-Value
GAME1	3.50	4.21	0.043	3.19	4.65	0.004	3.81	3.57	0.617
GAME2	3.50	3.35	0.968	3.06	3.45	0.483	3.94	3.21	0.465
P-Values for difference in means Rank Sum test									

Additionally, we calculate $\Delta\text{GAME} = \text{GAME1} - \text{GAME2}$; the choice displacement between games. A positive value of ΔGAME means the subject chose a riskier lottery in game 1. On average, the subjects chose riskier lotteries when losses were possible, consistent with Cardenas and Carpenter (2009). Panel (e) in Figure 4 shows the full distribution of ΔGAME for treatments and controls: the treatments are more to the left, suggesting higher levels of risk aversion. We show later that choosing different lotteries in each game may be consistent with a stable attitude towards risk, however.

Figure 4: Decisions in Game 1 and Game 2



Next we estimate parametric and non-parametric individual-level regressions, using the survey data as explanatory variables. Following standard practice, we take the game unambiguously without losses (GAME2) to be the benchmark –the intrinsic risk attitude of the player. The ordered logit (Ologit) regression (1) in Table 5 deals with the determinants of that intrinsic risk attitude. The dependent variable is GAME2; no explanatory variable has a clear effect on the risk attitude of the players.

Table 5: Regression results

	Dependent Variable			
	(1)	(2)	(3)	(4)
	GAME2	GAME1	γ (GAME1)	Δγ (Sign)
Treatment	-0.484	-2.051***	0.999**	2.827**
	[0.614]	[0.672]	[0.384]	[1.103]
GAME2		0.301*		1.415***
		[0.155]		[0.303]
γ (GAME2)			0.230**	
			[0.099]	
Gender	-0.289	-1.229*	0.784**	1.524
	[0.612]	[0.651]	[0.332]	[1.097]
Gender*Treatment	1.105	2.115**	-1.167	-1.433
	[0.905]	[0.967]	[0.575]	[1.418]
Expenses	0.168	-0.289**	0.180***	0.182
	[0.118]	[0.120]	[0.054]	[0.169]
Stratum	0.0243	0.423*	-0.278*	0.309
	[0.227]	[0.240]	[0.141]	[0.344]
Constant			-0.267	
			[0.682]	
Observations	66	66	66	66
R-squared	0.02	0.10	0.34	0.47
Method	OLogit	OLogit	OLS	OLogit

Note: Standard errors in brackets. * significant at 10%, ** significant at 5%, *** significant at 1%.

Column (2) in Table 5 is also an Ologit; the categorical dependent variable is GAME1. Table 6 reports the marginal effects associated with this regression, the coefficients on TREATMENT indicate the change in the probability of choosing the corresponding lottery. Other things equal, belonging to the treatment group is associated with a higher probability of playing lotteries B and C and with a lower probability of playing lotteries D and F. Again, the treatments chose less risky lotteries. However, for women the evidence is mixed: women in the treatment group have a 0.07 higher probability of playing lottery B but also a 0.1 higher probability of choosing F.

Table 6: Marginal Effects, Regression 2 (Table 5)

	Marginal Effects on Outcomes Probabilities. Dependent Variable: GAME 1					
	Outcome					
	A	B	C	D	E	F
Treatment	0.023	0.220**	0.213***	-0.116*	-0.0559	-0.285***
	[0.0240]	[0.0895]	[0.0717]	[0.0699]	[0.0343]	[0.0996]
Gender	0.0128	0.131*	0.143*	-0.0853	-0.0369	-0.165*
	[0.0149]	[0.0789]	[0.0738]	[0.0619]	[0.0275]	[0.0891]
Gender*Treatment	-0.0137	-0.153**	-0.235**	-0.0349	0.0468	0.390*
	[0.0143]	[0.0649]	[0.0924]	[0.0955]	[0.0297]	[0.204]

Returning to Table 5, columns (3) and (4) carry out a parametric analysis. Each subject is assumed to have a von Neumann-Morgenstern utility function with Constant-Relative-Risk-Aversion (CRRA) state-contingent utility:

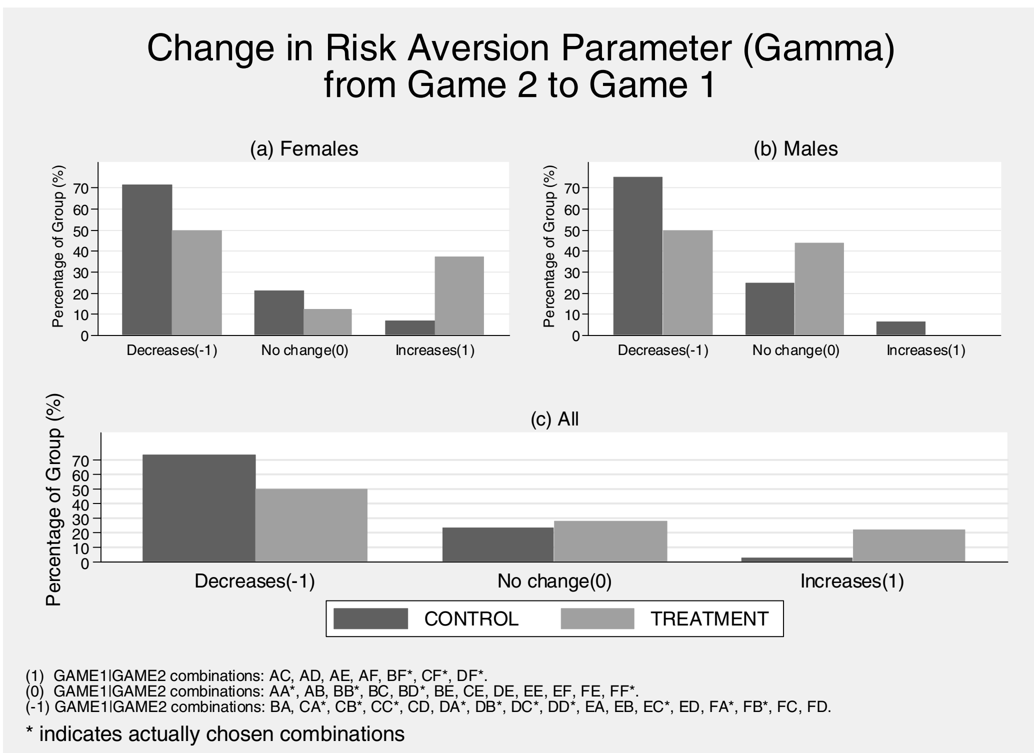
$$u(C) = \frac{C^{1-\gamma}}{1-\gamma}$$

γ is then the risk aversion parameter. Following Binswanger (1980) and Barr and Genicot (2008), we then ask what range of γ is consistent with each choice of lottery in each game. To do this, we take into account that the subjects choose their first lottery thinking this choice is the only source of uncertainty, but when they get to the second lottery they are aware that they are already facing uncertainty due to the previous lottery (i.e. they face four possible states of the world). Thus they presumably choose the second lottery to hedge their overall risk. For their choices to be consistent there must exist some value of γ that fits with both of them.

For each lottery choice in each one of the games we calculate then a range of compatible γ and assign it to those subjects who chose that lottery –each player has two assigned ranges, one for each game.[1] In the OLS regression in column (3) of Table 5, we imputed to each player in each game the mean value of the range. The γ implied by GAME1 is the dependent variable. The results show that the treatment increases γ by roughly 1 on average.

One could worry however that the OLS relies on an imputed point value of γ. In the ordered logit regression in column (4) of Table 5 we use as dependent variable Δγ(Sign): the sign of the change in risk aversion from game 2 to game 1. Δγ(Sign) may be one, zero or minus one, zero meaning that the choices in both games were consistent with some value of γ. Figure 7 shows the distribution of Δγ(Sign) for the treatment and control groups. Panel (c) shows a general tendency for people to become less risk averse when faced with losses, as expected from Prospect Theory. It also shows that this tendency was larger for the control group, suggesting again the presence of the house-money effect. However, panels (a) and (b) contradict our previous reading of the effect of gender insofar as women appear to exhibit the house-money effect more than men.

Figure 7: Sign of Change in γ from Game 2 to Game 1



[1] The ranges of γ are available upon request.

Table 8 shows marginal effects for regression (4) of Table 5. People in the treatment group are 0.57 less likely to become more risk loving when moving from the game without losses to the game with losses. The gender controls have no statistical significance.

Table 8: Marginal Effects, Regression 4 (Table 5)

	Marginal Effects on Outcomes Probabilities. Dependent Variable: Δ γ (Sign)		
	Outcome		
	-1	0	1
Treatment	-0.567***	0.525***	0.0426
	[0.174]	[0.169]	[0.0345]
Gender	-0.333	0.313	0.0193
	[0.223]	[0.212]	[0.0199]
Gender*Treatment	0.268	-0.256	-0.0117
	[0.210]	[0.204]	[0.0123]

Conclusions

We ran an economic experiment with 66 students to measure the house-money effect on their risk preferences. They received an amount of money with which they made risky decisions involving losses and gains; a treatment group got the money 21 days in advance and a control group got it the day of the experiment. The money the treatments had in their wallets confirmed that they had in fact spent part of the endowment –thus we believe that the money was incorporated as part of their disposable income.

Our results agree with the literature in finding that, on average, women are more risk averse than men and people are less risk averse when the game involves possible losses. However, when facing possible losses, people in the treatment group showed a lower tolerance to risk than people in the control group. If the players are assumed to have a CRRA utility function and to behave according to expected-utility theory, the risk-attitude adjustment corresponds to an average increase of 1 in their risk aversion coefficient. Finally, while the exact pattern of this house-money adjustment differs by gender, it is not possible to determine the sign of this gender effect unambiguously.

Our results contribute to the existing literature in various domains. Experiments that involve studying strategic behavior with possible losses should take into account that when subjects receive an endowment they might not treat it as part of their real income. Secondly, there is a cross interaction of gender and house-money effects that suggests that individual characteristics may influence the way in which easily-gotten money affects behavior. This should be taken into account when designing and interpreting experiments in economics.

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