Risk Aversion When Gains Are Likely and Unlikely: Evidence from a Natural Experiment with Large Stakes

Pavlo Blavatskyy[*] and Ganna Pogrebna[†]

March 2006

Abstract

In the television show *Affari Tuoi* a contestant is endowed with a sealed box containing a monetary prize between one cent and half a million euros. In the course of the show the contestant learns more information about the distribution of possible monetary prizes inside her box. Consider two groups of contestants, who learned that the chances of their boxes containing a large prize are 20% and 80% correspondingly. Contestants in both groups receive qualitatively similar price offers for selling the content of their boxes. If contestants are less risk averse when facing unlikely gains, the price offer is likely to be more frequently rejected in the first group than in the second group. However, the fraction of rejections is virtually identical across two groups. Thus, contestants appear to have identical risk attitudes over (large) gains of low and high probability.

Key words: risk attitude, risk aversion, risk seeking, natural experiment

JEL Classification codes: C93, D81

---

[*] Corresponding author, Institute for Empirical Research in Economics, University of Zurich, Winterthurerstrasse 30, CH-8006 Zurich, Switzerland, tel.: +41(0)446343586, fax: +41(0)446344978, e-mail: pavlo.blavatskyy@iew.unizh.ch

[†] University of Innsbruck, Department of Economics, Institute of Public Finance, Universitätstrasse 15/4, A - 6020 Innsbruck, Austria, tel.: +43 (0)5125077148, email: ganna.pogrebna@uibk.ac.at The second author acknowledges financial support from the Center for Experimental Economics at the University of Innsbruck (sponsored by *Raiffeisen-Landesbank Tirol*).

Risk Aversion When Gains Are Likely and Unlikely: Evidence from a Natural Experiment with Large Stakes

1. Introduction

Empirical studies find that individuals tend to exhibit a risk seeking behavior when dealing with risky lotteries that yield positive outcomes with small probability. At the same time, individuals often exhibit risk aversion when faced with lotteries that deliver positive outcomes with moderate or high probability. Historically, one of the first observations in support of this phenomenon was empirical evidence that people simultaneously purchase insurance and public lottery tickets (e.g. Friedman and Savage (1948)). Studies of betting behavior in horse races (e.g. McGlothlin (1956), Mukhtar (1977), Williams and Paton (1997)) also document that individual risk attitudes depend on the nature of risky alternatives. Specifically, the evidence from gambling in horse races suggests that individuals tend to undervalue horses, listed as favorites, and bet on long shots.

The general tendency to prefer less risky alternatives when dealing with probable gains and more risky alternatives when dealing with unlikely gains is reflected in well-known experimental findings of the common consequence effect (e.g. the Allais paradox, Allais, 1953) and the common ratio effect (e.g. Kahneman and Tversky, 1979). Numerous experimental studies documented risk seeking behavior over gains of low probability and risk aversion over gains of medium and high probability. For example, Cohen, Jaffray and Said (1985) find that 75% (56%) of subjects are risk seeking, i.e. they prefer a lottery yielding a gain with probability 1/6 (1/4) over its expected value for certain. Tversky and Kahneman (1992) show that subjects reveal a higher certainty equivalent than the expected value of a lottery in 78% of cases when probability of a gain

is less than 10% and only in 10% of cases when probability of a gain is higher than 50%. Di Mauro and Maffioletti (2004) demonstrate that in the auction setting subjects exhibit risk seeking behavior when they face a lottery with 3% and 20% probability of a gain, and risk averse behavior when probability of a gain is 50% and 80%.

Studies of risk aversion with large outcomes of low and high probability rely only on hypothetical incentives. Hershey and Schoemaker (1980) find that subjects tend to choose a risky lottery over its expected value when the lottery yields small gain with low probability. However, when a hypothetical gain is large, subjects tend to be risk averse irrespective of whether the probability of a gain is low or high[1]. Using a large representative sample of 3,949 Dutch respondents, Donkers, Melenberg and Van Soest (2001) find that individuals exhibit lower risk aversion when they face large hypothetical gains of low probability[2].

In this paper, we use the natural laboratory of Italian television show *Affari Tuoi*[3] with high monetary incentives to compare risk attitudes when contestants face lotteries with high and low probability of a gain. *Affari Tuoi* is the Italian version of the television show *Deal or No Deal*. Initially produced in the Netherlands by the media company Endemol, *Deal or No Deal* has been later exported to 26 countries worldwide. In *Affari Tuoi* a contestant is assigned a sealed box containing a monetary prize between 0.01 and 500,000 EUR. In the course of the show, the contestant receives more information about

---

[1] The faction of subjects, who prefer a hypothetical gain of 10,000 USD with probability p (zero otherwise) over its expected value for sure, remains nearly identical (27%-32%) when the value of p is 0.1%, 1%, 10%, 50%, 90% and 99%.

[2] Only 21% of respondents prefer a 50% chance of receiving 2,000 DFL (zero otherwise) to earning 1,000 DFL for sure. At the same time, 56% of respondents opt for 1% chance of winning 6,000 DFL over 2% chance of receiving 3,000 DFL. At the time of the questionnaire, the exchange rate was 1 DFL ≈ 0.50 USD.

[3] In translation from Italian "Your Business", "Your Affairs".

the distribution of possible monetary prizes inside her box and has an opportunity to sell or exchange her box.

We select two groups of contestants—those, who learned that there is a 20% probability of having a large prize inside their boxes, and those, who learned that the corresponding probability is 80%. Contestants in both groups receive qualitatively similar monetary offers for selling the content of their boxes. If *Affari Tuoi* contestants are indeed less risk averse when facing low-probability gains, contestants from the first group should reject such offers significantly more often than contestants from the second group. However, we find that the fraction of contestants who reject the price offer is virtually identical in both groups. This suggests that contestants have identical risk attitudes irrespective of whether lotteries yield positive outcomes with low or high probability.

Natural experiments, provided by television shows, are often used in economic research to draw conclusions about various aspects of human behavior. Television shows provide an appealing material for economists, because they are often structured as strategic games and well-defined decision problems (Metrick (1995)). For example, Bennett and Hickman (1993) and Berk, Hughson and Vandezande (1996) employ the natural laboratory of *The Prize is Right* to test for the optimal information updating and rational bidding strategies correspondingly. Levitt (2004) and Antonovics, Arcidiancono and Walsh (2005) examine discrimination in *The Weakest Link*.

Several studies elicit individual risk attitudes using the data, obtained from the natural experiments. Particularly, Gertner (1993), Metrick (1995), and Beetsma and Schotman (2001) measure individual risk attitudes in the television shows *Card Sharks*,

Jeopardy! and *Lingo* respectively. Due to its simple design and high monetary incentives, *Deal or No Deal* television show has attracted economic researchers as a perfect laboratory for studying individual decision making under risk. For example, Bombardini and Trebbi (2005) attempt to elicit risk attitudes of *Affari Tuoi* contestants. Post et al. (2004) analyze risk attitudes of Dutch and Australian contestants using the natural laboratory of *Deal or No Deal*. Mulino et al. (2006) and de Roos and Sarafidis (2006) measure risk attitudes and study the endowment effect in the Australian version of *Deal or No Deal*. Blavatskyy and Pogrebna (2006) analyze exchange offers in *Affari Tuoi* and find that contestants do not appear to be predominantly loss averse when facing lotteries with large outcomes.

Interestingly, Post et al. (2004) find that the Arrow-Pratt coefficient of relative risk aversion (estimated for every contestant) sharply decreases after the contestant learns that her box does not contain large prize(s). Since such unlucky contestants are likely to end up facing a gain with small probability, this finding may be interpreted as an indirect evidence of contestants being less risk averse when facing low-probability gains. However, Post et al. (2004) find that contestants typically face similar distribution of monetary prizes in their recorded sample. Therefore, direct testing of whether Dutch and Australian contestants overvalue (undervalue) the gains of low (high) probability does not seem to be feasible.

The remainder of this paper is organized as follows. Section 2 describes the rules of the television show *Affari Tuoi*. Section 3 provides basic statistical analysis of our recorded sample of television episodes. Section 4 presents our between-subject design. Section 5 summarizes the results of the natural experiment. Section 6 concludes.

2. Description of the Television Show

Affari Tuoi is an Italian prototype of the well-known Endemol television show *Deal or No Deal*. It is aired six days a week with an exception of Sunday on the first channel of Italian television RAI Uno. In order to become a contestant, interested candidates have to call a countrywide selection center. In other words, all contestants self-select into the show. According to Bombardini and Trebbi (2005), contestants are selected from the pool of interested candidates based on two criteria: entertaining appearance and income (wealthy candidates are discarded).

Twenty contestants, all representing different administrative regions of Italy, participate in every television episode. Contestants are randomly assigned sealed boxes, numbered consecutively from 1 to 20. Each box contains one of twenty monetary prizes ranging from 0.01 to 500,000 EUR. The list of possible prizes is presented in Figure 1. An independent notary company allocates prizes across the boxes and seals the boxes.

€0.01	€5,000[4]
€0.2	€10,000
€0.5	€15,000
€1	€20,000
€5	€25,000
€10	€50,000
€50	€75,000
€100	€100,000
€250	€250,000
€500	€500,000

**Figure 1 A typical screenshot with a list of possible prizes (in EUR)
at the beginning of the game**

Contestants know the list of potential prizes, that could be won during the game (i.e. Figure 1), but they do not know the content of each box. In every episode four small monetary prizes, ranging from 0.01 to 500, are substituted with token gifts, such as, for example, an orange instead of 0.20 EUR or a puppy instead of 100 EUR. This

---

[4] Prize 5 000 Euro was replaced with prize 30 000 Euro starting from January 30, 2006

substitution is done primarily for entertainment purposes and any contestant can reject a token gift and opt for its monetary equivalent.

Every television episode consists of two phases – the selection phase and the game itself. During the selection phase, contestants receive one multiple-choice general knowledge question. The contestant, who is the first to answer this question correctly, is selected to play the game.[5] During the game, the contestant keeps her own box and opens the remaining boxes one by one. Once a box is opened, the prize sealed inside is publicly revealed and deleted from the list of possible prizes i.e. Figure 1.

After opening several boxes the contestant receives an offer from the "bank". The offer could be either a monetary price for the content of her box or the possibility to exchange her box for any of the remaining sealed boxes[6]. In this paper we analyze the decisions of contestants when they receive a monetary offer (Blavatskyy and Pogrebna (2006) analyze exchange offers). Figure 2 shows the timing of "bank" offers.

The more boxes the contestant opens, the more information she obtains about the distribution of possible prizes inside her own box. "Bank" monetary offers are fairly predictable across the episodes and follow a general pattern. In the early stages of the game, they are smaller than the expected value of possible prizes. As the game progresses, the gap between the expected value and the monetary offer decreases and often disappears when there are two unopened boxes left. The game terminates when either the contestant accepts the price offered by the "bank" or when all boxes are opened. In the latter case, the contestant leaves with the content of her box, which is opened last.

---

[5] The remaining 19 contestants continue to participate in the next television episode. The contestant who was selected to play the game is replaced by a new contestant from the same region. New contestant is selected from a pool of volunteers who called the selection center.

[6] Official rules of the show require the "bank" to offer exchange option at least once in every television episode. Therefore, the first offer that the "bank" makes is always the exchange offer. Before February 9, 2006, the first offer was always made after the contestant opened six boxes. Starting from February 9, 2006, the first offer is made after the contestant opened three boxes.
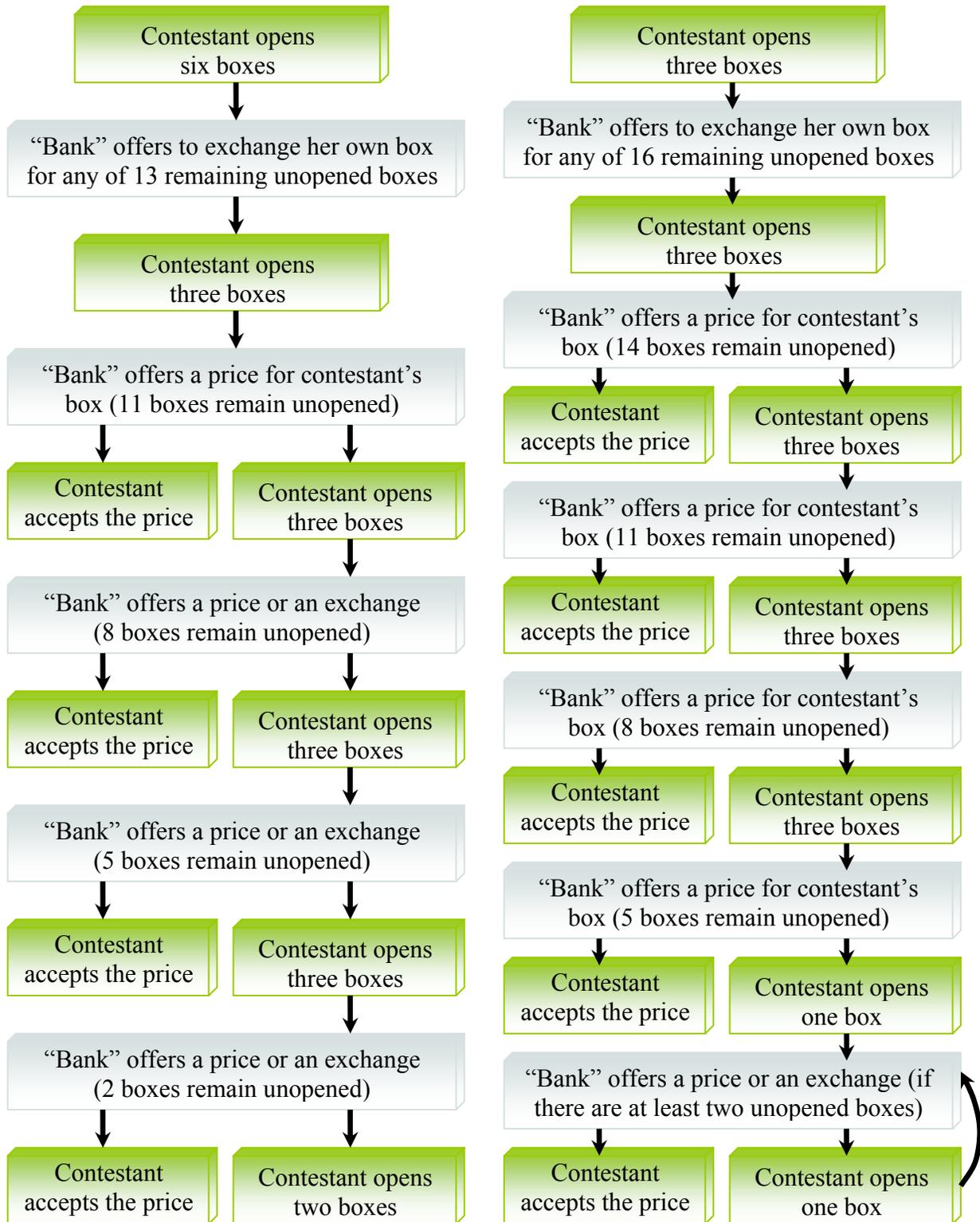
Contestant opens
six boxes

"Bank" offers to exchange her own box
for any of 13 remaining unopened boxes

Contestant opens
three boxes

"Bank" offers a price for contestant's
box (11 boxes remain unopened)

Contestant
accepts the price

Contestant opens
three boxes

"Bank" offers a price or an exchange
(8 boxes remain unopened)

Contestant
accepts the price

Contestant opens
three boxes

"Bank" offers a price or an exchange
(5 boxes remain unopened)

Contestant
accepts the price

Contestant opens
three boxes

"Bank" offers a price or an exchange
(2 boxes remain unopened)

Contestant
accepts the price

Contestant opens
two boxes

Contestant opens
three boxes

"Bank" offers to exchange her own box
for any of 16 remaining unopened boxes

Contestant opens
three boxes

"Bank" offers a price for contestant's
box (14 boxes remain unopened)

Contestant
accepts the price

Contestant opens
three boxes

"Bank" offers a price for contestant's
box (11 boxes remain unopened)

Contestant
accepts the price

Contestant opens
three boxes

"Bank" offers a price for contestant's
box (8 boxes remain unopened)

Contestant
accepts the price

Contestant opens
three boxes

"Bank" offers a price for contestant's
box (5 boxes remain unopened)

Contestant
accepts the price

Contestant opens
one box

"Bank" offers a price or an exchange (if
there are at least two unopened boxes)

Contestant
accepts the price

Contestant opens
one box

Figure 2 Timing of "bank" offers in television episodes before February 9, 2006 (left chart) and starting from February 9, 2006 (right chart)

3. Basic Statistics

The data, analyzed in this paper, were transcribed from original RAI Uno broadcasts of the television show *Affari Tuoi* from September 20, 2005 to March 4, 2006. The resulting natural laboratory contained 114 television episodes.

In the beginning of each television episode, the contestant, selected to play the game, reveals her name, place of current residence, marital status and, less often, age and occupation. In our dataset, representatives of all Italian regions played the game at least once (Figure 3). The representatives of Lombardia played the game more frequently than contestants from other regions (10 times), while a contestant from Campania played the game only once.
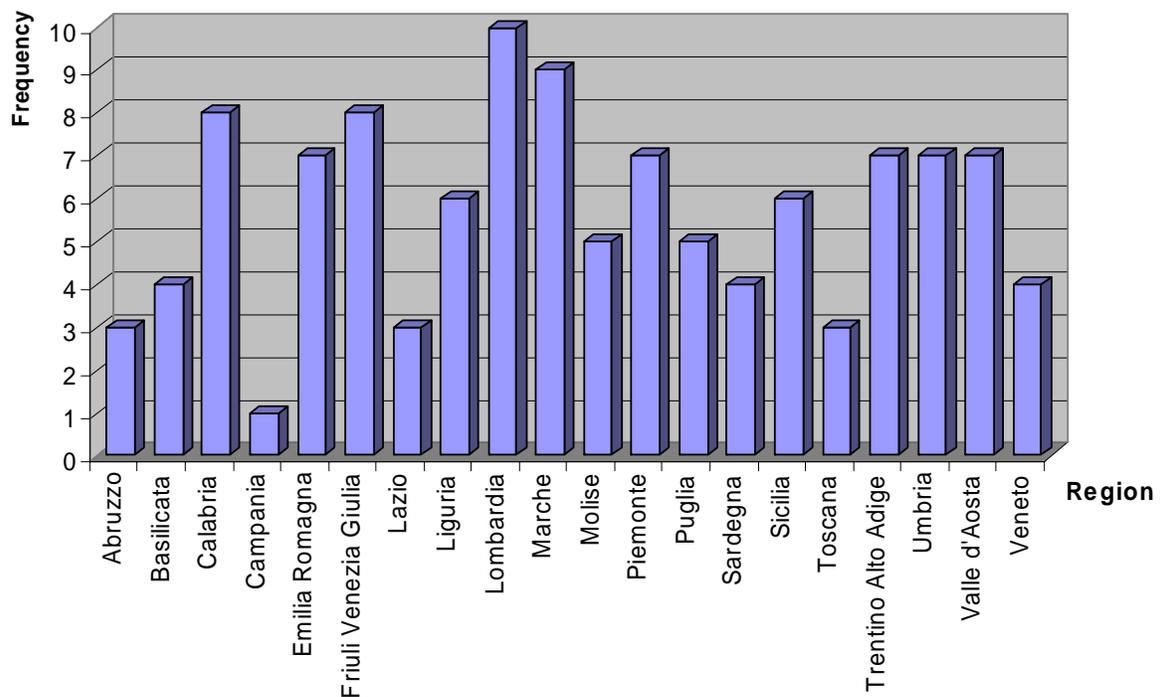
Figure 3 Regional distribution of contestants

According to their self-reported data, *Affari Tuoi* contestants greatly varied in their age. The youngest contestant in our sample was 23 and the oldest was 70 years old. In terms of the gender composition, the share of female contestants (54%) was slightly

higher than that of male contestants (46%). 79% of all contestants were married, 14% –
single, 5% – divorced and 2% – widowed. Therefore, the demographics, age and personal
characteristics of *Affari Tuoi* contestants make them a more representative subject pool
than standard pools, composed primarily of undergraduate students. Moreover, obtaining
a similar dataset in conventional laboratory conditions would be a highly ambitious
project, since it would require a budget of at least 3,364,852 EUR.

Potentially, in *Affari Tuoi* any contestant can earn a maximum prize of 500,000
EUR. However, in our sample of observations contestants failed to reach this target. The
minimum prize earned in television episodes from September 20, 2005 to March 4, 2006
was 0.01 EUR and the maximum prize was 250,000 EUR. The distribution of final
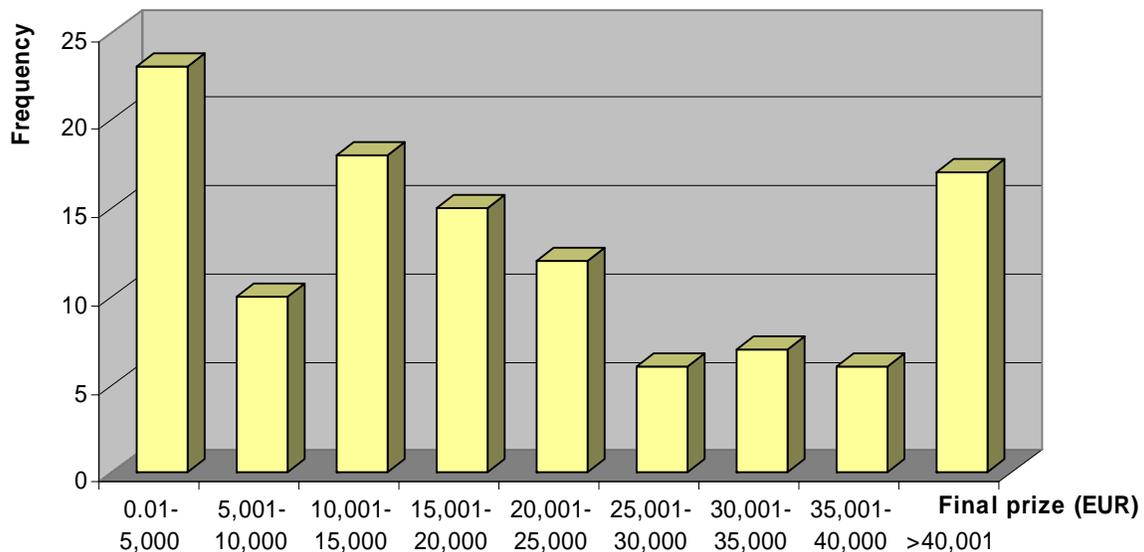earnings across 114 television episodes is shown on Figure 4.

Figure 4 The distribution of final earnings across 114 episodes

Actual average earnings of contestants were 29,516 EUR, with a median of
19,000 EUR and a standard deviation of 42,120 EUR. Men earned on average 3,798 EUR
more than women, however, standard deviation for final prizes, received by men, was

11,780 EUR higher than that for final prizes, won by women. While median earnings received by male contestants were 20,000 EUR, median earnings of females were 17,000 EUR. However, irrespective of the gender, actual average earnings in the show were significantly lower than the *ex ante* expected value of the prizes from Figure 1 (52,295 EUR).

Furthermore, actual average earnings were also lower than the average prize in the boxes, initially assigned to contestants who played the game. Figure 5 presents the distribution of monetary prizes in these boxes across 114 television episodes. This distribution is not significantly different from a uniform distribution ($\chi^2 = 22.49$, $p=0.2605$). On average, contestants were endowed with 41,279 EUR and the median initial endowment was 250 EUR.
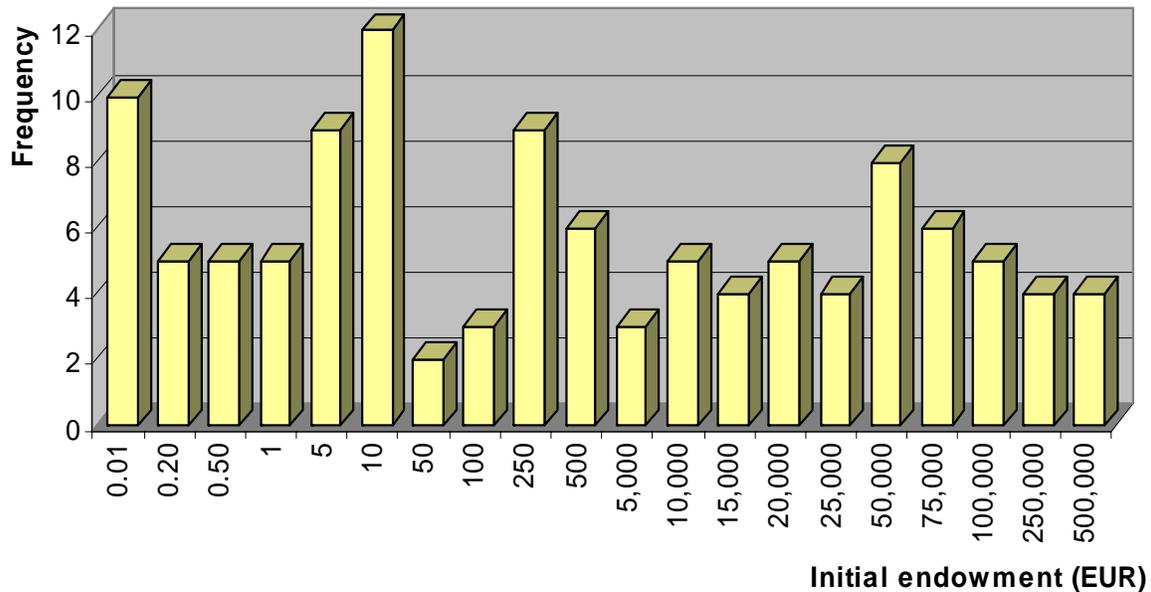

Figure 5 The distribution of initial endowments across 114 episodes

4. Natural Experiment

The main idea of our between-subject design is to identify two groups of contestants—those who learned that there is a small chance of a large prize inside their box and those who learned that this chance is high—and to compare the rejection rates for "bank" monetary offers across two groups. In order to select two groups we use the stage of the game when five unopened boxes are left and the probability of receiving each of five possible prizes is 20%[7]. Specifically, contestants in the first group have learned that the chances of a large prize inside their box are one to five. Contestants in the second group have learned that the corresponding chances are four to five.

In conventional laboratory experiments, which test for risk attitudes across various types of probabilistic distributions, subjects typically face a lottery with only one positive outcome of varied probability (e.g. Cohen et al. (1985)). In this natural experiment contestants face lotteries with five positive outcomes. Since we manipulate the probability of receiving a large prize across two groups, we need to provide a definition of a "large prize". Figure 1 offers a natural threshold for distinguishing between large and small prizes. All prizes that are below or equal to 500 EUR are significantly (at least 10 times) smaller than all prizes above 500 EUR. Thus, we identify a contestant as a member of the first (second) group if after opening 15 boxes she learns that there is a 20% (80%) probability that the prize inside her box exceeds 500 EUR.

A natural way to compare risk attitudes across two groups is to contrast the decisions of their members when they are offered the expected value of possible prizes

---

[7] In the later stage of the game (before February 9, 2006) contestants choose between fifty-fifty gambles and the offer of the "bank", which does not allow for distinguishing between contestants who face likely and unlikely gains. In the earlier stages of the game, there is no sufficient variability in the data. For example, at the stage when there are 11 unopened boxes, only one contestant out of 114 contestants in our sample accepted a monetary offer. At the stage when there are 8 unopened boxes left, only 10 contestants out of 109 accepted monetary offers and all 109 contestants faced similar distribution of possible prizes.

for forgoing the content of their box. However, when five boxes remain unopened, "bank" monetary offers are always below the expected value of possible prizes. Nevertheless, the regression analysis of the monetary offers presented in the third column of Table 1 shows that they are strongly driven by the expected value of possible prizes. In particular, "bank" offers appear to be a power function of the expected value of the prizes in the unopened boxes with a power coefficient of 0.84. This simple functional form explains 89% of total variation in monetary offers.

Explanatory Variable	Description	Regression coefficient (standard error)		
Constant		0.6610 (0.3392)	0.9228[*] (0.3746)	0.5194 (0.4243)
Expected Value (x_1)	Natural logarithm of the expected value of possible prizes	0.8395[***] (0.0319)	0.8145[***] (0.0381)	0.8229[***] (0.0386)
Median (x_2)	Natural logarithm of a median possible prize		-0.0155 (0.0173)	-0.0166 (0.0172)
Prize in own box (x_3)	Natural logarithm of a prize inside the contestant's box		0.0169[*] (0.0080)	0.0169[*] (0.0081)
Group dummy (x_4)	+1 (-1) for members of the first (second) group, zero otherwise		-0.1173 (0.0896)	-0.0907 (0.0909)
Gender dummy (x_5)	One for males, zero for females			0.0647 (0.0771)
Age (x_6)	Self-reported age (in years) or estimate based on physical appearance[8]			0.0065 (0.0034)
Marital status dummy (x_7)	Zero for married, 1 for single, 2 for divorced, and 3 for widowed			0.0116 (0.0565)
Region dummy (x_8)	Zero for contestants from the region with the lowest income per capita (Calabria), 19 for the highest (Lombardia)			-0.0009 (0.0063)
R^2		0.8870	0.8953	0.9004
Adjusted R^2		0.8858	0.8907	0.8912

[*] significant at 5% significance level
[***] significant at 0.1% significance level

Table 1 OLS regression results for "bank" monetary offers for a distribution of five prizes (dependent variable—natural logarithm of a price offered by the "bank")

---

[8] If a contestant did not reveal her age during the show, we followed the approach of Post et al. (2004) and Bombardini and Trebbi (2005) and assigned an estimate based on the physical appearance of the contestant.

The last two columns of Table 1 show the results of ordinary least squares (OLS) regression of the natural logarithm of "bank" offers $\ln(\boldsymbol{Offer}) = \beta_0 + \beta_1 x_1 + ... + \beta_8 x_8 + \varepsilon$. Regression coefficients β_i, $i \in \{2,...,8\}$ are not significantly different from zero for all lottery-specific variables, except for "expected value", and for all individual-specific variables at 1% significance level[9]. Thus, contestants in both groups receive qualitatively similar monetary offers from the bank i.e. the bank does not systematically offer less attractive prices for contestants in one of the groups, when five boxes remain unopened.

Note that regression coefficient β_3 associated with a prize inside a contestant's box (unobservable for the contestant) is positive and significantly different from zero at 5% significance level. This observation might suggest that the "bank" knows the content of the contestant's box and signals it to the contestant through monetary offers (e.g. Bombardini and Trebbi (2005)). However, Table 1 shows that all lottery-specific variables (including "prize in own box"), except for "expected value", explain less than 1% of total variation in monetary offers. Thus, the information content of "bank" offers appears to be negligible and, therefore, it is impossible for contestants to deduce the content of their boxes from the monetary offers that they receive.

If a contestant rejects a monetary offer when five boxes remain unopened, she still has an option to accept a "bank" offer when only two boxes remain unopened. Thus, the decision of a contestant on the monetary offer for a distribution of five prizes depends on the expectation of a future "bank" offer for a distribution of two prizes. If contestants in

---

[9] Bombardini and Trebbi (2005) also find that "bank" offers do not depend on individual characteristics of contestants in *Affari Tuoi*. Post et al. (2004) argue that "bank" offers depend only on the game round (how many boxes remain unopened) and the expected value of possible prizes in the unopened boxes in Dutch and Australian version of the show (*Deal or No Deal*). De Roos and Sarafidis (2006) conduct the same OLS regression analysis of "bank" offers in the Australian show *Deal or No Deal* as we do in this paper, though they consider only lottery-specific explanatory variables, and find that monetary offers depend only on the expected value and the standard deviation of possible prizes.

one of the groups expect to receive more favorable monetary offers in the future (when two boxes remain unopened) they might reject "bank" offers more frequently at the stage when five boxes are unopened.

However, we do not find any apparent reason for the representatives of two groups to expect qualitatively different monetary offers for a distribution of two prizes. When two boxes remain unopened, monetary offers are driven by the same factors as the offers that the "bank" makes when five boxes are sealed. Specifically, offers are highly correlated with the expected value of possible prizes (e.g. Figure 6) and they do not depend on any other lottery-specific or individual-specific variables. OLS regression of the natural logarithm of "bank" offers (with standard errors in parenthesis) is

$$\ln(\boldsymbol{Offer}) = -\underset{(0.94)}{0.29} + \underset{(0.06)}{1.12}\, x_1 - \underset{(0.04)}{0.05}\, x_3 + \underset{(0.31)}{0.19}\, x_4 + \underset{(0.32)}{0.17}\, x_5 - \underset{(0.02)}{0.01}\, x_6 - \underset{(0.38)}{0.04}\, x_7 - \underset{(0.03)}{0.06}\, x_8 + \varepsilon.$$
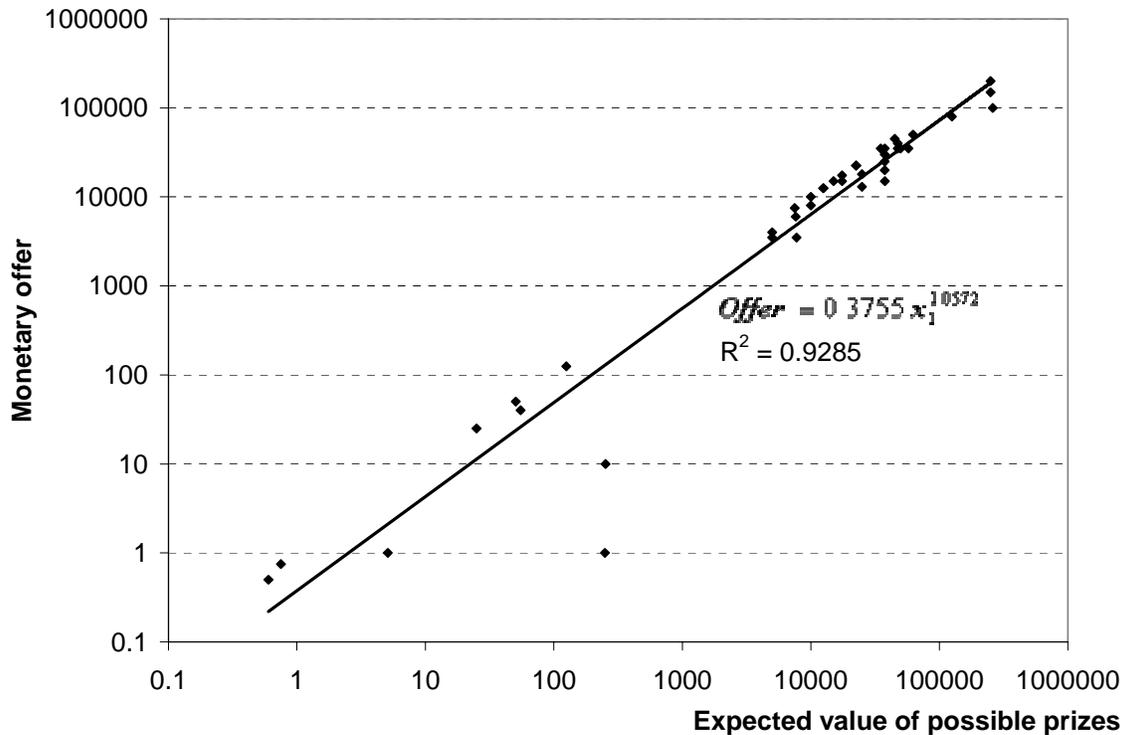

Figure 6 "Bank" monetary offers for a distribution of two prizes as a function of the expected value of two possible prizes

15

5. Results

Affari Tuoi contestants are allocated across two groups at random (as a result of pure chance events). Moreover, at a given stage of the game, the representatives of two groups receive qualitatively similar offers that depend only on the expected value of possible prizes. This allows us to formulate our testing hypotheses as follows:

Hypothesis I The fraction of contestants who reject monetary offers from the "bank" is the same in two groups if there are no systematic differences in risk attitudes across two groups.

Hypothesis II The fraction of contestants who reject monetary offers from the "bank" is significantly higher in the first group if its members are less risk averse than the members of the second group.

In our recorded sample of 114 television episodes, 13 contestants are identified as the members of the first group and 20 contestants — as the members of the second group. Table 2 shows how many contestants in each group reject/accept a monetary offer when five boxes remain unopened. The rejection/acceptance rates are remarkably similar across two groups (p-value for Fisher's exact probability test is 0.5535). Thus, we cannot reject Hypothesis I that risk attitudes are identical across two groups. Apparently, *Affari Tuoi* contestants do not become less risk averse when facing large gains of small probability[10].

Group	Number (percentage) of contestants who…	
	Reject "bank" offer	Accept "bank" offer
First group, $prob(\text{Prize} > €500) = 1/5$	9 (69%)	4 (31%)
Second group, $prob(\text{Prize} > €500) = 4/5$	13 (65%)	7 (35%)

Table 2 Rejection/acceptance rates for "bank" monetary offers across two groups

---

[10] We also checked if this conclusion depends on the threshold of what constitutes a "large" prize. Remarkably, the rejection rates across two groups remain nearly identical when the threshold is varied across all possible values between 5 EUR and 30,000 EUR (with p-values for Fisher's exact probability test being between 0.2401 and 0.7073). Details of this analysis are available from authors on request.

The design of *Affari Tuoi* has slightly changed starting from February 9, 2006. In the television episodes broadcasted before this date, a contestant, who rejects a monetary offer when five boxes remain unopened, receives the next "bank" offer after opening three boxes. In the episodes aired starting from February 9, 2006, such contestant receives the next "bank" offer each time she opens one box (e.g. Figure 2). Thus, the optional value of rejecting a monetary offer for a distribution of five prizes is higher in the episodes starting from February 9, 2006.

One can argue that contestants, who participated in *Affari Tuoi* after the change in design, are more likely to reject monetary offers, when five boxes remain unopened. In our recorded sample, out of 82 contestants, who received a monetary offer for a distribution of five prizes before February 9, 2006, 51 contestants rejected the offer. Starting from February 9, 2006, 14 contestants received a monetary offer when five boxes remained unopened and 11 of them rejected the offer. Although the rejection rate increased from 62.2% to 78.6% after the change in design, this effect does not appear to be statistically significant (p-value for Fisher's exact probability test is 0.1908).

In our recorded sample 3 contestants from the first group and 2 contestants from the second group participated in *Affari Tuoi* starting from February 9, 2006. Thus, if these contestants are indeed more likely to reject the monetary offers for a distribution of five prizes, this effect may be expected to be similar for both groups or it reinforces the fraction of rejections in the first group.

17

6. Conclusion

This paper uses the natural laboratory of *Affari Tuoi* television show to test if individuals exhibit lower risk aversion when dealing with risky lotteries that yield (large) gains of low probability. Such lower risk aversion (and even risk seeking behavior) over unlikely gains is persistently documented in numerous experimental studies though evidence in the domain of large gains relies on hypothetical incentives. The natural experiment in *Affari Tuoi* offers a unique opportunity to explore this phenomenon with real incentives (prizes up to half a million euros) and real people (representatives of all Italian administrative regions, widely dispersed in terms of age and occupation).

Using a between-subject design, we compare the decisions of two groups of contestants on qualitatively similar price offers for a risky lottery that delivers a large outcome with probability 20% in the first group and 80% in the second group. The fraction of contestants, who reject the monetary offer, is nearly identical across two groups, contrary to the expectation that it should be higher in the first group. This finding suggests that *Affari Tuoi* contestants do not become less risk averse when facing large gains of small probability.

Our results seem to confirm the findings of Hershey and Schoemaker (1980) that individuals are not prone to lower risk aversion when dealing with large improbable gains (see footnote 1). Thus, a frequently observed phenomenon that people overvalue risky lotteries delivering a relatively small positive outcome with low probability does not appear to hold with risky lotteries yielding a large positive outcome with low probability. Apparently, individuals reveal identical risk attitudes when the probability of a large gain is low and when it is high. This finding provides indirect support for the descriptive validity of expected utility theory for decisions involving lotteries with large outcomes.

18

References

Allais, M. (1953) "Le Comportement de l'Homme Rationnel devant le Risque: Critique des Postulates et Axiomes de l'École Américaine" *Econometrica* **21**, 503-546

Antonovics, K., P. Arcidiancono, and R. Walsh (2005): "Games and Discrimination: Lessons From *The Weakest Link*," *Journal of Human Resources*, 40(4), 918-947.

Beetsma, R. M. and P.C. Schotman (2001): "Measuring Risk Attitudes in a Natural Experiment: Data from the Television Game Show Lingo," *Economic Journal*, 111(474), 821-848.

Bennett, R.W. and K. A. Hickman (1993): "Rationality and 'The Price Is Right'," *Journal of Economic Behavior and Organization*, 21(1), 99-105.

Berk, J. B., E. Hughson and K. Vandezande (1996): "The Price Is Right, But Are the Bids? An Investigation of Rational Decision Theory," *American Economic Review*, 86(4), 954-970.

Blavatskyy, P. and G. Pogrebna (2006) "Loss Aversion? Not with Half-a-Million on the Table!" available at *IEW WP* 274 http://www.iew.unizh.ch/wp/iewwp274.pdf

Bombardini, M. and F. Trebbi (2005): "Risk Aversion and Expected Utility Theory: A Field Experiment with Large and Small Stakes," Unpublished manuscript, available at http://www.people.fas.harvard.edu/~trebbi/BT_17nov2005.pdf

Cohen, M., J.-Y. Jaffray, and S. Tanios (1985), "Individual Behavior under Risk and under Uncertainty: An Experimental Study," *Theory and Decision* 18, 203–228

De Roos, N. and Y. Sarafidis (2006) "Decision Making under Risk in Deal or no Deal" available at SSRN: http://ssrn.com/abstract=881129

Di Mauro, C. and A. Maffioletti (2004), "Attitudes to Risk and Attitudes to Uncertainty: Experimental Evidence" *Applied Economics* **36**, 357-372

Mulino, D, R. Scheelings, R. Brooks and R. Faff (2006) "Is a Dollar in the Hand Worth Two in a Lottery? Risk Aversion and Prospect Theory in Deal or No Deal", Monash University working paper

Friedman, M. and L. Savage (1948) "The Utility Analysis of Choices Involving Risk" *Journal of Political Economy* **56**, 279-304

Gertner, R. (1993): "Game Shows and Economic Behavior: Risk Taking on 'Card Sharks'," *Quarterly Journal of Economics*, 108(2), 507-522.

Kahneman, D. and A. Tversky (1979) "Prospect Theory: an Analysis of Decision Under Risk" *Econometrica* **47**, 263-291

Levitt, S. D. (2004) "Testing Theories of Discrimination: Evidence from Weakest Link," *Journal of Law and Economics*, 47(2), 431-52.

McGlothlin, W. (1956) "Stability of Choices among Uncertain Alternatives," *American Journal of Psychology* **69**, 604–615

Metrick, A. (1995): "A Natural Experiment in 'Jeopardy!'," *American Economic Review*, 85(1), 240-253.

Mukhtar A. (1977) "Probability and Utility Estimates for Racetrack Betting," *Journal of Political Economy* **85**, 803–815

Post, T., M. Van den Assem, G. Baltussen and R. Thaler, (2004) "Deal or No Deal? Decision Making Under Risk in a Large-Payoff Game Show" available at SSRN: http://ssrn.com/abstract=636508

Tversky, A. and D. Kahneman (1992) "Advances in Prospect Theory: Cumulative Representation of Uncertainty" *Journal of Risk and Uncertainty* **5**, 297-323

Williams, L. and D. Paton (1997), "Why is there a Favourite-Longshot Bias in British Racetrack Betting Markets?," *Economic Journal* 107, 150–158