

**Economic Symposium Series on
“Experimental Economics: Implications for Public Policy”**

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Introduction

“This division of labour, from which so many advantages are derived, is not originally the effect of any human wisdom, which foresees and intends that general opulence to which it gives occasion. It is the necessary, though very slow and gradual, consequence of a propensity in human nature which has in view no such extensive utility; the propensity to truck, barter and exchange one thing for another.”

Professor Vernon Smith quoted Adam Smith’s “The Wealth of Nations” written in 1776 during the time of the Scottish Enlightenment. He noted that since then, many countries including Singapore have created a lot of wealth by specialisation in production and exchange/trade. Market experiments can show how the gains of trade are captured.

Market Experiment

To help the audience better understand experimental economics, Associate Professor Bart Wilson conducted a market experiment involving audience participation. The audience was divided into small groups representing buyers and sellers in a market for a hypothetical good. Buyers were supposed to call out the prices at which they were willing to buy one unit of the good, based on given schedules of prices at which they could resell units of the good they had bought in the market. The differences between their purchase prices and resale prices would be their profits. Sellers were supposed to call out the prices at which they were willing to sell one unit of the good, based on given schedules of their costs of producing individual units of the good. The differences between their production costs and sale prices would be their profits. Buyers and sellers did not know each others’ schedules and were asked to maximise their profits. A transaction would occur only when a bid price (buyer call-out) matches an ask price (seller call-out). This kind of market institution is known as an oral double auction because both buyers and sellers are required to express their preferences verbally.

The bids, asks and transactions were recorded using a software. At the end of the period when there were no further transactions, the software was able to derive the demand and supply curves and the efficiency of the market. Although there were minor fluctuations in the prices transacted initially, the prices of later transactions eventually converged at the equilibrium price. Market efficiency—measuring the potential profits in the market that had been realised—was close to 100%. Prof Wilson revealed that this experiment had been done many times with different participants and the findings were robust.

Lessons from Market Experiments

Prof Wilson highlighted that even though buyers and sellers had no knowledge of each others' reservation prices and production costs, the market was able to clear quite quickly. The experiment also illustrated that by interacting non-cooperatively and impersonally, a market of individuals is able to simultaneously maximise an individual's return intentionally and the aggregate social gains from exchange unintentionally; "*an end which was not part of his [the individual's] intention*", according to Adam Smith.

In the second period of the experiment, when a price cap of \$9 was instituted, the quantity of goods transacted fell and market efficiency was reduced to 73%. This showed the influence of rules on market outcomes. Prof Wilson explained that in an economic system with market institutions and rules, the market environment (e.g., agents' skills, costs, values, knowledge) influences agents' behaviour which in turn affects market outcomes. Laboratory experiments can show how market environments and institutions affect the efficiency/performance of markets.

Prof Smith cited his first experiment for his Economics students, on the first day of their class in January 1956, when he was examining how to relate what people did in real markets to economic theory, e.g., theory of supply and demand and equilibrium. Economic theory states that all agents need complete information in the market, e.g., demand and supply conditions, for markets to be perfectly competitive. However, Prof Smith's market experiments showed that, in reality, competitive markets can emerge without perfect information. Even in extreme cases where all buyers have the same value for the good and all sellers face the same costs, there is eventual convergence to equilibrium.

These findings were replicated in electronic double auction experiments first conducted in the 1970s and 1980s by Arlington Williams which jumpstarted the electronic age in experimental economics. Electronic experiments enabled more complex experiments, e.g., combinatorial auctions and modelling of electricity markets. Despite increasing complexity of the experiments, participants were able to arrive at market equilibriums quickly.

The fact that it was not unusual for people, with no knowledge of economics or any experience with experiments, to arrive at efficient outcomes convinced Prof Smith that humans were born traders. This was further affirmed by the fact that auctions and market institutions had been created in ancient times without knowledge of economic theory, and the Chinese and Soviet attempts to establish market economies in the 1980s without similar market institutions.

Asset Market Experiments and Asset Bubbles

Prof Smith related an experiment modelling asset markets, where participants were told they were endowed with different combinations of cash and shares that paid dividends in each period. In the first run of the experiment, share prices peaked before crashing. Although participants were given information about the dividends and reminded of the intrinsic value of the shares in each period, Prof Smith observed that they paid no attention to these when trading. In the second run of the experiment with the same participants, the booms and crashes came sooner and were shorter. When the experiment was run a third time, participants traded close to the fundamental value of the shares.

Prof Smith explained that asset markets behaved differently from consumer markets. Consumer and producer markets are more efficient and converge more quickly to equilibrium than asset markets. Asset bubbles persist in the real world because market conditions are constantly changing. Prof Smith shared that he had attempted to treat the bubbles in the experiments, but the treatments prolonged the bubbles instead. Prof Smith observed that stock market bubbles occurred at least once a decade and attributed the cause of the US housing bubble preceding the current crisis to the 1997 tax cuts for capital gains on housing and assets up to US\$500,000. He commended Singapore's policy of not taxing capital gains for all assets, which avoids diversion of funds to non-taxed assets.

Airport Takeoff and Landing Slots

Currently, decisions on airport takeoff and landing slots in the US are allocated by various airport committees. To be efficient, airlines need a system that effectively and efficiently coordinates airport takeoff and landing slots, airport gate rights, types of aircraft, and crew decisions. Professor Stephen Rassenti's answer was to create an auction mechanism with a language that was complex enough for airlines to meet their expectations.

Prof Rassenti presented the results of a set of experiments to compare the efficiencies of simple independent and more complex combinatorial auctions for the allocation of airport takeoff and landing slots. Participants of the experiments were divided into experienced and inexperienced groups, and each participant was given a set of constraints governing his/her preferred slots. For the experiments with independent auctions, individual slots were allocated using auctions, and participants were allowed to trade these slots in a secondary market to get what they wanted. For the experiments with combinatorial auctions, slots were packaged and auctioned together, and could be traded in a secondary market.

Prof Rassenti found that independent auctions were much less efficient than combinatorial auctions which had close to 100% efficiency. Trading in secondary markets raised efficiency, and experienced traders achieved higher efficiencies than non-experienced traders. There was an added danger of participants trying to manipulate the market by monopolising slots in one airport for independent auctions because they did not have the language to express their interest clearly. This would be practically impossible for combinatorial auctions where participants can bid for what they want.

Petrol Market

Prof Wilson presented the findings of a Federal Trade Commission project that he had participated in which examined the potential impact of banning the practice of zone pricing of petrol, i.e., the practice of refiners setting different wholesale prices for retail petrol stations that operate in different geographic areas or zones. The practice of zone pricing had been blamed for rising prices of petrol by many interest groups and gained the attention of US Senators. The intuition of these interest groups was that banning zone pricing would lower retail petrol prices in non-competitive areas.

The project compared the results of two experiments—the first experiment allowed zone pricing in a hypothetical market where there was a lot of competition between petrol stations in the centre and less competition in the corners, and the second experiment prohibited zone pricing in the same market. In contrast to popular belief, banning zone pricing hurt consumers by raising petrol prices in the centre instead of helping consumers through lower prices in the

corners. Refiners and consumers' share of the gains of trade were lower when zone pricing was banned. The main beneficiaries of banning zone pricing were the petrol stations whose share of the gains almost tripled.

According to Prof Wilson, these experiments showed that well-meaning interventions were designed to manipulate market allocations but eventually backfired because they could not account for the complex incentives in an intricate industry. The legislation to ban zone pricing would not have its intended effect on market outcomes because changing the rules would also change the behaviour of refiners and station owners.

Laboratory Experiments and Field Experiments

Economic experiments in the laboratory are important as they offer possible sources of information for policymakers before they change or implement policies, but they are not exhaustive and should be accompanied by field experiments as well. Prof Smith explained that experiments can serve as practical walkthroughs before actual policy decisions are made.

There are pros and cons in choosing between laboratory and field experiments. Laboratory experiments are less disruptive and costly than field experiments. The rules of laboratory experiments can be easily changed to correct mistakes in the laboratory. People are reluctant to use field experiments when they believe that the results will not be much different from their expectations, but laboratory experiments may motivate people to look at other sources of information. A general problem with empirical work is the uncertainty that results are transferable across different environments. Hence, Prof Smith encouraged the usage of field experiments where feasible. Prof Smith recalled that he had conducted laboratory experiments in the 1960s on whether US Treasury securities should be priced uniformly or discriminatorily. The results showed that the Treasury could raise more money if prices were not uniform. Field experiments in the 1970s had similar conclusions. After debate in the 1980s, the Treasury decided to change its uniform pricing policy in the early 1990s.

Prof Smith concluded the lecture by stressing the importance for experimenters to involve industry and government practitioners when conducting laboratory experiments as the latter can inform experimenters of potential problems or issues with the experiments. According to Prof Smith, the main limitation on laboratory experiments is the imagination and ingenuity of the experimenters.

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