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Climate Change, the Knowledge Problem, and the Good Life

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Abstract
We must address the challenge of climate change through the prism of the knowledge problem and—no less important—from the perspective of the good life. When discussing our society's big problems, we tend to assume that we have the knowledge required to act on them. We also tend to assume that our intentions will translate seamlessly to the desired consequences. Knowledge problems are why both of these assumptions can be wrong—and why they can lead to unintended outcomes, some of them disastrous. This paper briefly outlines some of the problems with our knowledge of climate and energy systems, how these problems can affect planning and policies on climate change, and how these plans and policies come to bear on the conception of the good life. The case of biofuels policies illustrates these problems.

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"The curious task of economics is to demonstrate to men how little they know about what they imagine they can design."
—Friedrich Hayek

I. The Unknowability of Future Advance

Fifty years ago, the thought of seven billion people on earth seemed impossible. Another fifty years before that, the idea of three billion people on earth looked unimaginable. Two hundred years ago, the idea of two billion people would have sounded heretical to

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anyone—most of all Alfred Malthus, who gave more thought to this question than perhaps anyone else. And yet, the impossible, unimaginable, and heretical all came to pass, as the earth has supported these huge numbers and the population continues to rise. It has done so because humans have invented new resources and new ways of dealing with resources that were revolutionary and changed life as we know it drastically. These inventions include the steam engine, fertilizers, desalination, antibiotics, and immunization, to name but a few. They were not only revolutionary; they were fundamentally and completely unforeseeable. Even when they were invented, no one could have foreseen the incredible impact they would have on humanity. Who could have guessed that a little tinkering with a pump in northern England would launch the Industrial Revolution that would completely change the world?

At every point in history, we are ignorant of what humans' future actions and ingenuity will bring about. They might bring about another revolutionary engine utilizing a new energy source, a cure for cancer, or a nuclear war. Or, they might not. However, we can be sure there will be new discoveries as a result of restless tinkering and the imagining of heretofore inconceivable possibilities, and the cumulative force of these discoveries will change things. The trouble is that we can never predict their arrival. If we could, they would not be new discoveries. As philosopher Karl Popper quipped, to predict the wheel is to invent it (MacIntyre 2011, p. 109). The key insight that allows us to understand the logic of scientific discovery is that it is fundamentally unknown before it happens.

Understanding this point is very important when thinking of mechanisms to address climate change. It is unwise to put all of our eggs in the basket of technologies that are not yet proven, because the evolution of these technologies is uncertain, and because relying on them might hinder the development of newer ones that we have not anticipated. The experience of investing heavily in biofuels development illustrates this lesson.

Since the "energy crisis" of the 1970s, biofuels researchers have touted cellulosic ethanol as the technology that will make biofuels a viable, significant contributor to the energy mix.[1] This promise has

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[1] See, for example, Doering and Peart (1980), where the authors state, "In 3 to 5 years, technology advances should occur that will allow the conversion of cellulosic materials, tree trimmings, old newspapers, crop residues, etc., to alcohol on an economic basis." The same Doering coauthored a report twenty-eight years later that claimed, "Currently, ethanol derived from corn kernels is the main biofuel in

consumed ever-increasing subsidies and incentivized many biofuel-supporting policies. Yet, after decades of subsidies and expected innovation, the promise of cellulosic ethanol has not materialized. Instead, the subsidies to biofuels have led to mass deforestation and to the development of dirty sources of biofuels. But perhaps most importantly, by tying up vast resources and brain power in the so-far futile search for this one energy source, policy makers may have prevented the emergence of other, better energy sources.

We ought not to rely on uncertain technologies as magic bullets, but remain open to unforeseen possibilities of technological advance. It will not be possible to make a correct choice, ex ante, of which technologies will succeed in addressing climate change. The technologies that will succeed will do so by proving themselves in the real world, not in a theoretical study before they are implemented. As such, a tax on carbon would have been a far better policy, as it would have incentivized the innovation of all carbon-friendly technologies while taxing and punishing all carbon-intensive technologies.

II. Knightian Uncertainty

To succeed in the task of controlling climate change will generally require us to take into account that social and economic systems are involved. One trouble this involvement causes is that the response of the actors in such a system is uncertain.

An extreme, though admirably clear, definition of uncertainty was introduced by the American economic theorist Frank Knight in his 1921 book *Risk, Uncertainty, and Profit.* In Knight's terms, uncertainty meant a condition in which the probabilities assigned to various contingencies and factors are *unknown*—"unmeasurable" in his terminology (Knight 1921). Knight may have had in mind that in the social world, such as a national economy, there may have been unseen changes in conditions, so there are no time series data from which to form a reliable estimate of the desired probability distribution(s). The Chinese have a familiar proverb underlining that point: "A man in the river can never stand in the same place twice."

But Knight may have had in mind something bigger. In recent decades, a few economists have emphasized that our knowledge of how the economy works—how things are interrelated—is bound to be "imperfect." We cannot understand fully an economy as complex

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the United States, with ethanol from 'cellulosic' plant sources (such as corn stalks and wheat straw, native grasses, and forest trimmings) expected to begin commercially within the next decade" (Schnoor et al. 2008, p. 1).

as the real-life one we face and even work in. This problem would exist even in an economy in having only a single innovator taking novel steps in the face of the unknown. It is hugely magnified by the restless experimentation and ceaseless originality occurring throughout the economy in the present and future. This experimentation, by definition, introduces unforeseen changes in production processes that can cause unforeseen consequences for policies that are blind to these possibilities.

This sort of uncertainty can bedevil well-meaning plans for combating climate change, and biofuels provide another example. When the European Union mandated increased concentrations of biofuels in its transportation fuel, the presumption was that this requirement would reduce fossil fuel combustion and therefore reduce carbon emissions. But as consumption of biodiesel increased to meet the EU mandate, entrepreneurs introduced an unforeseen production method: southeast Asian peatlands, immensely rich with carbon, were burned down to grow palm trees to produce palm oil. This process likely produced carbon emissions that were orders of magnitude larger than the emissions saved from reduced fossil fuel use in Europe. By being blind to Knightian uncertainty, policy makers had presumed that they could measure with certainty specific polices' impact on carbon and the environment. But when their policies were carried out, the consequences were very different than what they had measured and anticipated, and the exact opposite of what was intended.

III. Human Action vs. Human Design

The great philosophers of the Scottish Enlightenment made the enormously important distinction between what is of human design and what is the product of human action yet not of human design, a distinction which seems to have been lost over the centuries. As Scottish philosopher Adam Ferguson put it, "Every step and every movement of the multitude, even in what are termed enlightened ages, are made with equal blindness to the future; and nations stumble upon establishments, which are indeed the result of human action, but not the execution of any human design" (Ferguson 1782, p. 205). This distinction is highly applicable to the problem of energy systems and climate change. Hayek developed the thesis that where knowledge is greatly specialized and therefore private and dispersed, uncoordinated human action in a society produces outcomes that are beyond what could have been imagined, let alone achieved, through the "design" imposed by a centralized system (Hayek 1988). A centralized system would be incapable of drawing upon all the knowledge and imagination that, though specialized, a decentralized system could draw upon.

How we approach thinking about these problems is of enormous importance. Vernon Smith distinguishes between two types of rationality: constructivist rationality and ecological rationality. Smith defines constructivist rationality as the "deliberate use of reason to analyze and prescribe actions judged to be better than alternative feasible actions that might be chosen." Ecological rationality, on the other hand, refers to "emergent order in the form of practices, norms, and involving institutional rules governing actions . . . created by human interaction but not by conscious human design" (Smith 2007, p. 2).

Constructivist rationality is what humans deliberately use when solving problems, choosing a course of action, designing machinery, inventing new technology, or trying to understand physical processes. It is what our brain learns to do through education. Constructivist rationality is what has produced the inventions, machines, devices and technological innovations that have improved our lives.

Ecological rationality, however, refers to order that exists without the direct reason of any individual designing it or implementing it, but that is also not a natural system arising independently of human action. It emerges through countless individuals acting and interacting with each other: "human action, not human design," as Ferguson puts it (Ferguson 1782, p. 205). It is an order whose details cannot be forecast or expected beforehand. After it emerges, however, it is at times possible to apply constructivist rationality in order to understand its properties and its process of emergence.

Smith maintains an evolutionary framework for understanding the emergence of ecologically rational systems: "But in cultural and biological coevolution, order arises from mechanisms for generating variation to which is applied mechanisms for selection. Reason is good at providing variation . . . but it is far too narrowly limited and inflexible in its ability to comprehend and apply all the relevant facts in order to serve the process of selection, which is better left to ecological processes that implicitly weights more versus less important influences" (Smith 2007, p. 38).

Whereas constructivist rationality is what provides us with particular designs, it is an ecologically rational selection process—which is the result of the actions of various individuals—that produces the ecologically rational system that employs some of these constructivist rationalist designs.

A common problem in thinking of our energy systems and climate change is the presumption that we can design our energy systems like we can design cars, to give us specific results; that we can apply the tools of constructivist rationality to design ecologically rational emergent orders.

Our existing energy systems are the result of countless actions by countless individuals producing, consuming, conserving, and constantly searching for ways to meet ever-increasing needs and demands. Numerous energy providers exist: electricity generation companies, fuel producers, gas stations, gas distributors, corn ethanol producers, nuclear power plants, and so on. There is also a large variety of energy consumers: individuals in their homes and cars, commercial enterprises, and industrial producers. Each of these agents has a large array of energy choices to choose from virtually every day in every decision they make. These decisions can be trivial, such as which fuel or gas station to use for the car, or more radical, such as what energy source to use for house heating or an industrial process.

The result of all these decisions is an ecologically rational order brought about through the action of all humans and the design of none. When viewed after the fact, the tools of constructivist rationalism can be brought to bear to analyze it. We can, for instance, draw up charts that break down energy consumption into energy sources (nuclear, fossil, biofuels, etc.) or energy uses (industrial, transportation, heating, etc.) and call this an "energy system." It would, however, be a striking example of what Hayek referred to as the "fatal conceit" to imagine that we can then design such a system using the tools of constructivist rationalism.

Just because we can analyze the results of these ecologically rational orders using constructivist tools does not mean that we can design them using these tools. The distinction is enormous; to presume we can design what is not designed could lead us to go down a road that leads sooner or later to ruin. The experience of U.S. energy policy in the aftermath of the 1970s "energy crisis" is a vivid example of such a failed attempt at constructivist design of ecologically rational energy systems.[2] The experience of socialist attempts at designing economic systems is a bigger and more

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[2] For more on this episode, see Lee, Ball, and Tabors (1990).

disastrous example of the same problem, and an example that unfortunately continues to survive in a few heavily communist states.

The experiences of the United States and European Union with biofuels policy provides another vivid example of the consequences of this confusion. Biofuels were touted by their enthusiasts as a magic bullet that would help the world avert an energy crisis, ameliorate the climate crisis, and offer an opportunity for the world's poor to escape poverty by planting valuable energy crops. In time, biofuels have proven to be a disaster on all of these fronts: they have certainly not helped in reducing fossil fuel consumption in any meaningful way, and they may have even increased it.[3] Biofuels have also almost certainly led to an increase in greenhouse gas emissions and massive environmental destruction. And finally, biofuels have undoubtedly played a role in the recent escalating food crisis that has placed hundreds of millions of people under the threat of starvation.

These negative outcomes occurred not because biofuels are inherently "bad" fuels, nor were they due to some unforeseen disaster, nor to any specific mistakes on the part of any specific actors. Rather, they occurred because it was presumed that we could think of the energy mix of the European Union and the United States as something we could design, mandating how much biofuel to use, knowing what the impact would be. Biofuels policies undoubtedly influenced EU and U.S. energy systems, but not as policy makers intended. The complex emergent energy system, which is the product of human action and not of human design, did not react to human design attempts as designers intended, validating, yet again, Hayek's warnings about the fatal conceit (Hayek 1988). Rather, humans everywhere reacted to these design attempts in ways that met their own ends. The complex system emerged from these human actions and looked very different from designers' intentions. Understanding Ferguson's distinction is essential to understanding how such policies backfire.

The end result of the past decades' experimentation with biofuels has been disastrous. It has caused massive increases in deforestation in southeast Asia, species loss, and increased production of costly, dirty and inefficient fuels. Also, massive government spending was wasted on all these projects and used to subsidize unproductive big farms. And political capital that could have been used for

[3] Two papers that make this case are de Gorter and Just (2008) and Grafton, Kompas, and Van Long (2010).

implementing good policies has been wasted on bad policies. In time, biofuels policy worsened every goal it aimed to improve. And as a response to this massive failure, we see governments forging ahead with even more of these disastrous policies.

IV. Trading Off the Good Life for the Good Earth

There is another perspective on programs for control of climate change—for energy, conservation, alternative energies, greenhouse gases and the other programs. Much advocacy for these initiatives implies that the rewards to society from private enterprise and competitive markets are of a lower order compared with the rewards that the new public initiatives are intended to bring. In this view, the social entrepreneurs have arrived in time to rescue society from capitalism's entrepreneurs and financiers, who have been using available resources to cater to all those lower-order wants. More precisely, the premise seems to be that preservation of the physical world more or less as it is today—in terms of temperature, biodiversity and so forth—ought to be mankind's highest priority. The lower-order wants may be addressed, but the use of resources for satisfying those wants is henceforth to be constrained by the new public imperatives.

Two objections can be raised. First, without capitalism, which is our best hope for growth of productivity and the maintenance of social harmony in the world, it may become more and more difficult to get on top of emerging environmental problems. To arrogate science over business as the planet's salvation is to be guided by the "scientism" that deluded so many economic leaders, from Mussolini to Stalin to Mitterrand, in the twentieth century. Putting so much reliance on science to the neglect of economic dynamism proved to be a bad bet. Further, positing a primacy of science over individualist capitalism presents a false dichotomy between the two that can be easily exploded by an examination of the scientific advances arrived at through free enterprise. The steam engine, perhaps the modern world's most pivotal innovation, was not invented by state-appointed scientists tasked with bringing about an industrial revolution. Instead, decades of trial and error by various mine workers and technicians succeeded in conceiving out of ordinary pumps a steam engine. Not one of those inventors could have foreseen the revolutionary impact that advanced pump would have on the planet.

Second, in the humanist philosophy, what is fundamental is the prospect of the "good life." The good life is a life of exploration, discovery, creativity, problem-solving, and personal growth. A humanist would say that society's establishment of economic structures that enable the good life should not take a back seat; that it would be unacceptable to sacrifice some part of the good life to avoid a survivable degradation of the environment. The constraint is on the other foot. The earth is the platform for human endeavor. The earth ought to be the means, not the end.

Capitalist systems—well-functioning ones, at any rate—are all about ideas, experiment, and imagination. They are about the innovating that goes on in business from the bottom up. These systems offer central humanist rewards: prosperity—available work at engaging, challenging jobs—and the fulfillment and personal development that come from ventures into the unknown. Moreover, because these systems draw upon the experiments and imaginings of ordinary people, the rewards tend to be spread widely—to be inclusive, not clubby, and popular, not elitist. It is reasonable to fear that a major shift of resources from private projects to public projects would significantly contract the opportunities and incentives for innovation in the private sector.

Companies that come to be under government contract for these public projects would find themselves having only one client—the government—to which they could offer an innovation rather than the entire array of diverse consumers. We do not want an expansion of new public initiatives so broad that it risks having the unintended consequence of causing a significant reduction in the opportunity of ordinary people in the business sector to innovate and to flourish.

What, then, ought to be our policy framework? The "good earth" is the earth that contributes most to the good life. (Think of an inverted U describing the goodness of life as a function of the goodness of the earth. We want the earth that puts us at the top of the hill—at the golden mean.) We don't want "improvements" of the earth that come at the expense of the good life—to the extent we have it now.

From this same perspective of the good earth, we must keep in mind that this issue is even more pressing for residents of developing countries. Compromising the good life in these countries will carry more significant and devastating implications than it will in rich countries.

Prince Charles has suggested that "capitalism may not be possible without saving the planet." We have suggested that saving the planet may not be possible without capitalism. We have further argued that some of the "best-laid plans" to improve the earth may have unintended consequences that put such a damper on capitalism as to cause humankind some loss of our good life. Worse, acting based on a lack of knowledge may cause a loss of our good life even while making the earth's state worse.

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