

Playing Games

*Ten years ago, it is more than likely that others in the profession would have shaken their heads in despair over the research methods employed by **DR. AXEL OCKENFELS** of the **MAX PLANCK INSTITUTE FOR RESEARCH INTO ECONOMIC SYSTEMS** in Jena. Or simply dismissed him as an outsider on account of his penchant for using real people to put his theories to the test – for example, by exposing his students to the “prisoner’s dilemma”. What should one make of an economist who spends as much time in the laboratory as many a chemist, and who actually films his “guinea pigs” as they struggle with specific game-playing situations? For most economists, that would have been taking things just a little too far.*

Nowadays economic science is no stranger to experimentation. Dr. Ockenfels is a man in great demand. The 33 year-old project manager simply cannot accept all of the invitations he receives. From Harvard to Berlin, Utrecht to Oxford, Ockenfels has already presented his theses in countless auditoriums in Europe and the USA. Universities, companies and economic associations are starting to take notice of this young man who works with the Strategic Interaction Group under the leadership of Werner Güth, a new research group that was only recently set up in Jena, in July 2001.

Ockenfels is one of the most innovative talents in a sub-discipline, which is growing progressively more influential in the world of economics. So who is this unusual economist whose academic career took off in a flash and who has already been offered professorships both at home and abroad? To describe Ockenfels as determined would be an understatement: at the age of 25 he earned a prize-winning degree at the University of Bonn; at 29 he completed his doctorate under the supervision of Joachim Weimann, writing a doc-

toral thesis that was hailed by the Economic Science Association as the best of the year; at 33 he gained his post-doctoral qualification at the University of Magdeburg, picking up another research prize on the way. He has added to his experience by working in the Management and Information Systems department at Penn State University in Pennsylvania, and in 1999 he spent a year as a Postdoctoral Research Fellow at the Harvard

Innovative talent:
Axel Ockenfels,
33, of the Max
Planck Institute
for Research
into Economic
Systems in Jena.



Chess is not the only game of strategy – the moves that make up economic behavior patterns could also be described as such. Who bids what and when in an online auction?

Business School before returning to Germany to take up a post as research group leader on the Emmy Noether Program run by the Deutsche Forschungsgemeinschaft (DFG). Ockenfels attributes the quality of his training above all to Reinhard Selten: “He was my academic teacher, my mentor, and a stroke of luck for my career.”

It was while Ockenfels was busy with his master’s thesis that his professor was awarded the highest of honors: in 1994 Selten, who has spent almost 50 years researching into game theory, became the first and so far only German to be awarded the Nobel Prize for Economics. However, even while the Swedish Academy was praising his achievements in the theory of games, it was impossible to overlook the fact that Selten was also one of the most vehement critics of many of the basic tenets of classic economics. Selten recognized at an early stage that most economic models are based on false premises: namely on the assumptions that humans are rational beings motivated only by their own self-interest. Deviations from these assumptions had been acknowledged in individual cases,

if only to take account of human error and certain moral concerns. However, in terms of theory, such deviations from the norm played no more than a subordinate role.

But just how do people behave when making day-to-day decisions in their business lives? Are we really as forward-looking, rational and self-interested as economic science would long have had us believe? Reinhard Selten’s pioneering work in experimental economic research has forever shaken the construct of earlier economic ideas, as evidenced by the award of the Nobel Prize for Economics in 2002. In selecting the two Americans, Daniel Kahneman and Vernon Smith, the Swedish Academy of Sciences chose to honor two researchers who, like Selten, have radically questioned the nature of *homo economicus* through their work with experimental subjects in the laboratory. Kahneman, who teaches psychology at Princeton University, shared joint responsibility for developing the “Prospect Theory” with his late colleague Amos Tversky, who died in 1996. On the basis of experimental findings, this theory postulates that human beings

PHOTOS: WOLFGANG FLEISER / CORBIS-STMART

often make decisions spontaneously – less on rational grounds than as a result of a given situation. People have a tendency to overestimate and attach too much weight to new information, as Kahneman demonstrated with his “nervous frogs theory”, using dollar fluctuations as an example. Vernon Smith, who carried out some of the first laboratory experiments at around the same time as Selten, is regarded as the pioneer of experimental methodologies in the USA.

The work done by Axel Ockenfels is inspired by the theoretical and experimental endeavors through which his teacher Reinhard Selten revolutionized this field of research. “Very simple, but enormously informative,” says Ockenfels of the “ultimatum game” that he and his colleagues at the Max Planck Institute have been repeating in varying forms in their laboratory in Jena. Fundamentally the “ultimatum” depicts a quite ordinary commercial relationship: for example, Player A is given 100 euros which he must share with an anonymous Player B. If Player B declines the offer, both parties are left empty-handed; if he accepts, each may keep their share. According to the theory of *homo economicus*, both participants will prefer to have more money rather than less. Consequently, Player A will keep 99 euros and give Player B

People don't just consider their own self-interest – they can also act cooperatively

the remaining one euro. Player B accepts even this minimal amount on the basis that it is better than getting nothing at all. Player A can accordingly claim almost the entire cake for himself.

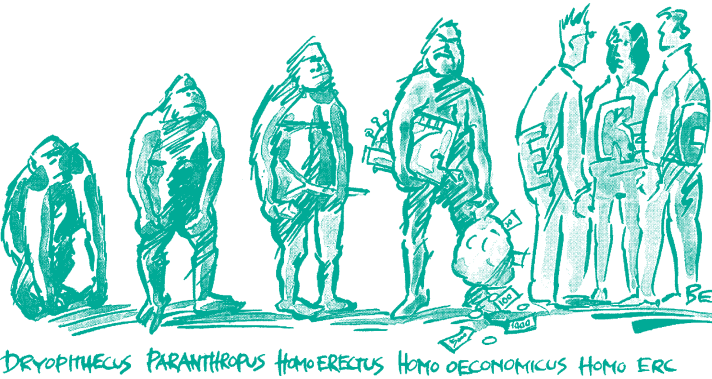
The “ultimatum game” was innovated and first investigated by Werner Güth and in its many variations it is today one of the most widely studied phenomena in the field of experimental economic research. The reason lies in the fact that forecasting the outcome proves dramatically ineffective in the experimental laboratory, as Ockenfels confirms: “In terms of human behavior, there is a wide gap between theory and practice. Many people are willing to reject unfair procedures or outcomes, even if it comes at a non-trivial cost to them.” With a split of 90 euros to 10, it is highly likely that Player B will turn down the offer. If Player A rightly suspects this to be the case, he will avoid making an unfair offer

in the first place. It is an interesting fact that economists frequently leave the laboratory empty-handed. “They assume themselves to be extremely cunning, and coldly offer the absolute minimum,” says Ockenfels.

The “ultimatum game” is related to the “dictator game”: here Player A is at liberty to split up any sum of money at will, while Player B, on the other hand, is unable to veto the split. Many “dictators” give their partner what seems to them to be a fair share – on average, about a quarter of the profits. A similar phenomenon is to be observed with the “prisoner’s dilemma” that has likewise been the subject of much research and is studied by economists, sociologists, psychologists, and political scientists alike. Here the profit accrues to the partner who fails to cooperate. Therefore in theory, cooperation between two players should never take place. The reason: there is a temptation to refuse to cooperate at the expense of one’s game partner in order to pocket a proportionately higher profit. This applies irrespective of whether one’s partner cooperates or not. “In fact, however, we notice a conditional behavior pattern. Many players are willing to cooperate, provided that the other does so too. These people adopt a reciprocal behavior and in so doing improve their financial position far beyond anything *homo economicus* could ever manage. Given such results, it must be asked, who is the cleverer: our experimental subjects in the laboratory, or *homo economicus*?” adds Ockenfels.

If the “prisoner’s dilemma” is repeated multiple times, however, by the final round the willingness to cooperate typically declines to a minimum. The players seem to know very well that cooperation can no longer be reciprocated in the future. In the moments before the game ends, each of them is pursuing their own personal advantage – there is no further

Human evolution – culminating in homo ERC in the theoretical field of conflict between equity, reciprocity and competition.



The eBay website, one of the best known online auction houses: many participants make their bids in the final seconds of an auction.

prospect of a quid pro quo, a fair exchange. Thus, while behavior systematically deviates from standard economic predictions, it is still clearly strategic in nature.

Axel Ockenfels has published numerous papers in which he investigates complex patterns of trading, negotiation and cooperation. One of his most recent contributions has been widely acclaimed even beyond economic circles. Together with his colleague Gary E. Bolton of the Smeal College of Business at Penn State University, Ockenfels published an essay in the American Economic Review entitled “ERC – A Theory of Equity, Reciprocity and Competition”. At the core of this paper lies the mathematical formulation of a simple behavioral principle that is responsible for organizing a host of apparently unconnected behavioral phenomena. “We believe that people are far more oriented towards the profits of others than has previously been assumed: they feel bad if they get less of the cake.” Put another way: in addition to pure self-interest, players are also motivated by their relative pay-off.

Two questions are of importance in arriving at a decision. Firstly: how much money do I get? And secondly: how do I stand in relation to my opponent? Ockenfels and Bolton do not believe that altruism plays a significant role in such economic decision-making situations. It is not a question of doing something to benefit the other party, but of reciprocal behavior: as you treat me, so will I treat you (cf. MAXPLANCKRESEARCH 2/2002, p. 10 f.).

Even complex market relationships can be simulated using the ERC model. The “auction

game” in which several competitors take part is aimed specifically at competitive situations in an anonymous market. And here it is evident that considerations of fairness can have no impact on market performance since the participants are no longer able to influence the distribution simply through their own behavior. Under extreme competitive conditions, so the study indicates, the classic self-interest hypothesis works well, even if the players would, in principle, prefer a fairer distribution.

Game theory and experimental economics undoubtedly has its educational attraction, believes Ockenfels. He uses auction games on occasion in order to provide his students with an impressive demonstration of their restricted rationality. It is simple enough to experiment for oneself: players are asked to estimate the contents of a glass full of euro coins and then make an offer. “I regularly find that the student who wins the bidding makes a

The winner overestimates the value – and comes to grief

bad bargain, there being nowhere near as many coins in the glass as he or she expected.” On average, students’ estimates are fairly realistic. However, since the winner of the auction tends to be the one whose estimate of the value of the coins in the glass was higher than all the others, it is all too often the case that the winner overestimates the true value.

According to Ockenfels, this statistical effect is also to be observed in the real economy: “That is the curse of winning.” An example might be the sell-off of UMTS licenses which in Germany were bought in an extravagant auction procedure by six mobile communications providers, some of whom are now indeed coming to grief as a result of the huge investment. A situation which might have been avoided given better game theoretical analyses that could be supported and illustrated by experimental testing.

In the end, believes Axel Ockenfels, the success of game theory and experimental research will be measured by the extent to which the knowledge gained can be implemented in practice. As a scientist, he is optimistic: methods have meanwhile become so sophisticated that it often proves possible to close the gap between theory and practice. Even the strategic interaction between nu-

merous people with varying goals and degrees of experience in highly complex markets could be investigated in detail by closely combining both theory and experimentation. The challenge is to use these methods in such a way as to exert control over the economically relevant complexities of human behavior and market institutions.

For Ockenfels, the Internet represents a hugely promising area of application – for the first time, it is now possible to dissect and monitor real markets and real behavior at will. Ockenfels in his research is therefore paying particular attention to the “market design” of online Internet auctions. Together with colleague Alvin E. Roth of Harvard University, Ockenfels has been comparing the platforms used by eBay and Amazon – two Internet companies with enormous growth potential and a gigantic array of products on offer. In addition to game theory and laboratory experiments, the researchers also have

Specific market design prevents “sniping” – and cuts out the hustle

field data to fall back on: eBay allows public access to the bids made in all auctions during the preceding four weeks, whilst Amazon actually stores the data for eight weeks. With this pool of data it is possible to precisely recreate the progress of an auction: in other words, to see who bid what price at what time for which specific product.

Ockenfels and Roth have made some interesting observations. The decisive difference between the two systems lies in the closing phase of the auctions, most of which last for several days. Whereas eBay puts a precise time limit on its auctions (the “hard close”), at Amazon the cut-off is automatically extended for a further ten minutes if a bidder makes an even higher offer in the closing phase (the “soft close”).

Amazon’s intention is to avoid “sniping” (bidding at the very last minute). At eBay, on the other hand, “sniping” is the order of the day: the data indicates that many bidders do not bid until right at the end. In 240 eBay auctions, there were 89 bids made during the final minute and 29 in the last ten seconds. At Amazon every bid made in the closing phase automatically leads to the auction being extended. The strategic attraction of “sniping” is thus countered by a specific mar-



Amazon, known primarily as a digital bookseller, prevents last minute bidding by automatically extending the auction.

ket design. Of 240 bids made at Amazon, only one was placed in the final minute.

Things are quite different at eBay: customers have a tendency towards last minute bidding, even though the risk exists that with all the hustle and bustle just before an auction ends, their bid might get lost somewhere in the data network. To avoid this the Internet auction houses offer their subscribers the assistance of an automatic “proxy” to safeguard their interests. At the beginning of an auction they can make a “proxy bid” which is stored in the system. Even without actively participating, bidders then have a chance of acquiring the object they are bidding for provided no higher bid is made – the purchase price is then only slightly higher than the second-highest bid and not necessarily as high as the bid stored.

Applying game theory and experimental economics, Ockenfels and his colleague Roth have discovered a number of strategic reasons for why far fewer eBay customers use a “proxy”, but prefer to make a bid shortly before the auction ends. For example, experienced bidders can use the chaos in the closing seconds to exclude less cunning competitors. “Sniping” often results in participants acquiring an item at a relatively low price, simply because the auction never progresses as far as an exchange of blows between bidders and thus leaves no time for bidders not using eBay’s proxy to respond. Furthermore, sniping is a strategy which enables experienced customers to avert two risks: on the one hand, they avoid price wars with other bidders; while on the other they deny shrewd

In his games laboratory, Axel Ockenfels tries out his theories on real people – for example by exposing students to the “prisoner’s dilemma”.



sellers the opportunity of artificially inflating the price of their item by making phony bids. On the other hand, there is a greater risk that in the closing hustle, chance will decide the outcome: the winner is the one who clicks their mouse at the right moment.

What do economists stand to learn from such studies? Axel Ockenfels is fascinated by how strongly the subtleties of market rules impact on market performance. Even small changes in structure can have significant consequences in terms of market performance, because the behavior of the participants in the market adapts immediately. Market design opens up a whole new field of experimental economics, Ockenfels believes – the more so because economists can “invent” new markets and test them at once: “Online markets can be reproduced on a one to one basis in the laboratory, or varied at will. But they can also serve to directly showcase economic behavior patterns. The transition from theory through laboratory experiment to reality is fluid. In the end, everything is controllable.”

On the other hand, it is comparatively simple to simulate interactions between anonymous participants who meet but once at an Internet auction. “An interesting challenge for market design is to explore relatively complex structures – for example, energy or telecommunications markets, the technological and economic constraints of which necessitate particularly innovative rules. Initial studies offer some impressive evidence that here too with the aid of game theory, rule constructs can be developed which ex ante experimentally and ex post empirically prove themselves to be successful,” says Ockenfels.

However, dangers lurk in the very anonymity of Internet market players. In traditional markets, a variety of personal relationships frequently exist which provide a basis for trust. Not so on the Internet. Here there is a lack of institutions to exclude fraud and misuse. Just how do you prevent an eBay seller from breaking the rules by supplying defective goods? How do you prevent the fraud which is becoming increasingly prevalent in online markets in particular? Ockenfels believes that economists can contribute

Control is good, but trust is better – even online

towards closing the virtual “trust gap”. He himself is currently engaged in analyzing and developing electronic reputation systems, which will make the previous conduct of market players transparent. “So far the work has been done by programmers, but slowly but surely we economists must also contribute our expertise.”

The difficulty lies in the fact that reputation systems as already deployed by Amazon or eBay are always dependent on the willingness of participants to provide information. Purchasers can assess the quality and delivery of products they have bought; whereas sellers can grade buyers on how they pay and how cooperative they are. However, such reputation systems may fail in practice because participants can change their Internet identities – no problem even for a layman. The willingness to give a voluntary, fair assessment is also lacking. In the opinion of some scientists, without some financial incentive the system cannot function effectively.

Dr. Ockenfels in his laboratory in Jena is aware that in this case too, economists have barely begun their task. “There is a huge amount of ground to be made up. What we need is to more closely link theoretical and empirical research. We must learn how to design intelligent reputation systems.” Without mutual trust between buyer and seller, without clearly defined rules and sanctions, the New Economy won’t work. A realization that may have come a little late but that is steadily gaining acceptance: there is a whole lot of work in store for experimental economists and market architects like Axel Ockenfels.

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