5. MECHANISM DESIGN AND POLICY APPLICATIONS

Early in the development of experimental economics interest emerged in using the lab as a test bed for mechanism design and the examination of public policy questions. Thus, a long standing debate as to the procedures used by the US Treasury in the primary auction of treasury bills and notes led Smith (1967) to compare the uniform price with the "as bid" price discrimination mechanism in a laboratory market environment like that faced by dealers in the Treasury's primary auction. This helped to motivate the US Treasury under George Schultz to conduct a series of 16 bond issues – 10 uniform price competitive and 6 discriminative – all conducted in the early to mid 1970s. This was a nice example of a substantive change in policy that was assisted by first by laboratory and then by field experiments, but many examples emerged during the 35-year debate.

The public policy issue of posted pricing versus negotiated pricing in rail and barge competition led Hong and Plott (1977) to examine it in the laboratory, and this led to a reexamination of rail-barge regulatory policy.

5.1. Abstract, Theory Driven

Public goods theory going back to Wicksell, Lindahl and Samuelson had long called attention to the incentive problem in the provision of goods with a common outcome for many or all agents. Hence there was adequate motivation in the theory literature to fuel interest in studying these incentive issues in the laboratory. Further impetus was provided by the path breaking work of Vickery, independently reexamined in the innovations by Clark, Groves and Ledyard a decade or so later.

In this section, Chen provides a survey of the theoretical literature on incentive compatible mechanisms and a large number of experiments designed to test the ability of these mechanisms to solve the free rider problem and predict the outcomes achieved by groups of cash motivated subjects in the laboratory. He also points out the many gaps in this literature – not all mechanisms have been tested, and equilibrium selection issues have not been examined.

Rassenti and Smith summarize their early published work introducing the concept of the combinatorial auction based on Rassenti's 1981 PhD dissertation at the University of Arizona. The combinatorial auction allows products, consisting of packages of elemental items, or characteristics, to be defined by the buyers who bid for the combinations they prefer, allowing the market to define the composition of the products in final demand. Although this was a contribution to basic auction design, theory, and testing, it was motivated by the move to deregulate airline routes in the late 1970s. Landing and take-off rights provide an excellent example of a product packaging problem in which

all the relevant information for assembling optimal packages is dispersed among the buyers. For these cases a mechanism that better aggregates that widely dispersed and heterogeneous information is of paramount importance.

The combinatorial auction is a special case of the more general concept of the smart, computer-assisted electricity market now widely applied in liberalized electrical power systems. It is also making inroads in a great variety of other applications.

5.2. Applied, Problem Driven

In the control of air and other forms of pollution in the economic theory literature, the traditional approach has been to recommend an optimal per-unit tax on those emissions creating the pollution. An equivalence theorem shows that an optimal pollution quota system is associated with the optimal tax. This classical approach is not useful because it is based on an institution-free static analysis that begs all the important questions of how to implement a control system; it represents one of the many examples of how experimental economics changes the way one thinks about economic theory and policy.

A tax arbitrarily, and therefore unfairly, impacts firms with higher abatement costs who need time to adapt, and any given tax may be too high or too low to incentivize the target reduction in carbon, sulfur, nitrogen oxides, or other emissions. Knowing how much to reduce emissions does not tell regulators the tax level needed to target that reduction. Failing to understand this principle invites government policy makers to favor taxes as a means of collecting revenue rather than an indirect control device. Information on abatement cost is dispersed among all emitters and is not given to any one individual, including in particular the regulator who is most in need of the required information. It is far better to set the aggregate target directly – however hazardous this is in the absence of a mechanism for determining the willingness-to-pay for clean air – and adjust it marginally over time as needed based on continuous observation. The tightening schedule of allowable emissions over time motivates the exchange of permits from those whose permits can fetch a price higher than their abatement cost to those for whom abatement costs are greater than the permit price. The market price that emerges for the emission rights enables emitters to plan ahead for introducing abatement technologies. Simultaneously, it allows those emitters who face higher cleanup costs to buy time before facing bankruptcy, and perhaps avoid it, in the event that technical innovations induced by the price of the permits lowers the cost of clean up.

Many technical issues arise in the design of a practical pollution control system. Mestleman and Muller discuss the problem that firms do not have perfect advance information on their emission levels, and Cason provides a survey spotlighting the importance of the institution in pollution abatement. If no allowance is made for the lack of perfect information on a firm's emissions, end period spikes in permit prices cause inefficiencies to occur as well as random and unnecessary redistributions of income. Mestleman and Muller explore the option of allowing permits to be "banked" in advance to cover this uncertainty. Another device, such as staggered permit expiration dates, is part of Cason's discussion of the many important institutional details in practi-

cal emissions control. Cason also discusses the EPA acid rain auction as an example of poor auction design, spotlighting the importance of thorough laboratory testing of any proposed design and comparison to alternatives before it is introduced into the field. The kinds of design errors commonly discovered during laboratory experiments are easily exposed and corrected because the issues are grouped around the problem of whether or not incentives are compatible with the desired public outcome.

Cox and Isaac use a model of cost information asymmetry in procurement contracting to derive hypotheses for experimental testing. They treat two objectives that government is likely to have in procurement contracting: (1) minimization of the budgetary cost of making the purchases; (2) the promotion of efficient allocations. Among other results, they find that budgetary cost minimization and the maximization of economic efficiency can be conflicting objectives when there is a cost information asymmetry between the parties to a procurement contract.

Rassenti and Smith offer three entries dealing with some of the many issues they have investigated in the smart, computer-assisted economic design and testing of electric power markets. The reports they summarize and many other studies they cite provided an important basis for the liberalization of electricity in New Zealand and Australia, and served to explicitly inform – alas to no political avail – the management requirements for effective deregulation in California. Their first entry provides an introduction to the issues that arise in electric market design, and to an elementary treatment of network power engineering and the resulting constraints on network prices that must be honored by an efficient smart market design.

The next entry uses experimental methods to study what should be the rules governing the bidding process in the spot market, and how transmission should be priced for short run efficiency in network allocations. These two questions are examined in a regime in which the number of independent generators is not systematically varied, and in which extensive interruptible demand side bidding is postulated. Moreover the network is an elementary radial system approximating those used in small countries such as the United Kingdom, New Zealand and Australia.

The last Rassenti–Smith entry studies how the existence of large must-serve inelastic loads impact market performance, and how markets can be used to provide both energy reserves and energy supplies in complex multi-node networks. In this case, a complex, nine-node network is used in a distributed power supply system consisting of 144 generators. Both the network and the generator parameters were those characterizing the south-east region of the United States.

The two experimental studies summarized illustrate contrasting degrees of complexity in laboratory experiments: a simple system in which certain kinds of behavioral questions can be answered with a minimum of confounding elements; a complex system to examine issues of feasibility, proof of concept and interactive behavior not addressable in smaller designs.

Chao and Plott examine a simple three node electric network in which inadvertent so called "loop flows" can occur as in any alternating current (AC) network where flows are famously controlled by the physics of the network. (There exists nothing comparable to

"valves" in AC networks, as in pipeline networks.) As in previous experimental studies of gas pipeline networks, suppliers submit location-specific asks, demanders submit location-specific bids, and transmission rights holders submit arc-specific asking prices for capacity. Again, as in previous gas pipeline experiments, smart optimization support is provided by linear programming algorithms, except that transmission prices are zero if none of the line constraints are binding. This is because the experiments assume no energy loss in transmission; otherwise, nodal transmission prices would reflect the marginal cost of lost power in each line as in the entries by Rassenti and Smith.

5.3. From the Lab to the Field

Camerer asks whether asset markets can be manipulated by making purchases that are observed by others, inducing them to enter and buy more, thus driving up the price. The context is horse race betting where the rules of the track allow bets to be canceled at the last minute. His field experiment involved heavy betting on long shots, e.g., 50 to 1, then canceling them at no cost to his temporary experimental purse budget. A matched long-odds control horse was not bet on for comparison. Betting is very thin on these horses so that by placing many $500 and $1000 bets there exists a good chance of influencing the market odds. The results suggest that it may be possible to weakly manipulate asset market prices, but it proved hard to move the market by much, making it plain that those who believe that such markets are readily manipulated will find little comfort in this study, a finding reminiscent of the historical demise of the Hunt fortune in his attempt to manipulate the price of silver.

Bohn provides three entries reporting on field experiments: the diverse topics include pollution permit trading, the demand for each of two public goods, and the evaluation of employment subsidies. In the emissions study, the first test investigated the cost effectiveness of international emissions trading within a group of four small countries using negotiating teams from their energy ministries. The second examined the acceptability of a tradable-quota proposal, using Swedish diplomats from the study countries.

In his second entry, Bohm reports two path-breaking public good field experiments conducted in 1969 and 1982. In the first, a random sample of Stockholm residents were asked to participate in a new type of TV rating. The test was designed by Bohm, and conducted by the Swedish public TV company. Various procedures for sharing the cost were then applied to different groups who could watch the program if and only if their total WTP covered the program cost. Under all the cost sharing procedures the public good was chosen with no significant difference in the WTP for the different groups. In a control treatment group hypothetical responses were solicited and, consistent with more recent contingent valuation methodologies, they significantly overstated WTP compared to the other treatment groups.

In the second test, the public good was a statistical data package that could only be made available by the government while the decision to produce the package was to be determined by the 279 local governments who might use the package. Total willingness-to-pay exceeded cost in each of two treatments.

These and a series of laboratory public good experiments in the 1970s consistently established the finding that various simple practical cost allocation mechanisms enabled small and even large groups to overcome the free rider problem in the case where a public good could be provided if and only if sufficient funds were forthcoming – the group excludability principle.

Berg, Forsythe, Nelson and Reitz report results from a unique innovation by experimental economists: the Iowa Presidential Market (IPM). This market was the best known in the class of futures markets that have been designed to predict public events ranging from election outcomes to a corporation's sales. Whereas election polls ask people who they will vote for, traders in the IPM and other election markets must ask who all the voters will vote for, and take positions in candidate shares based on their answer. Similar candidate elections have been run in many states and countries throughout the world. Compared with the polls, election markets average somewhat lower final prediction error (1.5% versus 1.9%), are closer to the final outcome over their history and are less volatile over that history.

The contingent valuation method (CVM) is a hypothetical survey instrument that has been widely used and promoted in the assessment of environmental resource damages. Harrison and Rutström discuss the crucial issue of whether there is bias in CVM instruments arising from the fact that both the policy being evaluated and its damage prevention value are hypothetical with weak and distorted private incentives for respondents to accurately reveal their preferences. In these settings the question is whether people overstate their true evaluations. They provide a comprehensive review of a wide range of experiments allowing the existence of hypothetical bias to be determined, concluding that the existence of such bias, while highly variable, is persistent and cannot be ignored in the use of CVM instruments.

References

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