

Introduction

Environmental Economics in Context

I looked around the store and there was nothing but healthy people, educated-class naturalists.... They were evidently well informed about their outdoor gear options, judging by their boots, packs, and shopping bags. Moreover, as they sat there reading Aldo Leopold's *A Sand County Almanac* ..., they radiated environment concern. Here was a community of good stewards, people who were protecting the earth and themselves. Nature used to mean wildness, abandon, Dionysian lustfulness. But here was a set of people who went out into nature carefully, who didn't want to upset the delicate balance, who studied their options, prepared and trained.

—David Brooks, *Bobos in Paradise* (2000)

Inevitably, humanity conceives its relationship with the natural environment by holding together two contradictory ideas. We delight in the wilderness as we encounter it, beautiful and sublime, and we bend it to our will, making it tame and useful.

Economists too have wrestled with that tension. Consider their efforts to quantify nature. Over the course of the twentieth century, these efforts evolved along with other efforts to measure an ever wider range of objects in monetary terms. For example, economists began to measure abstract indices like Gross Domestic Product and inflation as well as the benefits and costs of public investments. When they similarly turned to quantifying natural resources and the environment, economists realized that if they limited themselves to those resources traded in markets, which come with a readily observed market price, they would omit much of what society holds dear. On the other hand, to quantify the value of untraded nature would seem to focus attention on its tame and useful aspects, or even, in some sense, to tame it.

This book is a history of how economists have thought about this dilemma. Far from being a comprehensive review of everything that could

be classified as environmental economics, it is limited in time, space, and subject matter. First, it focuses on the twentieth century, especially the postwar period up to the 1980s.¹ This limitation fits the modern environmental movement. Indeed, as Hays (1982) and other historians have emphasized, merely to use the modifier “environmental” is already to restrict oneself to the postwar period, when the environmental movement emerged through the realignment of two earlier movements, one grounded in the rational planning and conservation of material resources, the other emphasizing the beautiful and the sublime. In the United States, these earlier movements had been represented by Gifford Pinchot and John Muir, respectively, but similar tendencies existed globally. With the concept of “environmental” being new, the term “environmental economics” was not used until the late 1960s, becoming common usage around 1970.²

Second, though European influences certainly play a role, the book primarily focuses on applied economics in the United States. This focus is reasonable as well, as US economists had enormous influence on the profession worldwide in the postwar period. Too, they were among the first to conduct large-scale benefit–cost analyses of natural resource projects and environmental regulations. Nevertheless, this limitation leaves much ground uncovered.³

Finally, the book also focuses on economists’ efforts to understand and quantify the value of scarce environmental resources and amenities, particularly by institutional and neoclassical economists of various strands. This emphasis thus leaves for others to explore additional aspects of the history of environmental economics, including property rights and institutional

¹ Previous books on the history of environmental economics include Kula (1998), de Steiguer (2006), and Wolloch (2017). De Steiguer (2006) considers the history of modern environmental thought through a series of episodes, many of them intersecting economics. Kula (1998) and Wolloch (2017) consider a broader sweep of the history of environmental economic thought.

² The term first appears in JSTOR (an electronic database of publications) in 1966, with the announcement of a new Environmental Economics Branch, in the new Natural Resources Division of the USDA’s Economic Research Service. The branch was to be “concerned with recreation and natural beauty; resource conservation and multiple use; quality of the environment, including air and water pollution; and urbanization of rural areas” (*Journal of Farm Economics* 1966 p. 177).

³ In recent years, several authors have considered international aspects to the history of environmental economics. Fourcade (2011) makes interesting comparisons between US and French approaches to valuing nature. Franco (2018), Franco and Missemer (2023), and Røpke (2004) consider the international history of a more heterodox ecological economics. Leonard (2019) considers the small-is-beautiful approach of German-British economist E. F. Schumacher.

factors; causal studies of the effects of environmental quality on human health and economic productivity; and modern heterodox approaches such as ecological economics, which tends to emphasize the biophysical constraints on economic activity.⁴

Following this introduction, Chapters 2 and 3 discuss the prewar historical context inherited by environmental economics. Rational planners like Pinchot and romantics like Muir had been at an impasse, holding incommensurable values. One wanted to tame wilderness and bend it to human wants, the other accepted it for what it was. In the following decades, economists and others trying to measure the economic value of wilderness concluded it could not be done. In their view, because economics was a study of material wealth, whereas wilderness involved decidedly immaterial and intangible experiences, economics simply could not address it. Thus, at the mid-century mark, there appeared to be little future for anything like an environment economics.

As discussed in the remainder of the book, that inauspicious beginning was overcome, slowly in the late 1950s, then swiftly in the 1960s. By about 1970, one could recognize the existence of a new and successful research program in environmental economics. This success was attended by three key moves. One was to approach the problem of valuing the environment through the lens of the consumer enjoying environmental amenities, rather than through the lens of a producer using natural resources as a material input. For example, Chapter 4 tells the story of efforts to incorporate outdoor recreation into benefit–cost analysis, by modeling individuals as consumer “purchasing” a recreation trip when selecting where to travel.

Indeed, economists during this period were considering increasingly abstract measures of consumer welfare for ever more intangible objects. Whereas, in the 1940s, they viewed outdoor recreation as too immaterial to value, by the 1970s, it was on the more material and concrete side of the spectrum of things they were attempting to value. As told in Chapter 9, economists then were extending measures of environmental values from uses such as recreation to so-called “non-uses:” values for simply enjoying the existence of wilderness.

A second move was to accompany the broader economics profession as it redefined itself as the study of tradeoffs and opportunity costs, rather

⁴ Franco (2018), Franco and Missemmer (2023), Missemmer (2017, 2018), and Røpke (2004) consider the history of ecological economics. The bio-physical approach has led to some very different suggestions for pricing the environment from the neoclassical approaches discussed in this book (e.g., Costanza, Farber, and Maxwell 1989).

than as the study of material welfare. As discussed in Chapter 5, the economist John Krutilla pointed out that there is always a tradeoff between developing a natural resource or preserving it. The price we pay for developing a resource is the opportunity cost of enjoying the natural amenities (and vice versa). As discussed in Chapter 7, Thomas Schelling and others similarly considered how to value health and mortality risks. They argued that, while, from one point of view, an individual life may be infinitely precious, from another individuals are constantly making tradeoffs between small *risks* and other goods.

A third move was to draw on the large body of thought by land economists and others on property rights. For example, Chapter 6 discusses work by Allen Kneese and others on how to use pollution fees to incentivize pollution abatement. This work drew on the American experience with designing new institutions to govern common property resources, ones that create a different set of incentives than private property. Whereas when property is held privately people have an interest in caring for it, when it is held in common their private interests push them toward over depletion. Thus, farmers may have an incentive to exhaust the fertility of a commonly owned farm or to overuse water from a commonly held source, fishers may have an incentive to overfish the seas, and so forth. Experience with these problems informed the work of applied economists in the 1960s as they began to think about the degradation of commonly held environmental resources.

Although focused on postwar pricing of the environment, the story told in this book obviously fits into a wider historical context. The remainder of this introductory chapter reviews six topics in the history of economics that serve as essential background. These include: (i) the long history of thinking about humanity's relationship to the natural environment, (ii) the increasing role given to the consumer in the twentieth century, (iii) ideas about pricing and incentives as found in the public finance literature during the period, (iv) the creation of separate schools of agricultural economics in the early twentieth century, (v) developments in postwar neoclassical economics, and (vi) the spread of economists into government and think tanks.

1.1 The Economy of Nature

Almost axiomatically, human thought about the natural environment is as old as our interaction with it. While a book on postwar environmental pricing is no place to attempt a thorough survey of such vast ground, it

will be useful to establish some of the enduring questions and themes that thinkers have wrestled with.⁵

In the opening chapters of *Genesis*, we read that God created the world, and all that lives in it, and declared it to be good. After creating humanity, He gave to us all good things to eat and commanded us to name the animals and to till the garden. Taking this as an origin story about the history of thought about our natural environment, we find already three dialectics that remain in tension over time. First, according to this account, we are placed into a natural world that is outside us and exists independently of us. Yet in this, we are no different than the plants and animals, so if they are part of “nature” then so too are we, and presumably so too is our relationship with them. Second, insofar as we use it to meet our own need for food and other material needs, we receive nature passively, as a gift, yet we also inherit it to actively manage, as a gardener. Third, taken in isolation, this parable of a gardener and a garden invites an anthropocentric thinking that situates the worth of nature in its instrumental use. Yet it is nested within a broader story, in which the inherent worthiness of nature is antecedent to humanity.

In his posthumously published essay *On Nature* (1874), John Stuart Mill (1806–1873) made a sharp distinction between two senses of the word. He wrote,

[I]n one sense, [“nature”] means all powers existing in either the outer or inner world and everything which takes place by means of those powers. In another sense, it means, not everything which happens, but only what takes place without the agency, or without the voluntary and intentional agency, of man. This distinction is far from exhausting the ambiguities of the word; but it is the key to most of those on which important consequences depend.⁶

Mill’s first meaning of the word, as everything that takes place whether outside or inside the aegis of human agency, arguably had been more pertinent to classical political economy up to his time (DesRoches 2018a, Schabas 2005). François Quesnay (1694–1774) and the French physiocrats, for example, insisted that good political economy required discerning and complying with the laws of nature. T. Robert Malthus (1766–1834) based his political economy on two postulates about the essence of human

⁵ For historical discussion of the interplay between nature and the economy, see DesRoches (2015, 2018a), Jonsson (2013), Kula (1998), Schabas (2005), Warde (2011), Wolloch (2017), and Worster (1994). For still broader discussions of the meaning of “nature” and “wilderness” in Western thought, see Coates (1998), Cronon (1995), Daston (1998), Kaufman (1972), Nash (1982), and Smout (2000).

⁶ Mill (1874 pp. 8–9).

nature: that (i) food is necessary to sustain human life and (ii) the passion between the sexes is necessary and enduring. These postulates gain their significance when confronting two equally important natural laws of the external world: that the fertility of the earth can increase at most arithmetically, whereas populations, if unchecked, increase geometrically. Thus, Malthus's theory is, in its essentials, about the interplay of human nature and the natural world. Perhaps most importantly, if less famously for economists, Carl Linnaeus (1707–1778) described, in his *Economy of Nature* (1791), the interdependence of the earth, the vegetable kingdom, the animal kingdom, and humanity, all bound together by common interest in the functioning of the food web. In the United States, the early conservationist George Perkins Marsh (1801–1882) expressed similar views in his *Man and Nature* (1864), warning that “we can never know how wide a circle of disturbance we produce in the harmonies of nature when we throw the smallest pebble in the ocean of organic life.”⁷

Mill himself preferred the second meaning for “nature,” as the world external to humans, or the environment in which we find ourselves. As Margaret Schabas (2005) has argued, this move freed humans from natural law, making us the masters of our own destiny. At the same time, it set aside “nature” as something untouched by humans, in contrast to the artificial ways in which we have transformed and, indeed, conquered nature. This meaning of the term arguably had been in ascendance since at least the time of Francis Bacon, whose project was to exert human mastery over nature, to control it. But its importance grew after Mill. According to Schabas, it has reached its pinnacle in neoclassical economics. Dynamically, neoclassical economics essentially assumes that wealth can grow indefinitely, without bound. Statically, it is focused on constrained optimization, but the constraints are so highly abstracted that they lose their connection to real physical objects, objects existing at a point in space and guided by physical laws. As discussed in Chapters 2 and 6, the history of environmental economics is about humanity becoming reacquainted with its dependence on nature while also coming to terms with the effects of its actions on it.

These questions about humanity's place in nature coevolved with questions about the role of nature in economic productivity. What makes nature productive? Is it something inherent in the earth, which humans

⁷ On Linnaeus and his importance for political economy, see DesRoches (2018a), Jonsson (2013), Schabas (2005), and Worster (1994). “We can never know...” (quoted in Worster 1994 p. 269). Though receiving attention in the history of ecology, Marsh is an understudied figure in the history of political economy.

receive passively, or something coaxed out of nature by human agency? Donald Worster (1994) organized his classic study of the history of ecological ideas along a continuum, anchored at one end by the Arcadian paradigm of Gilbert White (1720–1793), in which humanity must live a simple agrarian life and accommodate itself to nature, and at the other end by the imperial paradigm of Linnaeus, in which humanity must organize nature to its own ends. Excepting White’s emphasis on simplicity, in the canon of political economy, Quesnay and his fellow physiocrats exemplify the former view. They contended that agriculture alone can yield the so-called net product, or a return above costs, making it the sole source of wealth for the economy. It is a free gift from Nature. Its primacy is both temporal, for it sustained humanity before agriculture, and causal, acting as a kind of prime mover putting economic circulation in motion. So humanity can best take advantage of nature’s powers by complying with natural laws.⁸

Similarly, Adam Smith referred to the importance of the “spontaneous productions of the earth.” For, “No equal capital puts into motion a greater quantity of productive labour than that of the farmer. Not only his labouring servants, but his labouring cattle, are productive labourers. In agriculture, too, Nature labours along with man; and though her labour costs no expense, its produce has its value, as well as that of the most expensive workmen.” Yet Smith also argued that “The most important operations of agriculture seem intended, not so much to increase ... as to direct the fertility of Nature towards the production of the plants most profitable to man.” In other words, humanity needs to direct natural fertility, managing nature to create wealth.⁹

Of course, humanity’s direction of nature only accelerated through the invention of the steam engine, the factory system, and other modern arts. Beginning in the nineteenth century, the scientific management of natural resources like forests and waterways emerged as a means of bringing social control to nature through rational planning, with the “conservation” of resources offered as a way to minimize both human and natural waste alike. By the twentieth century, such management increasingly

⁸ Banzhaf (2000) discusses the role of Nature in physiocracy in more detail. While humanity is an agent in the production of wealth, the circular flow of exchange requires a first cause, which is rooted in Nature. This motion, not land *per se*, is the ultimate “free gift” from nature. Such gifts, free of human agency, are one way of distinguishing different forms of capital or assets, separating natural capital from man-made capital (e.g., Barbier 2011). DesRoches (2015, 2018a, b) offers further discussion.

⁹ Quotations from *Wealth of Nations*, II.iii.3 and II.v.12.

incorporated formal economics, for example in benefit–cost analysis of dams and water projects.

These questions about the “productivity” of nature beg the additional question of what is the good to be “produced,” or rather *whose* good. Linnaeus, for all his belief that humans were members of nature’s economy, believed that “all things are made for the sake of man,” though ultimately only as an intermediate good that enabled mankind to glorify God. Marsh too believed that it is a mark of civilization when man subjects the world to his control and subjects it “to his uses.” As discussed in Chapter 2, this view was echoed by Gifford Pinchot (1865–1946), the great forester and pioneer of US conservation policy. Pinchot paired his intense utilitarianism with an equally intense materialism, reaching the conclusion that “there are just two things on this material earth – people and natural resources.”¹⁰

This emphasis on human *use* may be contrasted to human *delight* (Smout 2000), not unlike Worster’s distinction between the “imperial” and “Arcadian” attitudes to the world. Smout discusses how in Scotland, for example, at the same time improvers were bemoaning the barren wastelands of the Highlands and the Hebrides, Walter Scott was writing panegyrics to such places, “where the proud Queen of Wilderness hath placed ... her lonely throne.” In the United States, transcendentalists like Emerson and Thoreau emphasized the spiritual value of experiencing wilderness. By the close of the nineteenth century, such views found their way into American political debates about land use. As discussed in Chapter 2, John Muir (1838–1914) in particular elevated natural landscapes, ecosystems, and other species to “sparks of the Divine Soul.” Challenging Pinchot’s anthropocentrism, he argued that they are good in themselves and should be preserved regardless of any practical use they may or may not have for humanity.¹¹

The tension between the imperial and the Arcadian, between use and delight, was a defining feature shaping conservation and preservation in the Progressive Era, leaving a lasting intellectual legacy. But as Hays (1982, 1987) discusses, when “environmentalism” emerged in the postwar era, it was as a new synthesis emerging from these opposing forces. This synthesis allowed a new economics of aesthetic consumption to bridge the gap

¹⁰ On Linnaeus, see DesRoches (2018a) and Worster (1994). Marsh quoted in Worster (1994 p. 173). “People and natural resources” (Pinchot 1947 p. 325).

¹¹ On romantic views of wilderness, see, in addition to Smout (2000), Cronon (1995). For the American tradition especially, the classic reference is Roderick Nash’s *Wilderness and the American Mind* (1982). On the specific case of Scotland and especially the work of the improvers, see Jonsson (2013). “Divine Soul” (Muir [1875] 1980).

between the economics of developing resources for narrowly construed instrumental uses, as advocated by Pinchot, and the anti-economics of Muir. While more radical environmental movements like deep ecology continue to decry human consumption, the postwar environmental movement succeeded by appealing to contemporary consumer movements.

1.2 The Increasing Role of the Consumer: Intangible Quality

Hays's thesis that the postwar environmental movement was, essentially, a consumer's movement, puts it in the middle of other developments that shaped economic thought in the twentieth century. It has been said that the nineteenth century was the century of production, while the twentieth century was the century of consumption. While that may be an oversimplification, certainly mass consumption and marketing were gaining ground like never before.¹² These societal changes were reflected in the writings of economists. Some responded by making the consumer central to their theories. As early as the nineteenth century, marginalist economists like W. Stanley Jevons, as well as Austrian economists like Carl Menger, emphasized the demand side of the supply-and-demand coin, relative to earlier thinkers like Smith, David Ricardo and Mill. Reversing the labor- or cost-of-production theories of value that had come before, they argued that an object's value depends on an individual's subjective evaluation of its utility.¹³ Later pushing the idea further, economists like Irving Fisher argued that income is best understood as the abstract services of capital – the shelter provided by a home, the music from a piano, or the nourishment from food. From there, it was no great leap to think about the final services provided by natural capital.

The increasing social prominence of the consumer also was tied up in political questions. Some commentators deprecated various aspects of consumerism, pointing to flaws in the institutional arrangements that encouraged it, with economists such as Thorsten Veblen, J. A. Hobson, John Kenneth Galbraith, and Tibor Scitovsky representing only a few prominent examples. Others, more optimistic, saw it as a way to reverse the social

¹² On the history of consumerism in Western societies, including connections to economic theory and politics, see Cohen (2003), Sandel (1996 Ch. 7), Sassatelli (2007), Thelen (1972), and Trentmann (2016). Brooks (2000) offers a humorous, but perhaps for that all the more insightful, commentary on how Veblen's conspicuous consumption and leisure has become intertwined with environmentalism.

¹³ Winch (2006) reviews the role of the consumer in English and French classical and neo-classical economics.

problems associated with industrialization and the plight of workers. Still others saw in an emphasis on consumption a way to overcome the divisions of race and religion, uniting people in their common interest of consuming. Interest in tracking how the consumer was doing led to the creation of cost-of-living indices in the early twentieth century.

Of course, the Great Depression created new challenges for individual consumers – and for the capitalist system generally. According to John Maynard Keynes and others who developed his ideas, economic instability was rooted in an anxious desire to hoard money against bad times, “multiplied” through a chain of forestalled consumption. Keynesian economists and American institutionalists alike developed theories of under-consumptionism, with public works and other types of government spending often promoted as a cure to get the economy going again.¹⁴ As discussed by Cohen (2003), at the end of WW II, fearing a return to Depression, leaders of business, commerce, labor unions, and government collaborated to send the message that it was one’s patriotic duty to spend money. An optimistic America, embracing marriage, home ownership, and children, was ready to comply. As but one apposite illustration, *Bride’s* magazine assured its readers that, in buying “the dozens of things you never bought or even thought of before ... you are helping to build greater security for the industries of this country [W]hat you buy and how you buy it is very vital in your new life—and to our whole American way of living.”¹⁵

As an alternative to the Keynesians’ political response to the Great Depression, in the 1930s other economists such as W. H. Hutt began to speak of “consumer sovereignty.” This language of sovereignty was consistent with the neoclassical view of the consumer making free choices from a set of options, but it also emphasized the role of the market as a social institution that shapes society, an alternative both to the authoritarian regimes

¹⁴ The literature on what constitutes true or bastardized Keynesianism is vast. For my purposes, it is not important what Keynes really meant, only that the social importance of aggregate spending was prominently discussed at the time. Rutherford and DesRoches (2008) and Backhouse (2017) review these ideas in the American context, looking at reactions from American institutionalists and from Samuelson, respectively.

Surveying the increasing role of the consumer in macroeconomics since Keynes, Boulding (1945) made a particularly interesting move. Emphasizing physical measures of the capital stock, rather than financial measures, he argued that when capital stocks grow too large, either consumption flows must increase, or capital must be destroyed (as in war). His focus there on the materiality of resources and the stock-flow relationship of material foreshadows his more famous analysis of the earth as “spaceship,” with limited natural resource stocks and limited capacity to store wastes (Boulding 1966).

¹⁵ Quoted in Cohen (2003 pp. 119–20).

threatening at the time and to majoritarianism. Thus, from their view, an individual consumer's choices in the market are analogous to their "votes" in collective bodies, both being ways society "decides" what to produce. Later, economists such as Charles Tiebout (1956) extended this logic even to public goods, with consumers able to "vote with their feet" for a bundle of taxes and amenities when they choose a neighborhood in which to live. As discussed in Chapter 8, whether to incorporate the environment into policy analysis using the logic of the market or the logic of civic republicanism has been an ongoing debate.¹⁶

This increasing focus on the consumer found its way into many consumer protection laws in the US as well as the creation of private organizations such as the Consumer's Union. Over time, it also caused political leaders and analysts to rethink the rationale for many government regulations. For example, US antitrust laws originally were designed to limit the overall economic and political power of concentrated interests, with workers, competing firms, and the self-government of local communities having as much at stake as consumers. By the 1970s, they were understood solely to protect consumers. Similarly, in the case of natural monopolies like railroads and utilities, where economists believed competition would be inefficient, economic experts would help regulate prices to protect consumers. Interestingly, rational oversight of utilities was sometimes conceptually linked to rational oversight of natural resources, as indicated, for example, by the title of the *Journal of Land and Public Utility Economics*, founded at the University of Wisconsin by Richard Ely. Environmental protection has continued to be wrapped up in the rhetoric of consumer protection.¹⁷

Even as it was growing in social importance, the very meaning of "consumption" was changing. For example, from the 1930s to 1960s, University of Chicago economists like Margaret Reid, Theodore Schultz, and Gary Becker were blurring the distinction between consumption and production. They introduced theories of household production, in which households are like little firms that buy goods, not so much as ends, but as material

¹⁶ On Hutt and consumer sovereignty, see Desmarais-Tremblay (2020) and Persky (1993). For discussions of Tiebout's work, including his extension of the concept of sovereignty and his reaction to Samuelson's claim that consumers cannot, or at least do not, reveal their demand for public goods, see Weisbrod (1959) for a contemporaneous view and Fischel (2006) and Singleton (2015) for historical discussion.

¹⁷ On the evolving role of consumer protection in the history of US anti-trust provisions, see Sandel (1996 Ch. 7) and Giocoli (2011). On railroad and public utilities regulations, see Rutherford (2000) and Giocoli (2017). Berman (2022) emphasized the rise of the economic way of thinking in government generally.

inputs, which they combine with human capital and time to produce the final services they actually enjoy. More generally, by the 1960s economists were beginning to embrace Lionel Robbins's (1935) definition of economics as the study of how people choose to use limited resources with alternative ends. This definition replaced an older one according to which economics was the study of material welfare. Robbins's definition replaced a definition based on a set of topics with one based on a way of thinking.

Together, these moves simultaneously expanded the consumer's domain to include virtually any activity – any choice of how to use time and skill, even if immaterial and unpaid – while also straying from the original meaning of the word consumption as physically using something up. For environmental economists, the so-called “consumer” thus could now be viewed as combining natural landscapes, time, and other inputs like transportation services, to “produce” a recreation experience (Chapter 4). Similarly, other economists like Zvi Griliches and Kelvin Lancaster were reimagining economic goods as bundles of underlying characteristics, characteristics which in Lancaster's view could be recombined to create new final services. This development provided a way to think about the multiple dimensions characterizing natural environments.¹⁸

The evolving meaning of “consumption” also had implications for quantitative measurement. For instance, during WW II, labor unions complained that the (then-named) Cost of Living Index understated inflation because it failed to control for the deteriorating quality or unavailability of goods. They pointed to inferior gasoline and tires, which increased the cost of necessary transportation. Such deteriorating quality meant the true cost of maintaining the standard of living was increasing, even if prices appeared to be steady (because of wartime price controls).

¹⁸ Classic references include Becker (1965, 1976), Adelman and Griliches (1961), Griliches (1961), Fisher, Griliches, and Kaysen (1962) and Lancaster (1966). Banzhaf (2001, 2006) provides additional discussion of Griliches's work. Backhouse and Medema (2009a, b) discuss the history of Robbins's definition. The history of the economics of outdoor recreation is covered in Chapters 3 and 4 of this book, but Cicchetti and Smith (1970) and Cicchetti, Fisher, and Smith (1976) are notable for emphasizing the connection to Becker's model of household production.

As discussed by Bianchi and De Marchi (1997) and Bianchi (1998), if united to the theory of the entrepreneur, the household production model invites us to treat the “consumer” as an individual who delights in adventure and novelty, by recombining inputs into new commodities. This insight may provide a potential framework for linking economic models of choice to the themes of delight and exploration in conservation policy and landscape architecture. For example, when designing the landscape around Niagara Falls, Frederick Law Olmsted wanted to assure a visit was “a series of expeditions,” with enjoyment coming from each individually but also from the variety (Sax 1980 pp. 23–4).

An outside scientific committee from the National Bureau of Economic Research (NBER), led by Wesley Clair Mitchell, Simon Kuznets, and Reid, reviewed this criticism. Although sympathetic, the committee concluded it knew “no satisfactory way of measuring changes in ‘real prices’—that is, the prices of a given quantity of utility, usefulness, or service, such as occurs when poorer qualities are priced.” But it recommended a new, less misleading name indicating its focus on prices *per se*. The renamed Consumer Price Index (CPI) came up for another NBER review in 1961, this time chaired by George Stigler. And this time, it recommended interpreting the CPI as a “true cost of living index,” or the money needed to hold utility or quality of wellbeing constant. As part of that move, it recommended adjusting the CPI for quality change.¹⁹

This history of quality-adjusted prices mirrors the history of pricing the natural environment. In the late 1940s, at the same time one government report by external economists rejected the possibility of objectively measuring the quality of priced goods, another rejected the possibility of measuring the quality of a recreation experience and the price it would have in a hypothetical market (Chapter 3). By the 1960s, attitudes to both problems had changed. In general, economists were increasingly eager to measure qualitative features of objects using abstract measurements tied to the microeconomic theory of the consumer, including environmental quality. They used “shadow prices” to adjust market prices for quality differences or market distortions, but also to fill in missing prices for health and the environment.²⁰

1.3 A. C. Pigou and the Public Finance Tradition

One way economists understand the problem of pollution is that people can use the natural environment at no cost, when in fact there is a very real one. Consequently, economists often focus on policy solutions that involve “getting the prices right.” The standard history of the getting-the-prices-right approach begins with the work of A. C. Pigou (1877–1959), the Cambridge economist famous for his theory of the potential divergence

¹⁹ “We know no satisfactory way...” (Mitchell, Kuznets, and Reid 1944 p. 262). On the history of price indices in the US, see Banzhaf (2001, 2004) and Stapleford (2009, 2011a, b), with Banzhaf (2001) and Stapleford (2011a) particularly covering the issue of quality change. Stapleford (2011a) emphasizes the connection between price indices and the consumer movement.

²⁰ Banzhaf (2005) and K. Smith and Banzhaf (2004) discuss the formal connection between quality-adjusted prices and pricing environmental quality.

between private benefits and costs (reflected in markets) and social benefits and costs. Following Francis Bator (1957, 1958), economists today would refer to these effects – especially as they relate to environmental problems – as “externalities.” Externalities are famously hard to define, but, roughly speaking, they represent an unpriced effect on third parties uninvolved in an economic transaction or decision.²¹

In *The Economics of Welfare*, Pigou identified three groupings of situations where he thought there is a divergence between private and social benefits and costs. His second grouping is the one closest to what we now think of as externalities. This grouping represents a situation where

One person A, in the course of rendering some service, for which payment is made, to a second person B, incidentally also renders services or disservices to other persons ..., of such a sort that payment cannot be exacted from the benefited parties or compensation enforced on behalf of the injured parties.

Pigou gives several examples of such services that certainly could be read as a kind of proto-environmental economics. “Uncompensated services are rendered,” he says,

when resources are invested in private parks in cities; for these, even though the public is not admitted to them, improve the air of the neighbourhood. The same thing is true—though here allowance should be made for detriment elsewhere—of resources invested in roads and tramways that increase the value of the adjoining land It is true, in like manner, of resources devoted to afforestation, since the beneficial effect on climate often extends beyond the borders of the estate owned by the person responsible for the forest.... It is true of resources devoted to the prevention of smoke from factory chimneys: for this smoke in large towns inflicts a heavy uncharged loss on the community, in injury to buildings and vegetables, expenses for washing clothes and cleaning rooms, expenses for the provision of extra artificial light, and in many other ways.²²

Thus, Pigou’s discussion seems like a natural source for economic thinking about environmental problems.

Pigou’s importance to environmental economics cannot be denied, but a story about environmental economics developed through direct applications of Pigou’s theory of externalities runs into three difficulties. First, Pigou’s analysis was much wider ranging than today’s theory of

²¹ For background on Pigou, see Medema (2009 Ch. 3), Aslanbeigui and Oakes (2015), and Kumekawa (2017). Classic attempts to wrestle with the definition of externalities include Viner (1932), Meade (1952), Scitovsky (1954), Bator (1958), Buchanan and Stubblebine (1962), and Arrow (1969). For historical overviews of the concept, see Papandreou (1994), Lagueux (2010), Berta (2017), and Medema (2020a).

²² Pigou (1932 pp. 183–84).

externalities, so it was not obviously focused on environmental harms. It was nestled between two other groupings of situations where, according to him, private and social cost diverge. The first grouping includes situations where productive investments might potentially be made by people who do not own the instrument of production being maintained or enhanced. A notable example is tenant farmers, who do not have the full incentive to enhance the fertility of the land they are renting. To the contrary, they have an incentive to let it depreciate rapidly in the years before their lease expires.²³

Pigou's third grouping comprises situations, discussed earlier by Alfred Marshall, where there are increasing or decreasing returns at the industry level or even between industries, so one firm's activities effects the productivity of another's. These situations are known as "external economies" or "diseconomies." This portion of Pigou's theory was the most controversial, and Pigou steadily revised his analysis, retreating from some of the stronger versions of the argument that he had espoused earlier in his career, which involved external effects on land and resource rents. Notably from the standpoint of the history of American resource economics, much of this was a transatlantic debate, with Pigou's ideas mediated through such American economists as Allyn Young, Frank Knight, Jacob Viner, Howard Ellis, and William Fellner, as well as the British economist James Meade. Even so, in the fourth edition of *The Economics of Welfare* (1932), Pigou gave the example of the cotton industry, which when it operates on a larger scale takes on a structure of increasing specialization among firms, with some firms weaving and some spinning, some spinning fine counts and others coarse. In such cases, he argued, investment enters the industry to the point where the marginal firm is indifferent to entering, but nevertheless its entrance increases economic rents for other firms, thus creating a divergence between the private value of investment and the social net product.²⁴

Pigou's work spawned a large literature sorting out the nuances of these three situations and how they inter-relate.²⁵ For now, it is enough to note that, because he was writing a large volume about welfare, Pigou's discussion is inherently synthetic, so not all the material found in it is uniquely his.

²³ Pigou (1932 pp. 174–83).

²⁴ On the controversy surrounding Pigou's analysis and his responses, see McDonald (2013), Aslanbeigui and Oakes (2015), and Medema (2020a). Salient entries in the transatlantic debate include Young (1913, 1928), Knight (1924), Viner (1932), Ellis and Fellner (1943), and Meade (1952). For Pigou's discussion in the 4th ed., see Pigou (1932 pp. 213–28).

²⁵ For discussion, see Lagueux (2010), McDonald (2013), Berta (2017), and Medema (2020a).

Additionally, while in retrospect it is easy to pick out the bits that resemble a proto-environmental economics, when taken as a whole, at the time Pigou's discussion did not obviously apply to environmental problems.

A second difficulty with a linear history from Pigou to modern environmental economics is that, while it is the second of Pigou's groups that today is most closely associated with the idea of "externalities," that group actually was the one most ignored in the literature until at least the late 1950s, with passing references to smoking chimneys or traffic congestion viewed as "curiosities" or, in William Baumol's words, "freakish exceptions." Even around 1970, with environmental economics on a swift ascent, Kneese commented:

Environmental pollution has existed for many years in one form or another. It is an old phenomenon, and yet in its contemporary forms it seems to have crept up on governments and even on pertinent professional disciplines A few economists, such as Pigou, wrote intelligently and usefully on the matter a long time ago, but generally even that subset of economists especially interested in externalities seems to have regarded them as rather freakish anomalies in an otherwise smoothly functioning exchange system. Even the examples commonly used in the literature have a whimsical air about them. We have heard much of bees and apple orchards and a current favorite example is sparks from a steam locomotive—this being some eighty years after the introduction of the spark arrester and twenty years after the abandonment of the steam locomotive.²⁶

Thus, there was a large gap between the time Pigou wrote about what we would now call externalities and references to it in the literature, at least by those that took it seriously. This gap raises the possibility that other currents were at work during the period.

The third, and most surprising, difficulty with the Pigouvian origin of environmental economics is that, even as economists like Bator, James Buchanan, Meade, and Scitovsky did begin to talk more about "externalities" with environmental examples, actual specialists in environmental economics hardly referenced Pigou at all until about 1970. When environmental economists in the 1960s did invoke Pigou, it usually was in reference to welfare economics very broadly or to Pigou's discussion of our defective "telescopic faculty" (i.e., proclivity to ignore the future) and the resulting excessively rapid depletion of natural resources.²⁷ Even more

²⁶ Quotations from Baumol (1952 p. 23) and Kneese (1971a p. 2). On the treatment of externalities as freakish exceptions, see Lagueux (2010), Lane (2014), Sandmo (2015), Berta (2020), and especially Medema (2020a).

²⁷ For example, Krutilla (1967a). See Collard (1996) and Kula (1998 Ch. 6) for historical discussion of Pigou's views on resource depletion.

to the point, they rarely mentioned him when discussing pricing access to environmental resources, not only for “green” uses like recreation, but even for “brown” uses like depositing wastes. Though today economists might commonly refer to such prices as “Pigouvian taxes,” at the time they called them “effluent charges,” without connecting them to Pigou (e.g., Kneese 1964). As discussed in Chapter 6, the Pigouvian terminology didn’t enter widespread circulation until the 1970s.

Of course, one possible reason economists might not have attributed their ideas to Pigou is that his ideas had become so embodied in economics, so taken for granted, that they did not warrant citation.²⁸ If it was merely the negative evidence of what environmental economists did *not* say, that explanation might be satisfactory. However, as discussed in Chapters 2 and 6, the arguments used by first-generation environmental economists suggest stronger links to the agricultural economics literature and institutionalist analysis of common property.

1.4 Agricultural and Natural Resource Economics

Thus, a central theme of this book is that the humble, applied work of agricultural economists played a particularly important role in the formation of environmental economics, both because of the content of their work and their outlook. With respect to outlook, as members of an applied field with a tradition of advising farmers, agricultural economists had a comfort both with normative economics and with diving into messy empirical measurement, even when economic theory could not provide guidance. With respect to content, they worked on many problems related to conservation and development of resources: city, farm, and forest as competing land uses; management of forestry as a crop; the depletion and renewal of soil fertility; development and conservation of water resources; and so forth. Additionally, they had been leaders in estimating and forecasting the demand for commodities. These experiences paved the way for agricultural economics to journey into difficult intellectual terrain such as the value of, or demand for, environmental resources.

A reasonable place to begin a history of American agricultural economics is with Richard Ely (1854–1943). Ely’s *Outlines of Economics* (1893, 1908),

²⁸ Medema (2020a) discusses some evidence in support of the idea of an “oral tradition” as mentioned by Coase (1960). Kneese too noted that “Economists have long held that technological spillovers can be counteracted by levying taxes on the unit ‘responsible’ for the diseconomy and by paying a subsidy on the ‘damaged’ party” (1964 p. 56), indicating such a tradition does lie in the background.

was the leading textbook in American economics before WW I, and continued to sell about 14,500 copies a year between the wars, clobbering Marshall's *Principles* in the United States 18-to-1. Methodologically eclectic, Ely gave space in his work to utilitarianism, but in contrast to what he considered the excessively reductionist approach of the *laissez faire* schools of economics, he never considered it the only or indeed the most important motivation. To the contrary, Ely co-founded the American Economic Association in 1885 as an organization for social change, for the "historical and statistical study of actual conditions of economic life" which would work with the state, "whose positive assistance is one of the indispensable conditions of human progress." A leader in the progressive Social Gospel movement as well as economics, Ely advocated thinking in terms of social rather than individualistic categories, for empirical work uncovering social and historical patterns, and for labor reforms to protect workers from the centralized power of capitalists. Thus, Ely's approach laid the groundwork for the institutionalist school of economics, more self-consciously developed by his student John R. Commons and others in the next generation.²⁹

Ely had had at least a passing interest in land use and natural resources from early in his career. In his studies under Karl Knies at the University of Heidelberg, he had been introduced to conservation and professional forestry management, then thriving in Germany but as yet non-existent in America. To help close this gap, in 1891 he organized a publication of the American Economic Association around these issues, bringing together Bernhard Fernow, the German-born and trained chief of the US Division of Forestry, and a young Pinchot.³⁰

As his career unfolded, Ely increasingly specialized in what he called "land economics." In 1925, he founded the *Journal of Land and Public Utility Economics*. He also co-authored, with colleagues at the University of Wisconsin, two texts on the topic, *Elements of Land Economics* (Ely and Morehouse 1924) and *Land Economics* (Ely and Wehrwein 1940). At Wisconsin, he partnered with Frederick Jackson Turner, the historian famous for his "Frontier Thesis," in training many future leaders of the

²⁹ See Bateman (1998), Bateman and Kapstein (1999), Kaufman (2017), and Leonard (2016) for background on Ely and his role in the history of economic thought. Quotation from Bateman and Kapstein (1999 p. 253). Textbook statistics come from Rader (1966) and Backhouse, Bateman, and Medema (2010 p. 64). On American Institutional economics generally, see Rutherford (2000, 2001) and Kaufman (2017).

³⁰ For Ely's recollections of these early episodes, see Ely (1918a, 1938). For the AEA publications, see Fernow (1891) and Pinchot (1891), as well as Bowers (1891).

field. These students included John D. Black, Lewis C. Gray, Benjamin Hibbard, George Wehrwein, Allyn Young, and Henry Taylor, whose dissertation was on land tenure.

More even than Ely, Henry C. Taylor (1873–1969) became the doyen of the new field of agricultural economics, combining his mentor's enthusiasm for applied work in service to humanity with a knack for finding funding and institutional platforms to support the mission.³¹ He was the first professor of agricultural economics in a Land Grant institution, the author of a seminal textbook in agricultural economics (Taylor 1905, 1919), and an architect of new academic institutions to support the field. After receiving his PhD in 1902, in 1909 Taylor formed a new department in the School of Agriculture, where it was positioned to tap new government funding. Outside his home institution of Wisconsin, he skillfully managed the relationships between agricultural economists and their rivals in "farm management," whose roots were in agronomy and allied fields, and which had developed at Cornell University under the leadership of Liberty Hyde Bailey and George Warren. Under Taylor's leadership, their respective societies merged to form the American Farm Economics Association (known today as the Agricultural and Applied Economics Association). This merger thus brought economics into closer contact with agronomic field work and applied farm management, creating a new synthesis. Given this background, the economists were almost compelled to further synthesize institutionalist and neoclassical approaches.³² For, even while fully appreciating the institutional factors that guided the behavior of farmers and the markets in which they operated, they could quite naturally apply the marginalist reasoning of optimization when, say, advising farmers on how much fertilizer to apply to their fields.

In 1919, Taylor left academia to go to Washington, becoming chief of the US Department of Agriculture's (USDA's) new Office of Farm Management and Farm Economics. Again showing his ability to politically maneuver, Taylor soon expanded the office through another reorganization, forming the Bureau of Agricultural Economics (BAE). By 1929, the BAE had a budget of \$6.1 million, and the USDA was spending an additional \$7.2 million for its extension work and giving grants of \$3.8 million to state experiment stations. At this point in time, the BAE had more social

³¹ For general histories of agricultural economics including Taylor's role, see Banzhaf (2006), Fox (1987), Glover (1952), and McDean (1983); see Taylor (1922) and Taylor and Taylor (1952) for his own account. Castle et al. (1981) draw a historical connection between agricultural and natural resource economics.

³² For more on this point, see Banzhaf (2006) and Rutherford (2011).

scientists than the rest of the federal government combined. Through their work at the BAE and academia, agricultural economists became leaders in estimating empirical demand relationships and forecasting prices, using technically advanced statistical methods.³³

Meanwhile, agricultural economists were beginning to colonize other parts of the Federal bureaucracy. By 1937, they had taken up positions as the heads of the research or statistical divisions of the Treasury Department, the Department of Commerce, and Federal Reserve Board. Particularly important for this story, they were rapidly growing in number at the Department of Interior. As they spread through the bureaucracy, agricultural economists encountered different policy problems, including fights over water resource plans. Water in the American West has always been for fighting, and at the close of World War II the stakes were bigger than ever. By 1955, federal expenditures had risen to \$800 million, with some \$8 billion of projects backlogged.³⁴

As the monetary stakes grew, the bureaucracies managing them developed more elaborate budgetary procedures. Since the Flood Control Act of 1936, the Army Corps of Engineers was required to compute the benefits and costs of its water projects. But over time other federal agencies began to do similar work. As discussed in Chapter 3, differences in procedures and bureaucratic turf wars threatened to undermine the scientific integrity of these benefit–cost analyses of water projects. Thus, to facilitate coordination, in 1946 the Federal Inter-Agency River Basin Committee appointed a subcommittee to codify best practices for benefit–cost analysis. Not surprisingly, given their success in government, the subcommittee was dominated by agricultural economists from the USDA and Interior.³⁵ Its report, the so-called Green Book (FIARBC 1950, 1958), became the blueprint for benefit–cost analysis of water projects for many years.

³³ Budget statistics from USDA (1929). By comparison, from 1923 to 1934 the Laura Spelman Rockefeller Memorial, followed by the Rockefeller Foundation, spent about \$3 million annually in support of social science (Craver 1986). In 1939, the Cowles Commission had a budget of \$28,000 and in 1945, at its peak, the Radiation Laboratory at MIT had a budget of \$13 million (Mirowski 2002 Ch. 4). Statistics on the number of economists and other details of the BAE during the period, together with an interesting comparison to the NBER, can be found in Hawley (1990). The BAE's luminaries included Louis Bean, Mordecai Ezekiel, W. J. Spillman, Howard Tolley, Frederick Waugh, and others. On the statistical work of BAE economists and other background, see Banzhaf (2006), Biddle (2021), Fox (1987), Morgan (1990), and Rutherford (2011).

³⁴ Statistics on agricultural economists as of 1937 from Ezekiel (1937). Statistics on funding for water projects from Eckstein (1958 p. 3).

³⁵ On this history, see Porter (1995 Ch. 7).

Around this time the economists involved faced intense bureaucratic pressures to increase benefit–cost ratios, which forced them into valuing outdoor recreation. This experience with valuing recreation – which seemed so intangible and aesthetic, so outside their usual material domain – represented economists’ first foray into pricing the environment. But, perhaps ironically, these early experiences were still in the context of evaluating policies to *develop* resources, with recreation as an added-on benefit, *not* in the context of preserving wilderness or natural environments.

1.5 Postwar Neoclassicism

Although agricultural and other institutional economists dominated resource planning in the first half of the twentieth century, by the late 1940s new schools of neoclassical economics were coming on the scene.³⁶ These schools emphasized economics as constrained optimization, consistent with Robbins’s definition. One was the Chicago school, led by economists like Milton Friedman and Stigler, which brought to bear a rough-and-ready pragmatic approach to economic analysis, an emphasis on simplicity and willingness to ignore “second order” concerns such as the indirect effects of prices on quantity demanded mediated by changes in income. As discussed above, Chicago school economists pioneered the expansion of economics into many areas previously considered outside its scope. They also were one wave of economists flowing into welfare economics.³⁷

At Chicago, economists like Ronald Coase and Harold Demsetz forged a neoclassical version of the study of institutions, including those that govern relationships between polluters and consumers. The famous “Coase theorem” states that when property rights are well defined and transactions costs are low, parties will negotiate to reach an economically efficient outcome. Thus, if a factory has the right to emit smoke from its chimney, a downwind neighbor could offer monetary payments or other forms of compensation to induce it to cease emitting, but this will happen only if the neighbor’s value of clean air exceeds the factory’s value of emitting. Contrariwise, if the downwind neighbor has the right to be free from the nuisance, the factory could negotiate with the neighbor to allow it to emit, but this will only happen if its value is higher. This “New Institutional” approach bore some resemblance to the older American institutionalism,

³⁶ For an overview of post-war neoclassical consumer theory, see Mirowski and Hands (1998) and Mirowski (2002).

³⁷ On the Chicago school’s place in the history of welfare economics, see Banzhaf (2010a).

though with a more neoclassical bent. Still, when it first appeared it was received by many environmental economists in the context of the literature they knew.³⁸

In the postwar period, another new school emerged which emphasized economics as constrained optimization, and which incorporated new methods of operations research (OR), linear programming, and game theory. Centered largely around the Cowles Commission, a research institute then based at the University of Chicago, this school viewed the economy as being at a single, general equilibrium coordinated simultaneously by all prices, an equilibrium interpreted in terms of these new mathematical tools, so that the whole economy could be viewed as a planning program. Using these tools, economists shed new light on environmental problems. Kenneth Arrow (1969), for example, drawing on his earlier work with Gérard Debreu, defined externalities by the gap between a situation where some markets are missing and an idealized complete and efficient economy. In this idealized world, gasoline for example and the pollution it causes would trade in separate markets, but in the real world only gasoline has a market. In some ways echoing the ideas of Coase, the implication seemed to be that creating markets would allow economic efficiency, but in this case the creation would have to be planned and deliberate, not emergent.

Earlier, Paul Samuelson (1954) had developed a formal model where participants make tradeoffs between “collective consumption” of a shared public good and “private consumption.” Out of Samuelson’s work as well as that of Richard Musgrave, a postwar theory of the two-fold nature of public goods emerged. First, public goods are non-excludable. That is, as with commonly owned resources, it can be difficult to exclude people from enjoying them. Additionally, public goods are “nonrival.” Whereas one person’s extraction of water from a shared aquifer, for example, is “rival” in the sense that it leaves less water for others to use, one person’s enjoyment of pure public goods like healthy ecosystems need not reduce another’s enjoyment. Samuelson argued that, because of non-excludability, individuals would free ride, or shirk, in the provision of public goods, so government had to play a role. But he also argued that, to provide the right level of a public good, the government would need to know *everybody’s* demands or willingness to pay and, because of nonrivalry, sum them together to get

³⁸ Coase’s original argument was published in Coase (1960). Coase’s career is physically tied to the University of Chicago and for my purposes the two can be linked, but just how well Coase fits into any single neat “Chicago school” is a matter of debate. For more on Coase and the Coase theorem, see Bertrand (2015) and Medema (2014a, b, 2020b, c).

the total value. As it turned out, this was the same kind of information applied economists working on water projects were already beginning to try to find. Unfortunately, Samuelson concluded pessimistically that this task would be a challenge because, by free riding, individuals had little incentive to reveal their values in the market.³⁹

1.6 The New Think Tanks: RAND and RFF

Postwar neoclassicism grew in tandem with new think tanks like the RAND Corporation. Following earlier applications of OR during WW II, at RAND this school developed its most practical contributions to planning. Officially opening in 1946 as “Project RAND,” it began as a small think tank within the Douglas Aircraft Company with funding from the US Air Force. Its primary purpose was to forge an interdisciplinary, integrated study of the engineering of weapons systems and of military strategy (the acronym is for “Research AND Development”), an integration it called “systems analysis.” Because of the inherent conflict of interest in an aircraft company appraising military hardware and strategy, RAND soon became independent in 1948 with a \$1m capital grant from the Ford Foundation. But it continued to rely primarily on annual support from the Defense Department and was most famous for its contributions to theories of nuclear deterrence.⁴⁰

RAND’s place in the history of postwar social sciences is well covered in the secondary literature. In the history of environmental economics, the DC-based think tank Resources for the Future (RFF) plays a larger role. Yet their histories are tied together in many ways.

First, both institutions were born out of Cold War anxieties. Like RAND’s, RFF’s origins can be found in wartime work, in particular at the National Resources Planning Board (NRPB) and its New Deal predecessors, who were studying the nation’s strategic resources. In 1947, war-time

³⁹ See Cherrier and Fleury (2017) and Desmarais-Tremblay (2017a) for further discussion. Earlier Italian and Swedish traditions had suggested the possibility of market-like revelation of the demand for public goods (see Medema 2009 Ch. 4 for a summary) and more recently economists like James Buchanan and Charles Tiebout were reviving such ideas. Samuelson was impatient with both approaches (Marciano 2013; Johnson 2015; Singleton 2015).

⁴⁰ Ford’s grant was initially structured as a loan but later changed. Hounshell (1997), Jardini (1996), Kaplan (1983), and B. Smith (1966) provide general background on RAND. Amadae (2003), Berman (2022 Ch. 3), Leonard (1991, 2010), Mirowski (2002), and Sent (2007) provide additional background and discuss RAND’s role in shaping modern economics. J. Smith (1991) discusses the history of US think tanks more generally and their place in social sciences research.

production and natural resources boards were reorganized as the National Security Resources Board (NSRB), with the mission to make plans to mobilize natural resources in the event of war or other emergencies. In 1950, the NSRB concluded that “there is nothing more important to the future security of the United States than obtaining, now and in the future, an adequate supply of those raw materials necessary to build up our defenses and maintain our economy” Based on the NSRB’s recommendations, President Truman created the President’s Materials Policy Commission, commonly known as the Paley Commission after its president William Paley, to study the problem of natural resource scarcity. The commission’s staff included many future RFF staff members and other social scientists of note, including Harold Barnett, Arnold Harberger, Orris Herfindahl, Arthur Maass, and Sam Schurr, among others.⁴¹

Titled *Resources for Freedom*, the Paley Commission’s report opened,

The question, “Has the United States of America the material means to sustain its civilization?” would never have occurred to the men who brought this Nation into greatness as the twentieth century dawned. But with the twentieth century now half gone by, the question presses and the honest answers are not glib.

The United States, once criticized as the creator of a crassly materialistic order of things, is today throwing its might into the task of keeping alive the spirit of Man and helping beat back from the frontiers of the free world everywhere the threats of force and of a new Dark Age which rise from the Communist nations. In defeating this barbarian violence moral values will count most, but they must be supported by an ample materials base.⁴²

In short, the United States and its allies had to develop and conserve their natural resources in order to outlast the communist threat.

Despite Cold War fears, the Paley Commission sounded an optimistic note. Under a market system, it reasoned, resource scarcity would lead to higher resource prices. Higher prices, in turn, would incentivize conservation and recycling on the demand side and incentivize discovery of new resources or development of renewables on the supply side. But the commission argued there was a role for government too. It needed to maintain

⁴¹ On the history of natural resources agencies in government during WW II and the early Cold War, including the Paley Commission, see Goodwin (1981), Landsberg (1987), and Lane (2014). Quotation from Goodwin (1981 p. 52). The understanding that natural resources are an important part of preparedness for war is probably as old as warfare, so it is not hard to find examples earlier than WW II. Still, it is notable that in the preface to *Foundations of National Prosperity*, Richard Ely highlighted the importance of natural resources for the “titanic war struggle” of WW I (1918b p. v).

⁴² President’s Materials Policy Commission (1952, I, 1).

the general economic environment, regulate natural resource monopolies, regulate resource use during critical emergencies, manage government-owned resources, and maintain foreign relations and international security.⁴³ Finally, the Paley Commission urged the ongoing documentation and study of natural resource scarcity, perhaps through a new independent organization.

Meanwhile, following the death of Henry Ford in 1947, the Ford Foundation had received a transformative gift from his estate. Accordingly, the foundation created a committee to set its strategic priorities for the funds, chaired by Rowan Gaither. Gaither had served as an administrator of MIT's Radiation Laboratory during the war, had helped found RAND, and had come to Ford in 1948 to request support for RAND's independence.⁴⁴ In 1949, the so-called Gaither report outlined the foundation's future priorities. Its central focus would be to "advance human welfare," as understood in a Cold War context. The report called for meeting the communist threat with a mix of hard and soft power, with support for organizations from RAND to the Fund for Adult Education, all part of a cohesive vision. It also highlighted the importance of natural resources, as a strategic necessity but also as an engine of economic growth. Thus, picking up where the Paley Commission had left off, in 1952 the Ford Foundation provided a small seed grant of \$50,000 to establish RFF and for it to host a "mid-century conference" on natural resources, a prestigious event attended by President Eisenhower. Beginning in 1953, RFF became a full-fledged think tank, with Paley serving as chairman of the board and Ford providing an average of \$865,000 per year for the next ten years. At that point, Ford increased its support further, until it cut its ties with a final large matching grant in 1979.⁴⁵

With their origins thus intertwined, it was perhaps inevitable that RAND and RFF would cover similar intellectual ground. RFF's first work was

⁴³ President's Materials Policy Commission (1952, I, 8–12, 18).

⁴⁴ MacDonald (1956).

⁴⁵ On the Gaither report's discussion of natural resources, see Ford Foundation (1949 pp. 34–7). On Ford's plans for a program in conservation, see McDaniel to Eliot 5-27-52 RAC 21.3.4.45; McDaniel to Eliot 8-24-53 with accompanying report "A Program for Resources Conservation and Development to Strengthen the Economy," RAC Ford Fdn, Assoc. Dir. RM Hutchins, II.11; and "A long term program for Resources for the Future, Inc." RAC microfilm, Reel 0387, grant 05300041. For a transcript of the mid-century conference, including discussion questions and summary statements, see RFF (1954). Annual funding statistics come from annual reports, available through the foundation's website at www.fordfoundation.org/about/library/annual-reports/YEAR-annual-report/, where "YEAR" should be replaced by any year, 1952 to 1964. See RFF (1977) for other documentation of its first 25 years.

focused on traditional questions of natural resource scarcity in line with the Paley Commission, as well as benefit–cost analyses of public investments in water projects. By the 1950s, this benefit–cost work began to address questions about the value of unpriced services like outdoor recreation, a theme which was extended during the 1960s (Chapters 4–6). For its part, RAND’s systems analysis required assessing the military worth of a weapons system within the context of a particular strategy. Accordingly, RAND too required benefit–cost analysis, as exemplified by Charles Hitch and Roland McKean’s book *Economics of Defense in the Nuclear Age* (1960). But, as with resource economists working with outdoor recreation, RAND’s analysts faced a number of empirical difficulties that challenged the application of their tools.

Thus, at the same time that resource economists were thinking about the value of non-market goods like recreation, RAND economists were struggling with quantifying the value of the lives of military personnel when weighing military systems (Chapter 7).⁴⁶ Meanwhile, with its Air Force patrons greatly displeased about its inability to address this problem, RAND also began to see the wisdom in diversifying away from its work on military matters. Again, it turned to the Ford Foundation for help. In 1952, the same year it first endowed RFF, Ford awarded RAND a second million-dollar grant, this time for a new initiative called “RAND-Sponsored Research,” for the study of non-military topics in the public interest. Closing the circle, some of RAND’s earliest non-defense projects were applications of benefit–cost analysis to water resource problems.⁴⁷

The postwar think tanks like RAND and RFF were intended to be places that broke down disciplinary boundaries, places where economists could interact with other social scientists, engineers, decision makers, and others. Importantly for the history of environmental economics, they also provided places where economists of different schools could mix, including agricultural and resource economists with institutionalist training, Chicago school economists, and economists trained in OR and other methods associated with RAND and Cowles. For example, RFF hired agricultural economists with substantial experience in government planning agencies, people like Marion Clawson, Joseph Fisher, and Irving Fox. At the same time, it hired economists working on OR problems at RAND, people like Barnett,

⁴⁶ This episode is discussed in Jardini (1996 pp. 52–63).

⁴⁷ On RAND-sponsored research, see Ford Foundation (1953) and Jardini (1996). For examples of work on water resources, see McKean (1958), De Haven and Hirshleifer (1957), and Hirshleifer, De Haven, and Milliman (1960).

Schurr, and eventually even its president Charles Hitch. As we shall see in this story, such interactions were crucial in shaping the history of environmental economics.

RFF also serves as a microcosm of the history of environmental economics. By 1970, it was helping to develop new tools for measuring the demand for environmental amenities not traded in markets, or the price people *would* pay for them if a market existed. This research agenda was distinctly different from its initial one of studying the conservation of strategic materials. This book tells the story of that shift over the course of the twentieth century, beginning in the next chapter with the state of the American conservation movement circa 1900.