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Fairness and competence in democratic decisions*

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Abstract. The price system is generally thought to be the epitome of efficiency. In some cases, however, lotteries are preferred to the market as a social decision-making system for reasons of fairness. As recent research has shown, neither procedure is always well accepted among the general population. We analyze the social acceptability of both mechanisms and apply our framework to the allocation of social burdens, namely the siting of nuclear waste facilities. Lotteries are only acceptable if they are applied to a set of efficient options. The market is accepted if the production of fairness precedes the use of prices.

1. Introduction

Random decision mechanisms are the embodiment of fair allocation procedures. None of the personal characteristics that typically interfere with decision processes in a completely unwarranted way enter procedures based on chance: Nepotism is out of the question. The rich and the powerful do not have any better chances than the poor and the humble if allocation relies on random decision processes. Provided the property rights initially assigned by a random mechanism can be freely transferred, there is not even a loss in allocative efficiency. Given the importance of fairness considerations, it is no wonder that random mechanisms have been widely used throughout history to allocate scarce goods and burdens.¹

Oil drilling leases, cellular telephone licenses, military draft, jury duty, and baggage inspection at the Mexican border are all assigned by using lotteries. Eighteenth century Swedish courts used lotteries to allocate the death penalty if a mob had murdered a person and the court could not identify the one who had delivered the mortal blow. In the seventeenth century, the University of Basle, at a time when it excelled in academia, used to appoint faculty

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professors to the various subjects by using a lottery. This resulted in the great mathematician Jakob Bernoulli teaching medicine instead of mathematics for quite some time. In the Roman Republic, a large number of important decisions were arrived at by lottery: The allocation of provinces amongst the senators, an important affair which granted the once-in-a-lifetime opportunity to exploit the barbarians and return to Rome as an even richer man, was decided by lottery. More important still, in case of disagreement, the two consuls decided legal issues by lottery (Meyer, 1975; Alföldy, 1984).

In contrast to random mechanisms, pricing is the epitome of efficiency. In voluntary trades between individuals mutual gains are realized. If society does not inhibit trading of this sort, an efficient allocation will result. Of course, the two fundamental theorems of welfare theory are based on the realization of mutual gains in voluntary trade. In combination with scientific knowledge, the use of the price system to allocate scarce goods resulted in unprecedented economic growth.

While the price system as well as random mechanisms clearly have their merits, it is obvious that they are not socially acceptable for all kinds of decisions. Consider the case where a lottery is used to allocate grades among students. Undoubtedly, this procedure would be rejected with great emphasis. Likewise, it is unacceptable to base the allocation of an important task within a firm or the distribution of income on random mechanisms. The same holds true for pricing. In recent years, a number of studies showed that the general public does not share the economists' enthusiasm for the price system. In situations of excess demand, for example, an allocation based on bureaucratic norms (i.e., the distribution of goods by administrators) or traditional rules such as "first come, first served" are preferred to the pricing approach (Frey and Pommerehne, 1993). These results correspond well with the observation that it seems to be (politically) very difficult to establish markets for organs, environmental damages, and even education.

The main purpose of this paper is to better understand the conditions that bring about the acceptability of different allocation principles. To this end, we will analyze a difficult social decision, the siting of locally unwanted facilities. Based on empirical findings, we will argue that competence, here used in the sense of efficiency, and fairness are key ingredients for acceptable allocation rules.² Most theorists seem to believe that pricing addresses the efficiency issue, while lotteries manage to establish fairness. As we will show this holds for specific circumstances, only. For a substantial number of important real-life problems including the siting of locally unwanted facilities, however, neither pricing nor lotteries are socially acceptable. Perhaps more surprisingly, lotteries are not considered to be fair, and pricing is not thought to achieve competent results by the public at large (Kahneman, Knetsch, and

Thaler, 1986; Frey, 1992: Ch. 10; Frey and Pommerehne, 1993). It is only when both requirements – competence and fairness – are met at the same time that the social acceptability of allocation principles is guaranteed.

Section 2 of this paper looks at one of the most difficult allocation decisions societies face today: the siting of radioactive waste repositories. In spite of expensive siting programs, most countries have so far failed to allocate these burdens. An empirical investigation into the perceived acceptability of different siting rules in this context reveals that acceptable rules manage to combine considerations of safety with fairness aspects. In Section 3, we develop a framework to understand situations where the exclusive reliance on either the price system or a random mechanism seems acceptable. As these cases are rare, in Section 4, we look for an institutional mechanism producing competence and fairness at the same time. Based on our analysis of the Swiss siting procedure for radioactive waste repositories, direct democracy seems to combine many of the essential features of a socially acceptable allocation rule for special burdens. Democratic decisions are accepted since they manage to simultaneously produce fairness and competence. Section 5 offers concluding remarks.

2. A topical issue: Siting noxious facilities

We hope to learn more about the social acceptability of allocation principles by studying a social problem for which a solution appears to be impossible to find. The siting of hazardous waste facilities presents such a challenge to most industrialized nations. We take up this specific example because no traditional rule of allocating this type of burden appears to be acceptable to the general public. Neither variants of the price system nor lotteries have been able to overcome the siting problem. Furthermore, the siting of noxious facilities is a prime example for efficiency losses due to the difficulty in reaching agreement over appropriate siting procedures.

For the US, there is ample empirical evidence that siting procedures based on price incentives are not successful in the majority of cases. 13 of 27 states with legislated siting procedures currently use compensation schemes to gain acceptance for the siting of new facilities. Yet, a 1987-report by state hazardous waste officials found that more than half of the proposed commercial facilities were rejected because of public opposition (Mason, 1989). The site selection for nuclear waste seems to be particularly difficult. Nebraska is a case in point. Despite a comprehensive compensation package and a 1991 General Accounting Office report stating that the site characterization had been completed in a technically correct manner, voters in McCulley township, the designated site, passed regulations prohibiting the storage of radioactive

material (Vari, Reagan-Cirincione, and Mumpower, 1993). The example is by no means an exception. None of the compacts³ in the US has been particularly successful at siting nuclear waste repositories. Most other industrialized nations, for example Canada and France, had to completely revise their siting procedures so that it is not known yet whether acceptable sites can thereby be found. In any case, the original siting processes are considerably delayed by public opposition (Kemp, 1992; Dunlap and Baxten, 1988). Likewise, lotteries are not met with much enthusiasm. Linnerooth-Bayer, Davy, Faast, and Fitzgerald (1994) suggested to participants in a survey on siting noxious facilities in Austria that an equal-chances lottery could be used if the prospective host communities “are all about equal on the criteria you have identified as important”. 62% of all respondents rejected the suggestion as being unfair.

In order to test the acceptability of various siting procedures empirically, we conducted a survey among the general population of Switzerland. In a personal interview, we asked more than 500 respondents about their attitudes regarding the siting of nuclear waste repositories in Switzerland. The interview, conducted at the respondents’ homes by a professional survey institute, comprised more than 60 questions and lasted about one hour. 15% of the interviews were cross-checked for accuracy of the recorded answers. The data were found to be of good quality. We controlled the selection of respondents for age, education and sex to guarantee representativeness of all subsamples.

The Swiss intend to build a facility for short-lived low- and mid-level radioactive waste which is supposed to be completed during the next decade. It is an underground, not monitored facility. Its construction is estimated to cost CHF 500 million, the operation will create 25 local jobs.

The Swiss site characterization and final siting decision process includes the following three steps (Seiler, 1986): (1) Swiss law holds the nuclear power plants responsible for safely disposing of nuclear waste. To this end, the Swiss electricity utilities incorporated a cooperative (NAGRA) which had to search for feasible sites largely according to geological and other technical criteria. (2) The association’s choice was submitted to federal agencies which reviewed the safety reports. (3) Ultimately, the federal parliament must grant the license to construct a repository. The host community and the host canton each have to approve of the federal plans in a popular referendum. Without their consent, the facility cannot be built.

For the low- and mid-level radioactive waste facility, step 2 has been completed by now. NAGRA recommended to build this facility in Wolfenschiessen, a community in Central Switzerland. Wolfenschiessen has already agreed to allow the building of the waste facility (in June 1994). In a first referendum, however, the developer failed to muster the support of the citizens of the canton of Nidwalden. At the time of our survey in 1993, however, the

choice had only been narrowed down to four communities (including Wolfenschiessen). Therefore, the procedure allowing for a discrimination between those four communities was still an open question. The survey was thus conducted not only in Wolfenschiessen but in several other communities as well (see Oberholzer-Gee, Frey, Pommerehne, and Hart, 1995).

2.1. *Choosing acceptable siting procedures*

Besides the current siting procedure, we proposed six other mechanisms to locate the future nuclear waste repositories in the survey. These included:

- *negotiations*, where the government would be forced to negotiate with different technically feasible sites until one of the communities agreed to voluntarily accept the facility;
- *a decision by foreign experts* who could decide where to locate the facilities without pressure from any of the national lobbying groups;
- *a national referendum*; this is the traditional Swiss method to decide how to allocate scarce goods and necessary burdens;
- an equal-chances *lottery* among technically feasible sites;
- *a willingness-to-accept mechanism* where the national government would promise generous compensations for communities willing to accept the repositories;
- *a willingness-to-pay procedure*, where the community with the lowest willingness to pay for not having to accept the noxious facility would receive it.

In addition, we included the current procedure which combines expert knowledge with a local veto of both the host community and the host canton.

For all procedures, it was emphasized that only technically feasible sites would be accepted as locations. All respondents had to rate the seven allocation procedures in terms of safety, fairness, time to reach a decision, local influence, and over-all social acceptability. Table 1 reports the acceptability rates.

Negotiations and the current procedure are by far the most acceptable allocation mechanisms. The siting rules we are most interested in, the lottery and procedures (6) and (7) based on the price mechanism, fare poorly. Our survey also reveals that the social acceptability of the siting rule is of critical importance for the success or the failure of the siting scheme as a whole. The individual probability of accepting a nuclear waste repository, *ceteris paribus*, increases by 8 percentage points with every additional point on a

Table 1. Percentage of respondents who rated the following procedures as acceptable (N=206)

(1) Negotiations	70.4%
(2) Current procedure	57.8%
(3) Foreign expert decision	34.9%
(4) Popular national referenda	33.5%
(5) Lottery	26.2%
(6) Willingness to accept	20.4%
(7) Willingness to pay	2.9%

Note. An answer is rated as acceptable if the procedure was given 4 points or more on a scale from “1 = not acceptable at all” to “6 = completely acceptable”. Since we are most interested in *ex ante* evaluations of these procedures, the answers of the respondents living in Wolfenschiessen were omitted from this analysis.

scale from “1 = siting rule not acceptable at all” to “6 = siting rule completely acceptable” (Oberholzer-Gee et al., 1995).

Using binary logit analysis to test for the reasons why a specific siting rule is accepted by the population, fairness and safety considerations turn out to be the most important criteria (the estimates are reproduced in Appendix A). With every additional fairness-point on a scale from 1 to 6, the probability of finding any given siting rule acceptable typically increases by 10 to 15 percentage points. An additional safety-point on a scale from 1 to 6 results in an increase in the probability of finding a siting scheme acceptable of 3 to 7 percentage points. Neither the time a procedure consumes nor personal characteristics of the respondents such as income, age or sex exercise any significant influence on the probability of accepting a particular siting rule.

These empirical results confirm most theorists’ notions of the social acceptability of allocation rules. Competence (which includes an effective dealing with issues of safety) and fairness are the decisive variables. Equating competence with the use of the price system and fairness with the lottery, however, would mean jumping to conclusions. As can be seen from Table 2, the lottery and the two rules based on pricing not only rank last in terms of overall acceptability, but also in terms of safety and fairness.

The poor performance of the price system cannot be explained by the nature of the survey situation. We exclude the possibility that the respondents did not understand the implications of the two pricing procedures. When asked how the different decision rules fared in terms of local influence of the citizens living in the prospective host community, the willingness-to-accept approach was ranked second after the negotiations. In terms of local influence, the

Table 2. Ranking of siting procedures in terms of safety and fairness

Rank	Safety	Fairness
1	Negotiations	Negotiations
2	Current procedure	Current procedure
3	Foreign expert decision	Foreign expert decision
4	National referendum	National referendum
5	Lottery	Lottery
6	Willingness to pay	Willingness to accept
7	Willingness to accept	Willingness to pay

Note. The ranking is based on the percentage of respondents who feel the siting rule in question guarantees “high safety” and is “fair” (4 points or more given on scale from 1 of 6).

willingness-to-pay procedure was judged superior to both the foreign expert decision and the lottery. Thus, people clearly understood how individual preferences entered the various decision processes and grasped the essence of the pricing approach.

Our discussion leads us to the following

Proposition 1: Competence and fairness are the key variables which determine the social acceptability of allocation rules. In the view of the public, competence is not automatically guaranteed by the use of the price system, nor is fairness when employing lotteries.

3. Understanding social acceptability

At first, proposition 1 seems to contradict much empirical evidence: If it were true that social acceptability depended on competence and fairness and that neither the price system nor lotteries could meet both requirements, why would we observe the widespread use of prices and, to a smaller extent, also of lotteries to allocate goods and bads? We propose that these two rules are only socially acceptable if one of the two relevant criteria, either competence or fairness, is naturally given and thus need not be produced.

3.1. Using lotteries

For the case of random decision mechanisms, we advance

Proposition 2: Lotteries are only socially acceptable if competence is a given state of nature or if the production of competence precedes the lottery.

Analyzing some uses of lotteries mentioned above will illustrate proposition 2.

- In the case of the University of Basle which used to appoint faculty professors to the various subjects by using a lottery, this decision is acceptable since competence has been guaranteed by appointing only capable universal scholars to the university.
- The allocation of provinces amongst the senators in the Roman Republic is also an example for the *ex ante* production of competence. According to Roman Republican ideology, the most able led the state and became senators or even consuls. Thus, once competence was (at least officially) guaranteed, the use of lotteries became acceptable.

The *ex ante* production of competence is a common feature of many random decision processes. Elster (1989: 67) notes that he knows of “no instance of social lotteries without some sort of preselection or postselection scrutiny on the basis of need, merit and the like”. While the workings of random mechanisms are fairly obvious in these examples, there is another class of lotteries. In many instances, the essential feature of lotteries is their blindness towards personal characteristics.⁴ When selecting citizens to defend the country or to arrive at verdicts in court, it is of no consequence whether they are rich or poor. This has led many scholars to believe that considerations of fairness dictate the use of lotteries. However, issues of competence remain vital in these cases for several reasons.

First, historically, it has been a major step in the development of institutions to guarantee equality for people of all standing in specific circumstances. The blindness of *iustitia* is an essential quality, a specific competence of law-abiding democratic nations. This competence is embodied in the use of lotteries to select judges and jurors. The recent use of a random mechanism to assign baggage inspections at the Mexican border signifies the competence to guarantee an impartial inspection process. Second, even where lotteries seem to disregard all personal characteristics, preselection processes which are usually overlooked provide for some degree of competence. The draft did not include children or elderly persons, and oil drilling licenses are not given to grocery stores.

3.2. *Employing the price system*

As in the case of the lottery, we contend that the price system does not generally guarantee both competent and fair outcomes.

Proposition 3: The price system is only socially acceptable if fairness is a

given state of nature or if the production of fairness precedes the use of prices.

While establishing competence is essential for the social acceptance of lotteries, achieving fairness is the equivalent for the price system. In a large number of situations, however, the dimension of fairness does not exist. This is true for all private decisions which do not have external effects on other individuals. In competitive markets, to cite the single most important example, individual consumption decisions do not even affect the market prices which serve as inputs for future production decisions. Therefore, the use of prices in competitive markets is in general socially accepted.

Where the social dimension of fairness exists, the *ex ante* production of fair entitlements is perceived to be a prerequisite for the use of prices as rationing devices.

Examples for these endeavors to achieve fairness before letting the invisible hand do its work include free schooling, and equal opportunity programs.

- General admission to schools is an important prerequisite for the social acceptance of the job market. Many school systems are designed to guarantee some degree of equality in human capital endowments. Quite often, early specialization is restricted and a certain number of years in school is mandatory.
- In recent years, equal opportunity programs have become more widespread. Just as free schooling, these can be seen as a means to establish some degree of fairness before letting the market perform the final selection. Economists are quick in pointing out the inefficiencies of equal opportunity programs. However, these views do not take into account the efficiency losses which arise due to the use of socially unacceptable allocation rules.

The importance of both competence and fairness explains why pricing is unthinkable in some areas. Consider the right to vote: It is a basic tenet of democratic societies that citizens are competent to decide matters of politics. Any attempts to redefine competence, for example, by auctioning off the right to vote or buying votes, meets the decisive resistance of most citizens.

So far, we have identified a number of situations where the price system or the lottery meet the requirements of both competence and fairness. These situations are characterized by the *ex ante* production of one of the two decisive factors. Once competence is given, the lottery becomes a socially accepted device. If fairness has been established, the pricing approach may be used. Socially intractable decision problems, such as the siting of nuclear

waste facilities, seem to be plagued by the absence of both factors. It is neither clear how one can efficiently dispose of this toxic waste (competence is not given), nor do we know of a common rule for the distribution of such bads (fairness criteria are missing). In disregard of the suggestions in the economic siting literature, there is, to our knowledge, no incident where a nuclear waste facility was successfully located by auction or lottery.⁵ Perhaps more important, even compensation payments do not elicit increased public support for noxious facilities (Dunlap and Baxten, 1988; Kunreuther and Easterling, 1992; Oberholzer-Gee et al., 1995).

4. Establishing competence and fairness

In June 1994, the citizens of Wolfenschiessen agreed to the siting of a low-and mid-level nuclear waste facility in their community. In November 1994, they approved of the necessary zoning changes. This is one of the rare success stories in nuclear waste siting and it seems well worth to investigate the reasons for this outcome. We propose that there are two marked differences between the Swiss siting scheme and most other procedures:

- The decision to produce nuclear energy was confirmed in a recent national referendum.
- The Swiss political system grants prospective host communities and host states the right to veto a siting decision.

The completion of a socially beneficial but locally unwanted facility may be looked at as being part of a prisoner's dilemma game with sequential moves covering all possible NIMBY projects a society wishes to undertake. If citizens manage to site such facilities as prisons, homes for the handicapped, freeways or airports, there are gains for a majority of the population. While it is in the general interest of everyone that such NIMBY problems are solved, there is a strong incentive to defect, i.e., not to contribute to the public good, once the suggestion is made to locate a specific facility in one's home town. This decision is neither taken repeatedly nor simultaneously with other potential host communities but only when the turn of the respective community has come. Each community acts like a link in a chain, learning from what other chain members did before when confronted with a NIMBY project. This "serial interaction" (Granovetter, 1978: 142) or "step-wise decision-making" (Macy, 1991: 731) leads to the same conclusion as do repeated prisoner's dilemma games: individuals tend to imitate each other, i.e., to play "tit for tat" (Axelrod, 1984).

Thus, also in sequential move games, the art of overcoming the free-rider problem consists in establishing a cooperative equilibrium right at the beginning of the game. To cooperate corresponds with the “fairness equilibrium” introduced by Rabin (1993) where all players are willing to sacrifice something to reward the other players’ cooperative acts. This concept reduces the problem to only one cooperative move, namely the first one. Public choice theorists have long recognized the potential of social contracts to increase the likelihood of cooperation in the first place (Mueller, 1989: 21, 22). If individuals have agreed to rules of cooperation behind the veil of ignorance, i.e., that every community must accept the facility once its turn has come, it is considered to be unfair to deviate from these rules *ex post*.⁶ Provided a social contract to accept socially beneficial but locally unwanted facilities existed, we contend that the fairness criterion would be met.

However, given the speed of technological change, developed societies continuously produce new types of locally unwanted facilities making it easy to exclude a specific facility from the repeated NIMBY-prisoner’s dilemma game. Thus, even if a social contract with respect to such projects existed, it is unclear whether it covered the current technology. Given the strong incentive not to contribute to the public good, it is an easy way out to claim that nuclear facilities were not included in the original contract and that no social obligation to accept them existed. Indeed, it is a reoccurring theme in many siting disputes that local opponents claim they did not want nuclear technology in the first place. Therefore, they now do not agree with the siting of such facilities.

It is at this point where the direct democratic nature of the Swiss political system plays a decisive role. The production of nuclear energy was democratically approved in a number of national referenda. In 1990, the Swiss last voted on two propositions regarding nuclear power. A first proposition suggested to completely abandon nuclear energy. It was rejected by a majority (53%). The second proposition, which was approved, demanded a 10-year moratorium with regard to the construction of new nuclear power plants. We wish to emphasize two effects of this institutional arrangement:

1. We found clear econometric evidence that people who approved of nuclear energy in the national referendum are inclined to also support the siting of the nuclear waste repository in their home town (Oberholzer-Gee et al., 1995). Thus, the social contract seems to hold *ex post*: A majority of the people appear to accept that nuclear technology is covered by the social contract with regard to the siting of noxious facilities. More than a third of the citizens of Wolfenschiessen agreed that it was a “national duty” to accept the waste repository.

2. Local opposition hardly ever consists of local residents only. In many cases, national lobbying groups play a decisive role in organizing and financing local resistance. In a situation where the production of nuclear energy and nuclear waste is legitimized by a social contract *ex ante*, fundamental opposition becomes much more difficult. It is no longer easily possible to argue that the waste should not have been produced in the first place. Thus, the opposition's strategy changes from fundamental opposition to the critique of a specific siting proposal. Indeed, we find that the arguments brought forward by the various anti-waste-repository groups are largely technical in nature and focus on geological and physical aspects of the siting project for Wolfenschiessen. In the terminology developed above, the dispute has shifted from fairness considerations to issues of competence.

We conclude that the Swiss situation is characterized by a remarkable willingness to accept locally undesired facilities in the nation's interest. This basic goodwill is decisively supported by the possibility to exclude specific technologies and even socially unwanted facilities via national referendums. Once a technology has been approved, basic fairness issues are settled and the national opposition groups are forced to deal with issues of competence, i.e., the efficiency aspects of specific siting proposals.

With respect to competence, the local veto plays a decisive role. In order to construct a nuclear waste facility, the consent of the host community and the host canton is necessary. It is important to recognize that the consent of local government does not suffice. Politicians have a large number of private incentives (career opportunities, national recognition, etc.) to agree to siting proposals. Therefore, the citizens of the host community and the host canton have to agree to the siting proposal in a local referendum. This represents the acid test in terms of competence. It is hardest to convince the local residents, who have the greatest incentives to be informed about potential risks of a noxious facility. Again, important implications for national opposition groups follow: Once the citizens of Wolfenschiessen agreed to the siting, anti-nuclear groups must be very careful when criticizing this decision. Any critique could alienate their natural allies in the struggle against a waste repository.

Once fairness issues have been dealt with at the level of implicit rules and basic approval of technology, local preferences evolve as the yardstick of competence. If both fairness and competence have been produced, the siting of nuclear waste facilities becomes possible. In the case of Switzerland, both the national agreement to produce nuclear energy (fairness), and the local consent to a potentially dangerous facility (competence) contributed to the overall social acceptability of Wolfenschiessen as the site for a nuclear waste repository.

5. Concluding remarks

Democratic societies do not always find it easy to solve social problems because, by their very nature, they have to meet stringent requirements. In particular, they have to reach the consent of their citizens.⁷ The siting of noxious facilities presents an important and topical case where many failures have occurred in a large number of countries. The use of the price mechanism suggested by orthodox economists – usually some kind of auctioning mechanism based on either willingness-to-pay or willingness-to-accept – has proved to be unacceptable in most circumstances.

We have argued that competence (efficiency) and fairness are two crucial ingredients for acceptable social decision-making mechanisms (proposition 1). Economists tend to take extreme positions and therefore often miss one of the two requirements. Due to their impersonal characteristics, lotteries are favored in economics in terms of fairness. However, we claim that they are an acceptable decision-making mechanism only if they occur within a preselected, competent (efficient) set of options (proposition 2). The price mechanism, favored in economics due to its efficiency characteristics (at least in the absence of market failure), is often rejected by the public as being utterly unfair. We argue that it is an acceptable social decision rule only if it occurs within a set of options considered fair.

Intractable social decisions are typically characterized by the absence of both fairness and competence. We have argued that the siting of noxious facilities falls into this class of problems. As the Swiss case illustrates, it is thus necessary to separately produce both elements to reach a socially acceptable solution. Direct democratic institutions have decisively contributed to the successful siting in Switzerland. On the one hand, they offered the opportunity to completely reject the use of a specific technology, i.e., nuclear power. However, once this technology was approved by a majority, the focus shifted from considerations of fairness to problems of competence. In terms of safety, local preferences represent the most stringent demands. If these can be satisfied, a *conditio sine qua non* is established making it difficult for “outsiders” to reject the building of a noxious facility.

Note that the Swiss institutions may neither be the only successful nor the most efficient. Indeed, relying on local judgments of safety, to take just one example, may prove to be relatively wasteful. Since local residents only bear a tiny portion of safety costs, their demand for additional risk reductions is practically unlimited. Deciding on the future use of technologies in national referenda can be costly as well.

Since it represents a low-cost decision for the individual voter to support or reject a specific technology at the polls, the opportunity cost of not introducing, say, nuclear power, do not enter the individual decision calculus. This

may lead to the rejection of very useful technological developments. The main goal of analyzing the Swiss siting procedure is to draw our attention to the conditions for socially acceptable decision systems: fairness and competence.

Notes

1. For an analysis of lotteries and many more past and current examples, see Elster (1989, 1992), Boyce (1994), and Goodwin (1994).
2. Efficiency is defined for a given set of institutions. We use the term “competence” to denote the efficient choice of institutional arrangements.
3. While responsible for the construction of low-level nuclear waste facilities, US states are allowed to cooperate in these undertakings. Several states can form a compact within which a single facility treats and stores all the waste of the participating states (incentive structures within these compacts are discussed by Coates and Munger, 1995).
4. See the discussion about “equal chances” by Young (1994: 21). “Equality” means not allowing for any distinguishing criteria to play a role while “equity” implies a specification according to individuals’ characteristics and specific circumstances (Elster, 1989).
5. The use of lotteries and auctions is suggested and analyzed by Easterling (1990), Goetze (1982), Inhaber (1992), Kunreuther and Kleindorfer (1986), Kunreuther and Portney (1991), and O’Sullivan (1993).
6. Experimental evidence shows that even a strategically non-binding pre-play commitment to the provision of the public good makes defecting afterwards very difficult (Ostrom, Gardner, and Walker, 1994). Thus, a “low cost decision” behind the veil of ignorance should exhibit at least as much power as a “low cost statement” in a “cheap talk” situation (see Bohnet and Frey, 1995).
7. This paper does not deal with non-democratic societies which can artificially produce their subjects’ consent by repression. While this allows to achieve solutions impossible in democracies in the short run, dictatorships are nevertheless faced with grave problems. One of them certainly is that they cannot establish credibility and a reputation to act efficiently which makes it more costly to raise internal and external credit (see Schultz and Weingast, 1994). The comparatively short life of many dictatorships lends support to the notion that authoritarian governments are not more efficient, and probably less efficient, than democracies.

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Appendix A

Determinants of changes in the probability to rate a siting procedure for radioactive waste as acceptable (and t-ratios).

	Negotiations “general population”	Current procedure “general population”	Current procedure “hosts”	Expert decision “general population”	Referenda “general population”
Fairness (effect of 1 point increase)	+11% ** (4.93)	+10% ** (3.50)	+9% ** (5.82)	+15% ** 6.03)	+14% ** (6.44)
Security (effect of 1 point increase)	+5% ** (2.33)	+7% ** (2.59)	+7% ** (4.35)	+5% * (2.20)	0% (0.20)
Time (effect of 1 point increase)	0% (-0.02)	-3% (-1.29)	-1% (-0.64)	-3% (-1.81)	+2% (1.26)
Local influence (effect of 1 point increase)	+4% * (2.19)	-4% * (-2.27)	-6% ** (-4.15)	+2% (1.05)	+1% (0.84)
Income	0% (-0.17)	-1% (-1.50)	0% (0.63)	+1% (1.34)	0% (-0.97)
Age	0% (-0.52)	0% (0.17)	0% (0.42)	0% (-0.17)	0% (1.36)
Sex	+2% (0.28)	+8% (1.32)	-6% (0.18)	+4% (0.78)	-1% (-0.16)
<i>Correctly predicted</i>	67.5%	62.8%	71.7%	71.4%	71.5%

Appendix A. Continued.

	Referenda "hosts"	Lottery "general population"	Lottery "hosts"	Willingness to accept "general population"	Willingness to pay "general population"
Fairness (effect of 1 point incr.)	+12%** (7.78)	+10%** (5.90)	+8%** (5.83)	+10%** (6.47)	+1% (0.64)
Security (effect of 1 point incr.)	+5%** (3.69)	+1% (0.36)	+5%** (4.25)	+3%* (1.84)	0% (0.01)
Time (effect of 1 point incr.)	0% (-0.22)	-4%** (-2.37)	+1% (1.05)	+2% (1.20)	-3%* (-1.95)
Local infl. (effect of 1 point incr.)	-2% (-1.11)	-4%** (-2.35)	-6%** (-4.73)	0% (-0.30)	0% (0.52)
Income	0% (0.76)	0% (-0.96)	0% (1.21)	0% (-0.39)	0% (1.17)
Age	0% (-1.29)	0% (0.75)	0% (-1.44)	0% (1.40)	0% (0.76)
Sex	-2% (-0.45)	-5% (-0.90)	+9%* (2.04)	+3% (0.71)	0% (0.02)
<i>Correctly predicted</i>	68.9%	75.1%	71.7%	82.4%	94.4%