

## *Preface*

### *The Argument in Brief*

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A simple question motivates this book: Can “green” sustain growth? The notion of “green growth” emerged as a justification for investments and policies intended to address the challenge of climate change. In that conflicted political environment, green growth was a powerful temptation: if climate policy can generate the jobs and productivity growth necessary to sustain rising incomes, then sustaining political support becomes much easier. We could act regardless of whether we agreed on bigger questions about the threat of climate change, the size of the damages it threatens, or the urgency of action.

To some, the answer to this question seems obvious: build the emissions-free windmills and solar energy systems, and in one stroke we reduce carbon emissions and create jobs. But the reality is more complicated. Building out a new green energy system may provide temporary stimulus, but it is not immediately evident that it is the source of sustained growth. For now, “green” energy — energy that entirely eliminates or substantively reduces carbon emissions from energy production — usually costs more than traditional energy sources. This both annoys consumers and raises costs for producers, requiring them to adapt to new energy sources that otherwise offer them few advantages. Similarly, arguments that green energy sources generate more jobs than traditional sources per, for example, kilowatt-hour of electricity also imply that those jobs are less productive, requiring more workers to accomplish the same thing. There is, then, an economic price for green energy in the short term. Whether green can overcome these short-term costs to create growth is thus at present unclear. The present enthusiasm for it thus appears more religion — taken on faith — than reality.

Can we move green growth from religion to reality? Part I of the book grounds the answer to this question in the idea of energy systems transformation. Taking emissions out of the energy system will require a radical recasting of the energy system. Consider electricity. Green energy sources like wind or solar power fluctuate with the natural cycles of the wind and sun they depend on. Experience has shown that this intermittency risks destabilizing existing power systems as the share of green energy rises. Hence, there are limits to how much of today's electricity generation we can replace before we have to look elsewhere. That elsewhere poses similar problems. We could, for instance, smooth these fluctuations by storing excess power on very windy days for use on calm ones. But for now, storage remains exceedingly expensive. To take another example, today's power grid is designed to bring power from big, centralized power plants to small, diffused consumers. But wind, solar, and other renewable sources will likely be diffuse themselves and located wherever natural conditions are most favorable. Hence, we will eventually need to rethink today's grid infrastructure as well. Finally, even more comprehensive solutions, like the "electrify everything, decarbonize electricity" proposals from Williams et al. (2012) and others, require still broader changes encompassing transport as well.

Part I of the book argues that green growth, if it is to help sustain the political consensus for climate policy, must find ways to exploit this wholesale transformation of the energy system for economic gain. Historically, radical changes in energy systems, whether in shifting from wood to coal, shifting from coal to oil, or electrification, all supported dramatic economic gains by changing what we could think of producing and how fast or cheaply we could produce it. More generally, technology systems transformations, such as the sequence of communications revolutions running from the telegraph to the Internet, can generate an entire universe of unanticipated opportunities throughout the economy that sustain growth. In the same sense, a low-emissions energy systems transformation may hold significant opportunities. But the economic possibilities of a transformed energy system — and the political support those possibilities may generate — will only become clear as we pursue the transformation itself. Consequently, the costs will remain evident, while the gains are murky and in the future.

Part II of the book takes up the political question posed by the present uncertainty surrounding green growth. If green growth proved to be a reality, its economic potential would generate powerful support for climate policy. But that potential will only become clear in the process of pursuing a low-emissions energy systems transformation. That transformation will, in the short term, generate higher costs and political opposition from those it displaces.

So far, that opposition—from powerful, organized industrial interests—has effectively resisted efforts to rapidly reduce emissions, even when those efforts garnered broad public support. Hence, how can the political support for systems transformation be sustained long enough to discover the economic potential that can sustain political support for it over the long term?

We frame our answer to the question arguing that countries successfully pursuing green policy share a particular political dynamic: a green spiral. At its core, we argue in Chapter 5, the green spiral reflects a process of mutually reinforcing feedback between climate policy and industrial interests, in which the development of new infrastructure and energy approaches creates new economic clienteles who then become advocates for further action. This self-reinforcing process helps explain how market-driven, profit-oriented constituencies for climate action can emerge. These green industrial interests help stabilize policies in place and push for new policies, offsetting opposition from interests tied to the preexisting system.

The countries profiled in Part II illustrate the different nature of the green spiral for developing and developed countries. For the advanced countries, the task is reconstituting around green existing and successful energy systems. For the emerging markets, the task is not only how to provide green but how to expand the energy system itself rapidly enough to sustain economic growth. In all cases, although the outcomes differ, the particular policies adopted are shaped by the existing energy system. The existing system sets up both the economic possibilities and political fights surrounding emissions reduction.

In particular, these cases illustrate how contingent a green spiral can be. Among the rich countries, successful green growth strategies have all built a green spiral atop incremental policy steps often unrelated to the actual climate problem. The Danish case demonstrates how a strategic concern about energy security triggered an energy system development that today has culminated in broad political and industrial support for completely removing fossil fuels from Denmark's energy system. In the European Union more broadly, new concerns about energy security interacted with long-standing industrial prowess in green technology to generate policy opportunities for using climate policy to solve challenges and promote new markets. Korea's green growth strategy represented under the Lee administration an opportunity to mobilize industrial interests to confront obstacles to the next phase of growth in the Korean economy.

In contrast, countries with weak or nonexistent green growth strategy have failed to translate small tasks to big ambitions. In the United States, policy experimentation at the local level has proved successful, but that success has yet to overcome gridlocked national politics. Instead, green coalitions and

xiv policy experimentation in the United States have emerged principally at the level of the individual states such as California and Colorado. Most evidently, in the California case, acute problems of smog and a concern with the risks of nuclear power provoked specific policies that, over time, became the foundation for new action on climate change. But local success in the United States has made little difference at the national level, where the balance of policy constitutes a significant subsidy for fossil fuel and nuclear power and what isolated efforts at energy systems transformation exist remain mired in political controversy. Meanwhile, Japan decoupled pollution from economic growth and became the paragon of energy efficiency. Yet, energy policy has been dominated by brown interests, principally those who support and defend the current fossil fuel–intensive energy system, and their allies in the nuclear sector. It remains to be seen whether the Fukushima crisis will become a critical juncture in the emergence of a green growth strategy.

The chapters on emerging markets illustrate a very different policy dynamic: how a green spiral might reconcile the competing objectives of rapid development and sustainable development. While Brazil and China arguably remain “brown” countries, they have both shown leadership in major areas of green technology: biofuels for Brazil and solar electricity for China. Furthermore, as the chapter on India suggests, both distributed renewable energy and energy efficiency may provide superior solutions to energy poverty when bureaucracies and politics make expanding the traditional energy system difficult.

In short, moving green growth from religion to reality is as much a political task as a technical or economic one. We reach that conclusion by addressing three questions in the next chapters: Where might the growth potential of low-emissions technologies come from? What would allow economies to discover and maximize this potential? What do ongoing national experiences tell us about the politics of green growth? We suggest that green might well offer new sources of productivity improvements and new forms of production. But exactly how remains an open question. Addressing climate change and answering that question will require a systemic transformation of today’s fossil fuel energy systems. Initiating and sustaining that transformation will, we conclude, require policy makers to find immediate material gains from transformation that can sustain the search for broad growth opportunities capable of supporting our long-term goals for the economy, the environment, and the planet at large.