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Achieving Ecological Reflexivity: The Limits of Deliberation and the Alternative of Free-Market-Environmentalism

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Abstract: Environmental problems are often highly complex and demand a great amount of knowledge of the people tasked to solve them. Therefore, a dynamic polit-economic institutional framework is necessary in which people can adapt and learn from changing environmental and social circumstances and in light of their own performance. The environmentalist literature refers to this knowledge producing and self-correcting capacity as ecological reflexivity. Large parts of the literature agree that deliberative democracy is the right institutional arrangement to achieve ecological reflexivity. Our paper sheds doubt on this consensus. While we agree with the critique of centralized, technocratic planning within the literature on deliberative democracy and agree that ecologically reflexive institutions must take advantage of the environmental 'wisdom of the crowd', we doubt that deliberative democracy is the right institutional arrangement to achieve this. Ecological deliberation fails to address its own epistemic shortcomings in using crowd wisdom: Rational ignorance, rational irrationality and radical ignorance weaken the performance of deliberative institutions as an alternative and reflexive form of ecological governance. Instead, we propose an institutional order based on market-based approaches as the best alternative for using the environmental wisdom of the crowd.

Keywords: ecological reflexivity; market environmentalism; deliberation; environmental economics; rational ignorance; environmental groups

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1. Introduction

Environmental problems are often long-term, have multiple, compounding risks and uncertainties, lead different value systems to collide and are hugely challenging for policymakers to solve. Climate change, the ozone layer, biodiversity loss or the protection of natural landscapes are only a few of the environmental problems that combine all the characteristics of high complexity [1]. To solve complex environmental problems, an environmental governance regime must be capable to adapt and learn from changing circumstances and its own performance. This capability is widely referred to as ecological reflexivity and is accepted as a major virtue of effective governance in a world faced with severe ecological problems [2,3]. Ecological reflexivity "in a social context means the self-critical capacity of a structure or process or set of ideas to change itself after scrutiny of its own failures (or successes)" [4] (p. 942). An institutional arrangement possesses ecological reflexivity if it has the capacity "to seek, receive and respond to early warnings about potential ecological state shifts" [4] (p. 953).

Ecological reflexivity asks: Which institutional framework is capable to realize ecological reflexivity so that agents, structures, processes and sets of ideas can change in light of their performance? A growing literature on environmental political economy argues that institutions that use deliberative democratic decision making most productively address environmental problems and achieve ecological reflexivity because deliberation among citizens uses the knowledge of a greater number of individuals than centralized, technocratic solutions of supposedly detached bureaucrats and experts. In other words, deliberation takes advantage of the environmental wisdom of the crowd.

Despite the increasing prevalence of this perspective in the academic literature and among environmental activists we explore whether deliberative democracies have the capability to provide ecologically reflexive forms of governance and take advantage of the wisdom of the crowd. In this paper we apply the literature from political science and economics that addresses deliberative democracy in other settings. We find that deliberative democracy is unlikely to lead to ecological reflexivity, because of the challenges of collective decision-making. Instead, we suggest an alternate approach to environmental issues that increases the likelihood of achieving that reflexivity: Market-based approaches are more likely to make use of the dispersed environmental knowledge of citizens.

We begin with a clear demonstration that important parts of the literature in environmental political economy advance deliberation as a superior institutional arrangement to achieve reflexivity and solve ecological commons problems. This conviction originates in the political economic critiques of technocratic environmental politics and its failure to solve environmental problems from the top-down. We agree in substance with this critique of technocratic solutions, however we disagree with its focus on deliberative democracy because it ignores the epistemic shortcomings of deliberation. We then identify three epistemic challenges from political and economic theory which demonstrate that deliberative democratic institutional arrangements are unlikely to achieve ecological reflexivity: Rational Ignorance, Rational Irrationality and Radical Ignorance. All three challenges take the limitations of human action seriously and challenge the idea that deliberation makes sufficient use of individuals knowledge and, therefore, leads to ecological reflexivity. We conclude with an alternative construction that proposes a solution outside the limits outlined. We suggest that institutional alternatives which utilize market approaches are a better fit to utilize the environmental wisdom of the crowd and provide ecologically reflexive governance for the solution of environmental problems.

While orthodox environmental economics has no room for ecological reflexivity, it is widely hailed as central to effective environmental governance in the ascendent circles of environmental policy which we collectively refer to as environmental political economy [5–7]. Some scholars in environmental political economy go even as far as to argue that reflexivity is the "essential, and possibly the first, virtue for governance in the Anthropocene" [3] (p. 1). The same scholars are sceptical of technocratic procedures in democracies to bring about ecologically reflexive governance. They doubt that experts and technocrats have the necessary knowledge and incentive to act ecologically reflexive [8].

Instead, they argue for institutional alternatives that harmonize human and ecological interests or to put it in the words of a recent contribution: "a more fundamental critique of neoliberal environmentalism and a [political] agenda that is more transformative participatory, cosmopolitan and ecocentric" [9] (p. 2).

Participative, discursive or deliberative democracy are terms used interchangeably to describe a conception of democracy that wants "citizens to actively participate in the democratic process by seriously deliberating over important issues, not merely voting for or against candidates put forward by political parties" [10] (p. 253). Democratic theory took a turn towards deliberation starting in the 1990's and went from "strength to strength" until it also reached environmental political economy and the research on ecological reflexivity [11] (p. 3). For scholars working in environmental political economy the connection between deliberation and ecological reflexivity is straightforward and assumed. Ecological reflexivity is "an important feature (and outcome) of a deliberative system" [12] (p. 18) because not elections and constitutions but inclusive and competent discussion of citizens unleash the capacities of democracy to self-critically assess itself considering its failures and successes [13] (p. 189). Hobson and Niemeyer emphasize the positive role of deliberation with special emphasis on citizens increased willingness to favour swift action on problems like climate change when they actively participate in a deliberative environment [14]. Niemeyer shows that if a certain rate of environmental destruction is exceeded in representative and technocratic institutions a "refusal to cooperate with collective efforts, increased denial and decreased trust in institutions" emerges [12] (p. 19).

He proposes deliberative forums to counter these maladaptive discourses and achieve ecological reflexivity. Dryzek and Pickering formulate the role of deliberation in achieving reflexivity most pointedly when they characterize ecological deliberation as the "catalyst for reflexive environmental governance" [15] (p. 353).

The argument for deliberation originated in a critique of centralized, technocratic governance. Environmental political economy defines technocracy as "scientific management [which] aspired to rise above politics, relying on science as the foundation for efficient policies made through a single, central authority, a bureaucratic structure with the appropriate mandate, jurisdiction, and expert personnel" [8] (p. 7). These technocratic approaches to environmental problems, they argue, fail because science, policy and decision-making of technocracy suffer from severe epistemic shortcomings. They argue that technocracy overrates the role of science and scientific knowledge in successful policy making and underestimates other kinds of knowledge. Applied science is incomplete and leaves too many uncertainties with regard to local environmental circumstances. Deliberative theory instead emphasizes that citizens' local and tacit knowledge must be added to scientific and technocratic knowledge because citizens who are directly affected by environmental problems are likely know more than far-away bureaucrats about the problems and solutions they face.

Further they argue a technocracy is too centralized politically and too often pursues a single politically determined target with the goal to be 'efficient'. The one-size-fits-all solution of technocratic governance is infeasible because there are just too many interests at stake and too much varying knowledge to accommodate. Ecological democratic deliberation in turn favours politics that integrates and balances multiple interests and knowledge trying to harmonize them in a participative process. Lastly, the technocratic form of decision-making underestimates the relevance of local community-based decision-making. Since a central authority is unlikely to be capable to decide on important local issues and make use of decentralized knowledge, decentralized decision-making is oftentimes superior to the centralized bureaucratic alternative [8] (pp. 7–8).

Different strands of environmental scholarship from Classical Liberals to Marxists share the worry of epistemic shortcomings in technocratic governance. The deliberative solution, however, appears to be particularly successful. The "deliberative wave" caught an increasing number of countries who have adopted deliberative institutions in addition to technocratic means of environmental governance [16]. And a recent study by Willis, Curato and Smith shows how different states have established different forms of deliberative forums like deliberative mini-publics and juries to "grapple with increasingly severe climate impacts and far-reaching cuts in greenhouse gas emissions" [17] (p. 11). The theoretical and real-world success of the "deliberative wave", however, leaves the questions of the epistemic success of environmental deliberation to attain ecological reflexivity unanswered.

2. Methods and Approach to Realizing Reflexivity: Three Challenges to Ecological Deliberation

Environmental political economy that argues for deliberative democracy asserts that it will bring about more reflexive environmental solutions than technocratic environmental governance because it utilizes more knowledge the bottom-up. The epistemic challenges that are well documented from political and economic theory suggest that such an assumption that deliberation will lead to reflexive solutions is unwarranted.

2.1. Challenge I: Rational Ignorance

Ecological reflexivity through deliberation expects a lot from individual citizens. It requires that they are well-informed about different environmental goals, about how those goals can be achieved, and when they are achieved. These expectations stand in stark contrast to staggering empirical evidence. The literature reveals that citizens are largely ignorant about basic facts of political life and specifics of public policy [18] (Voters tend to be altruistic but badly informed when their votes do not count for much). The political scientist

John Ferejohn puts it: "Nothing strikes the student of public opinion and democracy more forcefully than the paucity of information most people possess about politics" [19] (p. 3). And one of the first empirical researchers on political ignorance—Philip Converse—noted: "The two simplest truths I know about distribution of political information in modern electorates are that the mean is low and the variance is high." [18] (p. 372). The political theorist Jason Brennan sums up different lines of research from the 1940s until today to demonstrate how little citizens in modern democracies know [20] (pp. 23–54). The bulk of the literature on this subject reinforces this reality [21–36].

Given these realities of such low levels of knowledge, asking citizens to deliberate about highly complex ecological questions to achieve ecological reflexivity appears unlikely to achieve its stated goal. The theoretical explanation of political ignorance advanced by the economic and political theory reinforces why this conflict emerges [15,37].

The economist Anthony Downs introduced the concept of rational ignorance finding that "in a complex society the cost in time alone of comparing all the ways in which [...] policies [...] differ is staggering" [38] (p. 141). Downs argues that voters are faced with a decision whether they should vote correctly, thus for the policy that provides her with the highest utility or incorrectly, thus for the policy that provides her with less utility. The voter's rational interest to acquire enough information to make this informed decision depends on the question of whether the marginal return to the acquisition of information is higher than the marginal costs of being a "bit" more informed. But since the electorate within a polity is usually very large, a single vote is insignificant. Therefore being informed to vote "correctly produces no gain in utility whatsoever, he might as well have voted incorrectly" [38] (p. 146). From this, Downs concludes that it is irrational for voters to acquire information for the purpose of voting—voters are rationally ignorant. Facing existential ecological degradation, widespread political ignorance and the Downsian explanation of rational ignorance in democracy simply providing 'more' democracy in the sense of deliberative democracy is unlikely to lead to ecological reflexivity. If deliberation is supposed to be the "catalyst for reflexive environmental governance", it needs to deal with the problem of widespread rational ignorance [15]. The challenge gets even harder when we turn to the empirical evidence on knowledge about the environment: Citizens are as ill-informed about the environment as about any other fact of political life.

Only 43% of the citizens in the United Kingdom, 49% in Germany, 34% in Norway and just over the majority of people in France believe that climate change is entirely the result of human action. The other part holds that natural processes or a mix of natural and human-made processes have caused global warming. This 2017 study is in stark opposition to the view that 90 per cent of scientists hold: climate change over the past century is entirely human made [39]. A 2010 study by the Yale Project on Climate Change Communication found that only 63 percent of Americans believe that global warming is happening. This means that more than one-third of the population does not believe climate change is happening at all or have never heard of the phenomenon [40]. Even more worrying is that of the 63 per cent who knew about the occurrence of climate change only 8 per cent "have knowledge equivalent to an A or B, 40% per cent would receive a C or D, and 52 per cent would get an F" [40] (p. 3). A substantial portion of the population doubt that global warming is the result of human activities and get the causes and potential solutions wrong. Large majorities incorrectly believe that "the hole in the ozone layer and aerosol spray cans contribute to global warming" which is why they believe that banning aerosol spray can help to fight climate change [40] (p. 3). An updated study from 2017 shows that only 13 per cent of Americans know that more than 90 per cent of climate scientists agree that human-caused climate change is happening. This data point is important because acknowledging a scientific consensus is a "gateway belief" for further political action [41] (p. 9). The findings of the "gateway belief" seem to be consistent throughout political change since the years of the Trump administration did not have a sizeable impact on the public's understanding of the scientific consensus on climate change. A study with more recent data from 2019 shows slightly better results on certain important

criteria but still demonstrates that more than one-third of the US citizens believe that climate change is mostly the result of natural changes in the environment [42] (p. 4).

The ignorance about climate change-related facts does not surprise when it is put in a framework of rational ignorance: A well-informed decision about climate-related policies demands that the individual citizen is interested in the acquisition of this information. Interest in acquisition depends on whether the marginal return to the acquisition of information is higher than the marginal costs of being a "bit" more informed. But since every individual action on mitigating or intensifying climate change is negligible for the heating process of the planet, so is every individual's decision to get informed. Temperatures in the future will not go down only because I, as an individual, am informed about the scientific consensus on climate change. It is irrational for individuals to be well-informed about the science on climate change—citizens are rationally ignorant.

2.2. Challenge II: Rational Irrationality

The failures of democratic decision-making through rational ignorance would be less problematic if citizens were truly rational in their ignorance. A truly rational ignorant citizen would be "almost entirely agnostic about political issues. If they decided to learn more, they would seek out information from credible sources. They would conform their beliefs to the best available evidence" [20] (pp. 36–37). Unfortunately, the evidence shows that citizens incorporate irrational cognitive biases into their ignorance. Instead, "people find it very difficult to escape the pull of their prior attitudes and beliefs, which guide the processing of new information in predictable and sometimes insidious ways" [43] (p. 767).

Caplan developed the concept of rational irrationality to answer the question of irrationality in political decision-making [31,44]. Caplan argues that irrationality can be modelled as a traditional economic good that is demanded highly when the price of being irrational is low. While rational ignorance alone does not explain systemic biases that often surround political issues, the concept of rational irrationality can.

For example, using information and evidence on climate change in a rational fashion is costly: There is information from different sources that you need to consider, and discussions about climate change can lead to unpleasant conflict with the climate change denying acquaintance and beating an intellectual foe with bad arguments just feels better than getting together with him to pool information and arrive at a conclusion which approaches the truth.

Compared to the high costs, the benefits of being rational about climate change-related information are minuscule: The climate does not cool just because an individual citizen decides to process information in an unbiased matter. The effort to put information and evidence to a rational use exceeds dramatically the expected benefit of doing so. It is not only rational to be ignorant, but also rational to be irrational. The psychologist Steven Pinker (2021) makes a similar argument when he argues that people must be rational in their day-to-day life because "we live in a world of cause and effect" and an irrational decision while crossing the street can have dire consequences [45]. But when it comes to greater questions like politics "your beliefs might as well be based on what's empowering, what's uplifting, what's inspiring, what's a good story" [46].

Dan Kahan finds similar empirical results when applied specifically to climate science. In two influential studies, he argues that citizens seldom follow the scientific consensus when they pursue political objectives but the support of their peer groups [47,48]. If the peer group of an individual has non-scientific convictions, individuals are likely to follow these convictions. Since the consequences of peer pressure on the individual seem worse than the consequences of climate change, it is rational for the individual to be rationally ignorant. Kahan calls this the Tragedy of the Belief Commons. While it is rational and beneficial for every individual to be irrational about their beliefs on climate change, the whole political belief landscape suffers under the immense collective irrationality [47,48].

We can also observe polarizing behaviour among and within partisan lines in current political groups. Groups with differing political ideologies and goals don't tend to come

together and reason together in pursuit of the political truth but develop a "us vs. them" psychology [49–51]. The outgroup members' motivations are misdiagnosed and vilified which leads to obstructive behaviour and anti-democratic attitudes [52,53]. (In contrast to the assertions of deliberative theory, political decision-making seems to jeopardize citizens' commitment to democracy [51] (p. 9). Yu Luo and Jiaying Zhao found that "despite the unequivocal scientific evidence and the overwhelming adverse impacts of climate change, there is a growing divide in the beliefs on the anthropogenic causes of climate change" [54] (p. 22). They survey recent studies and offer a view from cognitive science on the "attentional and perceptual biases" that give rise to polarization in the debates around climate change. Consistent with prior research, participants of varied experiments tend to pay more attention to the information that is consistent with prior beliefs, motivations, and values [54]. In contrast to intuition, "individuals with greater education, science education, and science literacy display more polarized beliefs on [. . .] issues" like anthropogenic climate change [55].

Motivated reasoning happens more often among educated citizens because they are better trained at interpreting evidence in support of their own preferred conclusion. They also find that educated citizens' confidence increases faster with additional bits of knowledge than the added knowledge would warrant [55] (p. 9590). If rational ignorance did not worry proponents of ecological deliberation, rational irrationality should. An account of rational irrationality challenges deliberative theory because it asks how deliberation incentivizes their citizens to become well-informed and use this information in a rational matter. Without either of them, ecological reflexivity as a goal of ecological deliberation is unlikely to be achieved.

2.3. Challenge III: Radical Ignorance

The epistemic challenges of rational ignorance and rational irrationality are put forward by economists and political scientists. But many scholars critical of mainstream economic reasoning doubt the relevance of economic reasoning. Still, they provide a powerful epistemic challenge to the assertion that ecological reflexivity can be achieved through deliberation. It is not based on these traditional understandings but on what they term radical ignorance [56,57] (Radical ignorance is also sometimes referred to as "inadvertent ignorance" [56] We stick to "radical ignorance" as advanced by Ikeda).

Scholars that advance an explanation of radical ignorance argue that often citizens "cannot know ex ante that it would be valuable to learn something—without first knowing it" [58] (p. 78). Economic reasoning is constrained in explaining limited mental capacity for deliberative decisions because economists assume that ignorance or rationality are deliberately chosen after a costs/benefits calculation [59] (p. 216).

Radical ignorance rejects this view and argues that ignorance or irrationality is not deliberately chosen. Citizens are "inadvertently, unwittingly ignorant of information that one does not know that one needs; or that one knows one needs but does not know exists; or that one needs but cannot find" [58]. While rationality and irrationality are part of decisions, radical ignorance is simply "there". Radical ignorance "is simply a basic aspect of the human condition, grounded in the fact that human beings are not omniscient" [58] (p. 75). Ignorance and irrationality are not the results of a lack of incentives. While "economists tend to view ignorance as "rational", [they neglect] the possibility that ignorance is unintentional" [58] (p. 73). What they mean by that is that economists like Caplan and Downs tend to design information searches as the discovery of previously unknown knowns, whose value is previously known and therefore easily calculable beforehand. But this model of human action does not include the possibility of radical ignorance which is the notion of ignorance precluding people from knowing which information to look for in the first place. Rational ignorance and rational irrationality base their verdict about citizens' epistemic shortcomings on "the epistemological assumption that dogmatism is a matter of affect rather than cognition, and can be avoided if only one retains a cool head" [56] (p. 199).

Evans and Friedman propose to include radical ignorance to understand political ignorance that can explain human error without an appeal to (i)rationality. However critical they are towards economic reasoning; they agree that mental limitations are a severe problem for deliberative democracy: individuals are just not rationally but radically ignorant [10,31,56,58].

This poses a crucial challenge to the idea that ecological reflexivity can be attained through deliberation: Even if citizens are well-informed and rational in their information processing, deliberation is unlikely to incorporate the unknown unknowns that radical ignorance is concerned with. It is unlikely "that environmental decisions be made collectively by citizens who consciously analyse how their action affect others' lives" because "the ends about which people know will always be a tiny fraction of the needs of dispersed and multitudinous others" [60] (p. 49). To achieve ecological reflexivity, ecological democratic deliberation must address a central problem of social coordination: It needs "to enable people to adjust to circumstances and interests of which they are not directly aware" [60] (p. 49).

The problem becomes more vivid when we consider a debate between the two political economists Mark Sagoff and Mark Pennington and their discussion about a thought experiment introduced by Sagoff and modified by Pennington. We then apply the arguments direction to our current debates [60,61] (Sagoff [61] example draws on the difference between consumer preferences and citizen preferences. While the consumer preferences in his students would love it when a company would build a huge recreational park in a National Park, the citizen's preferences in his students would revolt against that. For Sagoff, conflicts like this need to be solved through deliberation).

Imagine a group of environmentalists who are deeply and honestly concerned about the implications of climate change for the world. They propose to build a large offshore wind farm on the Northeast Coast close to Cape Cod Massachusetts, USA. The size of the wind farm would allow a drastic reduction of carbon emissions for the whole State of Massachusetts. Imagine a second group of environmentalists who are deeply and honestly concerned about endangered birds and bats in the same area. The group organizes a signature campaign against the wind farm because it endangers the rare bird and bat species in the area which would run in danger to be killed by the rotating blades. Imagine a third group of environmentalists who care deeply and honestly about the natural beauty of the Northeast Coast close to Cape Cod. They organize as a political action group to lobby the Massachusetts State Legislature to put a stop to the wind farm because the alleged ugliness of it would destroy the natural beauty of the landscape and would mean a human encroachment on this natural landmark. All three environmental groups pose legitimate environmental concerns: climate change, species protection and the protection of natural landmarks. But all three are not reconcilable. Building the wind farm would endanger the birds and destroy the natural beauty of the landscape. Not building the wind farm would save the birds and the landscape but would be a blow to the fight against climate change.

Here the concepts of rationality and irrationality do not apply. It is impossible to make a deliberate, well-informed, and rational choice about all three proposals. Individuals value different environmental goods differently and it is impossible to calculate the future rational benefits because they are in the unknown. Environmental political economists tend to favour deliberation to manage these complications through democratic deliberation [61] (pp. 38–40). But deliberation fails in handling the radical ignorance involved here. As Pennington correctly notes that

> "Democratic representatives can never access or process the complex of factors to adjust for the demand for [wind farms] accordingly. Information pertaining to ethics, local conditions, pressures on land use, and so on, does not exist as an integrated whole and nor can it be gathered into a deliberative forum". [62] (p. 246)

Citizens are not incentivized to be ignorant about the alternative uses of a strip of coast and they are not incentivized to be irrational. They simply cannot know: the problem

here lies in radical ignorance. Deliberative mechanisms will struggle with the wicked nature of environmental problems, the dispersed and tacit information about competing environmental uses of resources that involve deep uncertainties and the fundamental value conflicts of what is beneficial for nature.

3. Results: Resolving the Issues of Ignorance to Better Achieve Ecological Reflexivity

As we detail, achieving Ecological Reflexivity through the deliberative democratic processes suggested by the environmental political economy literature is unlikely. The approach suggested fails precisely because of its core claim, namely that they rely on the ability of individual citizens to engage in intense deliberative processes to ensure correction and better outcomes. Across the literature on political and policy decision making accounts of the lack of information among the public abound, and suggestions that environmental policy is in some way different are not supported. The field is so well developed that the origins of this ignorance have been thoroughly studied and at least three explanations, rational ignorance, rational irrationality, and the more recently postulated radical ignorance all provide ample evidence that the average citizen is unlikely to obtain the information necessary to use deliberation to arrive at ecological reflexivity. Deliberation cannot take sufficient advantage of the environmental knowledge of the crowd.

As a result, we are left to ask given the clear problems of technocratic solutions that have been detailed by the environmental political economy literature and the incapacity for success of deliberative democratic approaches, if an alternative approach that could account for both the realities of individual ignorance, and have the capacity to address the criteria of ecological reflexivity. Criteria that have been identified as likely to allow for better environmental outcomes.

4. Discussion: Better Achieving Ecological Reflexivity

We turn again to the tools of economics for a potential answer. Decision making within informational constraints is well understood by economists. Economists view the information contained within the market not as the product of "correct" decisions by each consumer but rather the product of individual marginal decisions that collectively reflect not just the easily identifiable information that are calculated in cost benefits for each actor, but also the latent information that exists only as the common product of exchange among the broader population [63].

A sub-discipline within economics and public policy emerged specifically to understand how to harness this diffuse knowledge and place it within a decision framework. That framework examines how market forces can be used to improve environmental decision-making. Like those who advocate deliberative democracy the advocates of market environmentalism argue that market forces contain the self-corrective forces indicative of reflexivity. They further argue that those forces may lead to better environmental outcomes than either technocratic central planning or the democratic deliberative approaches for the reasons detailed above.

The field emerged in the late 1970's in response to increasingly centralized technocratic solutions, and since then a robust literature has developed that has examined instances where technocratic solutions are replaced with voluntary action within a market frame work.

Market environmentalism turns to the realm of human action that offers solutions in most realms—markets. Such a complex issue as the environment can only be approached with the equally complex problem-solving method that utilizes as much knowledge as possible while setting up proper incentives for people to actually employ that individual knowledge and skill. Markets with clearly defined property rights and market prices have the greatest potential to achieve such a result. [64–71]

The faulty foundations technocratic or collectively determined centralized actions as solutions to environmental problems ultimately lie in the fact that knowledge necessary to address multiple issues is dispersed and incomplete. Accurately creating and choosing

policies that effectively reduce environmental problems across the board requires the use of that information either by an omniscient government that knows how every person should and will act at all times or by a deliberative process that has the same information. Not only it has to be omniscient, but omnipotent—able to actually make sure necessary actions are taken, consistently, across time. However, neither policy makers, bureaucrats, or deliberative democratic processes are omniscient or omnipotent [19,43,72–75].

Ultimately, the solution in alleviating the knowledge problem lies in relying on market processes. Favoring market solutions presents an opportunity for both the promotion of economic efficiency and the legitimate protection of environmental quality [72]. Eckersley (1993) adds to the discussion by providing a more nuanced opinion, stating that market environmentalism may prove to be the most appropriate solution for specific environmental problems, even if it cannot be used as a blanket solution to the ecological crisis [76]. Eckersley's nuanced opinion on market environmentalism is of special relevance because she is also widely hailed a forerunner of ecological deliberative democracy [77].

A careful consideration of each specific problem ensures that a shift towards free markets is not abrupt or harmful to existing issues and is cognizant that efficiency alone is not sufficient to address the social realities of environmental problems. On balance, applying free-market principles to environmentalism are observed to be promising and a better, more effective alternative to government planning, or the knowledge problem in environmental political economy discussed previously.

Improving environmental quality and ecological reflexivity requires the use of both free-markets and strong property rights. A strict adherence to private property rights will do more to secure air and water purity and sound resource management than will centralized control over the economy, even if done with this purpose in mind [78]. According to Stroup, well-defined and enforced property rights will produce the optimal results in preserving the environment, while simultaneously facilitating mutually advantageous trades [67]. Ultimately, there is a need for property rights to be both defined and enforced to eliminate the social inefficiencies of rent-seeking and misallocation resulting from government action.

Water markets are an example of how private property rights have the potential to efficiently preserve the environment without the use of government regulations. Government regulations on water have generally been observed as counterproductive in achieving its goals of improving quality and allocation [79–82]. The failure of the Clean Water Act due to its disregard to economic incentives highlighted the difficulty of balancing environmental goals with economic implications and reinforces the case for free-market environmentalism [81,83–86]. Furthermore, political lobbying, made possible due to government intervention, was cited as one of the main reasons for inefficient allocation of water and the degrading quality of most water sources [80].

Anderson and Simmons and Gardner demonstrate how water markets have consistently outperformed governmental action of the watershed [66,82,84]. Howe supports this notion, describing the concept of a free water market as being more flexible, secure, predictable, and fair compared to other allocation methods [87]. Weinberg argues that water markets may reduce irrigation-related water quality problems as well as improving allocation efficiency [88]. This potential benefit was examined with a model developed to simulate agricultural decision-making in a drainage problem area in California's San Joaquin Valley. The results indicate that a 30% drainage goal is achievable through improvements in irrigation practices and changes in cropping patterns induced by a water market. Weinberg acknowledges that water markets may not achieve a cost minimizing solution. However, he believes that they are a practical alternative to environmental policies such as Pigouvian taxes.

Similar problems are found in them management of timberland. The National Forest Service, Stroup and Baden found, succumbed to the special interests of petitioning groups, granting, transferring, or revoking property rights behind closed doors [89]. Yonk et al. finds a similar problem in the management of the Elliott State Forest [90]. O'Toole proposed

that shortages of timberland were the direct result of failure of the National Forest Service to use market prices [91]. Here, the authors suggest that a regime of property rights would be more transparent, effective, and less wasteful, because it would not introduce, as Baden noted another common pool resource to be depleted by special interests [64].

Market environmentalism does not argue that all problems of pollution or depleting natural resources like fisheries or land will simply disappear with introduction of markets and private property rights. The common law is another element that must be present in order for free-market environmentalism to thrive. Environmental common law predominantly involves tort law, which extends the protection of the environment through awarding damages to plaintiffs. Meiners and Morris (2000) argue that Common law is as fit, if not more, to deal with market shortcomings if such arise [79]. They further suggest that reinvigorating the spirit of common law may encourage individuals themselves to engage in protection of their local environment without the need for a centralized system.

Environmental concerns have already begun to reshape the landscape in which global organizations and individuals compete. The demands and influences of the environmental movement are evident in the dollar value size of the environmentally conscious marketplace and corporate strategies [92,93]. Environmental entrepreneurs have taken the personal initiative to mobilize resources and manpower for private conservation efforts [94]. When locals bear direct costs of participation and benefits of preservation through their own actions, much success is achieved [95]. Baden and Snow maintain, however, that government management has alienated local groups and people from these activities, and that the solution is to reduce the role of the government in environmental issues [96]. Pennington (1999) concludes that the current extent of government intervention has actively suppressed the emergence of private solutions to issues like land-use problems through a continued adherence to policy prescriptions that do not allow markets to work [97].

Historically, attempts to solve environmental issues prove to be inefficient or even detrimental in certain situations, doing more harm than good. The inevitable struggle with the knowledge problem often results in the misallocation of resources and money, rent-seeking, and inaccurate cost-benefit analysis. The balance between considering both environmental issues and economic incentives is often ignored. Action that inhibits the emergence of private solutions which are often more efficient and effective in solving problems work against environmental improvements. Ultimately, market environmentalism, and the reliance on market processes can provide potentially better outcomes. Both defined and enforced property rights as well as a strong legal allows market environmentalism to harness the dispersed knowledge of the crowd and achieve ecological reflexivity that ultimately leads to better outcomes.

5. Conclusions

Environmental issues are among the most difficult problems to address, and the standard environmental economics and environmental political economy literatures have failed to provide consistent implementable solutions that make use of the dispersed environmental knowledge of the crowd and lead up to ecological reflexivity. Instead, they rely either on the unresponsive centralized solutions suggested by the traditional policy approaches or attempt to engage citizens with few incentives to overcome their well-established ignorance in an intense deliberative process to determine what the outcomes should be, how to achieve them, and how to know when those objectives are achieved.

The evidence shows that citizens are not just rationally ignorant but also rationally irrational. Even if they acquired the necessary information, they are unlikely to be able use it effectively because it is rational for individuals to incorporate irrational cognitive biases into their political reasoning. We doubt the knowledge-generating capability of deliberative democracy because it struggles with radical ignorance, namely the wicked nature of environmental problems, the dispersed and tacit information about competing environmental uses of resources that involve deep uncertainties and the fundamental value conflicts of what is beneficial for nature.

We suggest that solutions that meet the reflexivity requirement must be consistent with how individual citizens use information and rely not on high levels of individual knowledge but rather harnesses dispersed knowledge. As the market environmental literature indicates, market focused solutions stand the greatest chance of achieving those outcomes. Market decisions by individuals do not require high levels of information and the tacit information present within the broader population can be coordinated through the aggregation effects of the market itself. Environmental markets are likely to better harness the environmental wisdom of citizens. While a substantial literature exists it is clear that better examinations of the results of market environmentalism that directly consider ecological reflexivity are necessary if we are to achieve improved environmental outcomes.

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