1 *Introduction: scarcity and frontiers*

Resource development is a neglected topic in economic history. To be sure, no economist would be surprised to learn that resource abundance is a function of extraction and transportation cost as well as of physical availability, and the role of substitution in mitigating resource scarcity is widely appreciated … But natural resources still are viewed as the last of the exogenous factors, governed by the principle of diminishing returns in an economic growth process whose other constituents have come to be treated both as endogenous and subject to increasing returns.

(David and Wright 1997, p. 204)

Introduction

For an early Spring day in Washington, DC in 1913, the weather was overcast but mild. The large crowd milling about the Capitol were jubilant and expectant. After all, their presidential candidate, Woodrow Wilson, had swept to victory the previous November, ousting the incumbent William Taft and soundly beating the third party candidate Theodore Roosevelt.

To the average American, Woodrow Wilson embodied the spirit and success of his times. His life and career spanned the US Civil War of the 1860s, the hard post-war years of reconstruction and reconciliation, and, from 1870 onwards, the rapid expansion of the US economy across the North American continent. Woodrow Wilson also typified the American Dream. The son of a southern Presbyterian minister, Wilson grew up in the South but eventually became a professor at Princeton University and then its President. He entered politics and was Governor of New Jersey from 1911 to 1913. He ran for President for the first time and won. Just like the United States itself, there seemed to be no limits to what this mild-mannered, devout and hard-working American could accomplish.

The crowd waiting for Wilson's first inaugural address on March 4, 1913 therefore anticipated a rousing affirmation of all that was good and great about the United States. But when he finally gave his speech, it was different to what his audience had expected.

At first, Wilson told the crowd what they wanted to hear. He outlined briefly the remarkable achievements of rapid US industrialization over recent decades. Soon, though, he launched into his main message: the need for economic and social reform. The human and environmental costs of recent US economic growth had been too high.

In particular, Wilson asserted, "We have squandered a great part of what we might have used, and have not stopped to conserve the exceeding bounty of nature, without which our genius for enterprise would have been worthless and impotent."[1]

The inaugural audience was stunned by this sober pronouncement. Hadn't the United States, through exploiting its bounteous land and natural resources, become the leading industrial power of the world, overtaking even the mighty British Empire? Didn't the United States still have plenty of land and natural resources left to keep its economy growing? Why was the new President so concerned that US economic development may have "squandered" its "exceeding bounty of nature"?

Woodrow Wilson's remarks turned out to be prescient, however. The period from 1870 to 1914 had been unique in world economic history, which scholars now refer to as the "Golden Age" of Resource-Based Development.[2] The transport revolution and trade booms of the era were primarily responsible for unprecedented land conversion and natural resource exploitation across many resource-rich regions of the world. The result was a long period of global economic growth, in which many countries and regions benefited from this pattern of resource use and development. The United States was the prime example of such success; in only a few decades the US had exploited its vast natural wealth to transform its economy into an industrial powerhouse. But with the advent of World War I, followed by the Depression years and World War II, the Golden Age came to an end. Although the United States continued to rely on its abundant natural resources to spur industrial expansion, by the 1950s the US economy had also become dependent on foreign sources of raw materials, fossil fuels, minerals and ores to support this expansion. In the post-war world, possessing an abundant endowment of natural resources no

longer guaranteed successful economic development. Over the past fifty years, increased trade and globalization has resulted in declining trade barriers and transport costs, fostered global integration of commodity markets, and severed the direct link between natural resource wealth and the development of domestic industrial capacity. Or, as the economic historian Gavin Wright maintains, in today's world economy, "there is no iron law associating natural resource abundance with national industrial strength."[3]

Nearly a hundred years after President Wilson's 1913 inaugural address, public reaction during another democratic election illustrates how contemporary perceptions of natural resources and economic development are very different. This time the location was France, and the election was the June 2009 vote for seats in the European Parliament, the legislature of the European Union.

A year before the election, the French Government of President Nicolas Sarkozy released its strategic plan for the French Armed Forces over the next several years. The plan's main recommendation was that "the current structure of the armed forces will undergo a controlled reduction, combining on the one hand the effects of concentration of military bases in France and the rationalization of administrative and support functions and, on the other, the redefinition of operational contracts. A similar reduction will be made in the size of prepositional forces and forces stations overseas."[4] The result of this recommendation would be a reduction in total French armed forces from 271,000 civilian and military personnel in 2008 to 225,000 in 2014–2015. By late 2008, the French legislature had approved the reductions.

One of the obvious targets for overseas troop reductions were the small garrisons stationed in the tiny overseas French possession, les Íles Eparses (the Scattered Islands).[5] These territories consist of four small coral islands and one atoll, dotted around Madagascar in the southern Indian Ocean. Although les Íles Eparses are unpopulated and are designated nature reserves, France maintains a military garrison of around fifteen troops on all but one of the territories. The garrisons establish French sovereignty against rival territorial claims by Madagascar and Mauritius and may deter the spread of piracy in the Indian Ocean. But the principal function of the garrisons has been to monitor and police the reserves, which are highly valued by the international scientific community as biodiversity sanctuaries and for studying the effects of global warming. With the planned

reductions in French forces stationed overseas, it seemed that eliminating these expensive outposts in les Íles Eparses was an obvious policy decision.

However, the June 2009 European elections in France caused a remarkable reversal in the political fortunes of les Íles Eparses. The French Greens received a significant share of votes in the elections, by campaigning for better policies to halt ecological degradation, biodiversity loss and global warming. French scientists, including ornithologists, meteorologists, archaeologists, coral reef experts and geologists, capitalized on the public concern over the environment. They argued that the pristine les Íles Eparses were of unique scientific and ecological value, which was well worth the costs of maintaining small garrisons on the islands to protect them from poachers and other unwelcome visitors. The French public was persuaded by the scientists, and the fate of les Íles Eparses became an electoral issue. The Sarkozy Government had no choice but to abandon any plans of eliminating the troop garrisons in les Íles Eparses. Despite the exorbitant budgetary costs of maintaining troops thousands of miles away on remote islands, preserving nature reserves of scarce biodiversity and ecological value was warranted. By October 5, 2009 the French Government was hosting a symposium on "Scattered Islands: Land of the Future," to plan the long-term management of the reserves and regional cooperation of the fisheries in the exclusive economic zone of 640,000 km^2 encompassed by les Íles Eparses.

The difference in public attitudes between the American crowd listening to President Wilson in 1913 and the French electorate in 2009 illustrates that much has changed over the past hundred years in how we view the role of natural resources in economic development. In Wilson's day, associating "natural resource abundance with national industrial strength" was the norm. Today, we no longer believe that this association holds. Instead, we see our economies and societies potentially threatened by a wide variety of constraints caused by natural resource scarcity. Such problems range from concerns over the cost and availability of key natural resources, including fossil fuel supplies, fisheries, arable land and water, to the environmental consequences of increasing global resource use, degradation of key ecosystems, such as coral reefs, tropical forests, freshwater systems, mangroves and marine environments, and the rising carbon dependency of the world economy. Contemporary unease over natural resource scarcity, energy insecurity, global warming and other

Table 1.1. ***Magnitudes of global environmental change, 1890s–1990s***

Indicator	Coefficient of increase, 1890s to 1990s
Drivers	
Human population	4
Urban proportion of human population	3
Total urban population	14
World economy	14
Industrial output	40
Energy use	13–14
Coal production	7
Freshwater use	9
Irrigated area	5
Cropland area	2
Pasture area	1.8
Pig population	9
Goat population	5
Cattle population	4
Marine fish catch	35
Impacts	
Forest area	0.8 (20% decrease)
Bird and mammal species	0.99 (1% decrease)
Fin whale population	0.03 (97% decrease)
Air pollution	2–10
Carbon dioxide (CO_2) emissions	17
Sulfur dioxide (SO_2) emissions	13
Lead emissions	8

Source: Adapted from McNeill (2000, pp. 360–361) and McNeill (2005, Tables 1 and 2).

environmental consequences is to be expected, given the rapid rate of environmental change caused by the global economy and human populations over the twentieth century (see Table 1.1).

At the beginning of the twenty-first century, therefore, we are more accustomed to viewing "the exceeding bounty of nature" to be running out, rather than providing unlimited supplies for "our genius for enterprise." Rather than enjoying a new "Golden Age" of Resource-

Based Development, we seem to be entering a different era, the "Age of Ecological Scarcity."

However, as the quote at the beginning of this chapter indicates, the contemporary concern with natural resource and ecological scarcity also shapes our view of how natural resources influence economic development. We regard natural resources as "fixed endowments." These endowments comprise the sources of raw materials, energy and land that are provided in varying amounts freely by nature and geology, and that are distributed randomly across regions and countries. Although natural resources serve as valuable inputs into our economies, as the economic historians Paul David and Gavin Wright note, because they are largely finite in supply relative to demand, we treat these endowments as "exogenous factors" that are subject to "diminishing returns." This view appears to be reinforced by current patterns of resource use and exploitation in today's economy. As we continue to encroach on and pollute fixed natural environments and habitats, the earth's natural capacity to sustain a stable climate, absorb emissions, support ecosystems and maintain wild species has declined (see Table 1.1). In today's world, we are more concerned about the impact of economic development on natural resources and global environmental change than how the abundance, or scarcity, of natural resources have shaped economic development.

Our preoccupation with present-day environmental and natural resource problems tends to be myopic, however. There is mounting scientific evidence that ecological scarcity, global warming and energy insecurity are serious issues that do require immediate attention by the international community. But our concern with these contemporary issues must be balanced with learning from the past. We tend to dismiss past uses of natural resources in previous eras, such as the Golden Age, as artifacts of history and thus irrelevant to our current environmental concerns. The result, as emphasized by David and Wright, is that "resource development is a neglected topic in economic history."

The purpose of this book is to correct this omission and, in doing so, show why the relationship between natural resources and economic development has been fundamental as economies have evolved over the past 10,000 years or so. There are two principal reasons motivating this task: first, to show that resource development should *not* be a neglected topic in economic history; and second, to demonstrate that the lessons learned from natural resource use and economic

development in past eras are relevant in the present Age of Ecological Scarcity.

Scarcity and frontiers

This book's title, *Scarcity and Frontiers*, conveys an important overall theme. Throughout much of history, a critical driving force behind global economic development has been the response of society to the scarcity of key natural resources. Increasing scarcity raises the cost of exploiting existing natural resources, and will induce incentives in all economies to innovate and conserve more of these resources. However, human society has also responded to natural resource scarcity not just through conserving scarce resources but also by obtaining and developing more of them. Since the Agricultural Transition over 12,000 years ago, exploiting new sources, or "frontiers," of natural resources has often proved to be a pivotal human response to natural resource scarcity.

The concept of natural resource frontiers is therefore significant to this book. The term *frontier*, as employed here, refers to an area or source of unusually abundant natural resources and land *relative* to labor and capital. Note that it is the relative scarcity, or abundance, of natural resources that matters to economic development, not their absolute physical availability. The process of *frontier expansion*, or *frontier-based development*, thus means exploiting or converting new sources of relatively abundant resources for production purposes. Years ago, the economist Joseph Schumpeter suggested that this process often contributes fundamentally to economic development, which he defined as "the carrying out of new combinations of the means of production," one of which is "the conquest of a new source of supply of raw materials … irrespective of whether this source already exists or whether it has first to be created."[6] As we shall see in this book, such *resource-based development* has proved to be highly successful in the past for some economies and regions, but less successful for others.

In sum, the process of economic development has not just been about allocating scarce resources but also about obtaining and developing new frontiers of natural resources. This is particularly the case if, as noted by the economists Ron Findlay and Mats Lundahl, the concept of a "frontier" extends "vertically downwards" to include mineral resources and extractive activities as well as "horizontally

extensive as in the case of land and agriculture."[7] When viewed in this way, frontier expansion has clearly been pivotal to economic development for most of global history.

Theories of frontier-based development

The focus of this book on how economies have developed through natural resource exploitation, especially by exploiting new frontiers of land and natural resources, has received little attention in contemporary economics.[8] In Woodrow Wilson's time, however, the recognition of the role of the frontier in economic development was widely appreciated, thanks to the *frontier thesis* put forward by the historian Frederick Jackson Turner.

In his infamous 1893 address to the American Historical Association, "The Significance of the Frontier in American History," Turner argued that "the existence of an area of free land, its continuous recession, and the advance of American settlement westward, explain American development."[9] Critical to this frontier expansion was the availability of "cheap" land and resources:

> Obviously, the immigrant was attracted by the cheap lands of the frontier, and even the native farmer felt their influence strongly. Year by year the farmers who lived on soil whose returns were diminished by unrotated crops were offered the virgin soils of the frontier at nominal prices. Their growing families demanded more lands, and these were dear. The competition of the unexhausted, cheap, and easily tilled prairie lands compelled the farmer either to go west and continue the exhaustion of the soil on a new frontier, or to adopt intensive culture.[10]

Turner's frontier thesis was further extended by the historian Walter Prescott Webb to explain not just American but global economic development from 1500 to1900. Webb suggested that exploitation of the world's "Great Frontier" – present-day North and South America, Australia, New Zealand and South Africa – was instrumental to the "economic boom" experienced in the "Metropolis," or modern Europe: "This boom began when Columbus returned from his first voyage, rose slowly, and continued at an ever-accelerating pace until the frontier which fed it was no more. Assuming that the frontier closed in 1890 or 1900, it may be said that the boom lasted about four hundred years."[11]

Historians, geographers and social scientists have continued to modify the ideas developed by Turner and Webb to describe processes of frontier-based development in many areas of the world, including Latin America, Russia, Canada, South Africa, Australia and New Zealand.[12] Although there is considerable debate over whether the frontier thesis as envisioned by Turner and Webb is still relevant for all regions, a consensus has emerged in this literature over both the definition of a frontier and its significance for economic development. A frontier area is typically defined as "a geographic region adjacent to the unsettled portions of the continent in which a low man-land ratio and unusually abundant, unexploited, natural resources provide an exceptional opportunity for social and economic betterment to the small-propertied individual."[13] Or, as summarized by the economist Guido di Tella, throughout history "processes" of frontier-based development "were characterized by the initial existence of abundant land, mostly unoccupied, and by a substantial migration of capital and people."[14]

It is not surprising that most theories of frontier-based development draw on the historical legacy of the Great Frontier expansion from 1500 to 1900, as described by Webb, for their inspiration.

As will be discussed further in Chapter 5, over this 400-year period Western European economies benefited significantly from the exploitation of frontiers on a global scale. Many European countries gained a vast array of natural wealth, not only through new lands that provided an outlet for poor populations emigrating from Europe in search of better economic opportunities but also through new sources of fishing, plantation, mining and other resource frontiers. For example, as suggested by the economic historian Eric Jones, during this era Europe had at its disposal four main global "frontiers" that provided "vast, varied, and cheap" supplies of "extra-European resources": ocean fisheries, including whale and seal fisheries; boreal forests around the Baltic, Scandinavia and Russia; tropical land for plantation and smallholder commercial crops, such as sugar, tobacco, cotton, rice and indigo; and temperate arable land for grains.[15]

The general perception, too, has been that the exploitation of the Great Frontier from 1500 to 1900 eventually benefited the regions that contained the abundant endowments of natural resources and land. Such a beneficial frontier-based development process, as outlined in Figure 1.1, can be termed the *classic pattern of frontier expansion*.

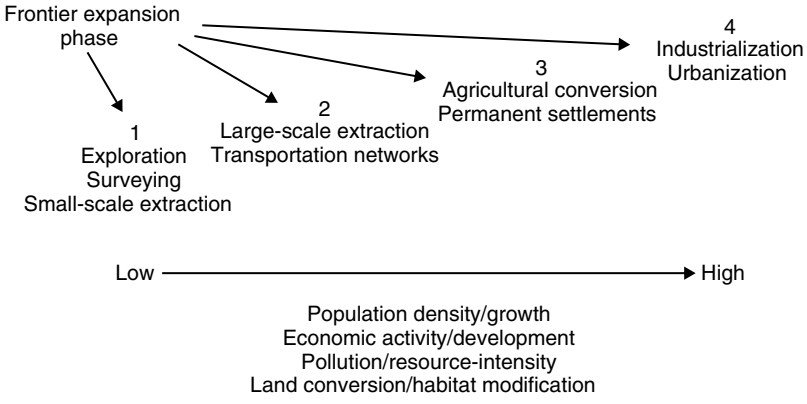

Figure 1.1. The classic pattern of frontier expansion

As shown in Figure 1.1, the first phase involves initial exploration and discovery of the vast areas of land and natural resources, and small-scale extracting of natural resources, minerals and other raw materials. The second phase sees the development of large-scale extraction activities, usually for commercial export, and transportation networks. By the third phase, agricultural conversion of land and the establishment of permanent settlements are in full fruition. The final phase involves the development of industrial activities, large urban centers and modern commercial networks. Somewhere between the third and fourth phases, the abundance of land and natural resources relative to labor and capital has disappeared, and the former frontier region has effectively "closed."

Various phases of European exploitation of the abundant land and natural resource wealth of the New World from 1500 to 1914 appear to fit this classic pattern of frontier expansion (see, for example, Chapter 5 and Figure 5.1).[16] The first phase, from 1500 to 1640, included much of the initial exploration and conquest of the New World, as well as the establishment for the first important resource-extractive enclaves, the Spanish silver mines and "sugar economy" of Portuguese Brazil.[17] The second phase (1580–1860) corresponded to the spread of the slave-based plantation economy from Brazil to other tropical and subtropical regions of South America, the Caribbean and southern North America. This economy was an agricultural-based export enclave on an extensive scale, and became an important leg of the Atlantic "triangular trade" between Europe, Africa and the New