The Economic Journal **107** (*May*), 618–635. © Royal Economic Society 1997. Published by Blackwell Publishers, 108 Cowley Road, Oxford OX4 1JF, UK and 350 Main Street, Malden, MA 02148, USA

TRAGIC CHOICES AND COLLECTIVE DECISION-MAKING: AN EMPIRICAL STUDY OF VOTER PREFERENCES FOR ALTERNATIVE COLLECTIVE DECISION-MAKING MECHANISMS*

Werner W. Pommerehne, Albert Hart and Friedrich Schneider

Central to this paper has been the idea that there might be a demand on the part of the citizens for having specific decision-mechanisms in specific types of situations. This demand cannot be deduced on purely theoretical grounds, but rather should be registered case by case. Theory might help in categorising classes of situations where decisions can be tackled with the same approach. In any case, the choice of a decision-mechanism should not be left completely at the discretion of the policy-maker if the citizens's welfare is to be promoted in a suitable way.

I. AUCTIONS AND 'TRAGIC' CHOICES

In contemporary economics, the auction system has a high reputation. This is true at least for those teaching the subject in the western hemisphere and to a lower degree for those who are practitioners.[1] Allocation systems not based on the idea of auctioning off a certain good are commonly viewed as interferences with the ideal system, to the benefit of policy makers, bureaucrats, and interest groups. Such actors in the political market supply decision-making systems directly or indirectly. The possibility that there could be, at least in certain areas, preferences for non-market decision systems on the demand side of the political market, i.e. on the part of the citizens, is hardly taken into consideration.

Two comments are in order: first, in the real world, there is evidence that people indeed do not prefer auctions to other mechanisms in every situation. Counterexamples abound.[2] Secondly, it does not have to be stupidity or lack of insight which accounts for a relative distaste for the application of auctions in certain situations. Some economists have elaborated on theoretical reasons

* The first author was with the University of Zurich as well as with the University of Saarland. Death came to him after submitting the first draft of this paper. We will not forget Werner. The remaining co-authors tried to finalise the paper in close coincidence with this first draft. This paper was part of a broader research project, conducted in cooperation with Bruno S. Frey and Felix Oberholzer-Gee, both of the University of Zurich. The Swiss National Foundation (Nationalfonds Grant No. 12-25581.88) as well as the Federal Ministry of Forestry and Environment (BUWAL) provided generous financial support. The ZUMA society in Mannheim with its specific expertise in administering surveys supported the design of the underlying survey questionnaire, so that potential problems with the wording could, from a psychologist's viewpoint, be eliminated prior to implementation. The questionnaire design was also influenced by Anselm U. Römer. Helpful research assistance was provided by Astrid Bachmann, Julia Ortmann, and Bodo G. Schirra. Geoffrey H. Brennan, Leonard Dudley, Reiner Eichenberger, Lars P. Feld, Susanne Krebs, Louis Lévy-Garboua, Gordon Tullock, and Erich Weede inspired us by giving useful comments on the first draft of the paper. We would also like to thank Howard Kunreuther and an anonymous referee for their comments on the final version of the paper.

[1] For empirical inquiries into this question, see Kearl *et al.* (1979), Bobe and Etchegoyen (1981), Frey *et al.* (1984), and Pommerehne *et al.* (1984). For a vivid discussion of the matter, see Solow (1980).

[2] For empirical investigations, see Kahneman *et al.* (1986), Frey and Pommerehne (1988, 1993). For an anecdotal discussion on a less methodological basis, see Okun (1981).

for this attitude on behalf of at least part of the economic subjects. In a framework where different institutional decision mechanisms are compared, Tobin (1970), Weitzman (1977), and Sah (1987) analyse purely egoistic reasons that could cause affected individuals to be against the auction system when it comes to the allocation of specific goods. These reasons basically reflect the intention to bolster up one's own endowment with material goods. If the Pareto criterion or the conditions for applying it are relaxed in some way, then it is possible to derive such conclusions. Buchanan (1954) as well as Ng (1988) discuss the notion of pure preferences for mechanisms. Buchanan talks about 'choice costs' as opposed to 'resource costs', the latter category covering purely material reasons. Ng calls the concept 'procedural preference'. On a less formalised basis, this possibility is found in Okun (1975, p. 13) when he mentions citizens who do not want to turn the state into a vending machine. Freely interpreted, one could say that there seems to be a demand for having certain specific areas where the market is not the preferred governance structure.

This paper examines the potential application of auctions in a specific case, namely the siting of nuclear waste facilities. Economic publications so far have attacked this problem from the viewpoint of contemporary economics: On the assumption of the desirability of auctions, O'Hare (1977), Kunreuther and Kleindorfer (1986), and Inhaber (1992) try to develop specific bidding systems for this situation. But the fact that auctions do not seem to be commonplace in siting cases as well as reflections by Kunreuther *et al.* (1987) arguing in the direction of mixing the pure auction system with lottery elements indicate that this kind of decision might not be an easy one.[3]

As will be elaborated in further detail in Section II, a nuclear waste repository is not a purely private good, and that is why the siting decision may consist of two separate components. There is a decision needed on the collective level as to whether it appears beneficial to have a repository or not. Given that there has been a concerted, collective move in the direction of having a repository, a decision is needed on who shall get the repository, i.e. in which community or region it shall be located. Such a setting where the decisions over the amount and the ensuing distribution are not arrived at simultaneously is termed a 'tragic choice' by Calabresi and Bobbit (1978). These authors argue that the pricing mechanism is often rejected by the citizens who are potentially affected in this kind of situation.[4] They maintain that the decision over the distribution, the 'second order determination' in their language, is particularly problematic in a tragic choice setting, because in such a setting, it is separated from the 'first order determination', namely the decision over the amount of provision of a certain good which is given at the second level.[5]

[3] On an applied basis, Opaluch *et al.* (1993) develop a non-pure-auction mechanism for siting cases, based on the presumption that auctions are hard to implement for various reasons.

[4] For a similar statement, see Dobb (1969, p 212).

[5] An example that Calabresi and Bobbit cite is military draft. You have a fixed number of soldiers that you need, and the question on the second level is how to recruit them. The authors point out that the system which was practised during the American Civil War was not very popular, when draftees could buy a man

Since the criteria for a tragic choice apply in the decision on the siting of a nuclear waste repository, we decided to study the matter from an empirical viewpoint. In a survey, we tried to find out about citizens' demand for the very mechanism by which a problem solution would be generated. To this end, we employed a framework whose range is considerably broader than that of the economic siting studies so far; we chose a political-economic framework which checks for the acceptance of possible siting mechanisms in the citizens' minds rather than starting out from the mere assumption that the optimal mechanism in economics would be accepted in this situation.

In what follows, Section II provides a description of the hazardous waste facility siting problem. Section III presents some discussion on mechanisms, criteria, and hypotheses. Section IV contains the main empirical results. Tentative conclusions are offered in Section V.

II. SITING OF HAZARDOUS WASTE FACILITIES AS A TRAGIC CHOICE

II.1. *The Case Considered: A NIMBY Problem*

Switzerland has been using nuclear power to produce energy for quite some time. Nuclear energy, and, thus, nuclear waste, will no doubt be generated well into the future. There has been a referendum on whether to close down the existing nuclear power plants, and the Swiss population has voted not to close them down.[6] Although Switzerland's nuclear waste has up to now been delivered to France for temporary storage, this option will no longer be available by the year 2000. Therefore, the citizens of Switzerland will have to look for a prospective repository site somewhere inside the borders of their country if they want to enjoy the amenities of nuclear energy any further. While finding a location for a repository is beneficial to the whole population because future waste can then be dealt with, those people who will then have the repository in their backyard will certainly not be excited. This structure is typical of the so called NIMBY (Not In My Back-Yard) syndrome:[7] Some goods may have a dual nature, as is the case for a repository. For some people they are positive benefits, to others they are disbenefits. In our case, there are benefits for the whole of Switzerland, since a precondition for using nuclear energy, namely, storage facilities for the waste, is fulfilled once you have a repository at your disposal. In the immediate neighbourhood of the site, however, the facility is obviously viewed quite differently. Here, the negative effects clearly dominate. For a certain good to be a NIMBY, its benefits have to be dispersed, whereas it also has to have negative side effects which are concentrated on relatively few individuals.[8] Nuclear waste repositories qualify as NIMBYs and thus suffer from the specific difficulty of this category. Collective action, although beneficial to most subjects in the society, will hardly

who had to go to war in their place. During the Vietnam War, the second order determination was done on the basis of a lottery system.

[6] On September 23, 1990, 47·1% of the voters spoke out in favour of closing down the existing nuclear power plants.

[7] Another term used is, in abbreviation, LULU (Locally Undesirable Land Use); see Kunreuther and Kleindorfer (1986, p. 295).

[8] O'Hare (1977) correctly points out the analogy to Olson's (1965) theory of groups.

come about spontaneously, because nobody wants to go ahead and then face the risk of hosting the otherwise beneficial facility.

We propose that NIMBY decisions in general are a subcategory of tragic choices: Since there are benefits as well as costs to individuals, and since the two different groups of individuals affected by the respective effects are extremely different in size, the implementation of a NIMBY project lends itself quite naturally to a sequential decision-making structure. There is a public good component, so it is a matter of collective action to decide whether it is desirable to have a repository or not in the future. This decision, even if it is binary in nature – take it or leave it – is of course a decision over an amount and thus a first order determination. There is a private good component, in that it is the community where the facility is located that exclusively has to bear the brunt of the negative effects. The second-state decision takes place at a lower level, and puts potentially affected communities into relative positions against each other. Hence, sequential decision-making corresponds to the structure of a NIMBY problem. At the second stage, distributive aspects are central to the solution.[9] This makes NIMBY decision-making a tragic choice.[10]

Of course, from the standpoint of normative economics one could argue that the two stages should be brought together so as to render a simultaneous choice.[11] This is indeed what Kunreuther and Kleindorfer's (1986) auction mechanism is all about. Since, however, one has to deal with a public good at the first stage, it is at least not easy to imagine how that kind of decision-making could be institutionalised. Who would signal interest in having a nuclear waste repository? And is it not necessary to install a clearinghouse for future siting cases? In any case, the public sector would have to make sure that access to the sites will be a club good.[12] Although it is not straightforward to imagine that this threat could be made credible in the area of political decisions, one should of course check for the acceptance of the theoretical proposal to implement

[9] A decision is tragic whenever the focus is on how people are treated. If the first-order determination is given, this implies that on the second level individuals will be necessarily treated unequally. Attention is centred exclusively on distributive aspects in these cases. If the quantity of a good is given, then there are people who will come to enjoy the benefits of this good, while there are others who will not. If the quantity of a bad is given, then some people will be able to evade it, while others will have to bear the burden. 'Tragic'.

[10] Calabresi and Bobbit's examples have a somewhat more specific structure than their definition of a tragic choice. The goods in their examples do not have a dual nature. They are goods on both layers of decision-making, in that the first order determination constitutes a scarcity which is a date for the second layer. Then, on the second layer, it is inevitable that the demands of some individuals cannot be honoured, whereas that of others can. We argue that NIMBY decisions are just another category of examples of tragic choices. Clearly, NIMBY decisions fit the theoretical definition of a tragic choice with separate decisions over amount and distribution and priority in time for the decision over the amount. On the second stage of decision-making in a NIMBY case, the dilemma is that the public good that turns out to be bad for the host community has to be located somewhere. Just as those who do not obtain a ration of the good in Calabresi and Bobbit's examples have reason to envy those who were lucky, the community that has to operate the local disamenity has reason to envy those communities who managed to evade this.

[11] The link is the idea of compensation. The definition of the entities which can participate in that auction must allow for the fact that their respective territories have to absorb the whole of the negative impacts of the facility. Transgression of disamenities must not be present, which is, of course, a considerable problem once you are leaving the realm of theory and go over to actual implementations.

[12] A 'club good' in this context means that it must be feasible from a merely technical viewpoint to exclude those from using the repository who did not state their interest in the services provided by it, i.e., their willingness to pay.

auctions for siting cases. We have checked for the acceptance of auctions in our survey, but we have also included different mechanisms that are certainly not that hard to implement from a purely technical viewpoint, given that sequential decision-making coincides with the nature of NIMBY decisions quite closely.[13]

II.2. *Philosophies for Solving NIMBY Problems and Empirical Evidence*

As has become clear, the handling of NIMBY cases presents a special problem of organisation. Spontaneous actions are not to be expected, since there is a common benefit as well as a private loss in NIMBY cases. Therefore, the collective body has to set up rules, either explicitly or implicitly, according to which future NIMBY cases are to be handled. In general, two philosophies for dealing with such cases are distinguished in the literature.

In a merely protective state, private property is always given priority.[14] Here, ideally the collective body has to await a decentralised drive for getting the decision over whether to build a NIMBY facility made. Thereafter, one of the local communities has to be persuaded to operate it on its territory. If a solution is found,[15] then nobody will be worse off in material terms, given the initial endowments and time consistent preferences.[16] Mechanisms for solving a NIMBY problem that are based on this philosophy are summarised under the heading 'Kompromißmodell' (Informed Bargaining Procedure) by Kunreuther and Linnerooth (1983, p. 261), a term denoting procedures guided by local autonomy.

On the other hand, if the common interest is given priority, then one does not have to bother about whether the project can be implemented (or whether it is even worth constructing) In order for a common interest approach to be feasible in a regime where all other property is privately owned there must be a proviso in the constitution stating that interference with private land use is permitted in cases of projects of 'common interest' (however, defined and balanced against the interest of the negatively affected) are at stake. Procedures based on this philosophy are summarised under the heading 'Schiedsspruchmodell' (Imposed Collective Choice Procedure) by Kunreuther and Linnerooth (1983, p. 261), a term denoting procedures guided by the competence of the collective body.[17]

[13] For a critical statement on the feasibility problems of auctions see also Opaluch *et al.* (1993).

[14] However, even in this case, the state might have to be endowed with confiscatory power in order to get the means necessary to guarantee the security of private property. A situation where this paradox does not occur is voluntary contributions.

[15] This is highly unlikely if you first seek out a community and then begin to negotiate with it, because in that case, the strong position of that community might prevent a solution.

[16] Frey *et al.* (1995) stress the importance of time-inconsistent decision-making on the part of individuals. This aspect, which casts doubts on the theoretical superiority of bargaining procedures while, at the same time, highlighting opportunities for implementing NIMBY facilities in practice, will be taken up later on in our paper. Like Frey *et al.*, we are convinced that time-inconsistent decision-making is a very good description of real-world phenomena, without getting into the empirical literature that deals with this issue.

[17] In a sense, expropriation for the community's sake might in some cases be considered desirable by those who finally have to bear the burden. Expropriation is not incompatible with compensation (though the amount must necessarily be a general rate not negotiated in the specific situation), and giving away their property for the common interest is potentially favoured by these people over giving away their land in exchange for a 'bribe'. For the relevance of this 'endowment effect' see Thaler (1980, 1987).

Theoretically, in the first of the cases above one would expect an impasse in many situations in that less action than optimal takes place. In the second case, one would rather expect that some of the projects are not worth implementing. Note, however, that this conclusion rests on a Paretian compensation framework, which itself is nothing other than a framework based on a general value judgment.

Before we proceed to a more detailed discussion of concrete possibilities for solving NIMBY problems, let us have a look at empirical evidence from previous actual siting decisions. As Morell and Magorian (1982) in their study of approaches to siting in the jurisdictions of American States point out, both philosophies have already been applied in actual siting cases.[18] Success has been rather limited for either approach.[19] Resistance on the part of the local population was hence observed in cases where the laws of the respective state dictated negotiation with the community in question, with property rights being assigned to the local level. Trying to find compensation agreements in many cases produced 'empty cores' (Sally, 1990). On the other hand, centralised assignment of locally unwanted facilities, when it was legally permitted, was not very popular, either. In typical cases, it is reported that the actual decision was perceived not to be justified by the selection criteria as they had been set out in advance. Most facilities were in fact located in the Western part of the United States.

Another interesting case, this time from the context of a different country, was the attempt to locate a power plant in the West German city of Bergkamen (Kunreuther and Linnerooth 1983, p. 276). Here, the prospective operator of that facility succeeded in persuading influential citizens to accept the plant. This was accomplished by the use of side payments. An outcry in the German press and among impartial citizens ensued, where the people involved were charged with accepting bribes. If we subscribe to the view that the judgment of external observers reflects some kind of meta preferences, then we might tentatively conclude that those concerned by the decision might perhaps act against their long-run interests, since they are tempted by the 'bribe'. In view of this, time inconsistency and temptation can be specific aspects to the local autonomy procedures. In any case, one can learn from this that 'successful' siting is not an end in itself. We will come back to this point later. In a more general perspective, this example also illustrates why it is not oblique to care about people's preferences regarding any mechanism.

[18] The same statement can be found in Rabe (1991).

[19] Success stories for a single case, each, can be found in Rabe (1991) and Kunreuther *et al.* (1993). Rabe (1994) explicitly discusses a successful siting case in Alberta, which was based on compensation as well as a referendum. Other examples of a successful siting come from the United States and Switzerland. In Eagle, New York, a negotiation procedure was successful. In Switzerland, as documented in Renn *et al.* (1995), a landfull could be sited in Aargau using Dienel's approach. The latter mechanism will be discussed later in our paper. A recent report of a defeat for siting attempts can be found in Meyer (1995). In Wolfenschiessen, Switzerland, a compensation mechanism failed. One should not, however, draw immediate conclusions without considering specific circumstances of the decision process in this case.

III. CRITERIA FOR DECISION, DECISION MECHANISMS AND HYPOTHESES

III.1. *Mechanisms for Solving Tragic Problems*

In the studies by Frey and Pommerehne (1988, 1993), in the context of allocating scarce supplies of water bottles at an isolated sightseeing point on a very hot day, four methods applicable to make second-order determinations are discussed: Pricing, First-Come-First-Served, Lottery, and Administrative Decision. For those procedures which are guided by the competence of the collective body at least, the situation in NIMBY cases is similar to the settings mentioned above.[20]

In the literature on the specific problem of siting a hazardous waste facility the following mechanisms have been proposed up to now, as far as we know.

(1) O'Hare (1977, 1983) as well as Kunreuther and Kleindorfer (1986) have developed procedures for *auctioning* off facilities. Their approaches rest on the idea that those who benefit have to pay, whereas that community which, after competitive bidding, is willing to accept the facility, receives compensation, according to the result of the auction.[21]

(2) Another procedure guided by local autonomy is to seek out a community first and then *bargain* with it in order to find terms under which it will accept the facility which is not wanted by the locality. This procedure has been criticised (O'Hare, 1977; Sally, 1990) for allegedly producing 'empty cores' due to the generation of market power on the side of the selected community.

(3) The idea of a *lottery* is introduced to the NIMBY context by Kunreuther and Linnerooth (1983, p. 273) and Kunreuther *et al.* (1987).[22] The latter see the need to complement their auction mechanism by some other design, in order to enhance the perceived equity of the underlying auction mechanism.[23] Thus, we are switching over to those procedures which concentrate on a compulsory allocation of the disbenefit. They start off from the assumption that siting has to be done, i.e., that the first-order determination has already been made. Thus, they concentrate on the second-order determination.

(4) A very familiar procedure is the *engineering* procedure (see, e.g., Keeney (1980), Mickan (1987)), as we would like to call it. Here, experts, e.g. geologists, have to make evaluations of the appropriateness of potential sites.

[20] In the NIMBY case, however, the First-Come-First-Served principle cannot be practised due to the fact that we have to allocate a loss, not a gain. Nobody is likely to be eager to queue to get a nuclear waste repository. Furthermore, immobility may obstruct the proper workings of a 'Devil-Take-The-Hindmost' procedure. A potential analogue, however, is in our case perhaps the engineering mechanism.

[21] Kunreuther and Kleindorfer's (1986) mechanism can be thought of as a somewhat more elaborated, though slightly different version of O'Hare's (1977) idea. Kunreuther and Kleindorfer's auction has particularly favourable properties in terms of incentive-compatibility (Kunreuther *et al.* 1987).

[22] On a general level, the idea is discussed in, e.g., Okun (1975), Calabresi and Bobbit (1978), Sah (1987), Elster (1989).

[23] Elster (1989, chapter 2) points out that there are considerable difficulties with auctions in practice. Embedded in an excellent discussion of those criteria that are not allowed to enter a decision which is arrived at by lottery, he emphasises that to his knowledge, there has never been an implementation of a pure lottery mechanism in practice in tragic situations à la Calabresi and Bobbit. In all instances, there have been combinations with other mechanisms, in that they served as a base for preselections or postselections (Elster, 1989, pp. 67–8).

The way this is done is by abstractly specifying those properties of a community which are of interest, then some elimination criteria with accompanying critical values (satisficing levels), some measurement scales, a hierarchy of decision levels, and weighting functions for those criteria whose values for respective communities are to be weighted against each other. All in all, the engineering approach does not take into account the wealth of a community (i.e., its ability to pay compensation), but rather concentrates on technical factors which determine the extent to which a facility is perceived as a benefit.

(5) Finally, a procedure which is similar to the engineering mechanism because decisions are based on explicit criteria, but which differs from that procedure in terms of who is to make the decisions is some sort of *layman planning*. There are several versions of this very general idea of assigning impartial observers the task of making a second-order determination. One version has been developed by Dienel (1978), a German sociologist, who proposed that a number of randomly chosen citizens should be drafted to make 'tragic' decisions. To this end they should congregate in a segregated place, the 'Planungszelle' (planning cell), for some time, until a decision has been reached. Another version has been developed by Opaluch *et al.* (1993), who propose to let the whole population decide over its appropriateness of a range of anonymous, idealised sites.[24]

III.2. *Criteria, Decision-Makers and Institutions*

Let us now look at some general asspects which might or might not be ingredients of the mechanisms presented so far. Who shall get the locally unwanted facility? In the first instance, this seems to be a matter of the characteristics of the potential host community. However, the decision process as such has certain characteristics, extending to who decides, what else is decided, how the decision is arrived at and so on. Finally, the procedure itself is perceived as an institution which an individual likes or dislikes, maybe depending on the specific context, due to his attitude, however this attitude has been formed.[25] Having said this, let us first come to criteria for the selection of host communities.

People are, as a matter of fact, unequal at least to a certain extent. The question is: is it considered just or unjust if inequality regarding some specific criterion is allowed to play a role in specific decisions? More specifically, is perception of inequality independent of the degree of publicness of a decision, i.e. is there a difference between public decisions and anonymous market transactions? Although the overall effects may be quite similar in both cases, the influence of inequalities gets noted very easily in second-order determinations, whereas individual barter does not immediately reveal the workings of the pricing mechanism for unequally distributed properties. In order to get a

[24] It is interesting to see that the 'Planungszelle' approach has been proposed quite recently for actual decision-making over where to site a hazardous waste facility in Switzerland. Application of this method produced surprisingly consistent results over a number of independent teams of laymen (see Renn, 1993).

[25] The issue of procedure equity is discussed in detail by Kunreuther *et al.* (1993) as well as Renn *et al.* (1995).

feeling for situations where auctioning off something might be problematic, one should generally give a second thought to the degree of publicity of the respective decision. Sure, we observe auctions in the private realm, too. However, in this case, auctions are not introduced by a public authority, but are organised spontaneously, on a decentralised basis.

Yet, it is not only the auction mechanism which does not filter out any inequality; with the exception of purely random assignment, other mechanisms also pay attention to existing inequalities. While it is differences in wealth, population, preferences and perhaps skill or influence (market power) which come out quite clearly when auctions are applied, the so called engineering approach gives special attention to differences in the characteristics of the land you live in. Here, it is to a larger extent impersonal inequalities which are allowed to exert some influence, although personal characteristics, too, are relevant to a certain degree: population density might be an explicit, skill, intelligence and wealth an implicit criterion; the latter ones are relevant when the implementation of a procedure is compatible with the use of incentives. As discussed above, the price system can also suffer from 'poor' implementation. Here, the result may be an empty core.

Concerning the question of who decides, it is experts in the engineering procedure, impartial ordinary citizens in the layman procedures, some kind of 'salesman' acting for the common interest in the pricing procedure (i.e. the auction), and a machine in a lottery. In any case, the citizens of the community that will be directly affected by the siting decision have a direct say only in those procedures guided by local autonomy, be it competitive auctioning or negotiation with one and only one community. Interference by politicians is imaginable in the engineering procedure and in the steps leading to the selection of a local entity that will then take over the role of a partner in the negotiations to follow.

As for procedural preferences, it is difficult to make a clear-cut (and contingent) theoretical proposition, due to their genuinely personal character. Hence, we go ahead and check for them, everything else isolated, without getting first into a discussion of the potential influences of the universe of personal factors that might shape such preferences.

III.3. *Hypotheses*

Considerations about personal endowments with riches set aside, the price system has much to recommend it from a theoretical viewpoint in terms of individual well-being. It honours personal tastes. If we observe that the auction system is not accepted that easily in second-order determinations, we may infer that in such situations, the relative position in terms of endowments is a dominant aspect in people's perception. In the latter case, differences in wealth, i.e., personal factors, are presumably considered as illegitimate determinants. If we observe that engineering procedures are doing well, then it is differences in non-personal ('technical') criteria which are deemed acceptable. Should lotteries be doing fine, then we can suppose that people do not consider any inequalities to be legitimate when it comes to the final

allocation decision. Attractiveness of layman procedures will be given if the question 'Who decides?' is in the centre of attention, at least to a larger extent than criteria as such.

On a more disaggregated level, those who are relatively rich should be more in favour of auctions and less in favour of lotteries than those who are relatively poor.[26] This should hold at least if the judgments on how to handle a tragic situation are influenced by 'personal' preferences, not only 'moral' ones (see, e.g., Harsanyi (1977)), since wealth, as a cumulated figure, is presumably not liable to quick changes. The calculus is straightforward: in a lottery, the chance of getting the unwanted facility cannot be reduced by means of side payments, neither officially nor otherwise, in contrast to, especially, auctions.

A somewhat more specific hypothesis, which can be contrasted with the conjecture that rich people favour the auction system, is this: maybe, since the temptation for poor people is particularly strong due to the prospect for payments (in exchange for hosting the facility), they might be inclined to find the auction system attractive (particularly if they are short-sight decision-makers). All in all, if we find out that it is not the rich but rather the poor who favour the auction system, we may infer that short-sighted, time-inconsistent decision-making is present to a considerable degree.[27] This, of course, rests on the assumption that nuclear waste repositories are in fact a very strong disbenefit for those who have them in their backyard.

In general, if people are of the opinion that those directly concerned in the end should have a say in the decision process, then it is the procedures guided by local autonomy which are the favourite candidates. The reverse is true if reaching an ultimate decision is preferred. These hypotheses rest on the discussion in Section II.2.

If interference by the administration is perceived as a handicap, then the engineering process and negotiations with a preselected community might not look too attractive.

III.4. *Some Reflections on Sustainability*

Before we proceed to the empirical results, a provisional comment is in order. It is perfectly clear that by simply asking people about their preferences for one or the other problem-solution method, we have not gained any insight into how well that mechanism is going to work in reality. One could reasonably argue that it is a non-negligible criterion for judging the adequacy of some method

[26] Please note that these statements refer to representative citizens. From an economic standpoint it is reasonable to suppose that a rich person tends to live in a rich region, whereas a poor person tends to live in a poor region. A rich person can be expected to have an expensive car, while a poor person is unlikely to have a car at all.

[27] The original idea of time-inconsistency is due to Strotz (1955). Elster (1986, pp. 1–34) gives an excellent account of potential settings where time-inconsistency might be encountered in reality. The models of Harsanyi (1977), Sen (1977) and Margolis (1982) develop frameworks where conflicts between different types of preferences in the same individual are possible. It is interesting to note that Kunreuther and Linnerooth (1983, p. 275) explicitly acknowledge the possibility of myopic behaviour in the NIMBY context, citing, approvingly, Calabresi and Bobbit (1978). Indeed, Calabresi and Bobbit make the point very clear, when they state (1978, p. 90), '…if one were someday poor and therefore wish to limit one's freedom, say, to volunteer as a paid subject of a dangerous but useful experiment, a good reason exists for one's view that the bad should be allocated…in a non-market way…'.

that the solution generate acceptance, non resistance, *ex post*. In that respect, the auction mechanism looks very attractive, since it is intertwined with negotiated compensation. That might, *ex post*, cause people not to move away or engage in protest movements. This, in turn, makes it worthwhile doing some moral suasion in an actual situation about the *ex post* virtues of the pricing system. However, in order for this solution to be sustainable, one has to make sure that preferences are not time-inconsistent. Otherwise, people might feel lured into the temptation of accepting some offered amount of money, a decision that they might come to regret later. The example of Bergkamen is somewhat suggestive in this context because community residents may have felt they had been bribed in the light of the outcry by the German public.

A rather general method that might influence sustainability is to let people choose what mechanism is to be applied in the case in question. A long time ago, Harsanyi (1969) argued that commitment is generated through this arrangement, in the sense that people accept the outcome of such a procedure even if they are personally concerned in the end.[28] In light of this, it is not sure whether a mechanism which is found to be acceptable by means of survey studies is as sustainable as if people had voted explicitly in favour of it (for a general discussion of the problem of discrepancies between preference and actual choice, an aspect not discussed in our paper, see Lévy-Garboua (1994)).

IV. EMPIRICAL FINDINGS

We confronted a sample of 301 citizens from a large area in Switzerland with a closed interview[29] that was designed to ask their preferences for applying certain mechanisms in case a nuclear waste repository was to be sited in Switzerland.[30] The situation was neither too hypothetical nor too concrete, since delivery of nuclear waste to France will have to end by the year 2000.[31] Thus, a repository will have to come in the near future.

One of the first questions yielded the result that there was a broad consensus (nearly 90 % of the respondents) that Switzerland should store the waste within its borders rather than exporting it to a third world country. Thus, we established that the public good component, which is typical of a NIMBY facility, was present. This is also compatible with the attitude expressed in two referenda on nuclear power, both held in 1990. The preference expressed was for using nuclear power in the future but with no more than the existing capacity, were mirrored in the attitudes of the people in our sample. A majority (55 %) of the respondents stated that they had voted in 1990 against discontinuing the use of nuclear power. The same result (55 %) was obtained when we asked the people in our survey what their decision on this item would

[28] Frey (1994) argues that decision mechanisms, for example a referendum, should at least be preceded by a pre-mechanism-discussion. We suggest that a deliberate, explicit decision by the population might help.

[29] In order to avoid exchange of information among the participants, the interviews were administered as simultaneously as possible.

[30] For basic references as to the concrete questions, the implementation of the survey, and other details see Oberholzer-Gee *et al.* (1994).

[31] Thus the situation might be interpreted as a concrete manifestation of Rawls' 'veil of uncertainty' (Rawls, 1971).

be today. As for expanding existing capacities, respondents both in 1990 (73 %) as well as today (76 %) formed a clear majority against this proposal. Hence, a majority of those interviewed do not want not want to get rid of the waste-producing nuclear power plants in general. The persons that we interviewed had, according to their answers to the respective questions, the following rough profile: average gross household income per month was about 8,100 Swiss Francs. Since the questionnaire was in German, we asked adult Swiss citizens of a German-speaking area, whose median age turned out to be 41 (with a maximum of 76).[32] The shares of men and women were approximately equal. A slight majority proclaimed themselves to be rather right-wing than left-wing.

The people in our sample were confronted with different mechanisms in well-specified scenarios as they were proposed in the context of NIMBY syndromes. The main essentials of the respective mechanism were set out first. Then, people were made to think about the respective mechanism by asking them to assess it according to some prespecified attributes. Thereafter, the participants had to decide whether they considered the mechanism as acceptable in total. This was done for each of them separately. In the end, we asked for some comparative overall valuation. The baseline mechanisms we presented were the engineering method, layman planning and auction. In addition, we also checked for the acceptance of some variations to some of these. The results are given in Table 1.

It turns out that the engineering approach is the only one of these four mechanisms which was found to be acceptable by a majority of the sample. Laymen decision came in second, lottery third, and auction fourth, the last one with less than 20 % in favour. The preference pattern, shown in Table 1, is also

Table 1

Acceptance of Decision-Making Mechanisms

Approaches	In favour (%)*
Engineering	56·2
Laymen	31·9
Lottery	26·2
Auction	19·9

* % of respondents (excluding non-respondents) in favour of the respective mechanism, each asked in isolation: *N* (in each case) was 301.

obtained when the people in our survey were asked to assess the respective mechanisms simultaneously, after the separate mechanisms had been presented. The strong acceptance of the engineering method might in part be due to the fact that this approach is the one Swiss people are familiar with, since a corporation of Swiss experts, the NAGRA, already exists whose job is to deal with questions in the context of nuclear power.[33]

Since we expected this familiarity in advance, we introduced, as a variation,

[32] Parts of the questionnaire, in its original language, are available on request.
[33] For more details on the NAGRA, consult Oberholzer-Gee *et al.* (1994).

Table 2

Association between Acceptance of Auctions/Lotteries and Income

	Acceptance of lotteries		
	Low income*	High income*	Total
Rejection	147	75	222
Acceptance	47	32	79
Total	194	107	301
$\chi^2 = 1{\cdot}15$; Pearson's corrected coefficient = 0·09.			
	Acceptance of auctions		
	Low income*	High income*	Total
Rejection	154	87	241
Acceptance	40	20	60
Total	194	107	301
$\chi^2 = 0{\cdot}16$; Pearson's corrected coefficient = 0·03.			

* 'Low income' and 'high income' correspond to below and above mean income of all respondents.

an engineering procedure with international experts making the decision. Acceptance of this mechanism, which is perhaps more comparable with the other options, was indeed drastically lower than that of the familiar status quo procedure; it failed to receive an absolute majority of the votes by a lot (34.6 %). However, it still did better than the other options.

A problem would also have occurred if we had tried to give a concise description of layman planning: we resorted to describing this procedure as an overall referendum, without specifying the anonymity of the proposed community profiles.

With auctions, we pointed out that it might, *ceteris paribus*, be the poorer communities who finally get the facility. At the same time, however, we stressed the fact that such a community would necessarily get a decent compensation.

In order to be able to check whether mechanisms might have been rejected because they were perceived as 'impractical', we explicitly asked the individuals whether they considered the respective procedure as far fetched. Though, in general, an overwhelming majority of people (87·4 %) stated that the questionnaire was quite realistic, more than half of the people found the auction mechanism (50·2 %) and the lottery mechanism (60·1 %) impractical, respectively.

It is also interesting to note what happens if we introduce a negotiated solution, i.e., in the case where a community has been singled out and has the right to accept or reject the facility in question, where compensation would be at the heart of the negotiation. This modification turns out to capture even more votes than the pure engineering approach (71·7 %). The setting in the case of a negotiated solution is, however, different from the setting the mechanisms in Table 1 were designed for. In the case of the negotiated solution, the central question is not how to select a community.

Highly interesting evidence comes from the study of potential determinants of acceptance of lotteries versus auctions, the two opposite extremes (see Table 2). Significant association between acceptance and whether one's income is above or below average was nowhere to be found, suggesting that people are neither particularly short-sighted nor particularly self-interested when considering the virtues of the respective mechanism.[34] This statement only holds, of course, if our theoretical hypotheses are valid.

Regarding the persons which, according to participants' will, should make the decisions, we asked the people surveyed to set up a hypothetical decision board with eight members. We offered to draw them from five groups: geologists of the university, geologists of the World Wildlife Fund (WWF), geologists of the electricity industry, politicians and laymen ('voters'). The representative board is made up as shown in Table 3.

Table 3

A Hypothetical Decision Board: Votes and Seats

Groups	Votes		Seats in absolute terms
	In absolute terms	In percentage terms	
University geologists	772	32	3
WWF geologists	600	25	2
Electricity industry geologists	387	16	1
Politicians	230	10	1
Laymen	419	17	1
Total ($N = 8 \times 301$)	2408	100	8

University geologists, not surprisingly, come in first, getting almost half of the seats. The relatively good performance of both WWF geologists and laymen suggests that people do place importance on having impartial decision-makers. The relatively poor performance of politicians (10% of votes), even as compared to electricity industry experts (16%), suggests that the reputation of politicians in terms of 'good decision-management' is not too impressive.

All in all, we are left with some paradoxes from the point of view of 'conventional wisdom' (Galbraith, 1958, p. 6), which strikingly underscore the problems of trying to isolate properties of institutions. Most puzzlingly, the assessment of auctions and negotiations are totally different, although both of them belong to the same class of procedures, namely those which are guided by local autonomy. While negotiations turned out to be the most favoured procedure, auctions were the least favoured by far. Under both procedures, nobody can be forced to accept a repository. Auctions, according to economic

[34] Lack of association between acceptance of auctions and income might, at first sight, suggest that self-interest and myopic decision-making are present but neutralise each other. In that respect, evidence from the acceptance of lotteries is very helpful, since it allows us to state that self-interest is probably not present, and neither, hence, is myopic decision-making.

theory, do not suffer from the problem of an empty core, since strategising is not possible. Compensation payments may be not as high under this type of procedure, as compared to negotiations. However, it seems to be difficult to explain the huge differences in public assessment by purely analytical reasoning. Perhaps, Frank's (1985) theory of relative position has some merit in the case of tragic goods, where the second-order determination is at the centre of of public attention. People may strongly resent being publicly compared to others in terms of their wealth. When it comes to other, impersonal, criteria such as geographical ones, inequalities are much more tolerated as determinants of decision-making, as may be inferred from the relatively high acceptance of engineering mechanisms. Hence, although it seems theoretically promising to look for marginal improvements of the auction mechanism in terms of game theory, it is highly questionable whether this approach as such will ever meet with public acceptance in NIMBY cases. Talk is cheap to many economists, but to the people, it is perhaps not.[35]

By the same token, we encounter more 'paradoxical evidence'. While 73% stated that priority should primarily be given to the common interest, only 47% found it acceptable to force a community to accept the facility after some time has been spent on negotiations. Perhaps some people had in mind that, as is the *status quo* in many similar cases, politicians would select the community before the enaction of negotiations, and on that basis it seemed unacceptable to them to force a community to submit to such a preselection if necessary. In other words, if there had been a state-wide referendum which resulted in the determination of the respective community as a potential host, then perhaps even more than 47% would have found it acceptable to force that community to accept the facility after some time has elapsed. We can conclude from this that politicians are not unilaterally perceived as acting in the common interest.

Another 'paradox' consists in the relatively high weight that is assigned to having impartial decision-makers in a siting board, as compared to the lower popularity of both the engineering approach with experts from abroad and the referendum as a layman procedure. We might speculate that as for the 'impartial' engineering approach, choice of foreigners as experts was not a good wording, and as for referenda, we should have specified that voting on candidate sites should be carried out on an anonymous basis. Again, the discrepancy to the ordinary engineering approach remains hard to explain.

A 'paradox' can also be seen in the fact that lottery was not particularly popular with the poor, and auction was not particularly popular with the rich. Finally, it is also hard to explain why 68% of the respondents stated that lottery was 'unfair'. In like vein, 66% stated that the degree of participation power for a potential host community was 'low' with the auction mechanism. Perhaps this is a key to why a negotiated solution with only one potential host community is very popular, while a competitive auction is not at all.

Preferences do not extend to properties of mechanisms exclusively. It seems to be highly questionble to tailor perfect, analytical solutions *ex ante*, in a

[35] C.f., e.g., Beed and Kane (1991, pp. 591–3).

constructivist fashion.[36] Not only are properties perceived differently, it is also very difficult to identify *a priori* characteristics of a situation in which some mechanism suits best. In the end, it is openness to the inputs from the process, the dialogue, what is perhaps called for most urgently in tragic situations.

V. CONCLUDING REMARKS

Central to this paper has been the idea that there might be a demand on the part of the citizens for having specific decision-*mechanisms* in specific types of situations. This demand cannot be deduced on purely theoretical grounds, but rather should be registered case by case. Theory might help in categorising classes of situations where decisions can be tackled with the same approach. In any case, the choice of a decision-mechanism should not be left completely to the discretion of the policy-maker if the citizens' welfare is to be promoted in a suitable way.

On the supply side of the political market, there are benefits to reap for politicians, bureaucrats or interest groups by implementing market interventions, but also by implementing auctions. This behaviour, though selfishly motivated, could happen to result in implementing a mechanism which is also preferred by the citizens. In that case the ensuing solution would have a second best character. To the outside observer, this is not clear from mere theoretical considerations.

What is called for is empirical evidence as to what mechanism is preferred by the citizens. Once this is available, one can distinguish between (second best) beneficial and socially harmful actions on the supply side of the political market. This certainly requires empirically oriented research, based on theoretically conceptions which treat institutions as entities, with a sound categorisation as the backbones for applied research. As is obvious from our studies of decision-making systems, it is important to take institutions seriously, even if their existence for a prejudiced eye seems paradoxical.

In the end, let us make clear that we did not intend to deal with the problem of how to implement 'successful' siting mechanisms in practice. Apart from the fact that siting is not necessarily an end in itself, we wanted to bring attention to the phenomenon that selecting a particular mechanism, or, put differently, choosing an institution is a problem because there are phenomenological aspects to this decision. One may or may not conclude from this that flexible combinations of mechanisms are called for when it comes to practical solutions of actual siting cases. To give advice for actual siting was, of course, not within the realm of the study as we designed it. All we are saying is that it might be good practice to question the mechanism one has in mind as a practical solution first before getting into the details of such a specific mechanism. It is, at least in certain specific cases, not possible to calculate the acceptance of certain mechanisms on the basis of their properties for bringing about particular end states. In our study, end state oriented hypotheses failed, and many results

[36] This necessitates implicit 'preconceptions' (Kapp, 1968, p. 6), which are grounded in a strongly reductionist view of man.

appeared to be paradoxical if one adopted an analytical, reductionist viewpoint. End states certainly matter in the subjective views of the concerned individuals, but also rules themselves, and not only as a means to achieve particular end states.

University of Linz

Date of receipt of final typescript: July 1996

References

Beed, C. and Kane, O. (1991). 'What is the critique of the mathematization of economics?' *Kyklos*, vol. 44, pp 581–612.

Bobe, B. and Etchegoyen, A. (1981). *Economistes en Désordre: Consensus et Dissensions*. Paris: Economica.

Buchanan, J. M. (1954). 'Individual choice in voting and the market.' *Journal of Political Economy*, vol. 62, pp. 334–43.

Calabresi, G. and Bobbitt, P. (1978). *Tragic Choices*. New York: Norton.

Dienel, P. C. (1978). *Die Planungszelle. Der Bürger plant seine Umwelt. Eine Alternative zur Establishment-Demokratie*. Opladen: Westdeutscher Verlag.

Dobb, M. (1969). *Welfare Economics and the Economics of Socialism: Towards a Common Sense Critique*. Cambridge: Cambridge University Press.

Elster, J. (ed.) (1986). *The Multiple Self*. Cambridge: Cambridge University Press.

Elster, J. (1989). *Solomonic Judgments*. Cambridge: Cambridge University Press.

Frank, R. H. (1985). *Choosing the Right Pond, Human Behaviour and the Quest for Status*. New York and Oxford: Oxford University Press.

Frey, B. S. (1994). 'Direct democracy: politico-economic lessons from Swiss experience.' *American Economic Review, Papers and Proceedings*, vol. 84, forthcoming.

Frey, B. S. and Pommerehne, W. W. (1988). 'Für wie fair gilt der Markt?' *Hamburger Jahrbuch für Wirtschafts- und Gesellschaftspolitik*, vol. 33, pp 223–37.

Frey, B. S. and Pommerehne, W. W. (1988). 'On the fairness of pricing – an empirical survey among the general population.' *Journal of Economic Behavior and Organizations*, vol. 20, pp. 295–307.

Frey, B. S., Pommerehne, W. W., Schneider, F. and Gilbert, G. (1984). 'Consensus and dissension among economists: an empirical inquiry.' *American Economic Review*, vol. 74, pp. 986–94.

Frey, B. S., Oberholzer-Gee, F. and Eichenberger, R. (1995). 'The old lady visits your backyard.' Working Paper, University of Zurich.

Galbraith, J. K. (1958). *The Affluent Society*. London: Hamish Hamilton.

Harsanyi, J. C. (1969). 'Rational-choice models of political behaviour *vs*. functionalist and conformist theories.' *World Politics*, vol. 21, pp. 513–38.

Harsanyi, J. C. (1977). *Rational Behaviour and Bargaining Equilibrium in Games and Social Situations*. Cambridge: Cambridge University Press.

Inhaber, H. (1992). 'Of Lulus, Nimbys, and Nimtoos.' *Public Interest*, vol. 107, pp. 52–64.

Kapp, K. W. (1968). 'In defense of institutional economics.' *Swedish Journal of Economics*, vol. 70, pp. 1–18.

Kahneman, D., Knetsch, J. L. and Thaler, R. (1986). 'Fairness as a constraint on profit seeking: entitlements in the market.' *American Economic Review*, vol. 76, pp. 728–41.

Kearl, J. R., Popp, C. L., Whiting, G. C. and Wimmer, L. T. (1979) 'A confusion to economists?' *American Economic Review, Papers and Proceedings*, vol. 69, pp. 28–37.

Keeney, R. L. (1980). *Sitting Energy Facilities*. New York: Academic Press.

Kunreuther, H., Fitzgerald, K. and Aarts, T (1993). 'Siting noxious facilities: a test of the facility credo.' *Risk Analysis*, vol. 13, pp. 301–15.

Kunreuther, H. and Kleindorfer, P. R. (1986). 'A sealed-bid auction mechanism for siting noxious facilities.' *American Economic Review, Papers and Proceedings*, vol. 76, pp. 295–9.

Kunreuther, H., Kleindorfer, P., Knez, P. J. and Yaksick, R. (1987). 'A compensation mechanism for siting noxious facilities: theory and experimental design.' *Journal of Environmental Economics and Management*, vol. 14, pp. 371–83.

Kunreuther, H. and Linnerooth, J. (1983). *Risikoanalyse und politische Entscheidungsprozesse. Standortbestimmung von Flüssiggasanlagen in vier Ländern*. Berlin: Springer.

Lévy-Garboua, L. (1994). 'Doubt, learning, and cognitive consistency in decision-making.' Unpublished Manuscript, University of Paris-I-Sorbonne.

Margolis, H. (1982). *Selfishness, Altruism, and Rationality: A Theory of Social Choice*. Cambridge: Cambridge University Press.

Meyer, C. (1995). 'Ein Entscheid, keine Lösung.' *Die Weltwoche*, Nummer 38/21. September, p. 49.

Mickan, B. (1987). *Parameters Characterizing Toxic and Hazardous Waste Disposal Sites: Management and Monitoring*. Brussels: Commission of the European Communities.

Morell, D. and Magorian, C. (1982). *Siting Hazardous Waste Facilities: Local Opposition and the Myth of Preemption*. Cambridge, MA: Ballinger.

Ng, Y.-K. (1988). 'Economic efficiency versus egalitarian rights.' *Kyklos*, vol. 41, pp. 215–37.

Oberholzer-Gee, F., Frey, B. S., Hart, A. and Pommerehene, W. W. (1994) 'Panik, Protest und Paralyse: Die Rationalität individueller Reaktionen auf nukleare Endlager.' Unpublished Manuscript, Universities of Zurich and of Saarland.

O'Hare, M. (1977). 'Not on my block you don't: facility siting and the strategic importance of compensation.' *Public Policy*, vol. 25, pp. 409–58.

O'Hare, M., Bacow, L. and Sanderson, D. (1983). *Facility Siting and Public Opposition*. New York: van Nostrand-Reinholt.

Okun, A. M. (1975). *Equality and Efficiency, the Big Tradeoff*. Washington, DC: Brookings Institution.

Okun, A. M. (1981). *Prices and Quantities*. Oxford: Blackwell.

Olson, M. (1965). *The Logic of Collective Action*. Cambridge, MA: Harvard University Press.

Opaluch, J. J., Swallow, S. K., Weaver, T., Wessels, C. W. and Wichelns, D. (1993). 'Evaluating impacts from noxious facilities: including public preferences in current siting mechanisms.' *Journal of Environmental Economics and Management*, vol. 24, pp. 41–59.

Pommerehne, W. W., Schneider, F., Gilbert, G. and Frey, B. S. (1984). 'Concordia discors, or: what do economists think?' *Theory and Decision*, vol. 16, pp. 251–308.

Rabe, B. (1991). 'Beyond the Nimby syndrome in hazardous waste facility siting: the Alberta breakthrough and the prospects for cooperation in Canada and the United States.' *Governance*, vol. 4, pp. 184–206.

Rabe, B. (1994). *Beyond Nimby: Hazardous Waste Siting in Canada and the United States*. Washington, DC: Brookings Institution.

Rawls, J. (1975). *A Theory of Justice*. Cambridge, MA: Harvard University Press.

Renn, O. (1993). 'Risikodialog statt Sankt-Florians-Prinzip.' *Neue Zürcher Zeitung*, no. 277, pp. 27–8.

Renn, O., Webler, T. and Kestenholz, X. (1995). 'Fairness and competence in siting a landfill: a case study from Switzerland.' Working Paper, Centre of Technology Assessment, Stuttgart.

Sah, R. K. (1987). 'Queues, rations, and market: comparisons of outcomes for the poor and the rich.' *American Economic Review*, vol. 77, pp. 69–77.

Sally, D. (1990). 'A political empty core: the case of hazardous waste disposal facilities.' Discussion Paper, University of Chicago.

Sen, A. K. (1977). 'Rational fools: a critique of the behavioural foundations of economic theory.' *Philosophy and Public Affairs*, vol. 6, pp. 317–44.

Solow, Robert M. (1980). 'On theories of unemployment.' *American Economic Review*, vol. 70, pp. 1–11.

Strotz, R. H. (1955). 'Myopia and inconsistency in dynamic utility maximization.' *Review of Economic Studies*, vol. 23, pp. 165–80.

Thaler, R. (1980). 'Towards a positive theory of consumer choice.' *Journal of Economic Behavior and Organization*, vol. 1, pp. 39–60.

Thaler, R. (1987). 'The psychology of choice and the assumptions of economics.' In: (A. E. Roth, ed.), *Laboratory Experimentation in Economics*. Cambridge: Cambridge University Press, pp. 99–130.

Tobin, J. (1970). 'On limiting the domain of inequality.' *Journal of Law and Economics*, vol. 13, pp. 263–77.

Weitzman, M. L. (1977). 'Is the price system or rationing more effective in getting a commodity to those who need it most?' *Bell Journal of Economics*, vol. 8, pp 517–24.