The Cost of Price Incentives: An Empirical Analysis of Motivation Crowding-Out

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Twenty-six years ago, Richard M. Titmuss (1970) claimed that monetary compensation tends to undermine an individual's sense of civic duty. He illustrated his claim with blood donations, contending that paying donors negatively affects their willingness to donate blood. This thesis attracted considerable attention. Among others, Robert S. Solow (1971) and Kenneth J. Arrow (1972) discussed the proposition, both assuming that the effects of price incentives can simply be added to those of altruistic donation. Contrary to Titmuss, economists therefore generally predicted that if the price of blood is raised, the total quantity offered would increase in accordance with a normal supply function of blood.

This discussion subsided rather quickly because there was neither an analytical framework nor convincing empirical evidence to support Titmuss's case. Today, new theoretical developments suggest that economists should consider possible detrimental effects of using price incentives. In this paper, we present such a theory which is derived from social psychology and focuses on the crowding-out of intrinsic motivation. It stipulates that intrinsic motivation is partially destroyed when price incentives are introduced. Consequently, the price mechanism becomes less effective. In some instances, the relative price effect may even be reversed, i.e., a price increase may *reduce* supply. Based on this framework, we present an econometric test of motivation crowding-out for an important real-life issue, the siting of locally unwanted projects (the so-called "Not In My Backyard" or NIMBY problem).

Section I provides a short overview of Crowding Theory applied to the siting of locally unwanted facilities. In Section II, we present a case study where increases in financial compensation lessened the willingness to host a noxious facility. As is shown in Section III, this reduction is due to motivation crowding-out. The final section contains conclusions for theory and policy.

I. The Motivation Crowding Effect: Theory

Human behavior is influenced by both extrinsic and intrinsic motivation. The former is activated from the outside. In particular, individuals follow the generalized law of demand. Intrinsic motivations, on the other hand, relate to activities one simply undertakes because one likes to do them or because the individual derives some satisfaction from doing his or her duty.

Social psychologists have argued that there are "hidden costs of reward" (Mark R. Lepper and David Greene, 1978), and that monetary rewards may reduce intrinsic motivation (surveys are given in Edward L. Deci and Richard M. Ryan, 1985; Robert E. Lane, 1991). From a rational choice point of view, this reduction of intrinsically motivated activities is straightforward (Frey, 1994): If a person derives intrinsic benefits simply by behaving in an altruistic manner or by living up to her civic duty, paying her for this service

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reduces her option of indulging in altruistic feelings. Her intrinsic motivation then has a reduced effect on supply. There is a psychological process which underlies this phenomenon: Where individuals perceive an external intervention to be controlling, their intrinsic motivation to perform the task diminishes (Deci and Ryan).

We apply this Crowding Theory to NIMBY projects. These projects are often socially desirable undertakings (they increase overall welfare), but they impose considerable net costs on their immediate neighbors. Consequently, citizens demand the completion of such projects, but refuse to have them located in their vicinity. Examples include incinerators, airports, prisons, or clinics for the physically or mentally handicapped. Recent experience in most industrialized countries indicates that it is generally not possible to build such facilities without local consent (Douglas Easterling and Howard Kunreuther, 1995 p. 6). Economists have a handy tool for solving NIMBY problems. As the aggregate net benefits of undertaking the project are positive, one must simply redistribute them in an appropriate way. Economic theory suggests that communities can be induced to accept the undesired project by *compensating* them in such a way as to make their net benefits positive, while all other communities must be taxed to raise the sum of compensation.[1]

More formally, an individual living in a prospective host community chooses the level of support (S) that maximizes his expected net benefits

$$(1) \qquad \max\{\, p(S)[B - C + E] + D(E, S) - K(S) \,\}.$$

Support for a NIMBY facility may consist of, e.g., participating in referendums, attending and organizing information meetings, or collecting signatures. S is defined as an index of support which includes all activities that influence the probability (p) of successful siting. We assume that in a referendum, an individual votes in favor of a noxious facility if S is positive. B represents the benefits associated with the facility (e.g., gain in employment, positive tax effects), C denotes the negative externalities such as health risks, lower property values, or environmental hazards, and E is the external monetary compensation that the individual will receive if the prospective host community allows the construction of the planned facility.[2] As *expected* net benefits enter the individual decision calculus, ($B - C + E$) is weighed with the probability of successful siting (p). Noxious facilities are more likely to be built in communities with higher levels of support (Hamilton). Therefore, the more a representative citizen increases his level of support (S) for the noxious facility, the more likely it is that the project will be located in his hometown, but there are decreasing returns ($p_S > 0$, $p_{SS} < 0$). In addition to these economic effects, intrinsic motivation may also play a role. This motivation consists in the willingness to contribute to the solution of pressing national or regional problems. Call the benefits of performing one's so-defined civic duty D.[3] It increases with the level of support for the siting of the facility in question, but there are diminishing returns ($D_S > 0$, $D_{SS} < 0$). As outlined above, external compensation tends to crowd out intrinsic motivation ($D_E < 0$). Finally, participating in referendums and other forms of support for the facility represent costly activities. These costs are denoted as K and have the conventional properties ($K_S > 0$, $K_{SS} > 0$).

[1] Michael O'Hare (1977) was the first to suggest the use of monetary compensation as a means to overcome the siting problem. Since then, a large literature has evolved. The search for locations for noxious facilities in the United States is discussed by Robert Cameron Mitchell and Richard T. Carson (1986), Kunreuther and Easterling (1990), and James T. Hamilton (1993). Kunreuther and Paul R. Portney (1991) and Arthur O'Sullivan (1993) contain theoretical considerations. Joanne Linnerooth-Bayer et al. (1994) and Oberholzer-Gee et al. (1995) present European case studies.

[2] The compensation payment is "external" in the sense that the money is not used to change the characteristics of the facility in any way. We envision the monetary reward to be paid out in cash to all the citizens living in the host community for efficiency reasons.

[3] Other terms such as "public spirit" are used to convey the same notion. An extensive discussion of these concepts with references to empirical findings is provided by Jane Mansbridge (1994).

We first consider a situation where the negative externalities outweigh the benefits associated with the facility ($B - C < 0$) and the developer offers no monetary compensation ($E = 0$). This is the starting point for many siting disputes (Barry G. Rabe, 1994). A rational citizen chooses the level of support S^* that maximizes his net benefits. This yields the first-order condition

$$(2) \quad p_S[B - C + E] + D_S - K_S = 0.$$

In many cases, the resulting equilibrium support S^* is insufficient for successful siting.[4] The developer may then seek to muster additional support by offering monetary compensation, thereby making expected net benefits positive ($B - C + E > 0$). Differentiating (2) with respect to external compensation E indicates how the citizen's optimal level of support is affected

$$(3) \quad \frac{dS^*}{dE} = \frac{p_S + D_{SE}}{-[p_{SS}(B - C + E) + D_{SS} - K_{SS}]} \gtreqless 0.$$

As the denominator in (3) is positive, the overall effect of compensation on equilibrium support hinges on the sign and magnitude of p_S and D_{SE}. Conventionally, external compensation does not affect intrinsic motivation, $D_{SE} = 0$. This yields the standard relative price effect ($p_S > 0$): An increase of monetary compensation unequivocally increases equilibrium support S^*.

In contrast, the crowding-out effect considered here leads to $D_{SE} < 0$: Monetary rewards undermine intrinsic motivation, and the marginal benefit of supporting the siting is lowered. Provided the motivation crowding-out effect dominates the standard relative price effect, the external monetary intervention reduces a citizen's optimal level of support, $dS^*/dE < 0$. Thus, acknowledging motivation crowding-out does not mean that monetary rewards do not work. However, using price incentives becomes more costly because increased support due to higher monetary incentives must be traded off against losing support due to crowding-out. This yields

Hypothesis 1: When local residents perceive it as their civic duty to accept a NIMBY project, introducing monetary compensation reduces the support for the noxious facility if the crowding-out effect dominates the relative price effect.

II. Empirical Test

Hypothesis 1 is tested by analyzing the reaction of Swiss residents to monetary compensation offered for the acceptance of a nuclear waste repository.

A. *The Survey*

The Swiss government intends to build two repositories to store nuclear waste. For low- and mid-level radioactive wastes, two adjacent communities located in central Switzerland have been designated as potential sites. In spring 1993, 305 interviews were conducted in these communities by a professional survey institute, covering more than two-thirds of all households. Before selecting individual respondents, quotas (number of interviewees) with regard to age, sex, and the level of education were specified. With respect to these criteria, both subsamples are representative for the communities where interviews were conducted. Next, individual respondents were selected, using a random selection process based on registration lists of Swiss residents.

As recommended by the National Oceanic and Atmospheric Administration (NOAA) panel chaired by Arrow and Solow (Arrow et al., 1993), we conducted in-person interviews (at the respondents' homes). The contingent valuation (CV) questions utilized the referendum format (W. Michael Hanemann, 1994;

[4] The required level of support mainly depends on institutional factors such as siting laws or the possibility for eminent domain. In many countries, construction permits for noxious facilities must be approved in local referenda. In these cases, the level of support is insufficient if S^* is negative for more than 50 percent of the voters.

Portney, 1994).[5] The present study is best thought of as representing how people would vote if they had to decide on siting a nuclear waste repository in their hometown. There is wide agreement that a CV study should be considered "essentially a self-contained referendum ..." (Arrow et al., 1993 p. 4606). Indeed, careful CV studies have correctly predicted ballot votes (Carson et al., 1986). However, we agree with the critique by Peter A. Diamond and Jerry A. Hausman (1994) who argue that this optimistic view of CV crucially hinges on the assumption that survey respondents possess the same information as voters. Besides including a detailed description of the siting procedure and the compensation mechanism in the survey, we therefore followed a novel approach: We chose to conduct the survey one week prior to an actual referendum on an amendment to the canton constitution regarding the construction of underground facilities and nuclear waste repositories. At the time of the survey, the issue had been debated extensively and we feel confident that the level of information corresponded to a typical referendum situation.

B. *Test of the Hypothesis*

We asked all respondents if they were willing to permit the construction of a nuclear waste repository for short-lived, low- and mid-level radioactive waste on the grounds of their community (Question 1, Appendix).[6] More than half of the respondents (50.8 percent) would have voted in favor of having the nuclear waste repository built in their community, 44.9 percent opposed the facility, and 4.3 percent did not care.[7] Thus, this NIMBY project received widespread support although it was mostly viewed as a heavy burden for the residents of the host community: Nearly 40 percent of all respondents believed the risk of serious accidents in the facility and groundwater contamination to be considerable. Thirty-four percent were convinced that some local residents would die as a result of any environmental contamination, and nearly 80 percent believed that many local residents would suffer long-term effects should any accident occur.

To test the effect of external compensation, we repeated the exact same question asking our respondents whether they were willing to accept the construction of a nuclear waste repository when the Swiss parliament had decided to compensate all residents of the host community (Question 2, Appendix). The amount offered varied from \$2,175 per individual and year ($N = 117$) to \$4,350 ($N = 102$) and \$6,525 ($N = 86$).[8] While 50.8 percent of the respondents agreed to accept the nuclear waste repository without compensation, *the level of acceptance dropped to 24.6 percent* when compensation was offered. About one-quarter of the respondents seem to reject the facility simply because of financial compensation. The amount of compensation had no significant effect on the level of

[5] The questionnaire was developed with the help of survey research specialists of the Zentrum für Umfragen in Mannheim, Germany. The final version of the questionnaire was pretested with 50 respondents living in communities adjacent to the ones selected for the survey. In an extensive debriefing session, we made sure test respondents understood the questions posed during the interview.

[6] The initial sections of the survey contained a detailed description of the facility and the siting procedure. Next, respondents answered a number of questions regarding the expected costs and benefits (probability of accidents, expected consequences if an accident occurs, economic impacts of the facility). The goal was to have respondents carefully think about all sorts of expected costs and benefits associated with the repository. Then, Question 1 of the Appendix followed. The procedure described in the question is identical to the one actually employed in Switzerland. In order to build a repository, the developer (NAGRA), the federal parliament, and the local town hall meeting all have to agree on the project.

[7] In the actual referendum which was held one week after the survey, a slight majority voted against a proposition that would have given the electorate the right to decide on construction permits for all underground facilities in the canton (not only nuclear waste facilities, but other civil construction projects as well). Unfortunately, the outcome of this referendum cannot be directly compared to our survey results because the propositions were not identical and the survey pertains to the communal and not to the cantonal level. However, our general impression that there are about as many proponents as opponents of a nuclear waste facility in Nidwalden is confirmed by the actual referendum outcome.

[8] The compensation offered here is quite substantial. Median household income for our respondents is \$4,565 per month.

acceptance.[9] Everyone who rejected the first compensation was then made a better offer, thereby raising the amount of compensation from \$2,175 to \$3,263, from \$4,350 to \$6,525, and from \$6,525 to \$8,700. Despite this marked increase, only a single respondent who declined the first compensation was now prepared to accept the higher offer.

To further test the crowding-out effect, we conducted an identical survey in northeastern Switzerland, namely in six communities that are designated as potential sites for the second Swiss repository, a facility for long-lived, highly radioactive wastes. Two hundred six interviews were conducted in these communities.[10] The sampling procedure and survey methodology were identical to the one described above. Forty-one percent of these respondents stated they would vote for the high-level radioactive waste facility, 56.4 percent would have voted against it, and 2.6 percent did not care. When offered compensation, *the level of acceptance dropped to 27.4 percent.* Again, variations of the financial incentives did not result in significant changes of the supportive votes.

These findings are not unique to Switzerland. Kunreuther and Easterling (1990) report that increased tax rebates failed to elicit increased support for a nuclear waste facility in Nevada ($N = 498$). They reject the possibility that the rebates offered were simply too small. Similar results concerning nuclear waste repositories are reported by S. A. Carnes et al. (1983) for Wisconsin ($N = 420$), by Riley E. Dunlap and Rodney K. Baxter (1988) for Washington State ($N = 658$), and by Eric Herzik (1993) for Nevada ($N = 1212$).

[9] Acceptance rates were 24.3 percent when \$2,175 was offered, 24.8 percent with \$4,350, and 24.7 percent with \$6,525.

[10] Unfortunately, there was no pending referendum in northeastern Switzerland. Thus, the information level of respondents may not have exactly corresponded to the one right before a referendum. However, seismic measurements conducted by the developer in all six communities had caused a considerable discussion amongst the residents before the survey was conducted.

C. *Competing Explanations*

While the above results correspond to Crowding Theory, there are two alternative interpretations of the observations.

1. *Strategic Behavior.* Since our observations relate to a real-world problem, we cannot rule out that the respondents answered strategically. In order to maximize the amount of compensation received from the central government, the citizens would understate their willingness to accept the repository. In this case, opposition should be greatest when no compensation was offered. This is just the opposite of what actually occurred. Furthermore, when asked why they declined the compensation offered, only 4.9 percent of the respondents indicated that the amount was insufficient to win their approval (Question 3 (a), Appendix).[11] Therefore, strategic behavior can be ruled out for the majority of the respondents.

2. *Signaling.* Citizens may take the offer of a generous compensation as an indication that the facility is more hazardous than they previously thought. A higher compensation should then lead to a higher risk evaluation, and ceteris paribus to a lower level of acceptance. We have tested this competing explanation by directly asking the respondents whether they perceived a link between the size of the compensation and the level of risk (Question 3 (b), Appendix). Only 6.3 percent agreed with this connection which clearly refutes the risk-signaling hypothesis.[12]

III. Determinants of Support

It could be argued that the public's reaction to nuclear facilities and similar sources of risk is highly emotional, sometimes even irrational (Stephen Breyer, 1993 pp. 33–39). In particular, one might suggest that compensation does not work since such facilities are not evaluated in terms of costs and benefits. In this

[11] For the high-level radioactive waste repository, 5.8 percent regarded the size of the compensation as insufficient.

[12] For the high-level radioactive waste repository, 6.9 percent agreed.

section, we test a rational choice explanation of our survey data and link the observed decline in support to the crowding-out of civic duty.

In accordance with the theory outlined in Section I, an increase in costs (risks, negative economic impacts, losses in property value) reduces the individual willingness to support the repository. Individual estimates of all three cost variables were collected in the survey. We expect these covariates to be negatively correlated with the willingness to accept the facility. Previous research supports these expectations (Easterling and Kunreuther, 1995). It has also been shown that the general attitude towards nuclear power[13] (James H. Flynn et al., 1990) and the perceived quality of the site selection process (Easterling, 1992) influence the willingness to host a waste repository. We test for the effects of both variables. Our model finally includes a number of personal characteristics such as political orientation, income, age, and sex as control variables.

Table 1 reports the results of a binary logit analysis which seeks to explain why individuals accept a nuclear waste facility. The dependent response are "accept" answers. Those who did not care about the construction of a nuclear waste repository were omitted from the analysis.

The predictive power of our model (column I, without compensation) is quite satisfactory. Eighty percent of all answers are predicted correctly.[14] The results of the binary logit analysis correspond to our theoretical expectations and previous empirical findings. Higher perceived risk, negative economic impacts, and ownership of a home all decrease the willingness to host a nuclear waste repository. This refutes the notion that individuals do not act rationally when confronted with nuclear waste facilities. The costs a facility imposes on its immediate neighbors largely explain their resistance.[15] Personal characteristics such as political orientation, income, age, education, and sex do not exercise any significant influence.

As does earlier siting research, we also find that the general support for nuclear energy and the quality of the site selection procedure positively influence the willingness to accept the repository. Previous studies have not paid much attention to these relationships. On the contrary, it was generally taken as a matter of course that supporters of nuclear energy are more likely to accept waste facilities. Judged from an economic perspective, however, this finding comes as a surprise. Given the private costs and benefits associated with the proposed project, why should individuals be more willing to accept the facility if they favor the technology that generates the waste stream? It is often argued that the production of nuclear energy will not be continued if the waste problem cannot be solved. However, even if the supporters of nuclear energy stand to gain much as a group if a site is found and if the future of nuclear energy is secured, accepting a waste repository that imposes net costs on the hosts is a public good for each member of the group. Assuming that individuals do not contribute to public goods, economic theory predicts that supporters of nuclear energy are as likely as opponents to vote in favor of the repository. However, this prediction is empirically not borne out.

[13] We measured the degree of support for nuclear energy by asking respondents how they would vote in a national referendum on a proposition which demanded to stop producing nuclear energy. Such a proposition was actually put to a national referendum in 1990 and was narrowly defeated. As such initiatives are quite frequent, Swiss voters are accustomed to making decisions regarding nuclear power.

[14] This approximately represents a 30-percent gain in correctly predicted answers compared to a completely random model which assigns each observation the same probability of acceptance. Likelihood ratio tests of the null hypothesis that all coefficients except the constant are zero reject these hypotheses. Estimate I: $2[LL(N)-LL(0)] = 207.801$ with 9 degrees of freedom, chi-square p-value = 0.000. Estimate II (see discussion below): $2[LL(N)-LL(0)] = 36.714$ with 9 degrees of freedom, chi-square p-value = 0.000. Estimates for the high-level radioactive waste repository yield the same effects.

[15] Note that this econometric analysis is not a test of causality. The observation is compatible with the argument that respondents oppose the facility for unknown reasons and simply claim it to be dangerous and costly because they oppose it. Besides the fact that it might be difficult to specify what these unknown reasons may be, we think it improbable that all standard economic variables in the model are the result of reversed causation.

TABLE 1—DETERMINANTS OF ACCEPTANCE TO HOST A NUCLEAR WASTE REPOSITORY—RESULTS OF A LOGIT ANALYSIS

Independent variables	Willingness to accept facility without compensation (I)		Willingness to accept facility with compensation (II)	
	Estimate (S.E.)	Change in probability of acceptance in percent (*t*-ratio)	Estimate (S.E.)	Change in probability of acceptance in percent (*t*-ratio)
Constant	16.35 (28.03)		16.78 (22.85)	
Individual risk estimate ("1 = very low" to "6 = very high"; effect of 1-point increase reported)	−0.72** (0.13)	−7.1** (−5.57)	−0.28** (0.11)	−4.4** (−2.54)
Negative economic impacts Expected DY, 1 = yes, 0 = otherwise	−1.32** (0.45)	−13.0** (−2.95)	−1.10* (0.47)	−17.5* (−2.35)
Home ownership DY, 1 = yes, 0 = otherwise	−1.25** (0.44)	−12.4** (−2.83)	−0.59 (0.32)	−9.4 (−1.79)
Political orientation ("1 = left" to "6 = right")	0.05 (0.14)	+1.0 (0.33)	0.13 (0.12)	+2.0 (1.05)
Income $870 per month	−0.01 (0.04)	0 (−0.33)	0.01 (0.03)	0 (0.12)
Age	−0.01 (0.01)	0 (−0.48)	−0.01 (0.01)	0 (−0.66)
Sex (Effect of being female)	−0.33 (0.39)	−3.2 (−0.84)	−0.23 (0.32)	−3.6 (−0.72)
General support for nuclear technology DY, 1 = yes, 0 = otherwise	1.13** (0.41)	+11.2** (2.76)	−0.21 (0.32)	−3.3 (−0.64)
Quality of current siting procedure ("1 = not acceptable at all" to "6 = completely acceptable"; effect of 1-point increase reported)	0.62** (0.13)	+6.2** (4.95)	0.04 (0.10)	+1 (0.42)

Notes: * = significant at the 95-percent level, ** = significant at the 99-percent level. The estimated coefficients can be interpreted as the log of odds-ratios for a dichotomous independent variable. Since these coefficients are not an intuitively meaningful quantity, we provide derivatives indicating changes in the probability of accepting a nuclear waste repository. Holding all independent variables at their mean value, these derivatives show the effect of point-for-point changes in a single independent variable on the probability of accepting a nuclear waste repository. Thus, the derivative for the risk variable with a value of −7.1 percent can be interpreted as follows. If two respondents, A and B, differ only in their risk estimates, A estimating the risk to be 4 points (on a scale from 1 to 6) and B judging it to be 5 points, the probability of accepting a nuclear waste repository is on average 7.1 percent lower for B than for A. If it were the only difference between A and B that the former owned his home while the latter did not, A's probability of accepting a nuclear waste repository would be 12.4 percent lower than B's (derivative of −12.4 percent).

We propose to interpret this variable as a proxy for the prevailing level of public spirit. Civic-minded individuals do not only further their personal goals, but are prepared to bear some cost for the benefit of the larger group. In our case, feelings of civic duty create a willingness to accept the waste repository and secure the benefits of nuclear energy for the group as a whole. Note that this does not imply that supporters of nuclear energy are more civic-minded than opponents. On the contrary, as the latter generally do not believe that nuclear energy is socially beneficial, feelings of public spirit imply that they actively oppose

this form of energy. In any case, as long as public spirit prevails, supporters of nuclear energy are more likely to accept the waste facility than opponents.

A similar argument can be made with regard to the quality of the site selection rule. Improved site selection processes identify safer locations. They thus result in reduced negative externalities associated with the facility by ruling out, e.g., building waste repositories in swamp areas, or emitting carcinogenic substances in densely populated regions. A superior site selection process does not only reduce the private negative externalities (for the residents of the host community). It also leads to *lower social costs* because an accident typically affects the entire region or nation. As above, we propose to interpret this variable as a measure of civic duty: Civic-minded individuals care about the social impacts of the planned facility. An improved site selection process, which lowers the social costs of the noxious facility, results in an increased willingness to host the repository because voters express their public spirit by advocating a socially beneficial project (for further empirical evidence, see Douglas J. Lober and Donald Philip Green, 1994).[16]

Interpreting the "General Support for Nuclear Technology" and the "Quality of the Current Siting Procedure" covariates as proxies for the level of public spirit affords us the opportunity to further test Crowding Theory. Based on motivation crowding-out, we predict that the positive influence of these two variables weakens or vanishes once financial compensation is offered and public spirit is crowded out. The following testable hypotheses are advanced.

Hypothesis 2: Compensation crowds out the (previously existing) civic spirit of supporters of nuclear energy. After compensation has been offered, they are thus as likely to vote for the project as are the opponents of nuclear energy.

Hypothesis 3: Due to crowding-out, the quality of the site selection rule is no longer positively correlated with the level of support for the noxious facility when financial rewards are offered.

Both hypotheses are tested in a model which seeks to explain the determinants of acceptance when compensation is offered (Table 1, column II). As before, higher private costs decrease the probability of acceptance, and personal characteristics do not exercise any statistically significant influence. Our hypotheses 2 and 3 are supported: The extra support from the proponents of nuclear energy and from those who regard the site selection rule as acceptable is lost once compensation is introduced. Assuming that these two variables represent proxies for the level of public spirit, the results are consistent with the predictions of our Crowding Theory.

IV. Conclusions

Our theoretical and empirical knowledge has progressed significantly since Titmuss's intuitive contention that monetary compensation destroys altruistic values. We can now draw on a well-established Crowding Theory moving far beyond the example of blood donations. This theory is consistent with rational choice and can therefore be integrated into economics. The crowding-out effect explains why the support for a noxious facility decreased when monetary compensation to host it was offered.

Important conclusions follow. First, where public spirit prevails, using price incentives to muster support for the construction of a socially desirable, but locally unwanted, facility comes at a higher price than suggested by standard economic theory because these incentives tend to crowd out civic duty. Second, the use of price incentives needs to be reconsidered in all areas where intrinsic motivation can empirically be shown to be important. We speculate that this may be the case in work relationships characterized by incomplete

[16] Dunlap and Baxter (1988) tested this proposition more directly. They found that 45.6 percent of the residents living in the tri-cities area near Hanford, Washington State, supported the construction of a high-level nuclear waste repository in Hanford. When they were told that Hanford was the safest site available in the United States, support for the repository increased from 45.6 percent to 60.1 percent.

contracts as well as in environmental policy. Third, in policy areas where intrinsic motivation does not exist or has already been crowded out, the relative price effect, and thus the use of compensation, are promising strategies to win local support.

These conclusions are of general relevance for economic theory and policy because they identify a particular limit of monetary compensation to rally support for a socially desired enterprise. The relative price effect of monetary compensation is not questioned in any way, but this measure becomes less effective when crowding-out is considered.

APPENDIX

Question 1: "Suppose that the National Cooperative for the Storage of Nuclear Waste (NAGRA), after completing exploratory drilling, proposes to build the repository for low- and mid-level radioactive waste in your hometown. Federal experts examine this proposition, and the federal parliament decides to build the repository in your community. In a townhall meeting, do you accept this proposition or do you reject this proposition?"

Question 2: "Suppose that the National Cooperative for the Storage of Nuclear Waste (NAGRA), after completing the exploratory drilling, proposes to build the repository for low- and mid-level radioactive waste in your hometown. Federal experts examine this proposition, and the federal parliament decides to build the repository in your community. Moreover, the parliament decides to compensate all residents of the host community with 5,000 francs per year and per person. Your family will thus receive xxx francs per year. The compensation is financed by all taxpayers in Switzerland. In a townhall meeting, do you accept this proposition or do you reject this proposition?" (The size of compensation was varied as described above; total compensation per family was automatically computed by the laptop computer the interviewer used. The payments were said to be continued during the lifetime of the facility.)

Question 3: "There are many reasons why one does not support the construction of a repository in one's own community even though compensation is offered. Please indicate if the following reasons were important for your decision: (a) I demand a higher compensation. (b) If so much money is offered, the repository must be very dangerous." (Question was only given to those who had rejected the compensation.)

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