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EXPERIMENTAL AND BEHAVIOURAL ECONOMICS

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Unlike psychology, laboratory experiments in economics are quite recent. Taking advantage of the main virtues of experiments (replicability and control), economics researchers have been able to test existing theory and contribute new evidence to the development of new models of human behaviour. This paper provides a short review of the origins and some of the topics of interest for experimental economics and behavioural economics. Special attention is paid to the areas where Spanish experimentalists have been most influential, highlighting those most closely related to psychology: cognitive hierarchies and social preferences.
Key words: *Economic experiments, Behaviour, Rationality, Altruism.*

A diferencia de la Psicología, la Economía no comenzó a experimentar hasta fechas muy recientes. Aprovechando las principales ventajas de la experimentación (la replicabilidad y el control) la Economía ha sido capaz de contrastar las teorías existentes y de aportar nueva evidencia que nos ha servido para desarrollar nuevos modelos de comportamiento humano. Este artículo hace un esbozo del origen y de lo que es en la actualidad la Economía Experimental y la Economía del Comportamiento. Además se presenta un repaso detallado de dos temas que han sido objeto de investigación en nuestro país, intentando resaltar aquellos desarrollos que guardan una mayor relación con la Psicología: los modelos de jerarquías cognitivas y las preferencias sociales.
Palabras clave: *Experimentos en economía, Comportamiento, Racionalidad, Altruismo.*

The 1991 edition of the Encyclopaedia Britannica (p. 395) pointed out that *"Economists are sometimes criticized for the fact that economics is not a science. Human behaviour cannot be analyzed with the same objectivity as atoms and particles."* The entry went on to highlight the fact that *"... economists cannot verify their hypotheses in a laboratory."* The aim of this brief study is to report on a discipline within economics that generates controlled data in a laboratory with which to verify hypotheses: experimental economics. The discipline which uses data thus observed in order to model human behaviour is called behavioural economics.

These sister disciplines are very closely connected to psychology, which is hardly surprising given that they both study human behaviour. Indeed, the laboratory has shown theoretical economists that their models were too simple, and failed to capture essential elements of the behaviour of human beings. These elements were most probably well known in psychology but had been overlooked by economists. For example, the importance of framing and focal points in decision-making had not been studied systematically until very recently (see Espinosa, Kovárik, &Ponti, 2012 for an introduction). It might be said that behavioural economics attempts to inform "the rest of economics" about what other disciplines have already learnt. For this purpose it uses models incorporating results from empirical research in "neighbouring" sciences (as defined by Camerer & Weber, 2006), such as psychology, sociology and anthropology. As Binmore (2010) states, this trend is not new, having been identified by Selten as early as the late 1970s (see Selten, 1978).

The rest of the chapter is organized in three parts. The first contains a brief review of the origins of experimental economics; the second focuses on behavioural economics today; in the third we look in more detail at two areas which have been the object of research in our country, trying to highlight those developments most closely related to psychology.

THE ORIGINS OF EXPERIMENTAL ECONOMICS

In the mid-1940s, Edward H. Chamberlin, a Harvard professor, had the idea of studying markets in an experimental way. He observed students buying and selling fictitious products in a market to discover whether the prediction that markets reach equilibrium at the

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resulting market price would be fulfilled. His market, where student buyers and sellers negotiated in the classroom, yielded a rather surprising result: a notably higher quantity was sold than was predicted by theoretical models (see Chamberlin 1948).

Vernon Smith, one of the students who participated in Chamberlin's experiments, was not convinced by his professor's interpretation, and 15 years later published two studies (Smith, 1962, 1964) which demonstrated that prices did indeed converge to equilibrium when information was publicly available. The published prices led to agreement between buyers and sellers, who carried out transactions until equilibrium prices were attained. Later, Smith began to analyze the effects of small institutional changes on the results, and so experimental economics was born. It is not surprising that years later, in 2007, Smith received the Nobel Prize in economics.

As the reader may have guessed, an important contribution to the development of experimental economics came from psychology, in the 1950s and 1960s. Starting with the prisoner's dilemma (Tucker, 1950), a rich body of literature developed in psychology about the way in which people acted in strategic contexts and whether their behaviour was actually consistent with Nash's equilibrium. Parallel to this, within economics, Game Theory concepts began being applied to non-competitive markets. Notable among such work was the first experimental oligopoly (Sauerman & Selten, 1959), created by German economist Reinhard Selten, who would receive the Nobel Prize in Economic Sciences in 1994.

Nevertheless, at that time, game theory had not yet reached the pre-eminent position it would later attain, and the majority of experiments were framed not in strategic contexts, but within Decision Theory. Studies were carried out on the axioms of Expected Utility Theory (the Allais paradox; see Davis & Holt, 1993: chap. 8), on anomalies in choice theory such as the intransitivity of preferences (May, 1954), on rationality, on consistency, and so on.

Although the rewards in the Chamberlin experiment (1948) were hypothetical, as experimental economics developed it became clear that decisions should involve real payments contingent upon the actions of each participant (and the other participants): yes, economists pay real money in their experiments!

In contrast to the case of hypothetical questions, such contingent payments are used so that participants make decisions similar to those in real life, where they have something to win or lose. Through their actions they reveal information and patterns in human behaviour, and above all they do not provide the information they think the researcher is looking for, or which seems the most appropriate. Economists today believe that experiments with real money yield results closer to behaviour in real situations than those provided by hypothetical experiments. Among other differences observed empirically, when they use real money participants are not as cooperative or as generous as they claim to be in questionnaires about their willingness to pay (Harrison & Rutsröm, 2008); nor do they take the same risks when playing lotteries which involve winning or losing real money, but rather display more prudent behaviour with the aim of ensuring some profits (Davis & Holt, 1993; Friedman & Sunder, 1994; García-Gallego, Georgantzís, Jaramillo-Gutierrez, & Parravano, 2012).

However, for some authors incentives do not solve everything. As Loewenstein (1999) warns: *"subjects may be substantially motivated by goals other than profit maximization. Among such motives are the desire to behave in a certain way, to fulfil some of the researcher's expectations, to give the impression of being clever, a good person, a winner, and so on."*

One obvious problem is the cost of the research, which can be extremely high. To minimize this cost it is not necessary to pay for all the decisions taken by all participants, but just a random selection. The participant does not know which decision will be paid for, so that the incentives remain intact. Likewise, participants may be offered different decision-making scenarios in which they are informed that only one will be implemented (and paid for). This method is known as the Strategy Method, and a good reference on the topic is Brandts and Charness (2000).

BEHAVIOURAL ECONOMICS

As previously mentioned, experimental economics emerged at the same time as behavioural economics. The two disciplines are closely related. Experimental economics is a tool (a method of work) of behavioural economics, the goal of which is the development of theoretical models of human behaviour in economic contexts and its consequences for the way in which markets and institutions function.

Experiments in neighbouring disciplines had already demonstrated the limitations of humans in terms of computing (limited rationality), lack of willpower to carry

out tasks on time (procrastination or postponement), or simply that individuals do not always want the best for themselves, i.e., that they do not behave selfishly (see Camerer & Lowenstein, 2003; Weber & Daves, 2005). As Brandt (2009) neatly puts it, behavioural economics tries simply to understand how "normal" people function.

In this section we outline some of the research areas that have featured most notably in behavioural economics. First among these is relative well-being – that is, the influence of the well-being of other individuals on one's own level of well-being. The Dictator Game (and Ultimatum Game) and the Trust Game have played key roles in the development of this research.

In the Dictator Game, a player has to decide how to divide a certain quantity *P* with another player under conditions of complete freedom and anonymity. Economic theory naturally predicts that the player who decides keeps everything, i.e., does not share anything. Brañas-Garza, Espinosa and García (2009b) contains a literature review in Spanish on these types of experiment. A variation of this game is the Ultimatum Game (Güth, Schmittberger, & Schwarze, 1982), in which the second player can accept or reject the offer, and in the case of rejection both players get nothing. This time the theory's prediction is slightly different. Given that player 2 will accept any positive offer ("almost" nothing is still better than nothing), player 1 will offer the smallest possible slice of the pie.

In the Trust Game (Berg, Dickhaut, & McCabe, 1995), player 1 receives an allocation *E* and has the option of giving a part of it to player 2, knowing that any amount he/she gives will be multiplied by three. Player 2 in turn can return any amount he/she likes. The theory obviously predicts that player 2 returns nothing, since he/she has no incentive to do so. Player 1 thus anticipates this behaviour and gives nothing to player 2. In a variant of this game called the Gift Exchange game (Fehr, Kirschsteiger, & Riedl, 1998), a company offers a salary to an employee whose work it cannot observe, and the employee looks at the salary and decides how much effort to make.

Results of multiple experiments (for example, those with the Dictator Game) show how a quite considerable number of individuals are very generous, forgoing a significant part of their income to benefit other players. Furthermore, the results of the ultimatum game show that player 1s anticipate the fairness criteria of player 2s and decline to make very low offers (which may upset them and cause them to reject). The results of experiments with the trust and gift exchange games reveal that people seem to have motivations other than the merely monetary, that they trust others and that there is also reciprocity: people behave well with those who behave well with them.

Since the studies of Rabin (1993), and subsequently those of Fehr and Schmidt (1999), Bolton and Ockenfels (2000), Fehr and Fischbacher (2003) or Charness and Rabin (2002), new utility functions or objective functions, whereby individuals care not only about their own well-being but also about the well-being of other players, have been explored. The work of Charness and Dufwenberg (2006) is a good example of modelling that incorporates social aspects in decision making. It is believed that in certain situations, individuals can take decisions (or fail to take them) with the sole aim of avoiding the personal cost of having to behave in a reprehensible manner, that is, they display guilt aversion. Experiments such as those of Brañas-Garza, Durán and Espinosa (2009) or Dana, Weber and Kuang (2007) demonstrate that a high percentage of experimental participants pay money in exchange for not having to make decisions which would negatively affect the remuneration of other players.

A key area, given its impact on the functioning of the economy, is the study of dynamic preferences: how present well-being is valued against future well-being. The influential work of Laibson (1997) has led researchers to reflect on people' so-called inter-temporal decision-making. This problem is relevant because the possible biases or anomalies found in preferences also affect crucially important questions for an economy, such as savings, pension planning or environmental care. Other types of empirical study with real data (e.g., Cutler & Glaser, 2005) have shown the connection between "patient" preferences and life decisions such as doing sports, controlling weight, smoking, and so on. Their results show that people with healthy habits have lower discount rates, i.e., they are more patient (see also Brañas-Garza, Espinosa, & Repollés, 2012).

There are also other aspects of behaviour, such as risk aversion, loss aversion or optimism bias, that can have very important consequences for the decisions of individuals and the functioning of markets. The subject of risk has undoubtedly been one of those generating most interest in the last 30 years. The Theory of Expected Utility has been a well-established paradigm in economics that predicts how individuals behave in uncertain situations where each possible scenario has an assigned

probability. The person would always choose the option that provided the maximum expected utility. Nevertheless, the studies of Kahneman and Tversky (1979), and the development of Prospect Theory called into question the Theory of Expected Utility: individuals did not choose in a manner consistent with this theory, but instead took fewer risks in the area of profits and more risks in that of losses. Thirty years on, we are still developing theories which try to explain how people take risks in conditions of uncertainty.

Perhaps the lines of research most closely associated with psychology are those addressing the subject of how people reason and learn. Evidence obtained in the laboratory shows that individuals do not necessarily reason and learn in the way assumed by Game Theory, which would depend on the necessary level of computation, and they often do not choose the best for themselves, selecting salient alternatives instead. The work of Espinosa et al. (2012) demonstrates how Game Theory has benefited from contributions from cognitive psychology for solving complicated problems such as choosing between multiple equilibria. After all, Schelling (1963) already asserted that a large part of social conventions or rules are not the result of any maximization or of any economic argument based on efficiency, emerging instead because of their intrinsic magnetism. From this point of view, social norms are no more than systems to aid coordination where there are multiple equilibria (see Miller, 2006, 2008) – that is, the norm is a reference point that helps us choose one equilibrium (and not others) and to avoid failures of coordination. The notion of focal points is one of the many contributions of psychology to Game Theory (Rojo, 2010).

We shall finish this section by speaking briefly about learning, a classic topic at the boundary between economics and psychology. Models of learning set out to understand and model how individuals adapt their decisions when new information appears, either exogenously or as feedback on their own decisions. Two types of models have been developed. Belief Learning assumes that people update their beliefs through observing what others do; that is, they do not react to actions with greater rewards unless others do so. Alternatively, models of Reinforcement Learning show that individuals react to rewards, and therefore value more highly those strategies which in the past provided a higher reward (Rey-Biel, 2008).

EXPERIMENTAL ECONOMICS IN SPAIN

In this final section we briefly summarize two of the many topics in experimental economics that have been studied in Spain. Both experimental and behavioural economics have grown very quickly in our country in terms of the number of publications (see Brañas-Garza & Georgantzís, 2012c). By way of example, we can highlight the growing number of Spanish universities with experimental economics laboratories: Granada University (EGEO), Pompeu Fabra University in Barcelona (LEEX), the University of the Basque Country (Bilbao-LABEAN), Jaume I University (LEE), Alicante University (LATEX), Valencia University (LINEEX), Carlos III University of Madrid (LEE) and the Autónoma University of Madrid (MAD-Lee).

It would be impossible to provide an exhaustive report on the areas of interest in this discipline in Spain, and we shall therefore simply attempt to give a general idea. Given the limitations of space we will look at just two lines of research, as examples of how research has evolved in Spain. There are many topics we cannot deal with for reasons of space. Industrial economics (the study of markets, oligopolies, auctions, etc.) is, for example, of fundamental importance in experimental economics and with a considerable tradition in Spain. Jordi Brandts, of the Autónoma University of Barcelona, Aurora García-Gallego of Jaume I University, Nikolaos Georgantzís of Granada University and Praveen Kujal of Carlos III University have made very important contributions in this field.

The first research line we shall consider focuses on individuals' levels of reasoning, and it can be said that this is the area in which our researchers have been most successful. The second line explores the motivations underlying altruistic behaviour observed in the Dictator Game. We acknowledge the fact that the area of social preferences is very broad, and that the above-mentioned games are only specific cases. Brandts and Fatás (2012) provide a review of these topics and references to their work which we shall not repeat here for reasons of space.

Both lines are closely linked to psychology and sociology, and it is no surprise that the *Revista Internacional de Sociologia* has recently published a special issue on Experimental and Behavioural Economics, a clear sign of the increasing interaction between sociology and economics.

In the first of these areas, research focuses on individuals' levels of reasoning (commonly known as *k*-

levels) when faced with strategic situations. The work of Nagel (1995) and of Bosch, Nagel, Satorra and García-Montalvo (2002), all at Barcelona's Pompeu Fabra University, were published in the American Economic Review and are key references for any study of cognitive hierarchy models (Nagel's seminal article has been cited more than 500 times). The cognitive hierarchy approach is based on the idea that people use *k*-levels of reasoning with frequency *f(k)* in the population. Level *0* individuals randomize and *k≥1* individuals use their best response with partially rational expectations about what level *0* to *k-1* individuals do (Camerer, Ho, & Chong, 2004).

This group of researchers started a new research line that describes the behaviour of individuals in response to strategic situations more accurately than the notions of equilibrium proposed by Game Theory as predictions of the outcome of these situations. These contributions were extended by other relevant studies, notably those of Crawford and Iriberri (2007) and of Coricelli and Nagel (2009, 2012), which link models of rationality with observations of brain activity (fMRi).

This Game Theory approach is linked to the notion of theory of mind (Baron-Cohen, 1995). The way in which people approach situations of strategic interaction often depends on the individual's capacity to predict the behaviour of others (their rivals), given that if one knows the behaviour of the other person one can use the best response to that behaviour. Being equipped with a theory of mind (the ability to put oneself in the other person's shoes) will permit individuals to understand and predict the mental state of their opponents, and hence their behaviour, and thus to react optimally to that behaviour. The contribution of this Game Theory perspective is, on the one hand, the empirical evidence that, when faced with complex strategic situations, people show that they have a theory of mind with varying degrees of sophistication, and on the other, the modelling of individuals' behaviour when the assumption that rationality is common knowledge fails – i.e. when people's predictions of their rivals' behaviour are heterogeneous. These new advances in Game Theory offer a complementary vision of human beings, and an insight into their interaction with others.

Game Theory attempts to understand how individuals behave in strategic situations – how they decide what suits them best in their interaction with others. Therefore, the theory has traditionally assumed that players' rationality is *common knowledge*. When this condition is met, individual *i* strategically determines his or her actions based on what suits him/her best (i.e., maximizing his/her goals as a selfish player), and also on the notion that individual *j* is doing the same (i.e., *i* knows that *j* is selfish), and furthermore *j* knows that *i* knows that *j* knows that ... both behave like this. Formally, *p* is said to be common knowledge in a group of players *G* when all the players in *G* know *p*, everybody knows that everybody knows *p*, everybody knows that everybody knows that everybody knows *p*, and so on ad infinitum. When rationality is common knowledge, the notions of equilibrium developed by Game Theory provide good predictions of individuals' behaviour in strategic situations.

The problem is that this condition is in many cases too demanding, especially when dealing with complex situations requiring that agents be equipped with a theory of mind that allows them to accurately predict the behaviour of others. It is also sometimes considered that an agent may not know the preferences of another (his/her type) but does know the distribution of probabilities of types, and is able to predict the behaviour of others in probabilistic fashion and react optimally.

The seminal work by Nagel (1995) shows that levels of reasoning are relatively limited, and that individuals are heterogeneous. Recently, Coricelli and Nagel (2012) have demonstrated using fMRI that there is a correlation between levels of reasoning and neural activity related to "mentalizing," i.e., the ability to think and attribute thoughts and mental states to other individuals. The most pertinent aspect of this study (and others by the same authors) on cerebral activity is the empirical support it provides for the modelling of levels of reasoning.

The second issue we address in this section is altruistic behaviour in Dictator Game situations. As we saw in the previous section, evidence has been accumulated in experimental economics that people are not only concerned with what they can obtain in strategic situations but also with what others gain, which has driven theoretical research on social preferences and social behaviour. This concern may refer to inequality of rewards, whereby people dislike other people earning much less or much more than themselves (models of inequality aversion), or to people preferring situations in which the group as a whole earns more or the disadvantaged are better treated (models of social well-being), or to situations in which people prefer that those who behave most fairly are better rewarded (models of reciprocity).

A key assumption in economics is that individuals behave in a selfish manner and try to maximize their payoffs. However, experimental economics has shown that people do not always behave in this way. The next step, therefore, is to discover what makes them act differently. One possibility is that they do not know how to solve complex problems of maximization, but this does not explain, for example, behaviour in the Dictator Game in which individuals donate real money in completely anonymous situations (approximately 20% of their fund). Brañas-Garza (2006) uses the Dictator Game format to test whether donations increase when participants know that they will be used for charitable purposes. The effect is considerable, with donations rising sharply for "good" uses of the money. This result may stem from inequality aversion, since in the Dictator Game not donating anything leads to inequalities in players' results, and when the recipient of the funds is a charitable organization, the inequality is perceived as being much greater. The next step was to study whether the impression of inequality could be reinforced simply by framing. In Brañas-Garza (2007), players were told that the recipient was "in their hands," and here donations also rose steeply (see also Aguiar, Brañas-Garza, & Miller, 2008).

However, in order to distinguish the motivations for altruistic behaviour (inequality aversion, generosity, guilt), more sophisticated designs are required to isolate the problem's key elements. In a series of experiments, Brañas-Garza et al. (2009) show that after being forced to take a decision which necessarily caused inequality (having to assign an indivisible amount to one individual or another), participants were ready to pay money to reduce the resulting inequality, and that the amount they paid was greater if, in the initial situation, they had benefited as recipients of fund money. These results indicate that motivations such as moral responsibility for decisions which produce an undesired effect (in this case, inequality) influence people's economic decisions, and means that people do not behave in line with the description of *Homo economicus* (Henrich, Boyd, Bowles, Camerer, Gintis, McElreath & Fehr, 2001).

An alternative motivation to those mentioned above is that, rather than being concerned with the well-being of others, individuals worry about their own image or social identity, and consequently behave altruistically. It should be borne in mind that the experiments described are completely anonymous; the donations of any given participant are not known to the recipients, to the other players, or to the experimenter. Nevertheless, despite the fact that the donations cannot be observed by the others, they can reinforce the identity of the donor. Introducing identity in the preferences of participants (Akerlof & Kranton, 2000) makes it possible to quantify the pleasure we feel when acting in a way that reinforces our identity, or our discomfort when we deviate from social norms – i.e., when we know that there is a rule (helping the poor, visiting a sick person, etc.), but it is costly to follow and we consider avoiding it. Aguiar, Brañas-Garza, Espinosa and Miller (2010) explore this problem theoretically and devise an experiment in which participants donate money and also reveal what they feel to be a morally acceptable rule for sharing it out. The results show that there is a great deal of heterogeneity in both the rule and its observation. Furthermore, the weight of identity in the preferences of each individual correlates strongly with his or her self-image in terms of being a competitive or cooperative person.

Finally, a recent research line pursued by researchers at the universities of Granada, Alicante and the Basque Country has revealed the relationship between individuals' altruistic behaviour and their social capital (degree of social integration). The degree of integration is quantified using measures from network theory (Vega, 2007), and it is necessary to elicit the participants' social network in a certain context. The relationship between altruism and social integration is complex, given that the direction of causality is not obvious. One may have a large number of social connections because of one's generous character or, alternatively, altruistic behaviour may be the result of being integrated in a dense social network; obviously, causality may also flow in both directions. What is clear, however, is that there is a high correlation between the two. As shown by Brañas-Garza, Cobo-Reyes, Espinosa, Jiménez, Kovárik and Ponti (2010), *i)* the least altruistic individuals, who donate nothing in the Dictator Game, tend to play unimportant roles in the social network, having fewer connections and being less central, and *ii)* people with high social capital, the most central individuals, are more altruistic and at the same time more inequality-averse (Brañas-Garza, Cobo-Reyes, Espinosa, Jiménez, Kovárik, & Ponti, 2012).

CONCLUSIONS

From Chamberlin's first economic experiments up to the present day, a whole series of techniques and standard practices have been developed which guarantee the key

advantages of experimentation in economics, replicability and control (see, e.g., Fréchette & Schotter, 2010; Bardsley, Cubitt, Loomes, Moffatt, Starmer, & Sudgen, 2010; Binmore & Shaked, 2010; Camerer & Weber, 2006; and Kagel & Roth, 1995). At the same time, the goals of the discipline, which initially involved only the testing of existing theories, now include the generation of a set of stylized facts which may or may not fit into already-established theories.

This evolution of the field has reinforced the function of experimental economics as a generator of new theories and models, and has broadened its research scope to include, for example, gender differences in economic behaviour (e.g., Croson & Gneezy, 2009 and Gneezy, Niederle, & Rustichini, 2003) or neuroeconomics (see Glimcher, Camerer, Poldrack, & Fehr, 2008 and Camerer, Loewenstein, & Pelec, 2005). Likewise, obtaining results from the data has benefited from the development of increasingly sophisticated and appropriate econometric techniques, giving rise to what Anderson, Harrison, Lau and Rutström (2010) refer to as *behavioural econometrics*, and from innovations such as virtual experiments, which combine the advantages of field and laboratory experiments (Fiore, Harrison, Hughes, & Rutström, 2009).

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