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BEAUTY CONTESTED. HOW MUCH OF KEYNES' REMAINS IN BEHAVIOURAL ECONOMICS BEAUTY CONTESTS?

Beauty Contested. How much of Keynes' remains
in Behavioural Economics Beauty Contests?[E]

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ABSTRACT. In one of the most famous passages of economic literature, John Maynard Keynes (1936, p.156) likens the stock market to a beauty contest in which the winners are those who anticipate the average opinion. Recently there have been attempts at investigating the BC experimentally (Nagel 1995, Duffy & Nagel 1997, Ho et al. 1998, Bosch-Domenech et al. 2002, Güth et al. 2002). In Experimental Beauty Contests, participants choose a real number from a closed interval, e.g. I [0,100]. Whoever picks the number closest to p times the average (usually with $p = 2/3$) is the winner of a monetary reward. An experiment like this is dominance solvable: the process of iterated elimination of dominated strategies leads to the unique and stable equilibrium at which every player chooses zero, and every player wins. Keynes' metaphor, on the other hand, referred to a situation in which not all participants can win, so that the goal of individual investors and speculators must be "to outwit the crowd" (p. 152). Despite the differences, the Keynesian theory of decision under uncertainty tallies with the behaviour observed in Experimental Beauty Contests.

KEYWORDS. Beauty Contest, Behavioural Economics, Keynes, Reasoning.

JEL Classification. B31, C9, D81

Behavioural economics marks the return of a strong focus on individual psychology after a long absence from the field of economics (Rabin 2002, Sent 2004). This praiseworthy approach is quickly becoming widespread thanks to its many merits. For instance, it often departs from the traditional assumptions of self-interest and perfect rationality in the direction of more realistic accounts of individual decision-making as performed by bounded rational human beings (but see Binmore and Shaked 2007 and Lanteri and Carabelli 2008 for criticism). In this pursuit, behavioural economists are clearly inspired by earlier authors, from Adam Smith to Jeremy Bentham, from Francis Edgeworth to Vilfredo Pareto and Irving Fisher…. In this article however, we shall especially refer to the inspiration provided by John Maynard Keynes, who rejected the idea that real economic agents rely on mathematical probabilities, maintaining instead that they calculate subjective risk and sometimes employ "practical theories of the future" (Keynes 1937, p. 114) – for instance following a convention when they lack reliable information or believe others have superior knowledge, or overweighting present conditions in their estimates about the future (Keynes 1921, p. 275) – in order to cope with an uncertain world. Keynes was attentive to the emotional and intellectual differences that tell speculators apart from the herd and the gamblers in financial markets (Keynes 1910; 1936, ch. 12; see also Carabelli 1988). More specifically, we shall consider the use in behavioural economics of one of Keynes' most popular inspirations: the beauty contest.

In spite of its popularity, the beauty contest may still have some hidden sides worth exploring. Firstly, it seems that behavioural economists do not reproduce Keynes' own beauty contest accurately, but some variations of it. Indeed, we argue that there are several varieties of beauty contests, each with peculiar features that permit a veritable taxonomy. Secondly, we identify some interesting (lab and field) experimental evidence that, in spite of the differences, clearly seems to support Keynes' original account of individual behaviour in a beauty contest.

KEYNES ON SPECULATION AND RATIONALITY

Keynes' notion of human behaviour as "*effective but reasonable*" (Carabelli 2002, p. 171), based on non-Bayesian probability, together with 'weight of argument' and 'moral risk' (Keynes 1921), can be best seen through his analysis of speculation. In his lecture notes for a course he taught in Cambridge, Keynes (1910) distinguishes four types of situations depending on the decision-maker's knowledge of risk, namely:[1]

[1.] Situations in which risk cannot be calculated – e.g. insurance against some political events.

[2a.] Situations in which risk can be, more or less, calculated but it is not averaged – e.g. the roulette.

[2b.] Situations in which risk can be, more or less, calculated and it is averaged – e.g. fire insurance.

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[1] All the excerpts from Keynes' (1910) manuscripts quoted here are appropriated from Carabelli (2002). We renew our gratitude to Keynes Trustees and King's College for permission to quote from Keynes' MSS.

[3.] Speculation.

We are chiefly interested in the latter category because it is the one for which Keynes' conception of rationality is most meaningful. Note that Keynes characterized speculation on the grounds that the speculator's knowledge is superior to that of the market (Keynes 1910, p. 98 and p. 93). Keynes seems to consider the market as a collective entity, possessed with knowledge and judgements which are a combination – but not the sum – of the knowledge and judgements of several individuals who operate within that market. The market as an autonomous entity is not reducible to these individuals, and this explains how it is possible for an individual to have a knowledge superior to that of the group of which he is a member. The speculator is described as having a certain skill in predicting short-term changes in prices, which the market − i.e. the majority of market agents – also has. The difference is in the degree, with the speculator having "superior skill" (Keynes 1910, p.100). Speculation, therefore, can be and usually is rational.

The central element in assessing whether a choice is rational is the knowledge an agent possesses at the time of decision-making. For instance, Keynes (1936, ch. 12) seems to suggest that when lacking knowledge, or when lacking confidence about his knowledge, an agent had better either follow the prevailing conventions or imitate his competitors.[2] On the other hand, he often qualifies speculation by means of the adjective 'sound' (Carabelli 2002, p. 174), and sound stands for logically justified *a priori* or for something that may be judged valid by an external observer. This does not imply that speculation ought to be coherent in a Bayesian sense, nor empirically successful in a lucrative sense (see also below). Gamblers, for instance, may become wealthy, yet this does not qualify them as rational, because they bet on events whose odds are incalculable or, even if calculable, cannot be averaged. According to Keynes, the speculator only differs from the investor in terms of his time horizon: both are intelligent businessmen who try to reasonably forecast the future from presently available information, but the entrepreneur forecasts the long term yields of an investment, whereas the speculator "buys and sells again soon" "within a relatively short period" (Keynes 1910, p.100).

Keynesian rationality can be seen at work in another passage on speculation.

THE BEAUTY CONTEST

In one of the most famous passages in economic literature of all times, John Maynard Keynes (1936, p.156) likened the investment in the stock market by professional traders to a beauty contest in which the winners are those who anticipate the average opinion.

> [P]rofessional investment may be likened to those newspaper competitions in which the competitors have to pick out the six prettiest faces from a hundred photographs, the prize being awarded to the competitor whose choice most nearly corresponds to the average preferences of the competitors as a whole: so that each competitor has to pick, not those faces which he himself finds prettiest, but those which he thinks likeliest to catch the fancy

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[2] For a more modern version of the same suggestion see Peteraf (1993). Similar arguments can also be found in Bikhchandani et al. (1992, 1998), according to which, on occasion, after observing the actions of those ahead of him, it may be optimal for an agent to imitate the observed behaviour disregarding his own information. Other accounts simply consider imitation as cheaper than trial-and-error learning (Cyert and March 1963, March and Simon 1958). Another source is: Orlèan (1998).

of the other competitors, all of whom are looking at the problem from the same point of view. It is not a case of choosing those which, to the best of one's judgement, are really the prettiest, nor even those which average opinion genuinely thinks the prettiest. We have reached the third degree where we devote our intelligences to anticipating what average opinion expects the average opinion to be. And there are some, I believe, who practise the fourth, fifth and higher degrees.

This passage highlights how, according to Keynes, subjective knowledge and beliefs, and not axiomatic requirements of internal consistency or mathematical probabilities, explain individual behaviour (vote casting for the most beautiful or stock picking).

The numerous attacks, in the form of exposed paradoxes and anomalies in its predictions, that targeted the Bayesian theory of rationality have often resulted in elaborate qualifications and adjustments to the standard theory.[3] These qualifications and adjustments, though in principle praiseworthy, in practice may not be the best way to achieve a better understanding of individual behaviour in financial markets. We believe that the Bayesian notions of rationality as coherence and as empirical success must be surpassed. If most or all of its predictions turn out as either paradoxical or anomalous, or must be qualified as being biased by uncertainty and ambiguity, one wonders whether we are not approaching the problem with the wrong tools. Uncertainty and ambiguity are not casual elements that disrupt the orderly working of an ideal decision context, but essential features of almost every real world decision context. Perhaps they should be included as corner stones in our approach to individual decision-making.

In the present paper we elaborate the Keynesian rationality of behaviour as reasonableness (Carabelli 2002, p. 170ff.). In other words, we employ a notion of rationality that is justified *a priori* on the grounds of 'somewhat objective' reasons for action and is independent from the actual *ex post* payoff.[4] It is not the success of a lucky gambler who wins the jackpot that sets the standard of rationality. We believe that rationality can only be meaningful as a property of individuals when it is cut loose from those practical consequences that depend not only on individual choice but also and crucially on other phenomena outside the control – and the knowledge – of the individual in question. Luck, therefore, seems to be a candidate that ought to be ruled out.[5]

Of course, a rational agent must take into account the feedback observed from his previous actions, but the implementation of such feedback is bounded by limited human cognitive skills (for experimental investigation of this problem, see Lanteri and Novarese 2007). We require that a choice be made 'to the best of one's judgement' for it to be rational.

Because rationality is defined as (good) reasons for action and these depend on available subjective knowledge, we can observe two individuals making completely different choices in the same situation and still claiming that both are being perfectly rational, because

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[3] For a review, see Carabelli (2002, p. 166ff.)

[4] Even 'somewhat objective' reasons are ultimately subjective (Carabelli 2002, p. 170.)

[5] See for instance Keynes' (1921, p.339-40) quote from Herodotus: "'There is nothing more profitable to a man,' he says, 'than to take good counsel with himself; for even if the event turns out contrary to one's hope, still one's decision was right, even though fortune has made it of no effect: whereas if a man acts contrary to good counsel, although by luck he gets what he had no right to expect, his decision was no less foolish'."

each had different knowledge and different reasons for acting. This distinction can only be meaningful insofar as we take a further step away from the traditional approach to economic decision-making based on representative agency. In financial economics it has been shown, for instance, that representative rational investors make higher order expectations redundant, through the martingale property of asset prices (Tirole 1982, Allen et al. 1993): in a financial world entirely populated by representative investors, asset prices would be bound by the discounted expected value of the stream of the asset's payoffs. One implication of the martingale property is the sequence of iterated expectations, in which the representative investor's current expectations of his tomorrow's expectations of future payoffs are equal to his current expectations of future payoffs. This allows the calculation of today's asset prices. But if the information available to investors is heterogeneous, or the reliability or importance each attributes to the information varies, average expectations do not follow the law of iterated expectations. Today's average expectation of tomorrow's average expectation of future payoffs does not equal today's average expectation of future payoffs. An implication of the metaphor of financial markets as beauty contests, instead, is that the calculation of asset prices requires the understanding not only of investors' beliefs about the future payoffs of assets, but also of investors' beliefs about other investors' beliefs, and higher order beliefs.

Therefore, if an investor has some reasons to believe that tomorrow some other investor will pay a price $X for a certain asset, then it is rational to buy the asset at any price lower than $X, even if that price were much higher than the expected value of the stream of payoffs for that asset. This idea has been sometimes called the 'greater-fool theory' (Camerer 1997), because even if it is foolish to overpay a certain stock, it is not foolish to overpay a certain stock that can be resold soon to some other fool at an even higher price. This intuition is at the basis of the beauty contest.

VARIETIES OF BEAUTY CONTESTS

According to Keynes (1936, p. 152), in order to avoid ending up as the greatest fool, a professional investor is "forced" to anticipate the changes "by which experience shows that the mass psychology of the market is most influenced."[6] The object of speculation (as opposed to investment) is therefore "to outwit the crowd, and to pass the bad, depreciating, half-crown to the other fellow." This can be likened to the game of Snap, in which a player must be the first to shout "Snap!" as soon as a card that matches the last card revealed is turned up, but not any sooner, lest he looses. Keyes also likened this to the games of Musical Chairs, in which at every round someone is left standing as everyone else sits down, and of Old Maids, in which someone ends the game with an unmatched card and therefore loses. The capacity to anticipate other players' moves perfectly coupled with any amount of skill are not sufficient to guarantee one's victory, because at each turn someone must lose, no matter how informed or skilled he may be. In financial markets, not all speculators can be winners by buying a stock before its value goes up, because for someone to buy a stock there must be someone who sells it and is thus a loser. In

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[6] This is both made possible and provoked by the 'fetish of liquidity', i.e. the belief that liquidity is a virtue of securities.

other words, a Keynesian Beauty Contest (KBC) is a noncooperative game, in which each participant must anticipate what others will do and what they will anticipate others will do, and so on. The metaphor itself is inspired by popular newspaper contests in which readers could vote six out of one hundred portraits of young women. The winners were those who submitted votes that most closely matched the overall votes.[7]

Sometimes (e.g. Camerer 1997), but it is fair to stress that this seems to be done in passing and innocently, the KBC is said to be inspired by newspaper contests in which the readers who chose the most popular face entered the raffle. Such, however, cannot be the case of a KBC. In a contest in which the winner is whoever picks the most voted portrait, the winner must indeed be part of a sizeable group of like-minded voters. In this variant, the players would try to predict the others' choice and then copy it. The goal therefore would no longer be to outsmart, but to imitate the crowd. This is a game we would tentatively (and somewhat spuriously) call a Coordination Beauty Contest (CBC). Indeed, the players of such a game would try to predict what others will do, knowing that they too, are trying to predict what others will do, knowing that they too, are trying to predict... and so on, considering that everyone wins if they choose as the others (e.g. Schelling 1980a,b). Though a variant by this name does not really exist in the economics literature, it is nonetheless useful to keep it in mind for comparison purposes.

There have also been attempts at investigating the beauty contest experimentally. These Experimental Beauty Contests (EBC) require the participants to choose a real number from a closed interval – e.g. I [0,100]. Whoever picks the number closest to p times the average (usually with $0 < p < 1$, e.g. $p = 2/3$) is the winner of a monetary reward (which is split among all winners). Experiments of this kind were once called guessing games but are nowadays commonly referred to as Beauty Contests, because they either are like the BC described by Keynes or like the financial markets to which Keynes likened his BC – or both, but... are they?

Whether they resemble the financial markets depends on how their external validity and their capacity to relate to the real world are assessed. Since this theme falls outside the intent of our paper we simply refer the reader to some relevant observations by Werner Güth and colleagues (2001, p. 2), namely that returns in financial markets are continuous and not dichotomous, that boundary equilibria are very rare, and that homogenous investors (i.e. with the same investment strategy) are far less common than heterogeneous ones. In what follows we shall show that, although these experiments resemble both Keynesian Beauty Contests and what we called Cooperative Beauty Contests, they also differ from both.

SOME IMPORTANT FEATURES OF BEAUTY CONTESTS
The three variants of Beauty Contests we identified above and the two additional sub-variants we shall introduce shortly all share a central requirement for each player: an accurate forecast of the choice other players will make. However, what precisely one has to forecast in each variant

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[7] This lets us point out an imprecision in Keynes' metaphor: in the beauty pageant, all players could in principle win – i.e. access the raffle – but this is not true in the financial markets. However, if one only refers to professional speculators, this imprecision would be solved, because they can all win at the expenses of the 'crowd.'

differs, as differs the choice that one ought to make as a consequence of one's forecast. Choices further differ in terms of their basis (parametric or not) and their consequences on the victory conditions of the game, which can also have different numbers of possible winners, ranging from one player to all players.

There are two variants of KBC: the beauty pageant (KBC-pag) and the financial markets (KBC-fin). In KBC-pag, a participant must choose six out of one hundred items in such a way that these are the six most voted by all players. If so, the participant enters a raffle. The forecast, therefore, concerns the votes expressed by the other players as a whole. In a very similar way, in KBC-fin players should forecast the valuation of single stocks by the market, since in this case a speculator must "anticipate the basis of conventional valuation a few months hence," in order to "'beat the gun' [...] and to pass the bad, or depreciating half-crown to the other fellow" without requiring "the conventional basis of valuation having any genuine long-term validity" (Keynes 1936, p. 155).[8] Also in EBC the goal is to guess a combination of the other players' choices. In this case however, the target is not an aggregate value but a combination of individual valuations. More specifically, the forecast must concern the average value of several real numbers. EBC also come in two versions: the lab version (EBC-lab) which is standard, and the remote version (EBC-news) conducted through national newspapers, as in the original.[9] Finally, in the case of CBC the prediction concerns the miss who has been voted by the greatest number of players, which once again is the result of the sum of individual responses and not the average, nor any other combination.

Given the already difficult task of making an accurate prediction, BC require a further non-trivial task: that of making a choice. In choosing a stock, investors do not rely on their genuine long-term expectations. Instead, Keynes (1936, p. 155) observed the speculator was forced to concern himself with the anticipation of those changes by which "experience shows that the mass psychology of the market is most influenced." The source of inspiration for Keynes is therefore not superior judgement about the long-term yield, but direct experience which results in superior knowledge of the ways markets react. We should thus recognize the rationality or indeed the "wisdom of acting on a rumour, which one does not himself believe, if one thinks it will be generally believed" (Keynes 1910, p. 109).

It is therefore easy to show how the choice of a miss or a stock, as originally discussed by Keynes, differs from EBC. The experiments do not deal with individual versus aggregate preferences, but with a cognitively intense exercise. The skills at play, in other words, are not a superior skill or experience in understanding ordinary tastes or aggregate reactions to changes "in the news or in the atmosphere" (Keynes 1936, p. 155), but the calculative and inferential skills in uncovering the structure of a theoretical game setting. In other words, a perfectly rational agent would play the game while entirely disregarding whatever other players do. For the same reason, Thomas Schelling (1980a, p. 94-95n.) observed that Keynes' BC differs from

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[8] Note that in our discussion of the KBC-fin we only refer to the behaviour of a Keynesian speculator and not of an investor.

[9] In what follows we shall refer to KBC as its financial markets variant and to EBC as its lab variant, unless differently specified.

coordination games because, "[w]hile it deals with exactly the problem [of coordination in games], its conception of the 'solution' is *not* at all the same." He further observed that "[t]his class of games demonstrates, incidentally, that the usual correlation between parametric behaviour and large numbers does not hold for tacit play with multiple equilibria. To adapt 'parametrically' to the behaviour of others requires in this case that their behaviour be observable, not conjectural; the nonparametric character of tacit coordination remains, no matter how large the number of players."

Besides these differences in the type of choice (i.e. parametric or not), there are also differences regarding what choice players must make in each BC and whether this choice makes the player win. In EBC for instance, players must choose a value equal to p times the forecast average and it is sometimes suggested that Keynes' was a special case, in which $p = 1$. From a strategic point of view, Keynesian and Experimental Beauty Contests are uncooperative games. If one participant had insider information about the numbers played by everyone else (assuming the others were not fully rational, as is in fact the case), he could quite easily be the only winner or one among few winners. In a Cooperative Beauty Contest instead, the insider trader could only win by picking the most voted miss, so that he may only affect the results of the contest by discriminating among pictures in a tied vote, but never favour the victory of a small number of competitors. Furthermore, whereas in KBC-fin a truly omniscient player who knows the responses given by every other player could in principle be the sole winner by picking the appropriate stock, in a KBC-pag as in a CBC even an omniscient player could be the winner only insofar as he voted with the largest crowd. It is indeed true by definition that the most voted lady must be the one who receives the highest number of votes and therefore this lady's group of voters must be larger than any other group.

What is again peculiar of the Experimental Beauty Contest is that –unlike the KBC and the CBC – one's bet makes one lose (unless it is 0, see below). Whereas in the KBC and CBC your decision increases the number of votes received by your favourite miss or the demand for your stock of choice, thereby increasing the likelihood that they turn out as the most voted or grow the most in value, in the EBC one's chosen number moves the average away from the number itself, effectively reducing the chances of winning. In other words, if all players chose the very same number, that would *not* be the correct number. In this case every player would nonetheless win, thanks to the rule that has the player who picked the closest number win. But there is another difference: while in the EBC every player could win, this cannot be applied to KBC-fin because in this case in order to have a winner you need some losers: "without people with insufficient knowledge, how could the possessor of superior knowledge possibly gain?" (Keynes 1910, p. 104).[10] Also in the CBC all participants could win.

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[10] In a KBC -pag, instead, the only goal within the reach of participants is to enter the raffle, since being actually drawn in the raffle is a matter of luck. Therefore w e should call winners those players who enter the raffle. In this sense, however, it is possible to have all players win (if all voted the same ladies).

TABLE 1. – FEATURES OF BEAUTY CONTESTS

Variant / Features	TYPE OF CHOICE	COGNITIVE PROCESS	CORRECT CHOICE	CORR. CHOICE WINS?	WINNERS
KBC (fin. mkts)	Parametric	Reason to choose	Experience-based	Possibly	Not all
KBC (pageant)	Parametric	Reason to choose	Experience-based	Possibly	Any no.[I]
CBC	Non-parametric	Tacit coordination	Focal point	Probably	Many
EBC (lab)	Non-parametric	Inference	Dominant response	No[II]	Any no.
EBC (remote)	Non-parametric; Parametric[III]	Inference / Analogy	Dominant response / Experience-based	No / Yes	Any no.

Notes. *I*: We consider as possible winners all those who enter the raffle, although there may exist a single winner of the raffle. *II*: We know of no experiment in which the players who played the Nash equilibrium won. *III*: In the newspaper contests, there is one parametric strategy, that of the players as 'experimenters.'

As noted above EBC require participants to pick a real number from a closed interval and the winner(s) is (are) those who choose the number closest to p times the average (often with $p = 2/3$). A game like this is dominance solvable: the process of *iterated elimination of dominated strategies* (IEDS) leads to the unique and stable equilibrium at which every player chooses zero.[11] Why? If everybody else chose 100, for instance, a player would win by choosing $p \cdot 100$. In fact, every rational player should choose $p \cdot 100$. In that case, one would obviously win by choosing $p^2 \cdot 100$, which is exactly what all rational players should choose... and so on, until the equilibrium value is reached, $p^8 \cdot 100 = 0$, at which all players win. Experimental studies (Nagel 1995, Duffy & Nagel 1997, Ho et al. 1998, Bosch-Domenech et al. 2002, Güth et al. 2002) however, have found that few subjects choose zero, whereas most only make a few of the steps and choose values such as $p \cdot 100$, $p^2 \cdot 100$ or $p^3 \cdot 100$, even in repeated experimental settings in which abundant game information – i.e. complete and timely feedback – is available.

In her path-breaking paper, Rosemary Nagel (1995, p. 1325) describes experimental subjects' behaviour as *iterative naïve best replies* (INBR). At each level of reasoning, the player believes he is exactly one level ahead of all the other players. At Level-0, players choose a random number in the allowed interval with a forecast mean of 50 (which is the reference value). At Level-1, each player assumes everyone else is at Level-0 and therefore plays $p \cdot 50$. At Level-2, each player assumes everyone else is at Level-1 and therefore plays $p^2 \cdot 50$. At Level-k, each player assumes everyone else is at Level-$(k-1)$ and therefore plays $p^k \cdot 50$... and so on.[12] The behaviour of subjects in EBC-lab, therefore, is not rational according to the standard decision theory. In fact, responses of Level-3 and subsequent are only observed after training and repetitions and, more generally, responses converge towards equilibrium rather slowly.

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[11] Nagel (1995, p. 1314) observes that for $p = 1$ and more than two players, this becomes a coordination game with infinitely many equilibrium points (in which all players choose the same number). For $p > 1$ and $2p < n$, "all choosing 0 and all choosing 100 are the only equilibrium points," but for $p > 1$, there exist no dominated strategies.

[12] Teck-Hua Ho, Colin Camerer, and Juin-Kuan Chong (2001) suggest instead that, at each Level-k, a player believes that the others are not all Level-$(k-1)$ but a mixture of lower levels, and estimate that the proportion of players who stop at each iteration follows a one-parameter Poisson distribution with mean t (i.e. the average number of steps). For alternative formalizations of limited strategic thinking, see Goeree and Holt (2004) and Stahl and Wilson (1995).

Antoni Bosch-Domènech, Josè Garcia-Montalvo, Nagel and Albert Satorra (2002) present a large study on three EBC-news, in which thousands of participants submit their guesses and, despite large variations in the experimental setup and in the subjects, similar results turn out. For instance, the overall averages are also similar at values (roughly) between 18 and 25. Therefore the winning numbers are (roughly) between 12 and 17. This suggests that the average is somewhere near Level-2 and therefore a Level-3 player has good chances of winning. By analysing the comments sent by participants, Bosch-Domènech and colleagues (2002) show that the iterative naïve best replies is indeed the most common (64%) type of reasoning. To corroborate this conclusion, there are high frequencies at number choices 33.33 (which equals $2/3 \cdot 50$, or Level-1), 22.22 (which equals $2/3 \cdot 2/3 \cdot 50$, or Level-2), and 0 (Level-8). This suggests that a majority of the players reason until Level-3, then extend their reasoning all the way to Level-8.

In the lab instead, high concentrations are observed for 33.33 and 22.22 but not for 0, which is understandable since participants in EBC-news have longer time to make a choice. Yet, by comparing the results of lab and take-home tests, Bosch-Domènech and colleagues (2002) conclude that more time translates into more people identifying the Nash equilibrium, but not necessarily in more people playing it. It is interesting to note that 81% of the players who identify the correct Nash equilibrium eventually submit numbers higher than zero, probably because they expect others to be imperfectly rational. Indeed those who chose the lowest possible number never won. To do so implies that a player believes others to behave like himself, which is clearly a mistake.

Another interesting element is that not only can EBC-news players think longer, but they can also gather information from a variety of sources, including first-hand experience by means of direct observation, as a small proportion of participants (5%) did. How would that be possible? By conducting their own experiments with family and acquaintances. 31% of these players – let's call them 'experimenters' – submitted numbers in the bracket 12-17 (the interval within which all the winning numbers in the EBC-news fall), while only 11% of the non-experimenters fell in the same bracket. 'Experimenters', therefore, chose closer to the winning number than anyone else.

CONCLUDING REMARKS

Every paper on EBC we came across either quotes directly or at least refers to Keynes' description of financial markets as beauty contests that we, too, reported above. The question remains pending, however, whether there is any point in doing so. Why should one refer to the KBC? Perhaps it helps the reader to better understand the structure of the experiment or, more generally, the problem at stake. For this explanation to be sound, EBC should be largely like KBC. But in the light of the discussion above, we believe there are numerous respects in which this does not seem to be the case. The references, moreover, only pay lip service to Keynes, since the discussions in the literature do not present his insightful account of individual decision-making under uncertainty. The first conclusion we may advance, therefore, could be to do away

with references to Keynes, since they do not concern the same problem. Instead, we want to take the reasoning one step further.

Keynes' concept of rationality neither requires a player to choose zero nor to win. It only requires to do so for *a good reason*. In the absence of direct experience, as is the case in the first rounds of EBC, we do not observe rational choices unless one has quite some time to think about it *and* has some reasons to believe others will also be rational. The first round is therefore often not a matter of speculation, but of gambling: the risk cannot be calculated. On the other hand, from round two onwards a player has some reference value to take into account and he also knows that other players know that value too. The game now becomes a matter of speculation, wherein superior knowledge in the form of previous experience might pay off.

We find it especially noteworthy, if nowhere surprising to a reader of Keynes, that the 'experimenters' perform so much better than other players. They already have direct experience and they are not gambling, but speculating on superior knowledge. Our second-level conclusion is therefore that contributors to the BC literature should take Keynes much more seriously, because it seems clear that he did much more than just think of a fascinating metaphor for a behavioural puzzle: he had also gone very far towards solving it.

On this occasion, we should emphasise we are not driven by the desire to protect the historical heritage of pure Keynesian thought. Instead, our main goal is an exercise in the history of economic thought, namely the comparison between a master economist of the past and a flourishing new field. In this respect we point out the many differences between the two in the use of beauty contests. On the other hand, all these differences should not be too surprising, since behavioural economists employ the BC in order to show that people can learn quickly how to behave quite rationally according to the traditional decision theory, whereas Keynes used it to make his point that people are *not* rational in the same sense. Our second goal is to clarify, so as to help turn what would otherwise be a source of confusion into a source of inspiration. For instance, we suggest that there may legitimately exist several types of beauty contests and it may be interesting to experimentally test the differences among several variants (for one rather novel variant, see Lanteri and Novarese 2008). If studying the history of economic thought should indeed help economists find inspiration and empower them with better economic tools, we believe our article to be an example of how this may be achieved.

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