



Hayek and Experimental Economics

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Abstract. This paper is an address given to the Austrian legislature in Vienna, Austria on March 3, 2004. The main focus is on the connection between insights from F.A. Hayek's research program and experimental economics.

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Thank you very much for your warm and embracing welcome. It is a special pleasure and honour to speak in this historic room where the great Austrian economist, Böhm-Bawerk and later Schumpeter each served the Austrian people in the capacity of Minister of Finance. I feel an immense sense of this history as I address you today.

One of the pleasures and challenges of receiving a Nobel Prize is that it gives you the opportunity to meet presidents and to speak to legislators. I never had this humbling opportunity before. The announcement that Nobel was recognizing my work came on October 9th in 2002, and one of the first major events for me after that was the invitation from President Bush for me and all the other American Nobel Laureates to come to the White House for a social, and of course a photo, opportunity to meet the President. President Jimmy Carter, the former President, had won the Nobel Peace Prize, so this was an opportunity for me to meet two presidents. When I met President Jimmy Carter I told him he was my favourite democratic president. In phrasing it that way, I didn't have to declare that I have no party favourites, and he said, "Why is that? And I replied, "It was your administration that really sparked the deregulation movement in the United States." I also said that "although President Reagan had been a supporter of the deregulation movement, many people had not realized that the deregulation of the airlines, the railroads, trucking and the natural gas industry in the US had been initiated under Jimmy Carter. And he was extremely proud of that and said "I'm glad you can appreciate it. Deregulation was one of the important things my administration did. We were proud of that accomplishment."

Each of the Laureates had about three or four minutes with President Bush to interact privately before we went into the Oval Room for pictures, and after that the Lincoln Room for a social gathering with friends and families. I had, of course, never been in the White House before. This was in November 2002 just after the mid-term elections in the United States. President Bush congratulated me for the Nobel Prize and I thanked him and I said, "I should congratulate you. Your win was bigger than mine." He agreed, and smiled proudly of the victories he had just won in the midterm elections. Then I said, "You must have been doing something right," adding, "but you did two things wrong: one was the farm bill and

the other was the steel tariff.” So we had an opportunity to discuss that a little bit. And I found the President very friendly and accepting of criticism and it was a wonderful and pleasant experience. He did come back with a final retort after some more discussion. With respect to the steel tariff, he suggested, “You handle the economics and I will handle the politics.” He certainly had me there.

None of my work in theory or in experimental economics was originally inspired by Austrian economics. I had taken a course as a graduate student in the history and development of economic ideas, and I had read Carl Menger and Böhm-Bawerk. Also, later I had the pleasure of having Gottfried Haberler as one of my teachers at Harvard. I had some tangential introduction to Austrian economic ideas, but they really were not an important source of inspiration for me in the early years and I know little of the more recent writing in that tradition. Mostly this was because I think I was not yet ready to appreciate and understand some of the major themes in the Austrian School, and to understand which of their ideas were of lasting importance.

It wasn’t until after about 40 years of work and development of my professional career, particularly of experimental economics, that I rediscovered the Scottish philosophers and their message and that of Hayek who is the person whose insights I want primarily to emphasize in this talk because those insights blend so well with those of experimental economics. I have a paper in which I talk about the relationship between von Mises and experimental economics, but those connections are weak compared with Friedrich Hayek on whom I will focus in this talk. Basically, I first had to discover certain things for myself, and essentially it was the behaviour I observed in human subjects in my laboratory study of markets that motivated me eventually to study Hayek seriously. Reading with the eyes of a new mind, I was able to appreciate an enormous depth of understanding in the work of Hayek that would have escaped me if I had not had this personal experience in the laboratory. That background prepared me to see the relevance and power of the Hayekian world of socio-political economy, and to see the outlines of a comprehensive theory of socioeconomic change that integrated the learning from experiments with the development of the human career.

In some ways there are other parallels between Hayek and myself. I also started out as a socialist, but you know that was all completely irrelevant. I could have started out as a Republican conservative or a 20th century liberal Democrat, and I would have learned the same things in my search for understanding. I would have learned that whether you call yourself by any of these labels is really not that important. It was not important to my understanding of how things work, or to where I came out. To me, we were in the business of trying to solve problems and finding solutions to problems. The devil was in the details, and ideology was just a really irrelevant distraction for getting those details right. What I soon learned was that it is not helpful in seeking to solve problems to begin with labels. If you begin with labels you will fail to focus on the learning. You will have a tendency to look for particular answers and what you will find is that often those are not satisfactory answers because they are too shallow. Even the classical liberal, or its current libertarian incarnation, where my sympathies have slowly if naturally come to lie, are not good frameworks from which to begin scientific enquiries, and for getting the details right. It’s the other way around. You start with the problem, ask what are its possible design solutions in the form

of a workable decentralized information and incentive system, proceed to thoroughly test, modify, test it, etc., until it is ready for policy application and further adaptation in the field. You *end* with a policy prescription, and this in turn defines an example of what it means to have a “political commitment to liberty.” Otherwise you will have only some good slogans that do not tell you what to do and how to proceed. If you are going to create a workable decentralized market for self regulating electrical energy on a grid, you don’t say, “Let’s just deregulate and let the market do it.”

So, I think all of us have a first responsibility to seek and understand the truth. And then from that understanding of the truth to ask ourselves how we might create more efficacious policies for a better world. It is toward this end that I want to talk about four or five main themes in Hayek which I will try to relate to my own intellectual development and in particular to the continuing learning with which I have been enriched by the discipline of laboratory experiments.

The first thing for which I think Hayek is deservedly best known is the idea that the problem of society is *how to utilize human knowledge when it is not, and cannot ever, be given to anyone in its totality*. How do you induce people to take the economically beneficial actions without anyone having to tell them what to do? And it was Hayek’s vision and great contribution to see the function of what he called the pricing system in solving this problem. I want to add that there is not just one pricing system, there are many, a great many. Every great industry has its own sort of unique special circumstances and institutions and constraints. How market details work out in different industries is endlessly variable and dependent on developing different property right arrangements.

One of the most significant features he recognized was that the pricing system was an information system; that prices served to coordinate people’s choices over vast distances, people who do not know each other. They speak different languages, they have different cultures. Markets serve to coordinate people and bring them together in a remarkably large scale cooperative enterprise. Furthermore, this task is executed in a manner such that its accomplishment is invisible to everyone who participates in that enterprise. This is an obscure and a difficult concept for people to grasp. But I discovered it in the laboratory where it was brought home to me in a way that I could not ignore because it was made so very transparent.

Let me tell you about the first experiment I did. What I was trying to do had the modest and very local objective of finding a way to teach economic theory, to teach about the economics of markets that would relate this thing that is in the text book called supply and demand to what it is that real people actually might do in a market. I found that after I received several degrees, finished at Harvard University, read much, and so on, that in trying to teach economics I did not know how markets worked. I did not understand the connection between what we taught as price theory and the operations of individuals within markets. I was not able to explain to my students that relationship, because I knew nothing of it myself. At the very heart of my education lived this big yawning chasm.

I would eventually discover that it was worse than just being ignorant: what I had learned was a wrong diversion that had to be unlearned. One of our problems as economists and generally as intellectuals is not just that we don’t know enough, but that we know so much that is either not true, or has not been demonstrated.

So what I did was to create a market on the first day of my economics class in January 1956 at Purdue University. I had 22 people enrolled in that class—they did not know any economics, it was an introductory course, they were not exposed to economic ideas, they knew nothing about markets, about the idea of supply and demand representing a market—so I thought I will do this experiment before their minds had been contaminated by any of the standard instructional study. I had 22 individuals so I made eleven of them buyers and eleven of them sellers. Each buyer I gave a private value representing the most that the person would be willing to pay for one unit of the commodity if he or she succeeded in buying a unit from one of the sellers. So if the value was ten dollars and the person made a purchase for five dollars it meant that I, the experimenter, would owe them five dollars because I promised to pay them the difference between the value I assigned them and the price they would pay in the market. And of course the idea here is fairly simple: We believe that buyers are motivated to buy low; all you have to do is to go to a department store clearance sale to see that, or go to an auction and watch how quickly buyers drop out of the bidding as the price rises. So I would create an environment where the buyers are motivated to buy low and sellers are motivated to sell high. As for the sellers, I gave them each a private secret cost for a unit, and I would reward them with the difference between the price at which they sold in the market and the cost that I had assigned them.

In this environment, unknown to the subjects in the experiment, if the eleven values I had given to the buyers were simply ordered without regard to ownership from highest to lowest that was precisely what was meant by a demand schedule in the text book. Similarly if you took the eleven seller costs and order them from lowest to highest you had a supply schedule. Again let me emphasize that all this was unknown to the participants in the market, as would be the case in any market in the world. Also unknown to them is that this supply and demand implied an equilibrium outcome in the market, which was the hypothesis or predicted outcome that I was testing in the laboratory.

Let me emphasize that I did not expect that the hypothesis would work nearly as well as it did. Notice that I had created a world in which all the basic information in that market was disbursed among the individuals and private to them. And as Hayek would have put it, all that information was not given to any one mind in that world, just as in the economy it is not given to any one mind—the huge number, the billions and billions of bits of information out there that add up to individuals' willingness to pay as buyers or willingness to accept if they are sellers. I then needed an institution to define the rules under which people could trade; for this I used the procedures of the open outcry bid and ask markets that are common in commodities and securities trading—the double auction as we have come to call it. Buyers announce bids and sellers announce asks, and contracts occur whenever a buyer accepts an asking price, or a seller accepts the bid of some buyer. I proceeded to conduct an experiment in which, after the market traded to completion, we moved to a new “trading day” so that the market was repeated in a sequence of trading periods.

The contract price results I observed have since then been replicated hundreds of times: by the third or fourth period this market had converged to near the equilibrium price and volume predicted by the operant supply and demand. Moreover, and this is most important, people in the market, the participants, were not aware that this convergence had taken place. When you ask participants if they think there is any kind of a mathematical model

that would predict their behaviour everyone flatly denies that this could be possible; they also deny that after a few periods the profits that each of them receive would be the best obtainable—everyone believes it surely must be possible that he could have done better. In fact by definition of the equilibrium no individual could do better for himself given what everybody else was doing. That's what John Nash meant by equilibrium. So it was not possible to improve on that state. After that first experiment, I did another dozen before I finally became convinced that what I was dealing with here was not an accident but a law of nature. But it took decades for me to further explore and to appreciate its full significance.

From that beginning I went on, and also many colleagues that I was able to influence went on, and we all began to do far more complex experiments—experiments, for example, in which two or more different commodities were traded simultaneously. In these markets what people were willing to pay for one commodity was dependent on the price of others. And so it was no longer such a simple matter to expect people to get to the equilibrium. Well, what is interesting is that although it may take a little longer all these markets converge. These agents in the laboratory achieve ends that are best, but that is not part of their intention. They have no idea that this is what they are doing. Also, they have no idea that markets allow people to specialize and that in specialization is the secret of wealth-creation.

The fundamental theorem in Adam Smith is that the division of labour is limited by the extent of the market. We now have experiments that we can actually use as research and teaching devices with high school and other students in which they discover for themselves that if they are on their own to produce, say, corn and hogs or engineering designs and software, themselves producing both products, and people have a comparative advantage in either the one product or the other, then they can discover that through trade they can greatly expand their welfare. Thus, in engineering, I recall that when computers were first introduced, all engineers did their own software programming. They learned FORTRAN to facilitate their design work. Within several years specialist firms started to spring up and produce software. Today we have this huge inventory of software programs you can buy off the shelf and we now have all these design engineers, and other specialists who use these programs and no longer have to do their own programming.

This has enormous wealth creating power. As an aside let me add that this process of knowledge specialization has been going on for some 50,000 years when our Cro-Magnon ancestors first walked out of Africa and migrated all over the globe. That is absolutely incredible. That was before the square rigger sailing ship. But the process was driven directly by technology and more deeply and fundamentally by our inherent sociality. The most primitive human groups have specialization and exchange systems. These come in the form of reciprocity and sharing systems, not in the form of formal markets, but the evidence is very strong that limited forms of specialization arose early in these family groups and through sharing and reciprocity norms the wealth created by that specialization was then shared and this enabled small bands of early peoples to globalise the entire planet.

No one understood that exchange process better than Frederick Hayek, when he said, and here I quote one of my favourites: *"Nobody can communicate to another all that he knows because much of the information he can make use of, he himself will illicit only in the process of making plans for action. As he will not merely make use of given knowledge he discovers what he needs to know in order to make appropriate actions."*

This is the reason why survey instruments of opinion can only give you a very limited indication of what constitutes people's "knowledge:" people don't know what it is they will do until they face particular circumstances and then they start to come up with solutions.

Another important theme in Hayek is the notion that rational action does not depend upon reason. For what was the fatal conceit? It was the idea that our ability to acquire skills stems from reason. He said that "*we should never suppose that our reason is in a higher critical position, and only those norms and rules are valid that reason endorses.*" This echoes the theme of David Hume who pointed out that the rules of morality are not the result of reason. The fundamental rules and norms that underlay our sociality and underlay our markets and the creation of wealth are rules like "thou shall not steal", "thou shall not covet the possessions of thy neighbour." These rules emerged very early in the human career and they emerged universally—these rules are cross-cultural human universals—all religions basically had versions of these rules.

Hayek also said that "*rules alone can unite an extended order, neither all ends pursued nor all means used are known or need to be known to anybody in order to be taken account of within a spontaneous order, such an order forms of itself.*" Ladies and Gentlemen, I have seen hundreds and hundreds of spontaneous orders emerge in laboratory experiments. People walk into the laboratory; they receive five dollars for showing up on time, and are escorted to a computer terminal and sit down. There might be a dozen or twenty people in the room who are scattered among various terminals throughout the room; they read the instructions for a laboratory market experiment defining what actions they can take in some form of interactive decision-making or management system. At the end of the experiment whatever they earn in the way of profit in the experiment is paid to them in cash before they leave. Between the time when they arrive and the time they leave they create a spontaneous order within the rules governing that market. And their decision making is motivated by earnings, while each is constrained by the rules of the market and by the actions of other people.

Many of our experiments are what we call today "smart computer-assisted markets" For example, in these markets people trade electric power on a high voltage network. The physics of the grid is built into the parameters defined by the computer so that no one trading electric power is allowed to violate the laws of physics. So we now are able to study man-machine systems, so to speak, and their interaction; and of course computers are very good at applying optimization algorithms to the messages of individuals and solving very complex combinatorial problems that humans would have a lot of difficulties with if they acted entirely alone. On the other hand the computers are useless without judgments/inputs from humans as to what they are willing to pay to receive or willing to accept to give.

The third point in Hayek I want to mention is in his book *Law, Legislation and Liberty*, where he says that "*fruitful social science must be very largely a study of what is not.*" I didn't read that in Hayek until about two and a half years ago. I read it and I thought: "Wow, what insight!" and that's exactly what we have stumbled into doing in the laboratory. It is very easy in the laboratory to study the impact of rule systems different from those in common use. Why do we study things that do not exist? Why would anybody want to do that? People say "Well that's not realistic." Of course it's not realistic, and that is why we

do it! Because we want to learn two things: we want to better understand what is; why are the rules what they are! Why aren't the rules something else that we can think of? You do not find answers to those questions in field data or in typical business histories. People don't write detailed histories of all the things that did not work, and that they abandoned. If it does not work they even want to deny that they did it, so that their clay feet will not be exposed. So, all the mistakes from which people learned, get covered up, swept under the rug. That knowledge and learning is lost in terms of failing to become part of recorded history, and thereby improving our comprehension of institutions. So one of the things we can do in experimental economics is go back and study alternative rules and alternative prescriptions and compare them with what is, to help us understand better our own past economic development. I am reminded of what Mark Twain said. When he was 16 years old he said he thought his father was the dumbest man in the world. When he was 19, he was amazed at how much the old man had learned in just three years.

These stories—mine and Mark Twain's—are about learning from experience, finding out experientially what is the opportunity cost of doing what is, or not following the embodied norms and rules.

The second reason why we study what is *not* is that we want to study social change. We want to examine new systems because new situations create a demand for rule and institutional changes. But how will new rules work in some new situation? Whenever you extend markets in new areas where they have never been used before we set the stage for much deeper specialisation and greater wealth creation. There is always the question of what rules are appropriate in this new environment. Society solves those problems by simple trial and error with people risking their own capital and trying out things. Most things they try don't work well enough so they lose their money; after 5 years 60% of new enterprises are already gone, after ten years 80% are gone. The few large successful firms that you see around the world have gone through a survival process. If they did not go through a survival process they may have received some kind of special deal from a legislator or a president. But then they will not have created wealth outcomes commensurate with the survival state that they have achieved. Most large enterprises, I believe, depend importantly on that process and of course should be required to continue to depend on it. So the laboratory is an excellent place to study things that are not, and I find it absolutely incredible that Hayek had such a deep comprehensive vision on this important objective of all social science.

Fourthly, Hayek said *an economist who is only an economist cannot be a good economist*. Thank you Frederick Hayek—how true! At some point in my career in learning economics I realized that I was always learning the same thing over and over again but applying it in different contexts. Economists have one model, and that is maximization subject to constraint. And then they just have an infinite number of applications of this model. That's not wrong, in fact that's true. The constraints are either the physical constraints that are put upon decision making or in the case of Nash equilibrium it is the constraints created by what other people are doing. But once you get that insight I think it's important to begin to draw inspirations from outside economics, if you want to make important contributions, and you certainly see that in the career of Frederick Hayek. He knew history, not only economic; he knew political history, law, studied the development of economic ideas, anthropology, philosophy, as well as economic theory and monetary theory.

Hayek also—although he never used these terms—understood that there are two fundamental kinds of exchange, what my colleagues and I now call personal and impersonal exchange. We borrowed these terms from Douglass North, the economic historian, who in trying to understand how Europe escaped the medieval period and developed long-distance trade, distinguished what he called personal exchange, the kinds of exchange that go on in villages and communities where people all know each other, from impersonal exchange. The problem was one of extending personal exchange to exchange with strangers, impersonal exchange through networks. He was trying to understand the development of long-distance trade, trade with the mid-east and how that process emerged.

I am going to give you an example of personal exchange in the laboratory, although it won't seem like an exchange, but we found this concept to be by far the best way of interpreting our observations. Imagine that you have been recruited to the laboratory and you arrive on time, get paid five dollars for arrival, and you are asked to sit at one of the computer terminals. If you bother to look around, you may be able to identify how many others there are, and find that there are 11 others, 12 total are in the room—although that may be difficult to tell because people are scattered around and they arrived separately.

You are matched anonymously with somebody else in that room and you are going to go through the following decision process: suppose you are the first mover in this interaction and you are matched with some anonymous person who is the second mover. You have two choices: one is to opt out of the game, in which case you get 10 dollars and your matched person gets 10 dollars, and the experiment is over. Alternatively, you can pass to your counterpart, and the twenty dollars becomes 40 dollars. Think of this increase as gains from trade, although this implicit interpretation is not stated. The interaction is an abstract extensive form game. So if you forgo 10 dollars for each and pass to the other person, that person has two alternatives. One is to give you 15 dollars and take 25 dollars for himself, or he can take all the money and you get nothing, so he gets 40 dollars. Those are his alternatives. Game theory predicts that if you are person number one you won't pass to person number two. This is because it is assumed that people are self-interested in the very narrow sense that, given two piles of money, they will always take the bigger one regardless of the circumstances. The equilibrium of that game is 10 dollars for you and 10 dollars for him.

If you do this experiment with undergraduates, if you do it with graduate students, or if you do it with Chiefs of Staff and their assistants—both Democrats and Republicans—from Capitol Hill who attend an annual retreat sponsored by the Mercatus Center, its interesting that we got the same quantitative results from all three groups. Exactly 50% of the persons take the equilibrium (\$10, \$10), while the other half pass to the second mover. Among the second movers, in most groups, 75% cooperate; they choose 15 dollars for the first person and take 25 themselves. Only 25% take all the money. Now, we have done this game with many different payoffs, and changing the payoffs changes the outcomes, but not by a large amount. Why do people take this risk, when they don't even know who they are matched with? We think it is really fairly simple: people come from a world of social exchange, they come from a world where they are accustomed to trading favours with their associates and their friends and that tradition is so strong that reciprocity even survives anonymity with half of the individuals. It's a powerful thing.

From my understanding of anthropology and the literature of hunter-gather societies I have come to the realization that what we are observing in the laboratory are the roots of a very ancient process. One which very likely is what originally created elements of exchange in small groupings and made possible specialisation. At some point in the history of most people their ancestors broke out of these local exchange systems and started to engage in more long-distance exchange systems, and this is what set the stage for a huge betterment in the human career through much richer forms of specialization. This is the ultimate means of reducing poverty, and the human race has been doing it now for 50,000 to 100,000 years, maybe longer. I should add that you don't get this insight from game theory. If you have only game theory, it is a puzzle as to what to do when the predictions of the theory fail to account for half of the observations. There are technical ways of modifying the theory but they provide no comprehensive social underpinning for accommodating the results.

So let me read the part from Hayek that relates to this. Most people, I think, who read this may not fully understand what Hayek is talking about. When I read it I immediately realized that it related directly to what I had learned from the laboratory, and now, in effect, I am getting a summary of what it means from F. Hayek. He says "*we constantly must adjust our lives, our thoughts and our emotions in order to live simultaneously within two different kinds of orders according to different rules. If we were to apply the unmodified, uncurbed rules* (and this refers to caring intervention to do visible good) *of the small band or our families to the extended order of cooperation through markets, as our instincts and our sentimental yearnings often make us wish to do, we would destroy it. Yet if we were always to apply the* (competitive, self seeking) *rules of the extended order to our more intimate groupings we would crush them.*" That is a tremendous insight and I think that one of the problems with intervening into the process of specialisation and the development of markets is that it's very easy for us to believe that we can intervene and improve and make things better. But so often we find that these actions have unintended consequences and make things worse. And unfortunately making it worse is not always visible, because we can not see what it would be like if we have not had done as we did. We cannot see what is *not*. That is the basic problem. But Hayek sees the great value in the transition to markets, but also the treasured value of our more intimate relations and their inherent conflict.

My wife and I spent last summer in Alaska, and Alaska is a remarkably interesting place where you can see conflict between the development of the extended order of the market, and the traditional forms of personal exchange, in the Alaskan Natives. Markets exist alongside these traditional Alaskan communities that only within the last 100 years have started to move away from sharing systems, from cultures that served them very well for thousands and thousands of years. Those cultural norms are what enabled them to be productive enough to migrate across Siberia and across into Alaska; 11,000 years ago these hardy and wonderful people were looking for a better life and they discovered all kinds of game and sea animals that you could harvest with stone and bone tools; these animals had never seen bipeds before, they had no fear of them. These large gregarious animals provided high value in each kill and they were easy to find because they were big herding animals, so search cost was low. The first Americans found game preserves that were unparalleled in history. The norms and practices that people brought with them served them well. Now they are in the process of transition, and it is a painful adjustment. All of our ancestors went through

that transition, but it was more likely a gradual step-by-step process. Somehow we evolved from a world of personal intimate exchange that involves specialisation through sharing, into a world where specialisation and trade occurs across vast continents. Somehow our forefathers made that transition. In the small group, you can see that good actions produce good outcomes, and we still carry that perception of control. Therefore it seems obvious that we ought always to be able to make things better by deliberately trying to do good. Well, this is not true, unfortunately, when we come to the extended order of markets because we do not experience the reciprocity inherent in those markets the way we experience it in our daily social interactions. In our social groupings you have to give in order to receive, but this reality is no different in markets, where you give of your knowledge and skills, receiving payment in return, so that you can receive things of value from others.

I think I have probably used more of your time than I should have. . . the president is shaking his head, no. . . but this is a wonderful experiment for me, this event is very inspiring, and I don't know if you have recorded this but if you have I'd like to have a copy because I haven't written any of this down, except for the quotes from Hayek.

I want to end by thanking you again for this unique event, for this wonderful opportunity, and I wish nothing but the best to all of you.