

CULTURE, LEARNING AND RATIONAL DECISION-MAKING: EVIDENCE FROM A TV SHOW

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Abstract: *This paper analyzes the French and the Vietnamese versions of the TV game show “The Price is Right”, using data from 130 episodes. We focus on the bidding game, covering 434 rounds and 1,736 bids. We document that players deviate significantly from what is predicted by the model of rational expectations, especially in the French population. Moreover, Vietnamese fourth bidders are found to win more frequently than their French counterparts in spite of using strategic bids less often. We attribute these results to cultural reasons. Contestants from the collectivistic, uncertainty-tolerant culture (i.e., Vietnam) are more reluctant to engage in strategic bidding than individuals from the individualistic, uncertainty-avoidant culture (i.e., France). However, Vietnamese contestants pay more attention to the estimates of the previous players and thus make a better use of the informational advantage inherent to the sequential nature of the game. Overall, our evidence suggests that culture is an important omitted variable in studies that examine cross-country differences in decision-making.*

Key words: *decision-making, culture, learning, rationality, TV show, France, Vietnam.*

DECYZJE UCZESTNIKÓW TELETURNIEJU: RÓŻNICE KULTUROWE, RACJONALNOŚĆ I UCZENIE SIĘ

Streszczenie: *W artykule przeanalizowano francuską i wietnamską wersję teleturnieju The Price is Right, korzystając z danych ze 130 odcinków. Skupiono się na grze licytacyjnej obejmującej 434 rundy i 1736 ofert. Udokumentowano, że gracze znacznie odbiegają od tego, co przewiduje model racjonalnych oczekiwań, zwłaszcza w populacji francuskiej. Ponadto okazało się, że czwarty oferent w Wietnamie wygrywa częściej niż we Francji, mimo że rzadziej stosuje optymalne strategie. Wyniki te można przypisać przyczynom kulturowym.*

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Uczestnicy z kolektywistycznej kultury tolerującej niepewność (tj. z Wietnamu) są bardziej niechętni do podejmowania strategicznych przetargów niż osoby z kultury indywidualistycznej, unikającej niepewności (czyli z Francji). Jednak wietnamscy zawodnicy zwracają większą uwagę na szacunki poprzednich graczy i dzięki temu lepiej wykorzystują przewagę informacyjną związaną z sekwencyjnym charakterem gry. Zebrane dowody ogólnie sugerują, że kultura jest ważną, lecz pomijaną zmienną w badaniach dotyczących różnic między krajami w podejmowaniu decyzji.

Słowa kluczowe: podejmowanie decyzji, kultura, racjonalność, uczenie się, teleturniej, Francja, Wietnam.

1. INTRODUCTION

Neoclassical economics has been a major influence on research into individual decision-making. Individuals have been often assumed to adopt the axioms of rationality, i.e., to maximize their expected utility and follow rational expectations, regardless of the circumstances and context. However, the normative logic of choice has been shown to be descriptively false (Kahneman and Tversky 1979; Tversky and Kahneman 1986) because individuals, among other factors, are influenced by their cultural background (Guiso *et al.* 2006; Henrich *et al.* 2011).

In this paper we use data from the French and Vietnamese versions of the TV show “The Price is Right” to explore the adherence of contestants to the axioms of rationality and to examine the influence of national culture on their decisions. We focus on the bidding game of that TV show and consider data from 130 episodes (88 episodes of the French version and 42 episodes of the Vietnamese version) covering 434 rounds of the game. The rules of the bidding game are simple. In each round, four contestants sequentially guess the retail price of an item. The bidder whose guess is closest to the retail price without exceeding it wins the prize and plays in subsequent games for more expensive prizes.

We document significant departures from what is predicted by the model of rational expectations, especially in the French population. For example, the Vietnamese third bidders won less often than expected and the French first bidders were unusually successful. Moreover, Vietnamese fourth bidders are found to win more frequently than their French counterparts in spite of using strategic bids less often. We attribute these differential results to cultural differences between France and Vietnam.

TV game shows have been an interesting environment to study individual decision-making as the rules of the games are better defined than in real life and the stakes are

usually much more substantial than those in laboratory experiments. For example, researchers have analyzed the decisions of contestants in “The Weakest link” to address issues of racial and gender discrimination (Levitt 2004; Antonovics *et al.* 2005), the degree of risk aversion was studied using decisions made in the quiz-shows “Who Wants to Be a Millionaire” (Hartley *et al.* 2014) and “Quiz Taxi” (Keldenich and Klemm 2014), and the decision to cooperate was scrutinized in the context of the shows “The Manipulation” (Gurevich and Kliger 2013) and “Divided” (Van Dolder *et al.* 2015). Bennett and Hickman (1993), Berk *et al.* (1996), Tenorio and Cason (2002) and Kvam (2018) used the games of the TV show “The Price is Right” to investigate the rationality of US contestants. Most of this literature focuses on the choices made by North American individuals.

Our paper adds to this literature by comparing the adherence of the contestants’ behavior to the axioms of rationality in two different national versions of the same TV show. To the best of our knowledge, the rationality of choice of French and Vietnamese individuals in this context was never studied.

During the last decades, cultural norms and values have been found to influence decision-making in different settings. For example, Chui *et al.* (2010) analyzed a set of 55 countries to conclude that investors in different cultures process the available information in different ways. Bae *et al.* (2012) showed that corporate managers only choose to have high dividend payouts when national cultures have high levels of uncertainty avoidance and/or masculinity. Lu *et al.* (1999) documented that sales agents from higher power distance, uncertainty-avoidant, collectivistic culture (i.e., Taiwan) place more value on company and fellow employee interests (vis-à-vis self-interests) than did agents from the masculine, individualistic culture (i.e., the US). Other authors, such as Mann *et al.* (1998) and Ohbuchi *et al.* (1999), addressed the topic recurring to surveys administered to students. Mann *et al.* (1998) concluded that students from individualistic cultures (US, Australia and New Zealand) are more confident of their decision-making ability than students from East Asian cultures (Japan, Hong Kong, Taiwan). Ohbuchi *et al.* (1999) showed that when managing conflicts, individualistic subjects prefer assertive tactics oriented towards achieving justice whereas collectivists adopt avoidance tactics motivated by a concern for relationship with others. Experimental evidence corroborates the impact of cultural norms on individual preferences and expectations (Henrich 2000; Henrich *et al.* 2001).

Our study contributes to this growing field of research that considers the role of culture in decision-making. By comparing the behavior of contestants in the same TV show, our approach overcomes the typical difficulties of conducting research in several languages, with the associated problems of translation of instructions and equivalent interpretations of key concepts.

We found cultural values to significantly influence the way players decide. In fact, the evidence shows that the strategic advantage of the fourth player in the game is more likely to be exploited in the context of an individualistic culture (France) whereas the observational learning tends to be more effective for those players that belong to the culture that scores high in collectivism (Vietnam).

The remainder of this paper develops as follows. In section 2, we explain the game show in greater detail. Section 3 describes the strategic bids to be adopted by the participants of the game and, in particular, by the fourth bidder. In section 4 we highlight the cultural differences between France and Vietnam and develop the hypothesis regarding the influence of culture on the choices made in the bidding game. Section 5 presents the population considered in the empirical study. In section 6 we discuss our empirical findings. Section 7 concludes the paper.

2. DESCRIPTION OF THE GAME

The French and the Vietnamese versions of the game show “The Price is Right” have been aired by the broadcasting television companies TF1 and VTV3, respectively. The show includes a bidding game. The rules of this bidding game are the same in both countries. At the start of each episode, four audience members are called from the audience to come down and compete in the bidding game. The contestants are then presented with a commercially-sold item on display, accompanied by a short description. The four players participate in a sequential bid, from left to right on the screen in the first round, on the retail price of the item so that the guesses of the previous bidders are known at the time each contestant makes his decision. A bidder must round his bid to the nearest euro (in the French version) or to the nearest thousand of Dong (in the Vietnamese version) and cannot submit the same bid as a previous contestant. The winner of the bid, who bids closest to the actual retail price without going over, gains the item and the opportunity to play for more valuable prizes later in the program. If all four bids exceed the actual price, the game is replayed in the same bidding order. The winner, who leaves the contestants’ row to compete individually in other games, does not make any payment in exchange for receiving the item. After each bidding game, a new contestant is selected from the audience to replace the previous winner in the bidding podium. A new prize is revealed and the bidding proceeds with the new contestant bidding first with the sequence continuing left to right. Thus, unless the first bidder wins, the bidding order changes in the following bidding game. Overall, the sequential bidding contest occurs three times over the course of a show in the French version and four times in the

Vietnamese version. It is possible, therefore, that one or more players participate in all the rounds without ever winning.

3. STRATEGIC BIDDING

Given the sequential nature of the game, the fourth bidder has two important advantages over her competitors. First, the fourth bidder has an informational advantage since he can learn the values of her opponents' bids and then adjust the estimated value based on this information. Second, the fourth bidder has a strategic advantage in that he can maximize his probability of winning by placing a cut-off bid, that is, bidding exactly one monetary unit above a competitor. Since this strategy effectively slashes that competitor's probability of winning to zero (unless that bidder has guessed the exact value of the item), the ability to submit a cut-off bid is a strategic advantage of bidding last. In their analysis of the game, Berk *et al.* (1996) show that the fourth contestant should always bid either one monetary unit, the lowest existing bid plus one monetary unit ($L+1$), the middle existing bid plus one monetary unit ($M+1$), or the highest existing bid plus one monetary unit ($H+1$). Furthermore, Berk *et al.* (1996) conclude that when players follow a rational strategy four results should be observed:

- (i) the fourth bidder must win at least as often as the third bidder and the third bidder must win at least as often as either the first or second bidders,
- (ii) the first and second bidders together cannot win more than $4/9$ of the time,
- (iii) the fourth bidder should win at least $1/3$ of the time, and
- (iv) players should bid in descending order at least $1/8$ ($= 12.5\%$) of the time.

These four assertions, taken together, correspond to the results that one would expect to observe if the participants in the game followed the model of rational expectations. We are thus in a position to formulate the first hypothesis to be tested:

H1: The players of the bidding game follow a rational strategy.

The remaining hypotheses to be tested relate to the possibility that countries' cultural features may influence the choices of the fourth bidder and will be addressed in the next section.

4. THE INFLUENCE OF CULTURE

Guiso *et al.* (2006, p. 23) define culture as “those customary beliefs and values that ethnic, religious, and social groups transmit fairly unchanged from generation to generation”. In his initial contribution, Hofstede (1980) considered that national cultures could be characterized by four distinct dimensions (power distance, individualism, masculinity and uncertainty avoidance). A few years later, as a result of his collaboration with Michael Bond, a fifth dimension (long term orientation) was added (Hofstede and Bond, 1988). And more recently, the data collected by Minkov (Minkov, 2007) allowed a new computation of the fifth, and the addition of a sixth dimension (Hofstede *et al.*, 2010). Thus, at present, according to Hofstede (2011), six fundamental cultural dimensions can be distinguished: power distance, individualism, masculinity, uncertainty avoidance, long term orientation and indulgence. Figure 1 summarizes the different scores of France and Vietnam in Hofstede’s studies.

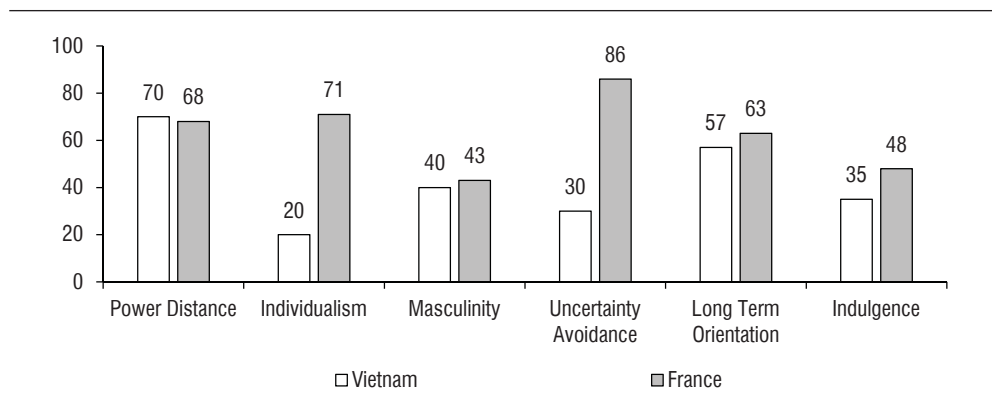


Figure 1. Hofstede cultural scores on France and Vietnam

Source: Hofstede Insights (2020)

The biggest differences between France and Vietnam concern the dimensions of individualism and uncertainty avoidance. The cultural difference between the two countries in these dimensions is extreme. In fact, considering the cultural distance as the absolute difference in the scores of individualism and uncertainty avoidance, of the 69 countries for which data are available for both dimensions, only Singapore is more culturally distant from France than Vietnam. However, in the remaining four dimensions, of the 61 countries for which data are available, Vietnam is, together with Bulgaria, the country that is culturally closest to France. This indicates that the

cultural differences between the two countries are extremely concentrated on the dimensions of individualism and uncertainty avoidance.

We take advantage of these distinctive features of the cultural distance between the two countries under scrutiny to explore the role of individualism and uncertainty avoidance on the choices made by the players in the bidding game.

The fundamental issue in the individualism dimension is the degree of interdependence that a society maintains among its members. It has to do with whether individual's self-image is defined in terms of "I" or "We". France, with a score of 71, is an individualistic society while Vietnam, with a low score on the individualism dimension, is a collectivistic country. This means that in France people are supposed to look primarily after themselves and their close relatives only whereas in Vietnam people maintain a close long-term commitment to a group (extended family or extended relationships) that is expected to take care of them in exchange of loyalty. As a consequence, approval and acceptance by others figure prominently in the definition of the collectivistic mindset. This cultural dimension of individualism vs. collectivism may be analogous to that of independent-self vs. interdependent-self as developed by Markus and Kitayama (1991). The independent-self is typical of western cultures where the self is seen as an entity that is separate from the surrounding social context and where the cultural norm is to be independent of others. The feeling of being an independent individual whose nature is free from a concrete situation leads independent-self persons to focus on abstract conceptualization abilities rather than to the specific experience ones. In contrast, those people with an interdependent-self, the typical East Asian notion of self, tend to have a strong sense of belongingness to social contexts and relationships. Consequently, interdependent-self persons tend to be very sensitive to others' feelings and to value harmonious social behaviors.

Broadly, uncertainty avoidance refers to the way a society deals with the fact that the future can never be known. There is an ambiguity between the choice to attempt to control the future and the resolution to simply let it happen. The uncertainty avoidance dimension reflects the extent to which the members of a culture feel threatened by unknown situations. The anxiety associated with this ambiguity may be dealt in different ways. At 86, France scores high on uncertainty avoidance. This means that in general structure and planning are valued and surprises are not seen in a positive way. French people have a preference for stable environments where clear rules allow one to develop successful strategies. On the other hand, Vietnam scores 30 on this dimension which means that has a low preference for avoiding uncertainty. In this type of societies, practice counts more than principles, people rely less in abstract rules of behavior and precision when performing a task does not come naturally.

Thus, we conjecture that each of these aspects of culture should impact decision making. First, the dimensions of individualism vs. collectivism and independent-self vs. interdependent-self should make French contestants to exhibit a higher level of self-interest, associated with a stronger adherence to the normative axioms of gain maximization. On the other hand, the need of acceptance by others, which is more typical of East Asian societies, may prevent Vietnamese contestants to cut-off their opponents in the bidding game. Likewise, the choice to bid only one monetary unit should also be viewed with greater reluctance in collectivist cultures as this implies that the bidding of the last player is clearly outside the price range presented by the other players, with the additional obvious implication that the choice of all the previous players was wrong. These assertions follow LeFebvre and Franke (2013) that used a survey to document that individualist subjects tend to be more rational in their decision-making.

Second, it is to be expected that people in cultures that rate high on uncertainty avoidance like France are less comfortable with ambiguous situations and tend to prefer clear rules of conduct, such as those prescribed by the axioms of rationality. On the other hand, the lower level of uncertainty avoidance observed in Vietnam should allow the contestants of this country to be more comfortable with less structured strategies, i.e., strategies that deviate from the strict rules of optimization. In consequence, we hypothesize the following:

H2: French fourth bidders are more likely to use their strategic advantage in the bidding game (i.e., bidding one monetary unit, the lowest existing bid plus one monetary unit, the middle existing bid plus monetary unit, or the highest existing bid plus one monetary unit).

Culture is also likely to exert an important influence on the propensity of the fourth bidders to use the informational advantage that they have at their disposal. People in different cultures exhibit significant differences in the way they process information and complement it with guesswork. The way individuals perceive environmental complexity, in terms of the number of alternatives considered and weights assigned to sample information is culturally induced (Schkade *et al.* 1978; Hofstede 1986; Ji and Yap 2016). In more collectivist societies, where the sense of belonging to a group is stronger, individuals are more likely to develop greater capacities to acquire and interpret public information, i.e., information provided by the group. These individuals have a strong tendency to seek information about others' perception and to use it to form their own estimates and projections about the future. Ji *et al.* (2009)

present some evidence in this regard, comparing the cultural differences in the way Canadian and Chinese individuals perceive past information. The authors conclude that, in comparison with the subjects of the country that scores high in individualism (i.e., Canada with a score of 80 in this dimension), individuals of the national culture that scores low in individualism (i.e., China with a score of 20 in this dimension) tend to consider past information to be more relevant in understanding reality, recall past event with greater detail and show a greater awareness of the past. In addition, it has been noted in financial literature that individualism is negatively associated with the propensity to interpret public information (e.g., Daniel *et al.* 1998; Chui *et al.* 2010). Consequently, we formulate the following hypothesis:

H3: Vietnamese fourth bidders are more likely to use their informational advantage of learning the previous estimates of their opponents in the bidding game.

In short, it is to be expected that the Vietnamese last bidders are more likely to exploit the informational advantage stemming from the sequential nature of the game while the French last bidders are more likely to make use of their strategic advantage. The first group should have primarily the objective of using other people's information to estimate the correct price while the second group should be more focused on beating other players using cut-off strategies. Given these two hypotheses, it is interesting to note that it is not possible to predict in which cultural context the fourth player will perform better.

5. THE DATASET

All the episodes available on Youtube in September 2018 of the French and Vietnamese versions of the game “The Price is Right” were viewed. This includes 88 episodes of the French version (originally called “Le juste prix”) and 42 episodes of the Vietnamese version (“Huy Chọn Giá Đúng”). All the results of the bidding game, including the bids, the order of the bids, the retail value of the prize and the gender of each bidder, were transcribed manually. The ordering of rounds within each show was also preserved and the rounds in which all the bids exceeded the price of the prize were excluded from the populations (since there were no winners). In all, the dataset included 434 bidding contests (262 in the French population and 172 in the Vietnamese population) and a total of 1,736 bids.

6. EMPIRICAL RESULTS

6.1. Bidding rounds

We begin by examining the winning percentage of each of the bidders in table 1.

Table 1
Winning percentage and overbidding according to the bidding order

Contestant	French population				Vietnamese population			
	No. of wins	Winning percentage	Percent of bids that exceed the actual retail price	Average bid (in euros)	No. of wins	Winning percentage	Percent of bids that exceed the actual retail price	Average bid (in 10^3 Dong)
1	67	25.57%	17.94%	86.43	31	18.02%	31.98%	250.11
2	54	20.61%	22.52%	89.13	45	26.16%	29.65%	259.93
3	59	22.52%	24.43%	89.31	34	19.77%	33.14%	276.23
4	82	31.30%	20.61%	80.54	62	36.05%	22.09%	256.15

Table 1 shows that the bidding order seems to be relevant to the probability of the last bidder to win the bidding contest. In both populations, the last bidder won the game more often. The percentage of wins of the fourth bidder is higher in the Vietnamese population (36.05%) than in the French population (31.30%). A Chi-square test rejects the hypothesis that the winning percentage is the same across the four French bidders at a significance level of 10% level (p -value=0.0766) and across the four Vietnamese bidders at a significance level of 1% level (p -value=0.0033). Moreover, in general, the fourth bidder does not overbid so often as the remaining players. The difference is especially significant in the Vietnamese population. Again, a Chi-square test allows one to reject the hypothesis that the likelihood of overbidding is the same across the four bidders for both populations at a significance level of 5% (p -value for the Vietnamese population=0.0187; p -value for the French population=0.0476). There are some cases that are noteworthy. The first player in the case of the French population is more successful than expected: despite being the first to bid, he has a success rate (25.57%) above that of the second player (20.61%) and third player (22.52%) and his percentage of overbids is the lowest among the four players. In the Vietnamese population, the third bidder also stands out, but now for negative reasons. Despite having the advantage of learning the previous two bids, the third player presents a percentage of winnings lower than that of the second bidder (19.77% vs 26.16%) and his percentage of overbids is the highest among all the contestants, presenting the highest average bid. Overall, the results do not confirm the prediction of proposition (i) presented in the third section thus suggesting that bidders, in general, do not use to their profit the informational advantage provided by sequential nature of the game.

There are some differences between the two populations regarding proposition (ii). It was mentioned above that if the players adopt a strategic bidding behavior, the first and second bidders together could not win more than 4/9 (about 44.44%) of the time. This is indeed what happens in the Vietnamese population since the first two players won together 44.19% of the rounds. However, the prediction of proposition (iii) is not confirmed in the French population given that the first two players won collectively 46.18% of the bidding games.

These differences between the two populations extend to proposition (iii). According to this proposition, the fourth bidder should win at least 1/3 of the time. In fact, this is what is observed in the Vietnamese population in which the last player has a rate of success of 36.05%. However, the results in the French population are not in accordance with proposition (iii) since the last player had a percentage of success (31.30%) somewhat lower than that expected within the rational paradigm.

In general, this evidence does not fit with the predicted outcomes when the participants in the bidding game follow a rational strategy, especially in the case of the French population. These results go against those obtained in the US. For example, Berk *et al.* (1996) document that in the US, the evidence is in accordance with the propositions (i), (ii) and (iii), which led the authors to not reject the hypothesis that rational expectations had guided the players in their decisions.

Proposition (iv) predicts that if contestants bid rationally, they should bid in descending order at least 1/8 (= 12.5%) of the time. Table 2 displays the bidding-order frequency observed in our two populations.

Table 2
Bidding-order frequency

Bidding order (descending)	Frequency in the French population	Frequency in the Vietnamese population
1234	2.29%	4.07%
1243	3.05%	5.81%
1324	3.05%	4.07%
1342	4.20%	3.49%
1423	4.20%	2.91%
1432	3.82%	5.81%
2134	3.82%	3.49%
2143	3.44%	2.91%
2314	4.96%	3.49%
2341	2.29%	5.23%
2413	1.15%	3.49%
2431	4.58%	2.91%
3124	4.58%	2.91%
3142	3.82%	1.74%

Bidding order (descending)	Frequency in the French population	Frequency in the Vietnamese population
3214	6.87%	6.40%
3241	4.20%	7.56%
3412	2.29%	5.23%
3421	3.44%	2.91%
4123	2.67%	4.07%
4132	2.29%	3.49%
4213	5.73%	3.49%
4231	3.44%	4.07%
4312	7.63%	5.23%
4321	12.21%	5.23%

Table 2 shows that the strictly descending order (1234) was observed only in 2.29% of the rounds in the French population and in 4.07% of the rounds in the Vietnamese population. Therefore, the prediction of proposition (iv) is not observed. The most prevalent pattern in the French population is the strictly ascending order (4321) which was observed in 12.21% of the bidding contests. These results seem to mirror the evidence collected in the US by Berk *et al.* (1996) in which the strictly ascending order was observed 12.1% of the time. In the case of the Vietnamese population, the results are significantly different. Given what was said about the third bidder's behavior, it is not surprising to find out that the most frequent bidding order (3241) is one in which that player has the highest bid. The hypothesis that the bidding orders in the French population occur equally often is strongly rejected by a Chi-square test at a significance level of 1%. In the Vietnamese population, that hypothesis cannot be rejected at the conventional levels of significance ($p\text{-value}=0.7699$).

Overall, it is difficult to reconcile the evidence presented so far with the hypothesis that the contestants had rational expectations, especially in the case of the French population. In fact, the results displayed in tables 1 and 2 indicate that contestants do not typically adopt a strategic bidding behavior. Thus, we are led to reject hypothesis H1.

It is now important to try to understand the strategy followed by the contestants and, in particular, by the contestant who has an informational and strategic advantage in the bidding game: the fourth bidder.

6.2. The strategy of the fourth bidder

As mentioned before, the strategic bidding behavior of the fourth contestant is to bid either one monetary unit, the lowest existing bid plus one monetary unit ($L+1$), the middle existing bid plus one monetary unit ($M+1$), or the highest existing bid plus one monetary unit ($H+1$). In the case of the French population, we considered

the euro as the monetary unit. In the case of the Vietnamese population, considering the low value of the Dong, we considered 5,000 Dongs (something like 0.19 euros using the exchange rate of 31st December, 2017) as the relevant monetary unit. Thus, for example, we consider that if a fourth player in the Vietnamese population bids the middle existing bid plus an amount up to 5,000 Dongs, he is choosing a strategic bid (M+1, in the case). Table 3 presents data regarding the behavior of the fourth bidder in both populations.

Table 3
Strategies adopted by the fourth bidder

	French population			Vietnamese population		
	No. of observations	Percentage of total	Winning percentage	No. of observations	Percentage of total	Winning percentage
Strategic bidding	103	39.31%	35.92%	44	25.58%	50.00%
Sub-optimal strategy	159	60.69%	28.30%	128	74.42%	31.25%
Total	262	100%	31.30	172	100%	36.05%

In our Vietnamese population there were only 44 bids (25.58% of the total) of the fourth bidder that were consistent with a strategic bidding behavior. Of these, in half of the cases the fourth bidder won the round. This means that almost three quarters of the bids (74.42%) departed from the strategic bidding behavior.¹ In the case of the French population, the frequency of strategic bids was higher (39.31% of the total) but with a lower rate of success (35.92%).

The percentage of rounds won with suboptimal strategies was substantially lower in the Vietnamese population (31.25% vs 50%) and somewhat lower in the French population (28.30% vs 35.92%). Since the group of fourth players that bided strategically performed significantly better in the Vietnamese population (z stat=2.23; $p=0.0127$), it is surprising that only 25.58% of those players adopted that type of strategy. In the French population, the results of both strategies were statistically different but only at a significance level of 10% (z stat=1.29; p -value=0.0969). In two different US samples, Bennett and Hickman (1993) and Berk *et al.* (1996) report that the fourth bidder chooses strategic bids 45.39% and 43.52% of the time, respectively. Thus, in our two populations the frequency of strategic bids is even lower.

It is important to understand whether the differences in the prevalence of strategic bidding behavior were due to the cultural differences between the two

¹ Had we considered 1,000 Dongs as the relevant monetary unit, we would have had only four cases in which the fourth player bided strategically in the Vietnamese population (about 2.8% of the total bids in this population).

countries or to the differences in the observable features of the events. For this reason, we followed the standard method to analyse the game show (e.g., Bennett and Hickman, 1993; Healy and Noussair, 2004), using a logistic model to regress a binary variable that equals 1 if the fourth bid was either one monetary unit, L+1, M+1 or H+1, and equals zero otherwise, against the variable of interest FRANCE, which is a binary variable that equals 1 if the bidder belonged to the French population and 0 if the bidder belonged to the Vietnamese population. We control the results for the round number of the show (ROUND), the gender of the bidder (GENDER) and the value of the prize (PRIZE).

Table 4
Logit regressions regarding the cultural influence in the prevalence of strategic bids

Const.	FRANCE	ROUND	GENDER	PRIZE	Adj. R-square
-1.067*** (<0.001)	0.633*** (0.003)	-	-	-	0.008
-1.343*** (<0.001)	0.688*** (0.002)	0.108 (0.322)	-	-	0.007
-1.357*** (<0.001)	0.691*** (0.002)	0.108 (0.322)	0.036 (0.868)	-	0.003
-0.800** (0.045)	0.590*** (0.009)	0.096 (0.384)	0.046 (0.835)	-0.395** (0.013)	0.013

Notes: The dependent variable is defined as a binary variable that equals 1 if the fourth bid was either one monetary unit, L+1, M+1 or H+1, and equals zero otherwise. FRANCE is a binary variable that equals 1 if the bidder belonged to the French population and 0 if the bidder belonged to the Vietnamese population; ROUND is the round number of the respective episode that day; GENDER stands for the gender of the fourth bidder and equals 1 if the fourth bidder is male and zero if the fourth bidder is a female; PRIZE stands for the price of the prize under dispute as the number of days worth of gross domestic product per capita in the respective country as of 2017 (International Monetary Fund, 2018). P-values in parenthesis. *, ** and *** represent significance at the 10%, 5% and 1% levels, respectively.

The results of the logit regression confirm that the fourth bidders in the French population are more likely to follow the rules of strategic bidding, even after controlling for factors such as the number of the round, the gender of the player or the value of the prize ($p < 0.01$). Thus, the evidence collectively considered lends support to H2 presented in section 4. Moreover, contrary to our expectations, the value of the prize was found to be negatively associated with the likelihood of observing a strategic bidding behavior of the last contestant.

6.3. Bias of the first three bidders

The rate of success of bidding strategically (either one monetary unit, L+1, M+1 or H+1) is relevant to understand whether the first three bidders carry out a biased

estimate of the retail value of the item under dispute. Table 5 shows the four types of strategic bids and their rate of success.

Table 5
Strategic bids chosen by the fourth bidder

	French population			Vietnamese population		
	No. of observations	Percentage of strategic bids	Winning percentage	No. of observations	Percentage of strategic bids	Winning percentage
1 euro / <=5,000 Dongs	27	26.21%	11.11%	0	0.00%	-
L+1	16	15.53%	18.75%	14	31.82%	35.71%
M+1	12	11.65%	16.67%	10	22.73%	40.00%
H+1	48	46.60%	60.42%	20	45.45%	65.00%

H+1, that is, the strategy of bidding the highest existing bid plus one monetary unit is the most frequent of the strategic bids, representing almost half of the strategic bids in both populations. It is also by far the strategy that performs better since it allowed the last bidder to win more than 60% of the rounds where it was used. It is interesting to note that the strategy of bidding just up to five thousand Dongs was not used in the Vietnamese population whereas in the French population the equivalent strategy of bidding just one euro represented about a quarter of the strategic bids.

The high rate of success of the H+1 strategy suggests that the first three bidders present a systematic downward bias when estimating the price of the prize. This result would not be entirely surprising since, given that the expected payoff function of the players is asymmetric around the true value of the prize, the rules of the game encourage them to underbid. However, it is interesting to analyze whether there are significant differences in the decisions exhibited by the players of the two populations. Thus, we compare the average bid of the first three bidders with the actual retail price. Table 6 presents the results.

Table 6
The average of the three first bids and the price of the prize

	French population		Vietnamese population	
	No. of observations	Percentage of total	No. of observations	Percentage of total
Average bid > retail price	63	24.05%	61	35.47%
Average bid < retail price	196	74.81%	110	63.95%
Average bid = retail price	3	1.15%	1	0.58%

Table 6 shows that in both populations the first three bidders presented a systematic downward bias when estimating the price of the item under dispute. The average of

the first three bids exceeded the price of the item only in 24.05% of the games in the French population and in 35.47% of the games in the Vietnamese population. The difference in these frequencies is statistically significant at the 1% level. Given the high rate of success of the H+1 strategy in the French population, this means that for the fourth bidder it would be advantageous to always adopt the simple strategy of bidding one euro above the highest existing bid. In fact, when we compare the overall rate of success of the fourth bidders in the French population (31.30% in table 1) with the rate of success that the fourth bidders would have obtained had they adopted a H+1 strategy in all the rounds (47.33%), we conclude that the two proportions are significantly different (z stat=4.47; $p<0.01$). This indicates that the H+1 strategy outperforms the observed choices of the fourth bidders. These results are in line with those presented by Bennett and Hickman (1993) and Berk *et al.* (1996) in US samples. On the contrary, in the Vietnamese population, given the relatively higher propensity of the three first bidders to overbid and the relatively higher rate of success of the last player, the difference between the observed rate of success of that player (36.05% in table 1) and that of the H+1 strategy (35.47%) is not statistically significant at the conventional level (z stat=0.12; $p=0.4524$).

Considering the results presented so far, it is worth noting that the fourth bidder in the Vietnamese population has a higher success rate than its counterpart in the French population (36.05% vs 31.30% in table 1) despite choosing strategic bids in a smaller percentage of the time (25.58% vs 39.31% in table 3). These results suggest that observational learning processes can be especially important in the Vietnamese population, as predicted by hypothesis 3. We analyze this conjecture in the following section.

6.4. Observational learning

Observational learning includes several dimensions. We begin by examining whether bidders in the two populations learn to bid strategically as the game progresses. In order to assess whether the fourth bidder learns in the show as each day's rounds proceed, we recur to a standard logit regression in which we regress a binary variable which equals to one if the fourth bid was either one monetary unit, L+1, M+1 or H+1, and equals to zero otherwise, to round number and some control variables. ROUND, the variable of interest, is the round number of the respective show that day and that varies in our population from 1 to 4, since there were four bidding rounds in the Vietnamese version of the show, and also in the French version of the show in the days where all the contestants overbid. The control variables are GENDER and PRIZE, as defined above, take into account the possibility that the behaviour of the fourth bidders may vary depending on their gender and on the price of the prize.

Table 7 shows the estimated coefficients in the logit regressions for each of the populations.

Table 7
Logit regressions regarding the learning hypothesis: learning how to bid strategically

Panel A: French population				
Const.	ROUND	GENDER	PRIZE	Adj. R-square
-0.054 (0.870)	-0.189 (0.220)	-	-	-0.007
-0.122 (0.720)	-0.191 (0.215)	0.246 (0.373)	-	-0.010
0.162 (0.686)	-0.206 (0.184)	0.262 (0.346)	-0.002 (0.191)	-0.010
Panel B: Vietnamese population				
Const.	ROUND	GENDER	PRIZE	Adj. R-square
-2.199*** (<0.001)	0.430*** (0.009)	-	-	0.016
-2.085*** (<0.001)	0.427*** (0.009)	-0.304 (0.420)	-	0.009
-1.102* (0.068)	0.439*** (0.009)	-0.297 (0.441)	-0.004*** (0.009)	0.044

Notes: The dependent variable is defined as a binary variable that equals 1 if the fourth bid was either one monetary unit, L+1, M+1 or H+1, and equals zero otherwise. ROUND is the round number of the respective episode that day; GENDER stands for the gender of the fourth bidder and equals 1 if the fourth bidder is male and zero if the fourth bidder is a female; PRIZE represents the retail price of the item under dispute (in euros for the case of the French population and in thousands of Dongs for the case of the Vietnamese population). P-values in parenthesis. *, ** and *** represent significance at the 10%, 5% and 1% levels respectively.

In the French population, the results do not confirm the conjecture that fourth bidders learn to cut-off other contestants as the show proceeds. In fact, the sign of the coefficient on ROUND is always negative but the coefficient is not statistically significant at the conventional levels. The negative adjusted R-square confirms the insignificance of the explanatory variables. On the contrary, in the case of the population from Vietnam the results show that it is more likely to witness a strategic bid in a later round thus suggesting that individuals learn to adopt strategic bids. This last result goes in accordance with the findings of Bennett and Hickman (1993), Berk *et al.* (1996) and Healy and Noussair (2004) who conclude that, in the context of the TV show “the price is right”, more experienced players tend to bid strategically more often than inexperienced individuals.

The fact that the fourth Vietnamese bidders learn to bid strategically does not explain by itself the high success rates of these players (table 1), since the percentage of strategic bids presented by these players is low (table 3). The explanation for the high success of the fourth bidders in the Vietnam population may lie in the learning that they carry out from previous players’ bids.

To investigate the learning of the fourth bidders, we compare the deviation of the average of the three first bids from the retail price with the deviation of the fourth bid from that same price. Thus, we consider that there will be observational learning in a given bidding round if:

$$|fourth\ bid - retail\ price| < |average\ of\ the\ first\ three\ bids - retail\ price|$$

In addition, if we want to have an appropriate measure of observational learning it makes sense to exclude from those cases in which the deviation is lower the cases where the fourth bidder has chosen a strategic bid (bidding one euro, L+1, M+1 or H+1). It is plausible to admit that the adoption of such a strategy can be made without a real weighting of the information contained in the previous three bids.

We conduct a multivariate analysis which allow us to assess the likelihood of observing observational learning after controlling for some observable features of the events. The dependent variable is defined as a binary variable that equals 1 if the fourth player does not bid strategically and if the deviation of the fourth bid from the retail price is lower than the deviation of the average of the first three bids, and equals zero otherwise. VIETNAM is the explanatory variable of interest, and equals 1 if the fourth bidder belongs to the Vietnamese population and equals zero if the bidder belongs to the French population. The control variables ROUND, GENDER and PRIZE have the meaning mentioned above. Table 8 presents the results of the standard logit regressions.

Table 8
Logit regressions regarding the cultural influence: learning from the previous estimates of the same round

Const.	VIETNAM	ROUND	GENDER	PRIZE	Adj. R-square
-1.279*** (<0.001)	0.830*** (<0.001)	-	-	-	0.020
-0.726*** (0.006)	0.970*** (<0.001)	-0.281** (0.012)	-	-	0.029
-0.734*** (0.007)	0.968*** (<0.001)	-0.281** (0.012)	0.024 (0.915)	-	0.025
-0.684** (0.015)	0.987*** (<0.001)	-0.288** (0.011)	0.019 (0.931)	-0.030 (0.536)	0.022

Notes: The dependent variable is defined as a binary variable that equals 1 if the fourth bidder does not bid strategically and if the fourth bid presents a lower relative deviation from the right price, measured as the absolute value of [(fourth bid – right price)/right price] than the deviation of the average of the three first bids, measured as the absolute value of [(average of the first three bids – right price)/right price], and equals zero otherwise. VIETNAM is a binary variable that equals 1 if the bidder belonged to the Vietnamese population and zero if the bidder belonged to the French population; ROUND is the round number of the respective show that day; GENDER stands for the gender of the fourth bidder and equals 1 if the fourth bidder is male and zero if the fourth bidder is a female; PRIZE stands for the price of the prize under dispute as the number of days worth of gross domestic product per capita in the respective country as of 2017 (International Monetary Fund, 2018). P-values in parenthesis. *, ** and *** represent significance at the 10%, 5% and 1% levels respectively.

The variable VIETNAM is statistically significant at a significance level of 1% in all logit regressions. The results collectively confirm that observational learning is more likely to happen in the Vietnamese population, thus supporting our hypothesis H3, that is, that players in collectivist cultures such as the Vietnamese culture are more efficient in exploiting the observational advantage resulting from the sequential nature of the bidding game.

To test the robustness of our results, we conducted regressions in which we removed the assumption that strategic bids do not contribute to the reduction of the deviation of the fourth bidder from the retail price. The results (not reported) remain unchanged in their substance. To confirm the higher prevalence in Vietnamese culture of observational learning, we also compared the learning of the third bidder in the two populations. The regressions carried out (not reported) show that the learning of the third player in the Vietnamese population is significantly more frequent than in the French population at a significance level of 1%, thus showing that the support of hypothesis H3 is robust.

7. CONCLUSION

The basic tenet of neoclassical finance is rational behavior. It means that an individual is assumed to be always rational in decision-making, acting within his own self-interest. People are expected to maximize their expected utility and not to be influenced by contextual factors such as cultural values. In this paper, we tested these assumptions recurring to the decisions of contestants in the bidding game of the French and Vietnamese versions of the TV game show “The Price is Right”.

We document that players deviated significantly from what is predicted by the model of rational expectations, especially in the French population. For example, the Vietnamese third bidders won less often than expected and the French first bidders were unusually successful. Our evidence contrasts with that obtained by other authors for the North American version of the same game (Bennett and Hickman 1993; Berk *et al.* 1996). This indicates that the rules of axiomatic rationality may not be a suitable starting point for a descriptive theory of how individuals decide in all circumstances.

Given its particularly advantageous position in the bidding game, we analyzed the behavior of the fourth player in greater detail. Vietnamese fourth bidders were found to win more frequently than their French counterparts in spite of choosing to bid strategically less often. We attribute this apparently contradictory result to cultural differences between France and Vietnam. Because of the collectivistic nature of their culture, Vietnamese players are more reluctant to engage in strategic bidding

behavior (i.e., to cut-off their competitors). However, for the same reasons, they pay more attention to the estimates of the previous players than their French counterparts and thus tend to make a better use of the informational advantage inherent to the sequential nature of the game. This latter effect more than compensates for the lower propensity of Vietnamese participants to bid strategically. Thus, it seems to be a trade-off between strategic and informational advantages in the game and that the balance between the exploitation of these two types of advantages is culturally induced.

The fact that subjects belonging to cultures that score low in the cultural dimension of individualism exhibit a more effective observational learning corroborates other studies from the fields of finance and social psychology (e.g., Ji *et al.* 2009; Chin *et al.* 2010). Overall, our evidence suggests that cultural differences are helpful in understanding country differences that cannot be explained by pure rational reasoning.

Several authors have argued that the kind of “associative” or “experiential” decision process typical of East Asian countries constitutes an adaptative strategy, being evolutionary much older than “rational thought” (Nettle 2009; Chang *et al.* 2011). Whereas the associative information processing tends to be context sensitive and more flexible, the “rational” process requires greater mental focus and is believed to perform better where the decision situation is well-defined and relatively simple, and there is a unique objective (Olsen, 2011). Our results suggest that even in simple contexts with a clear goal as that of the bidding game under analysis, the use of an experiential decision style may lead to a better performance than those predicted by the model of rational expectations. The adaptative value of culture in specific contexts can be understood in the context of studies on ecological rationality. According to this field of research, the norms of axiomatic rationality, by ignoring evolved capacities and environmental structure, may not have prescriptive value. In consequence, fast and frugal heuristics based on evolved and culturally determined capacities may perform better than models based on the rules of logic (Gigerenzer and Selten 2002; Gigerenzer *et al.* 2015).

There remains much to be known regarding the influence of culture on individual decision-making. Given that the TV show under scrutiny was aired in other countries with very different cultural features (e.g., Australia, China, Japan, Spain, etc.) future research may include conducting out-of-sample tests in some of these geographies, controlling if possible, for other variables that capture the social and economic background of the contestant. Also, it would be of interest to examine the topic in larger datasets using other statistical models such as conditional and mixed logit regressions which can overcome some of the limitations of the standard logit model. Finally, because culture can be examined at other conceptual levels,

such as religions and social classes, it would be interesting to consider some of these dimensions in future studies.

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