

5

ENVIRONMENTAL JUSTICE AND RATIONAL CHOICE THEORY

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Rational choice theory is a framework for understanding social and economic behaviour. It can be applied in making policy or taking action for environmental justice. To either make policy or take action for environmental justice requires decisions, some of which are about what to believe, some about what to prefer, and some about what to say or do. Rational choice theory claims to describe these decisions and prescribe ways to improve the process of making them.

Every day, countless individuals and groups, such as firms, throughout society, face decision situations in which they must choose one out of a range of alternative feasible courses of action in choice sets they face. A choice set is the collection of options which are available to the decision-maker at a given time. Each time a decision is made, the decision-maker can specifically choose to act in a way that is consistent with the creation of conditions of environmental justice in the future, or not. Decision-makers in firms for example that manage characteristic hazardous waste products might have a choice set from which they must select one out of a range of alternative feasible locations for a landfill site. Some sites in the choice set might create inequities in the spatial distribution of hazards and others not. The environmental justice research literature contains plenty of documented instances in which the decision-maker selected a site location that created or exacerbated inequities. For instance, in the 1980s, a Texas study performed by Robert D. Bullard concluded that despite black people only making up 28 per cent of Houston's population, five out of six municipal landfill sites were located in predominantly black neighbourhoods (Been 1993). Similarly, standards of fairness and equity were quite evidently disregarded in the decision in 1984, in Warren County, North Carolina, in which a large amount of soil contaminated by polychlorinated biphenyls (PCBs) was stored in a community that was 84 per cent African American. In the Warren County decision, it was later concluded that the site was chosen on no scientific basis, as it lay 8–10 feet above a water table and would undoubtedly contaminate the drinking water of this area (McGurty 2007).

Choices create or exacerbate environmental injustices when they disregard standards of fairness and equity and lead to outcomes that negatively affect people and/or the environment (Been 1993). Mennis (2005), for instance, argued that state-permits allowing air polluting facilities to operate in New Jersey were concentrated in minority neighbourhoods, and that facilities in areas with a relatively high percentage of minority population tended to have

a significantly weaker record of environmental enforcement as compared to other facilities. This outcome could, it would seem, only have been produced by the aggregate of many state-level choices that disregarded fairness and equity made by officials and administrators within state government. Similarly, Lavelle and Coyle (1992) found that the United States Environmental Protection Agency (EPA) more frequently decided to use “containment” tactics rather than permanent remediation of hazardous contamination in minority areas, and this despite the fact that the Congress had explicitly directed permanent remediation of hazardous contamination for everyone. Likewise, Kuehn (1994) found that the decisions to levy penalties against violators of environmental laws in predominantly white communities were higher than those in minority communities, by sometimes as much as 500 per cent. These are only a few of many situations in which individuals and groups made decisions which led to outcomes that negatively affected other people, including minorities.

Individual or group-level choices contribute to the creation of conditions of environmental justice, or not, every day. Some such choices involve the dumping of garbage, construction and demolition debris, toxic and hazardous materials, household appliances, abandoned automobiles, and other waste products, which are often discarded at night to avoid the cost and inconvenience of proper waste disposal. This “midnight dumping” can affect public health. Moreover, areas occupied by minority or low income communities can provide relatively easy targets. Trucking companies, for instance, routinely transport and dispose of toxic liquids. Unfortunately, going as far back as the late summer of 1979, in Warren County, when truckers deliberately leaked 31 000 gallons of PCB-contaminated oil within a 3-foot swath along about 240 miles of rural highway, some have chosen to midnight dump their materials, including in minority or low income areas. The outcomes of choices to midnight dump negatively affect communities and the environment, and are inconsistent with environmental justice. Government officials, too, can make choices that undermine environmental justice: administrators in state-level Departments of Environmental Protection routinely face the choice of whether or not to grant applications by firms that emit toxic chemicals into the environment. If and when pollution permits are disproportionately granted to industrial facilities near minority communities, this creates discriminatory patterns in the locations of toxic chemical emissions (Bowen et al. 2009). In each such situation, the course of action taken by the individual or group may or may not result in environmental justice. When all such choices throughout society are made each day, they aggregate into outcomes in which environmental justice is to a certain degree present or absent. Conditions of improved environmental justice thus cannot and will not be created unless the decisions of individuals and groups lead to aggregate outcomes that are consistent with the standards and principles of equity that characterize environmental justice.

This chapter is guided by the following questions about these decisions. To what extent is rational choice theory useful as a theoretical basis from which to understand and prescribe policies and actions for improving conditions of environmental justice? What are the implications of reliance upon rational choice theory as a basis from which to formulate public policy for environmental justice? What challenges does rational choice theory pose to improved levels of environmental justice? What are the alternatives to rational choice theory as a framework with which to understand environmental justice and prescribe remedies when problems arise? What insight or understanding does rational choice theory suggest for improving environmental justice decisions? The answers to these and similar questions imply that it is important for those individuals interested in achieving improvements in environmental justice to develop grounded, behavioural models of moral decision-making that go beyond formal rational choice theory.

Rational choice theory

Rational choice theory is based upon an idealized model of human decision-making. In its formal form, this model is predicated upon the assumption that choice-making behaviour may be understood on the basis of a set of normative axioms (von Neumann and Morgenstern 1944). These axioms stipulate specifically that decision-makers can make fully rational choices if and only if they have complete knowledge of all the alternatives in their choice sets, they know the entire range of consequences that will follow from the selection of each of the alternatives, they possess a perfectly known and consistent preference ordering across the alternatives, and they use a consistent decision rule for combining their knowledge and preferences. According to rational choice theory, when these axioms are fulfilled decision-makers make rational decisions by selecting from within their choice set of alternative feasible courses of action the one that brings the greatest utility, which is to say the greatest satisfaction, personal value, or pleasure. In this sense, rational choice theory is explicitly utilitarian in nature.

In application, rational choice theory stipulates a decision-making process in which decision-makers follow five steps. The process begins with identifying the problem, then specifying the goals, specifying all of the alternative courses of action available to attain these goals along with the range of outcomes that would be likely to follow from making a commitment to each, evaluating the alternatives in light of these outcomes, and selecting the optimal alternative, which is to say the one that maximizes the decision-makers' utility. In selecting between the alternatives, the golden rule of rational choice theory is to *maximize expected utility*. That is, the theory prescribes that decision-makers should select whichever of the alternative feasible courses of action is expected to bring them the greatest utility. Of course, given that the full range of outcomes of any given decision made today will not occur until sometime in the future, and that the future is always to some degree uncertain, there is always some degree of uncertainty in making rational decisions. Rational choice theory factors this uncertainty in to its model of the decision process by weighting the probability of each alternative with uncertain outcomes by the probability of its occurrence. Thus, the expected utility of each alternative with uncertain outcomes is the sum of its possible outcomes, each weighted by its probability of occurrence. In formal, mathematical terms, the expected utility (EU) of any given alternative feasible course of action is expressed by:

$$EU = P_1U_1 + P_2U_2 + \dots + P_kU_k$$

where P_1 is the probability of a given outcome and U_1 is the utility of that outcome. It is often suggested that the advantages of applying rational choice theory in this way include greater clarity and precision in thinking through decision situations. The theory is also hugely versatile, making it applicable across an unfathomably wide range of decision situations faced by individuals and groups throughout society.

The idea behind applying rational choice theory in making policy or taking action specifically for environmental justice would usually be to help to determine which out of a set of alternative feasible courses of action is most likely with time to bring about environmental justice. This chapter will consider this idea in some detail. In such situations the environment typically contains a hazard or hazards that threaten the well-being of individuals or communities. The environment in this sense is the totality of circumstances in which a threatened individual or community is situated, including the human-made surroundings as well as the natural ecosystem. The hazard might be physical, chemical, biological, or nuclear,

but in any case environmental justice considerations arise only when this hazard has been introduced into the environment by human activity (Been 1993). Environmental justice problems arise specifically when the health and well-being of individuals or communities who have not volunteered to expose themselves to the hazard are put unfairly at risk by virtue of their presence in an affected environment.

The term “environmental justice” has evolved over time from giving reference almost exclusively to hazardous materials in low income and minority communities to a much broader social justice movement today. It is now often used in reference to a more general set of issues of equity, often divided into their procedural, geographic and social aspects. The term is now often used to recognize disparities in the burden of the cost on human beings of conducting industrial society as well as an active effort to prevent the injustice. But no matter how the term is used, choices are always required to bring about conditions of environmental justice in the world, and lie at the core of rational choice theory.

Rational choice theory of environmental justice decisions

Although expected utility maximization is the defining characteristic of the concept of rational choice which is the predominant one within the decision science, public policy, risk, and economics literatures, like any model, there are limits to what it can do and to when it should be applied (Jaeger et al. 2001). Descriptions of the actual behaviours of decisions-makers, for instance, indicate that the axioms upon which expected utility maximization is based are seldom fulfilled in practice. The assumption that decision-makers have complete knowledge of the alternatives and the range of outcomes likely to follow from committing themselves to any given alternative must, on the basis of extensive evidence, be rejected in all but the most simplistic models of choice situations. The assumptions that decision-makers possess a perfectly known and consistent preference ordering, and that they use a consistent decision rule for combining their knowledge and preferences, are at odds with the body of research on preference reversals (Tversky et al. 1990). Instead, a substantial body of research evidence shows that decision-makers tend to use simplifying rules, mental shortcuts, or cognitive heuristics which allow them to focus on some aspects of complex decisions, and to ignore others, thereby simplifying their choices, but inducing systematic error. Social scientists have also recognized that decisions are strongly affected by other factors not considered by formal rational choice theory, such as the context within which a choice presents itself, the levels of trust amongst decision-makers and those affected by the decisions, the quantity and sorts of communication channels available, and many others (Ostrom 2010; Ostrom 1998; Kiser and Ostrom 1982; Zeleny 1982).

The recognition, documentation, and understanding that humans have a more complex motivational structure and a greater capability to solve social dilemmas than is posited in formal rational choice theory has led scholars and researchers to create a range of alternative theories (Zey 1992). One prominent alternative theory stipulates that in actual decisions, rational choice is a limiting condition; decision-makers do not make fully rational decisions, but instead make “boundedly rational” ones (Simon 1957). Proponents of boundedly rational decision theory maintain that the formal theory is basically correct, but that decision-makers usually have somewhat less than full knowledge of the alternatives and their consequences, an imperfectly known and somewhat inconsistent preference ordering, and/or a somewhat inconsistent decision rule for combining their knowledge with their preferences. So when making choices they gather information up to the point at which the cost of additional information acquisition begins to outweigh its expected benefits, at which point they “satisfice.”

Another alternative (Zeleny 1982) views rational choice not in terms of a search for mathematical maximum utility but rather as the art of balancing multiple objectives. Yet another view stipulates that formal rational choice theory is deeply incorrect, that environmental decisions are not at all rational, but rather that they are characteristically about power, politics, persistent solutions looking for problems, and other such things that have nothing much at all to do with rationality (Cohen et al. 1972). A difficulty with this last view is that it offers very little hope of success for individuals and groups who seek through the use of intelligent reason and argumentation to improve conditions of environmental justice.

One of the most empirically researched and definitive views of rational choice theory is based upon the research of Daniel Kahneman and Amos Tversky. The many carefully observed and documented inconsistencies between the normative axioms of rational choice theory and the actual behaviours of decision-makers led Tversky and Kahneman to conclude that:

the logic of choice does not provide an adequate foundation for a descriptive theory of decision making. We argue that the deviations of actual behaviour from the normative model are too widespread to be ignored, too systematic to be dismissed as random error, and too fundamental to be accommodated by relaxing the normative system... . We conclude from these findings that the normative and descriptive analyses cannot be reconciled.

Tversky and Kahneman (1986: S252)

Thus, insofar as formal rational choice theory is based upon a model that fails on the grounds of consistency with the body of empirical evidence about how individuals make decisions, its applicability as a theoretical basis from which to understand environmental justice and prescribe remedies when problems arise is empirically limited.

The prescriptions of rational choice theory for environmental justice

One of the practical difficulties of relying upon rational choice as a theoretical basis for making decisions related to environmental justice stems from its predictions about individual-level behaviours. Specifically, rational choice theory predicts behaviours that are inconsistent with those that the research on social dilemmas concludes are necessary for purposes of creating collective outcomes consistent with the normative standards of environmental justice. This difficulty arises in large measure due to the fact that rational choice theory models human beings as if individuals are independent of groups, and are self-interested, short-term utility maximizers. Such models have been highly successful at predicting marginal behaviour under conditions of competition, and especially those typified by individuals and firms acting in perfectly competitive markets, in which selective pressures screen out those competitors who do not maximize expected utility. But when standard rational choice models are applied within the context of averting disasters or working out social dilemmas, they are likely to prescribe choices that lead to the very worst possible outcomes, and to do so without stipulating any way that individuals might achieve more productive and sustainable outcomes.

A stark example of how the application of rational choice theory can lead to the very worst possible outcomes may be gleaned from a leaked memo dated December 12, 1991, signed by Lawrence H. Summers, who was then the Chief Economist at the World Bank, and on his way to the Presidency of Harvard University and the Chairmanship of the

US President's Council of Economic Advisors (Summers 1991). The memo, which is presented as Exhibit 1 at the end of this chapter, was about the management and spatial disposition of health impairing pollutants, and specifically their transshipment out of the United States and eventual final location in poor countries. In the memo, Summers assumed his readers to be rational decision-makers who maximize their expected utility, and from this assumption deduced a set of prescriptions for where the pollutants should be finally located. He showed using a deep, long, logical chain of reasoning that rational choice theory logically entails the morally repugnant, ruthless and arrogant conclusion that health impairing pollutants should be shipped out of affluent countries such as the United States areas and in to poorer countries, such as those in Africa, where they will lead to a smaller aggregate loss of utility. Using a very similar chain of reasoning, albeit at a different geographical scale, the assumptions of rational choice theory would logically entail the conclusion that the hazards at issue in environmental justice within the United States should, for purposes of maximizing utility, be located in minority and low income areas.

Facts, standards, and a behavioral theory of choice in environmental justice

While considerations about environmental justice require reference to standards of fairness or equity, formal rational choice theory does not. Indeed, a wide range of conceptual definitions have been proposed for use in stipulating appropriate fairness and equity standards for environmental justice (Wenz 1988; Phillips and Sexton 1999; Schlosberg 2007; Walker 2012). Been (1993), for instance, identified, characterized, and classified these to include 1) equal division of hazards on a per-capita or per-neighbourhood basis; 2) progressive siting, in which more affluent neighbourhoods compensate poorer neighbourhoods by receiving a disproportionately large percentage of the hazards; 3) siting of hazards on the basis of competitive bidding; 4) governmentally-forced internalization of hazards by producers; and 5) fairness in the procedures used to decide a location for the hazard. She also recognized the point made later by Phillips and Sexton (1999) that the selection of any one of these concepts has its own distinct implications for policy, as well as for prescribing the appropriate remedy in situations when wrongs have occurred, and problems have arisen, some of which may be incompatible with others. Schlosberg (2007) argued that in the end none of them can be singled out and used alone in all situations in which environmental justice considerations occur. Walker (2012) recognized the range of such concepts, observed that they are all explicitly prescriptive or normative in nature, distinguished them from empirical evidence about the facts of situations, on one hand, and from the explanations of why things are the way they are on the other, and pointed out that all three (normative concepts, facts, and explanations) are basic elements of environmental justice claim-making.

The distinction between normative concepts and facts is important in environmental justice for a number of reasons. One is that it goes a long way toward avoiding a major thought-stultifying error known as the "is-ought" confusion, which is a pernicious source of bewilderment in that it implies that the way in which decisions are currently being made cannot be improved (Kadane and Larkey 1983). The "is-ought" confusion, as described by Simon (1965: 137), results from failure to distinguish between normative statements about standards used to evaluate facts, on one hand, and empirical statements about the facts thus evaluated on the other. To be clear, empirically-oriented "is" statements are of a different order from normatively-oriented "ought" statements. On the "is" side are declarative, empirical statements related to descriptive or factual claims. On the "ought" side are imperative statements

related to judgments, evaluations, norms or principles of conduct. “Ought” statements propose standards and contain the word “should.” Both “is” statements and “ought” statements can be debated, but the two are nevertheless decisively asymmetrical in at least one fundamental way. That is, while the decision to accept any given set of facts does not and cannot in and of itself create those facts, the decision to create a standard does create that standard, even if only tentatively (Popper 1961). Failure to recognize this distinction leads logically to the conclusion that a given standard can be reduced to the facts to which it is applied, and thus to the implication that the way in which decisions are currently being made cannot be improved. The many practical implications of the failure to recognize this distinction when considering rational choice and action are among the main reasons why Rescher (1988) argued that only a normative theory of rational choice can be adequate to the complexities of the subject.

This line of reasoning also leads to a view in which only a normative theory of decision and action can be adequate to the task of guiding decisions for the purpose of creating a more environmentally just future. But while explicit recognition of the asymmetry between facts and standards stands to greatly improve the clarity and quality of thought about the nature and limitations of rational choice in environmental justice, it does not go very far in terms of prescribing how to go about actually making decisions that lead to the necessary and desired improvements. It is only to take a first step toward the development of a coherent, useful, and widely agreed upon behavioural approach to a rational choice theory of collective action applicable in environmental justice. Such a theory must also identify and describe the ways in which the decisions of individuals and groups need to improve to be consistent with what is known about rational choice and collective action, one on hand, and with equitable burdens of environmental hazards, judged according to whatever standard is used to define equity, on the other. In application, the purpose of such a theory would be to enable decisions intended to create or improve conditions of environmental justice to be guided by an explicitly behaviourally-oriented framework that enables coherent description and explanation of how myriad individuals and groups acting within the context of their own sets of local circumstances, facts, values, and institutions make decisions that aggregate into the outcomes we observe and associate with environmental justice, or the lack thereof. Such a theory would ideally be well grounded in empirical research, consistent with what is known about behaviour, and useful in terms of enhancing decision-making. Although Ostrom’s (1998: 1) work on “social dilemmas” (occurrences in which “individuals in interdependent situations face choices in which the maximization of short-term self-interest yields outcomes that leave all participants worse off than feasible alternatives”) goes a long way toward developing such a theory, that work remains far from complete. Currently, and unfortunately, such a theory does not yet exist.

Implications

Environmental justice is most clearly understood as a proposal to adopt a particular set of principles or standards, not a fact or set of facts but rather a standard against which to judge such facts, or sets of facts. Understood this way, environmental justice appears to be something that can be created by the aggregated outcomes of myriad decisions made by individuals and groups acting within a framework of social institutions over time. Every day, countless decision-makers throughout society face decision situations in which they must choose one out of a range of alternative feasible courses of action in a choice set. Insofar as these decisions are based upon the set of normative axioms that underlie formal rational choice theory, such

theory is clearly applicable to environmental justice. But insofar as these axioms are not met, rational choice theory is of limited applicability. Accordingly, this chapter has contended that the decision-making processes necessary for making improvements in conditions of environmental justice are inadequately described in terms of formal rational choice theory, and that only a normative theory of rational choice would suffice for helping to make such improvements.

Inasmuch as social scientists take interest in this proposal, one important contribution that can be made is to work toward the development of a coherent, useful, and widely-agreed-upon behavioural approach to a rational choice theory of collective action for environmental justice. Formal models of rational decision-making based upon expected utility theory will not, in the end, lead to improved conditions of environmental justice. Not only are the actual choices made by people and groups far too complex to be fully described by formal rational choice models, but the assumption implicit in advocating the use of rational choice models for this purpose – that somehow greater levels of utility maximization will bring about increases in the rates of adoption – is both logically and empirically unjustified. Formal rational choice theory does not include any standards of fairness or equity in its model of decision-making, and these are the core values of interest in environmental justice. Rather, rational choice theory treats fairness and equity as if they can be captured and represented completely in terms of the decision-makers' utility. Rational choice theory thus does not distinguish what is from what ought to be, a fatal oversight in any decision theory useful for purposes of guiding decisions toward improvements in conditions of environmental justice.

For a behavioural approach to a rational choice theory of collective action to be coherent and applicable in environmental justice, it must recognize that the only way to create pervasive conditions of environmental justice is through widespread consideration, discussion and advocacy. Such theory must therefore be far-reaching, multi-faceted and inclusive enough to encompass the domain of collective human action when faced with social dilemmas. In particular, it must include normative elements related to the spread of morality, justice, and equity in highly complex ecological, economic, and socio-technical systems, at large.

In this regard, the research agenda described by Ostrom (1998) is exceedingly promising. She described the “second generation models” of choice that she and her colleagues worked on for years, ones based upon reciprocity, reputation and trust rather than any sort of utility maximization or other overly narrow conception of what rationality is all about. These models assume that there “is a general theory of human behaviour that views all humans as complex, fallible learners who seek to do as well as they can under the constraints that they face and who are able to learn heuristics, norms, rules, and how to craft rules to improve achieved outcomes” (Ostrom 1998: 9). This leads to a research focus in such areas as how people learn and employ heuristics, norms, rules in social dilemmas; the strategies they learn and develop for reciprocity; the roles of trustworthiness and face-to-face communication in the attainment of desirable collective choice outcomes; and the importance of building a reputation for keeping promises and performing actions with short-term costs but long-term net benefits. Considerations such as these, rather than ones designed to cultivate the limited concerns of any particular academic discipline, are far more conducive to the possibility of keeping a perspective on how complex and many-sided rationality is.

The implications of the “is-ought” distinction in application to environmental justice, and particularly the failure of formal rational choice to make this distinction, are substantial. Especially when theorizing about the nature and use of rationality specifically within the context of proposals to improve the levels of justice and equity in the spatial distribution of hazards throughout society, only a fundamentally normative theory will be adequate to the

task. The creation of improvements in environmental justice requires improvements in moral decision-making, not utility maximization. The application of formal rational choice theory will not only not suffice to enhance the likelihood of such improvements, but it may even lead to dysfunctional outcomes, as illustrated by Lawrence Summers' leaked memo. Social scientists and theorists who want on one hand to present a theory of rational choice, such as expected utility theory, while at the same time avoiding the vexing empirical and behavioural complexities of collective decisions and actions taken for normative purposes on the other, are engaged in a futile venture condemned from the start to an overly narrow and misguided conception of what rational human choice is all about.

References

- Been, V. (1993). "What's fairness got to do with it? environmental justice and the siting of locally unwanted land uses." *Cornell Law Review*, vol. 78, pp. 1001–1085.
- Bowen, W.M., Atlas, M., & Lee, S. (2009). "Industrial agglomeration and the regional scientific explanation of perceived environmental injustice." *Annals of Regional Science*, vol. 43(9), pp. 1013–1031.
- Cohen, M.D., March, J.G., & Olsen, J.P. (1972). "A garbage can model of organizational choice." *Administrative Science Quarterly*, vol. 3(1), pp. 1–25.
- Fabio C., Ashok, A., Waitz, J.A., Yim, S. H.L., Barrett, S. R.H., & Caiazzo, F. (2013). "Air pollution and early deaths in the United States. Part I: Quantifying the impact of major sectors in 2005." *Atmospheric Environment*, vol. 79, pp. 198–208.
- Jaeger, C.C., Ortwin, R., Rosa, E.A., & Webler, T. (2001). *Risk, uncertainty, and rational action*. London: Earthscan Publications, Ltd.
- Kadane, J.B. & Larkey, P.D. (1983). "The confusion of 'is' and 'ought' in game theoretic contexts." *Management Science*, vol. 29(12), pp. 1365–1379.
- Kiser, L.L. & Ostrom, E. (1982). "The three worlds of action: a metatheoretical synthesis of institutional approaches." In Haynes, K.E., A. Kuklinski, & O. Kultalahti (eds), *Pathologies of urban processes*. Jyvasyla, Finland: Finnpublishers.
- Kuehn, R.R. (1994). "Remedying the unequal enforcement of environmental laws." *Journal of Civil Rights and Economic Development*, vol. 9(2), pp. 625–668.
- Lavelle, M. & Coyle, M. (1992). "Unequal protection: the racial divide in environmental law, a special investigation." *The National Law Journal*, vol. 15(3), pp. S1–S12.
- McGurty, E. (2007) *Transforming environmentalism: Warren County, PCBs, and the origins of environmental justice*. New Brunswick, NJ: Rutgers University Press.
- Mennis, J. (2005). "The distribution and enforcement of air polluting facilities in New Jersey." *Professional Geographer*, vol. 57(3), pp. 411–422.
- Neumann, J. von & Morgenstern, O. (1953). *Theory of games and economic behavior*. Princeton, NJ, Princeton University Press, 1944, second ed. 1947, third ed. 1953.
- Ostrom, E. (1998). "A behavioral approach to the rational choice theory of collective action: Presidential Address, American Political Science Association, 1997." *The American Political Science Review*, vol. 92(1), pp. 1–22.
- Ostrom, E. (2010). "Beyond markets and states: polycentric governance of complex economic systems." *American Economic Review*, vol. 100, pp. 1–33.
- Phillips, C.V. & Sexton, K. (1999). "Science and policy implications of defining environmental justice." *Journal of Exposure Analysis and Environmental Epidemiology*, vol. 91(1), pp. 9–17.
- Popper, K.R. (1961). "Facts, standards, and truth: a further criticism of relativism." *The open society and its enemies*, pp. 369–396.
- Rescher, N. (1988). *Rationality: a philosophical inquiry into the nature and rationale of reason*. Oxford: Clarendon Press.
- Schlosberg, D. (2007). *Defining environmental justice: theories, movements and nature*. Oxford: Oxford University Press.
- Simon, H.A. (1957). *Models of man*. New York: Wiley.
- Simon, H. (1965). *Models of discovery*. New York: D. Reidel Publishing Company.
- Summers, L. (1991). Hearing before the Committee on Finance United States Senate One Hundred Third Congress First Session on the Nomination of Lawrence H. Summers to be Undersecretary

- of the Treasury for International Affairs. pp. 117–147. www.finance.senate.gov/library/hearings/download/?id=7735172f-99ef-4424-a608-866d965d0e61
- Tversky, A. & Kahneman, D. (1974). “Judgment under uncertainty: heuristics and biases.” *Science*, vol. 185(4157), pp. 1124–1131.
- Tversky, A. & Kahneman, D. (1986). “Rational choice and the framing of decisions.” *The Journal of Business*, vol. 59(4: Part 2). *The Behavioral Foundations of Economic Theory*. pp. S251–S278.
- Tversky, A., Slovic, P., & Kahneman, D. (1990). “The causes of preference reversal.” *The American Economic Review*, 80(1): pp. 204–217.
- Walker, G. (2012). *Environmental justice: concepts, evidence and politics*. London: Routledge.
- Wenz, P.S. (1988). *Environmental justice*. Albany, NY: Suny Press.
- Zeleny, M. (1982). *Multiple criteria decision making*. New York: McGraw-Hill Book Company.
- Zey, M. (1992) (ed.). *Decision-making: alternatives to rational choice models*. Newbury Park, California: Sage Publishers.

Exhibit 1: Memorandum from Lawrence H. Summers

TO: Distribution

FR: Lawrence H. Summers

Subject: GEP [*Global Economic Prospects*]

‘Dirty’ Industries: Just between you and me, shouldn’t the World Bank be encouraging MORE migration of the dirty industries to the LDCs [Least Developed Countries]? I can think of three reasons:

- 1) The measurements of the costs of health impairing pollution depends on the foregone earnings from increased morbidity and mortality. From this point of view a given amount of health impairing pollution should be done in the country with the lowest cost, which will be the country with the lowest wages. I think the economic logic behind dumping a load of toxic waste in the lowest wage country is impeccable and we should face up to that.
- 2) The costs of pollution are likely to be non-linear as the initial increments of pollution probably have very low cost. I’ve always thought that under-populated countries in Africa are vastly UNDER-polluted, their air quality is probably vastly inefficiently low compared to Los Angeles or Mexico City. Only the lamentable facts that so much pollution is generated by non-tradable industries (transport, electrical generation) and that the unit transport costs of solid waste are so high prevent world welfare enhancing trade in air pollution and waste.
- 3) The demand for a clean environment for aesthetic and health reasons is likely to have very high income elasticity. The concern over an agent that causes a one in a million change in the odds of prostate cancer is obviously going to be much higher in a country where people survive to get prostate cancer than in a country where under 5 mortality is 200 per thousand. Also, much of the concern over industrial atmosphere discharge is about visibility impairing particulates. These discharges may have very little direct health impact. Clearly trade in goods that embody aesthetic pollution concerns could be welfare enhancing. While production is mobile the consumption of pretty air is a non-tradable.

The problem with the arguments against all of these proposals for more pollution in LDCs (intrinsic rights to certain goods, moral reasons, social concerns, lack of adequate markets, etc.) could be turned around and used more or less effectively against every Bank proposal for liberalization.