A Behavioral Finance Approach to Commodity Supply Scares

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ABSTRACT

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This study aims to generate a more robust understanding of public attitudes regarding non-renewable natural resource markets. Employing a comparative-historical case study method, it analyzes three waves of widespread fear that swept the United States over the course of the twentieth century regarding an imminent, irreversible shortage of oil. Each of these periods of fear over oil supply availability coincided with a significant rise in the price of crude oil, only to be followed by a sudden collapse as new production came onstream in response to higher prices. The study utilizes process tracing and pattern matching techniques to examine the linkages between fundamental supply-demand conditions in the crude oil market, oil price movements, and expert predictions of and other public expressions of belief that oil in the United States would become scarcer and more expensive in the future.

This dissertation's core arguments contribute to existing theoretical debates in three ways. First, by providing a comparative historical portrait of cyclical patterns in public and expert beliefs regarding non-renewable resource availability and long-term price behavior, the study puts contemporary debates over the future of oil supply in historical perspective. It allows the rampant claims of, and widespread belief in, a global

shortage of oil that have gained popularity over the last decade—most notably, in the so-called "peak oil" movement—to be situated within a broader chronological context. It also extends and deepens earlier historical work analyzing oil shortage scares in the United States, both in terms of their underlying dynamics and their effect on federal government policy relative to the oil industry.[1]

Second, the study establishes the link between fundamental supply-demand conditions in the oil market, generally reflected in oil prices, and the degree of media attention given to, and apparent public belief in, an imminent, irreversible shortage of oil in the United States over the course of the twentieth century. In so doing, it demonstrates the applicability of Shiller's (2000, 2005) conceptualization of new era economic theory formation and popularization to observed phenomena in the oil market, but with a crucial difference. Rather than new era economic thinking taking the form of unbounded optimism about the future, in the case of the oil market new era thinking has tended to be manifested as the pessimistic belief that an impending, irreversible shortage of oil would lead to a long-term, even perpetual, rise in oil prices.

The study suggests two modifications to the concept that enhance its greater explanatory leverage with regard to exhaustible resource markets: one, that often the new era predictions most widely cited during shortage scares were actually made prior to the boom in prices, to little fanfare, but subsequently deemed prophetic by new era proponents; and two, that the new era narratives often contained normative elements. Moral judgments—in particular, condemnation of the oil economy's degradation of the

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natural environment—have often intertwined with predictions that the oil supply was more limited than widely believed and that prices were destined to continue rising.

Third, the study demonstrates that the concept of narratives of decline, as described by Bennett (2001) and Lieber (2008), constitutes a powerful theoretical lens through which to understand trends in popular opinion with regard to non-renewable resource availability, and to asset prices more generally—a link that has heretofore gone unrecognized. It finds that a positive feedback loop tended to exist between popular fears of a new era of oil shortages, marked by a long-term rise in prices, and related narratives of the environmental and relative political-economic decline of the United States.

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Project overview

"But what if stories themselves move markets? What if these stories of over-explanation have real effects? What if they themselves are a real part of how the economy function? […] The stories no longer merely explain the facts; they are the facts."

Akerlof and Shiller, *Animal Spirits, p.54*

This study aims to generate a more robust understanding of public attitudes regarding the oil market. Employing a comparative-historical case study method, it analyzes three waves of widespread fear that swept the United States over the course of the twentieth century regarding an imminent, irreversible shortage of oil. Each of these periods of fear over oil supply availability coincided with a significant rise in the price of crude oil, only to be followed by a sudden collapse as new production came onstream in response to higher prices. The study utilizes process tracing and pattern matching techniques to examine the linkages between fundamental supply-demand conditions in the crude oil market, oil price movements, and expert predictions of and other public expressions of belief that oil in the United States would become scarcer and more expensive in the future.

Three central questions motivate this study. First, what precedent exists in the United States for the wave of expert predictions and apparent public fear of an imminent, irreversible global oil supply shortage that has emerged since the 1990s, most vividly as the so-called "Peak Oil" movement? The second question derives from the first: do these historical episodes of heightened fear over the future of oil supply bear any relationship to short-term conditions in the oil market at the time? If so, under what market conditions, if any, have these fears appeared to emerge, thrive, and decline? The third and

final question is, to what extent is the link that Shiller (2000, 2009) draws between the spread of what he terms “new era economic thinking” and coincidental booms in financial markets applicable to the apparent historical coincidence of short-term price conditions in the oil market and coincidental prophecies of permanent oil shortage? How do these historical episodes from the oil market contribute to our understanding of the social, cultural, and psychological forces that attend asset price booms?

To address these research questions, the study utilizes a variable-oriented comparative-historical case method in combination with the analytic techniques of process tracing and pattern matching. The population of cases consisted of the set of periods in the history of the United States in which predictions of or expressions of belief in an imminent, irreversible exhaustion of oil were particularly preponderant or seemed to define the oil-related public discourse of the time in a notable or significant way. To identify these periods, an extensive body of primary and secondary sources on the history of the American oil industry was surveyed, including a host of contemporary source material, particularly popular newspapers and magazines. Three cases were selected after being filtered according to representativeness and feasibility. These case studies explore three periods of American history in which a popular narrative involving an imminent, irreversible shortage of oil in the United States gained a significant degree of credence among an influential element of American society, only to vanish as production growth (and subsequent price collapse) put a temporary end to the debate. The variables on which the cases focus are physical supply-demand fundamentals in the oil market, oil prices, and predictions of and expressions of belief in an imminent, irreversible shortage of oil.

This study contributes to existing theoretical debates in three ways. First, by providing a comparative historical portrait of cyclical patterns in public and expert beliefs regarding non-renewable resource availability and long-term price behavior, the study puts contemporary debates over the future of oil supply in historical perspective. It allows the rampant claims of, and widespread belief in, a global shortage of oil that have gained popularity over the last decade—most notably, in the so-called "peak oil" movement—to be situated within a broader chronological context. It also extends and deepens earlier historical work analyzing oil shortage scares in the United States, both in terms of their underlying dynamics and their effect on federal government policy relative to the oil industry.[2]

Second, the study establishes the link between fundamental supply-demand conditions in the oil market, generally reflected in oil prices, and the degree of media attention given to, and apparent public belief in, an imminent, irreversible shortage of oil in the United States over the course of the twentieth century. In so doing, it demonstrates the applicability of Shiller's (2000, 2005) conceptualization of new era economic theory formation and popularization to observed phenomena in the oil market, but with a crucial difference. Rather than new era economic thinking taking the form of unbounded optimism about the future, in the case of the oil market new era thinking has tended to be manifested as the pessimistic belief that an impending, irreversible shortage of oil would lead to a long-term, even perpetual, rise in oil prices.

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The study suggests two modifications to the concept that enhance its greater explanatory leverage with regard to exhaustible resource markets: one, that often the new era predictions most widely cited during shortage scares were actually made prior to the boom in prices, to little fanfare, but subsequently deemed prophetic by new era proponents; and two, that the new era narratives often contained normative elements. Moral judgments—in particular, condemnation of the oil economy's degradation of the natural environment—have often intertwined with predictions that the oil supply was more limited than widely believed and that prices were destined to continue rising.

Third, the study demonstrates that the concept of narratives of decline, as described by Bennett (2001) and Lieber (2008), constitutes a powerful theoretical lens through which to understand trends in popular opinion with regard to non-renewable resource availability, and to asset prices more generally—a link that has heretofore gone unrecognized. It finds that a positive feedback loop tended to exist between popular fears of a new era of oil shortages, marked by a long-term rise in prices, and related narratives of the environmental and relative political-economic decline of the United States.

The text of the dissertation is divided into several sections. The first section reviews the scholarly literature to which the study responds and on which it is based, principally natural resource economic theory, behavioral finance and in particular new era economic thinking, and narratives of decline. The next section discusses the structure of the dissertation and the research methods employed in crafting it. It lays out the core theoretical questions that motivate the study, explains the methodological approach, and provides the case selection criteria. It also presents the analytic logic behind the study's approach and discusses the limitations of the study, then lays out the key steps and

methods used to craft the case studies, including the sources of evidence, data collection processes, and application of analytic techniques.

The body of the dissertation presents the three case studies chronologically. Chapter Four traces the genesis and popularization of oil shortage narrative from 1909 to 1927, as George Otis Smith and the United States Geological Survey, buoyed by the nascent American environmentalist movement, declared the imminent demise of American oil reserves, a view that gained traction as World War I and the dawn of the automobile age radically increased demand for domestic oil. Chapter Five shows the resurgence of an oil shortage narrative from 1940 to 1949. This time, soaring demand for U.S. crude to fuel the allied war effort set the context for frightening predictions by the U.S. military and industry experts of the near-term exhaustion of domestic crude oil, led by Secretary of the Interior Harold Ickes, the "representative of a new alarmism." Chapter Six, covering 1970 to 1986, traces the origins and development of President Carter's "problem unprecedented in our history," a narrative of national anxiety over an ineluctable energy shortage and broader American decline, ignited by the rise of OPEC and heightened by Cold War fears.

The next section summarizes the key findings from the case studies relative to the three key research questions driving the study. It then analyzes the implications of the findings for existing theoretical debates, particularly Shiller's (2000; 2005) concept of new era economic thinking as a behavioral phenomenon that has manifested itself during periods of soaring equity markets. It also argues for the relevance of the concept of narratives of decline, whose usage as a theoretical lens is primarily limited to critical

literary theory, to the idea of new era economic thinking and the scholarship on investor psychology more broadly.

Finally, Chapter Eight discusses the implications of the three historical episodes presented in the case studies to the most recent—and indeed ongoing—wave of widespread fear over a new era of prolonged, if not permanent, shortage of oil. Renewed concerns in the United States (but extending globally) that the world is running out of oil, a view that has been encapsulated most vividly in the Peak Oil movement of the post-2000 years, which has become a forceful voice in the energy community since the price run-up of the last decade, are the focus of this very brief chapter. It also endeavors to look ahead at the future of oil supply in the coming decades and discusses the historical lessons of the dissertation for current debates. The chapter also offers some concluding remarks regarding the choice of theoretical framing in Shiller's (2000, 2009) concept of new era economic thinking, grounds the idea more fully within the behavioral economic scholarship, and further interrogates its assumptions. It then suggests several further avenues for research.

Literature review

The problem of natural resource scarcity has occupied the attention of modern economists since the seminal work of Thomas Malthus in the eighteenth century. Malthus's *An Essay on the Principle of Population* (1798) argues that the finite supply of tillable land puts an absolute limit on human population growth. In his view, the scarcity constraint on land meant that the population could not expand beyond the point that per capita food consumption fell to the minimum level needed to sustain life. Were it to exceed those bounds, population would decrease until it fell within the range dictated by the absolute scarcity constraint, at which point it would begin to grow again. Malthus was sanguine about humankind's ability to stay within the bounds of subsistence only if people practiced "prudential constraint," which would limit population growth.

Ricardo, in his *Principles of Political Economy and Taxation* (1817), responds to Malthus by noting that agricultural land is a heterogeneous commodity defined by relative rather than absolute scarcity. While the most productive land tends to be worked first, inferior-quality land can be made to yield comparable nutrition if inputs are increased. That increase in inputs, however, pushes the price of food higher, which in turn dampens consumption growth and population multiplication. Moreover, argues Ricardo, this principle of declining marginal returns to natural resource production applies not only to agriculture but also to minerals. This parallelism is shortsighted, however, given that it overlooks a fundamental difference between nonrenewable and renewable resources.

According to Barbier (1989), preoccupation with the finiteness of natural resources, and what classical economics saw as the inexorable constraints on human

possibility that resulted from that fact, was a defining feature of the so-called "dismal science" during this period. Mill (1862) and Jevons (1865)—who both accepted that resource constraints ultimately would limit economic growth at some stage—are best understood in the context of these classical debates. Agreeing with Ricardo's relative scarcity paradigm, Mill contends that Malthus's view ignores or obscures several vital factors, however. For one, he argues, the ultimate quantity of arable land is much greater than Malthus assumes. So while an absolute constraint may exist, it is less pressing than the Malthusian view admits. What is more, the adverse effects of unchecked population growth on quality of life provide incentive to reduce population growth, long before subsistence considerations take effect. Perhaps most importantly, Mill is the first modern economist to articulate a role for technological improvement in the problem of resource scarcity. Through technological advances, he argues, living standards can remain steady even as resource scarcity problems may worsen.

Jevons (1865), like Malthus before him, had the dubious distinction of uttering one of the first doomed economic forecasts on modern record. Malthus, of course, did not foresee the incredible boom in population that would occur in the nineteenth and twentieth century. As for Jevons, it is his wrongheaded prediction for which he is now arguably most well known. In 1865, he warned Britain that the supply of coal as an energy source was running out, with dire consequences for his country's economic growth and international competitiveness. Yet, now 246 years later, proven reserves of coal worldwide would last for another 119 years at the current rate of production (British Petroleum, 2011).

By the turn of the twentieth century, however, economic theory largely eschewed the classical school's regard for scarcity as a fundamental constraint on economic growth. The birth of neoclassical economics, led by the work of Marshall, Walras, and Fisher, saw growth through the lens of the income-expenditure cycle, wherein labor is exchanged to produce goods for which income is received, and so on. The neoclassical paradigm's relatively benign view of natural resource constraints constituted the economic orthodoxy for much of the twentieth century. It was a school of thought well suited to the times, given that economic growth in the leading Western nations was generally robust over the period – with major exceptions, of course, such as the Great Depression. But scholars did not tend to see such downturns as a product of exhaustible resource problems. While some social campaigns, such as the American Conservation Movement, certainly took strong views of how natural resources should fit into public policy, their arguments did not tend to cross over into economic theorization (Pinchot, 1910).

One notable theoretical contribution to the future debates over oil scarcity came in Hotelling (1931). Hotelling argues that wealth-maximizing oil producers, facing a finite or "fixed" supply of oil in the ground, would extract the resource at a rate that ensured the market price for their oil rose with their discount rate. This assertion has generated some amount of controversy over the last two decades. While neoclassical economists reject a critical assumption of Hotelling's principle by disputing the notion that oil reserves are a fixed quantity, others have asserted that the principle lacks empirical support (Bradley and Watkins, 1994; Adelman and Watkins, 1995). Still, the idea that below-ground scarcity would reveal itself as rising costs of extraction and hence increasing market prices is a notable contribution of Hotelling's thesis. The extent to which the 1931

Hotelling argument provides a sound analytical approach for understanding the modern oil market continues to generate debate (see Adelman, 1972; Gordon, 1994).

The neoclassical economists' view with regard to resource scarcity did not come under fire until the 1970s. A chorus of scholars—many of whose work was prompted by a combination of sharp increases in commodity prices during the decade, tectonic shifts in the geopolitical landscape (the rise of OPEC, for instance), and a resurgent American environmental movement—questioned whether neoclassical scholarship was too dismissive of the threat that resource exhaustion posed to global economic growth. The Club of Rome's *Limits to Growth* (Meadows et al, 1972) was perhaps the most culturally influential of these arguments. Some economic scholarship buttressed these views, but even those that sympathized with the normative aims of the work did not tend to attempt a comprehensive theoretical defense for it (Daly, 1977; Georgescu-Roegen, 1971 and 1975; Mishan, 1974). Even so, these voices were quite heterodox within the context of the larger economic community of the day and generally dismissed as eccentric perspectives.

Neoclassical economic scholarship, meanwhile, rejected the assertion that scarcity limits would be a significant constraint on the long-term growth frontier (Solow, 1974; Dasgupta and Heal, 1974). It found little persuasive in the Club of Rome's report (see Beckerman, 1972 and 1974). Nordhaus' (1974) exhaustive critique was typical: "With much fanfare and alum, Malthusian theories have recently been revived by a group of engineers and scientists." While such predictions "are impressive to laymen and scientists alike because they appear to be derived from sophisticated models," they are riddled with "subjective plausibility" and "represent no advance over earlier work." In the neoclassical

view, technological progress, coupled with the substitution-inducing effects of relative price changes, were sufficient to overcome perceived scarcity limits, keeping exhaustible resources from ever being totally consumed. Stiglitz (1974), for example, offers a quantitative model arguing that at least three economic forces offset the limitations imposed by natural resource constraints: technological change, substitution, and returns to scale. These forces make sustained growth in per capita consumption not only feasible, in his view, but observed rates of resource extraction at the time were actually economically optimal.

The future of the world's supply of crude oil was a particularly heated flashpoint in the debate between neoclassical and neo-Malthusian scholars in the 1970s. Much of the neo-Malthusian thought about oil supply during this decade can be traced back to the work of M. King Hubbert (1956, 1969), whose work in the 1950s correctly predicted a peak in oil production in the United States between the mid-1960s and early 1970s. Hubbert's held that oil supply, a finite resource, would be exhausted over a period of time determined by the size of the resource base and the rate of production. Plotted over time, an idealized cycle of production for a given field—or on a larger scale, a state or country—could be bell-shaped, in what has come to be known as a classic Hubbert curve. The methodology he employs to forecast the United States' oil production decline makes two key assumptions, both anathema to neoclassical economic thought, as McCabe (1998) observes. First, it posits that the area under a normalized production curve, what he termed an "ultimate cumulative production curve," would equal the total volume of the Earth's oil resources. That assumption presupposes that such a figure can be accurately measured, which is a tall order from a geolometric standpoint. Second, it

assumes that a given deposit of oil, once discovered, would be extracted as quickly as possible, and does not take into account the potential impact that other forces may have on the timing of extraction, such as the market price, technological advances, and political factors.

Hubbert's work on the exhaustion of oil supplies was seminal for a new generation of neo-Malthusian scholars in the 1990s and 2000s. Updating Hubbert's models, these "depletionist" scholars, as Stevens (2005) labels them, argue that a downturn in world oil production was imminent (Bartlett, 1986, 1994; Campbell, 1997, 2005; Edwards, 1997; Campbell and Laherre, 1998). Their contention that world oil production had either reached or would reach within several years a production ceiling, which could not be exceeded due to geological limitations, came to be known as the "peak oil" thesis. These ideas have tended to buttress the views of the contemporary environmental movement, which has popularized concern over what it has termed "sustainable development" and the planet's "carrying capacity," the latter of which it borrows directly from Malthusian thought (Flavin and Lenssen, 1994).

Since the turn of the century, numerous neo-Malthusian scholars have echoed the arguments (or at least the central concerns) of Hubbert and later depletionist scholars, stressing the adverse economic and indeed humanitarian consequences of the imminent and irreversible waning of oil production potential due to geological constraints (Deffeyes, 2006, 2008; Heinberg, 2003; Simmons, 2005). Their contribution to long-standing theoretical debates over the economics of natural resource exhaustion has tended to be minimal, however. Rather, they have generally applied the theoretical work of earlier scholars to the current oil supply outlook and focused on the adverse

consequences of these developments (Roberts, 2004; Austin Fitts, 2004; Campbell, 2005). The alarming titles that many of these works carry are suggestive of the fearful message they deliver: for instance, *The End of Oil: On the Edge of a Perilous New World* (Roberts, 2004); *Peak Everything: Waking Up to the Century of Declines* (Heinberg, 2007); *The Party's Over: Oil, War, and the Fate of Industrial Societies* (Heinberg, 2003); and *The Long Emergency* (2005). Beyond the academic realm, the peak oil school of thought has become a cultural sensation, spawning scores of government studies, media productions, and other popular works, discussion of which is beyond the scope of the current study but noteworthy nonetheless.[3]

Just as they did in the 1970s, economists subscribing to the more mainstream neoclassical approach to exhaustible resource theory have roundly criticized the methodology and claims of these neo-Malthusian scholars (Adelman, 1990, 1994; Gordon, 1994; McCabe, 1998; Stevens, 2004; Gorelick, 2009). As Stevens (2005) delineates, this scholarship generally raises three main methodological objections to the depletionist viewpoint. First, it assumes that conventional oil resources are a fixed quantity, which fails to take into account the role of investment in expanding the existing stock. Implicit in the view is "an even more egregious error," according to Stevens, which is that it ignores the productive potential of unconventional oil resources to expand global supply. Second, it assumes that future demand will grow without constraint. Mainstream economic thought would argue that a variety of forces (in addition to the price mechanism) would temper demand should supply become increasingly scarce,

[3] See, for instance, documentary films such as *Crude Awakening: The Oil Crash* (2006); *The Power of Community: How Cuba Survived Peak Oil* (2006); T*he End of Suburbia: Oil Depletion and the Collapse of the American Dream* (2004); *What a Way to Go: Life at the End of Empire* (2007); *PetroApocalypse Now?* (2008); and *Collapse* (2009).

among them environment and supply-security concerns, sales taxes on petroleum products in net-consumer nations, and other unspecified forces. Third, it ignores basic market mechanisms. A growing shortage would tend to increase costs of production and market prices, which would simultaneously temper the quantity of oil demanded and boost the quantity supplied.

Much of this scholarship found an intellectual forebear in Julian Simon (Simon, 1995). Simon's hallmark contention is that the real prices of exhaustible resources tend to trend lower over time, despite rising rates of production (Simon, 1980, 1981). While prices may spike for a period, the longer-term tendency is for them to decline steeply in the early years and then flatten out over time (Simon et al, 1994). Other studies have reaffirmed this finding (Cashing and McDermott, 2006; World Bank, 2009). Simon's work is more concerned with the price behavior of exhaustible resources as a class than of oil specifically.

It is within the context of this centuries-old debate concerning the economics of natural resources, and non-renewable natural resources in particular, that much of the historical work on the oil market on which this dissertation draws has emerged. So it was necessary to review that work here. The purpose of this dissertation, however, is not to address the economic theory of exhaustible resources in a traditional sense. It does not seek to contribute to the theoretical corpus of work on the economics of natural resources, as the works surveyed so far in this literature review do. Rather, its aim is to document, understand, and describes the implications of repeated arguments over the course of the twentieth century that society was facing a sudden and irreversible shortage of one particular exhaustible resource—crude oil. Previous scholarly work that touches

on a similar theme and documents similar patterns of thought, however, has tended overwhelmingly to fall within the theoretical economic literature on non-renewable resource supply.

Almost all of the scholarship that has chronicled or analyzed previous historical instances of widespread fears or expert predictions of an imminent, irreversible oil supply shortage has been written with an objective of debunking similar contemporary claims by neo-Malthusian scholars (see Williamson, 1945; Fanning, 1950; Adelman, 1995, 2004; Porter, 1995; Deming, 2003; Maugeri, 2006; Gorelick, 2009). This body of work, grounded in neoclassical economic theory, recalls the numerous past examples of predictions of impending oil scarcity that proved wildly incorrect in an effort to show how similar sorts of modern-day Cassandras are likewise misguided. While none of these authors claims that the failure of past predictions of scarcity is proof that similar existing predictions are also wrong, they recount them for at least two reasons. First, they point out that the myriad times that similar predictions of shortage were disproven by history lends a certain amount of skepticism to similar contemporary claims. Indeed, some authors heap more than a little scorn on oil's Cassandras (see Lynch, 1998, 2002; Maugeri, 2006). Second, contemporary shortage predictions have often been based on the same (or very similar) forecasting methodology as earlier incorrect shortage predictions (Lynch, 1994, 1996; McCabe, 1998; Porter, 1995; Stevens, 2005). By showing how this methodology has yielded incorrect conclusions in the past, these authors provide a stronger basis for criticizing contemporary predictions of shortage based on similar methodologies.

Two of the earliest historical studies of failed predictions of oil supply shortages in the United States were Williamson's (1945) "Prophecies of Scarcity or Exhaustion of Natural Resources in the United States" and Fanning's (1950) "A Case History of Oil Supply Scares." Williamson argues that prophecies of scarcity or exhaustion of the United States' natural resources have played an "important part in bringing about changes in public opinion and policy by dramatizing the problems involved and putting them into more concrete and understandable terms." His purpose in chronicling past predictions that America's oil supply would soon be depleted is to show how their overwhelmingly poor track record has "made it difficult to secure more effective policy." The approach is groundbreaking in the way it which it attempts to link these past predictions to policy outcomes, though it does not specify these links clearly. While he is sympathetic to the forecasts' errors, he bemoans the predictions as "quite unfortunate" since they have "cast discredit on the conservation movement"—a cause he supports. Fanning (1950) is rather less sympathetic but provides a similarly comprehensive review of failed predictions that oil reserves in the United States were facing or had already hit a permanent and irreversible decline.

DeNovo (1955, 1956), Wildavsky and Tenenbaum (1982), and Randall (1983) further develop the notion that incorrect oil supply predictions have warped United States government policy, yet their studies differ in terms of historical focus and unit of analysis. The focus of Wildavsky and Tenenbaum (1982) is to demonstrate how chronic uncertainty over the country's oil reserves "has fueled mutual mistrust between participants on opposite poles of energy policy issues, to compound the confusion and frustration of all." What is more, the differing viewpoints of the major parties involved—

whether the oil industry, federal government, or public—have tended to remain the same over the decades despite new geologic findings, lending credence to the view that policy outcomes have been warped by a failure to update beliefs in the face of new supply evidence. Randall (1983) assesses the role of Harold Ickes, Secretary of the Interior under F. D. Roosevelt and head of the Office of Petroleum Coordinator and the Petroleum Administration for War during World War II, in formulating United States oil-related foreign policy during a pivotal period in the industry's history. It provides little analysis, however, with regard to the ways in which Ickes's outspokenly pessimistic views on the country's oil reserves differed from those of his contemporaries or impacted federal policy. Still, it provides rich detail in demonstrating the extent to which his views drove the Roosevelt Administration's policy of proactively assisting domestic producers to obtain overseas oil acreage, most notably in Saudi Arabia. DeNovo (1955, 1956) makes substantively similar claims—American fears of oil scarcity during World War I, although ultimately exaggerated, were instrumental in the "movement for an aggressive American oil policy abroad" during the latter half of the 1920s.

Persistent popular fears over the waning of oil supply originating in the 1970s, not to mention two major supply disruptions in the Middle East during the decade, gave rise to a wave of work from that time through the 1990s analyzing the economic methodology behind these and prior predictions (Adelman, 1993, 1995; Olien and Olien, 1993; Porter, 1995; McCabe, 1998). From a theoretical standpoint, Adelman (1972, 1993, 1995) makes significant contributions to elucidating the economic dynamics underlying global oil supply. He persuasively argues that misguided worries over oil market tightness during both of the major Middle Eastern oil disruptions of the 1970s caused unmerited oil price

volatility at the time. Wholly rejecting the view that global oil scarcity was at fault for the price spikes of the 1970s, he asserts that public policy, particularly Nixon's price controls on domestic petroleum products, and fear of shortage itself were the root causes of that decade's woeful oil supply issues. Moreover, in the papers compiled in Adelman (1993), he lays out what remains the classic argument for a more cornucopian view of the world's oil resources, tailored to the economics of the global oil market and rooted in neoclassical economic theory, which would provide the intellectual framework for future rebuttals of neo-Malthusian claims (Lynch, 1994, 1996, 1998, 2002; McCabe, 1998; Deming, 2003; Adelman, 2004; Stevens, 2005; Maugeri, 2006; Gorelick, 2009; Smith, 2009).

Olien and Olien (1993) break ground in the level of granularity with which they portray the heated debates from 1909 through 1929 over what many claimed was the imminent exhaustion of the nation's, and in some cases the world's, oil supply. "To anyone familiar with the history of the American petroleum industry, early twentieth-century fears of oil shortage seem singularly unreal," they correctly note. What is most important about the study is the way in which it demonstrates the effect of ideology on economic prediction-making. The archival richness of the study enables it to illustrate the extent to which these debates were not merely academic to Americans during these years, but the stuff of colorful and at times melodramatic popular press reports, numerous federal investigations, muckraking journalism, and conspiracy theorizing. What is more, their analysis demonstrates the extent to which various entrenched interests spun the debate to suit their own interests, thus revealing the at times highly partisan, even ideological, influences on oil market predictions. As they see it, "The contrary

perspectives of petroleum industry critics and oilmen over the question of whether America was running out of oil […] represent a struggle between federal bureaucrats, politicians, journalists, and economists on the one hand, and industry participants on the other, to control petroleum-related public policy discourse."

Yergin's epical *The Prize* (1991) is perhaps the most comprehensive account of the series of panics in the United States over fear that oil would soon run out. In telling the story of the American oil industry from its earliest days down through the close of the twentieth century, Yergin identifies five historical periods during which a significant constituency of Americans (not necessarily in terms of size, but at least in influence) believed that a perhaps permanent oil supply shortage was lurking. (Three of the five periods he identifies make up the historical case studies in this dissertation.) While he makes little attempt to draw connections among these episodes, he, like earlier authors, traces their impact on public policy, particularly within the United States. Of all the historical treatments of these episodes, Yergin's account is particularly valuable for both its chronological comprehensiveness and its success in placing the events within a broader historical context.

The resurgence of neo-Malthusian scholarship on global oil supply in the 1990s and 2000s, some of which took the form of the peak oil movement of the 2000s, has prompted a wave of strong rebuttals (Lynch, 1994, 1996, 1998, 2002; McCabe, 1998; Myers Jaffe, 2000; Deming, 2003; Adelman, 2004; Stevens, 2005; Maugeri, 2006; CERA, 2008; Gorelick, 2009; Smith, 2009). Many of these publications recite past incorrect predictions of an impending oil supply crunch from nineteenth- and twentieth-century American history in an effort to point out the wrongheadedness, even silliness, of

such claims, as noted above. Of these, Maugeri (2006) and Gorelick (2009) provide the most focused examination of pre-1990s oil scarcity predictions.

Both studies are worthwhile additions to the body of research on oil predictions. Magueri (2006) combines a view of the entire span of the oil industry in the United States, from its Pennsylvania origins and into the new millennium. While largely derived from secondary sources, his study breaks ground in employing narrative-based, comprehensive accounts of oil shortage predictions and fears to inform the study's subsequent analysis of recent controversies in the oil world, such as the merits of peak oil theory and the effect of speculation on the global oil market. Gorelick (2009) combines rigorous geologic and economic analysis in crafting the most damning rebuttal to peak oil theory, and the broader neo-Malthusian viewpoint, to date.

Behavioral finance

Meanwhile, the behavioral economics paradigm, of which behavioral finance was originally an outgrowth, emerged and developed quite independently from economic scholarship on non-renewable resources. Behavioral economics has its theoretical roots in scholarship regarding human judgment under uncertainty at the level of the individual decision-making. This now voluminous body of theory was launched by the seminal work of Amos Tversky and Daniel Kahneman in the late 1960s and early 1970s that pioneered the "heuristics and biases" agenda. The pair built upon the experimental work of Simon in the 1950s on what he called behavioral aspects of rational choice (see Simon, 1955; 1956). The essence of their findings—that "judgment under uncertainty often rests on a limited number of simplifying heuristics rather than on extensive algorithmic

processing"—constituted a significant challenge to dominant paradigm in psychology and across the social sciences, rational choice theory. Rational choice scholarship, while not assuming perfect human rationality, does assume that departures from formal rationality occur randomly rather than systematically. Research in the heuristics and biases tradition rejects that notion, arguing that natural selection has geared the human mind to follow certain cognitive rules of thumb when forming judgments (Simon, 1956). The behavioral implications of such a view has since spread across diverse fields, such as law, medicine, economics, and political science (Gilovich et al., 2002).

The transition of behavioral economic theory into mainstream finance scholarship has been slow and marked by controversy. The efficient markets hypothesis, the backbone of modern financial theory since it was first articulated in Fama (1970) as a market that "adjusts rapidly to new information," holds that an efficient market fully reflects all available information (Fama, 1991). Thus, the hypothesis "rules out the possibility of trading systems based on currently available information that have expected profits or returns in excess of equilibrium expected profit or return" (Fama, 1970). Ultimately, the central insight of this view is that "securities prices are influenced by a powerful corrective force" (Daniel et al, 2002). Early theoretical foundations for the hypothesis came in the form of proofs that returns are unpredictable in competitive markets with rational, risk-neutral investors (Samuelson, 1965; Mandelbrot, 1966) and that arbitrage removes mispricings instantaneously (Friedman, 1953; Fama, 1965), among others. Empirical support of the hypothesis (at least in its weak and semi-strong form) in the 1970s was significant enough to lead Jensen (1978) to declare that "there is

no other proposition in economics which has more solid empirical evidence supporting it than the Efficient Markets Hypothesis" (Fama, 1969; Scholes, 1972).

In the ensuing decades, however, various theoretical and empirical challenges to the efficient market hypothesis emerged, which have collectively become known as behavioral finance. Behavioral finance, while a varied and somewhat inchoate body of scholarship, may be defined as "finance from a broader social science perspective including psychology and sociology" (Shiller, 2003).[4] It rests on two major foundations, both of which take aim at the core tenets of the efficient markets paradigm, according to Shleifer (2000). First, arbitrage in empirical securities markets is limited and risky, which helps explain why security prices do not necessarily respond rationally to new information regarding a security's fundamental value and why security prices sometimes react to non-information. Second, investor sentiment, or how "how real-world investors actually form their beliefs and valuations, and more generally their demand for securities," is meaningfully different from what standard finance theory assumes. Although behavioral finance was once at the margins of the finance literature (dismissed derisively by some orthodox finance scholars as the so-called "anomalies literature"), it has made its way into the mainstream of economic thought, although it is certainly still not without its ardent critics (see Fama, 1998; van der Sar, 2004; Malkiel, 2003; Subrahmanyam, 2007).

New era economic thinking

Shiller's (2000) conceptualization of what he terms "new era economic thinking" and the way in which he applies the concept to investor behavior, fit squarely within the

[4] For excellent surveys of the field of behavioral finance, see Shefrin, 2000, 2001; Shleifer, 2000; Thaler, 2003.

behavioral finance paradigm. Within the behavioral finance literature, the concept of new era economic thinking, and its relationship to asset pricing, fits under the strand of theory that looks at the social processes through which information is constructed, reified, and commercialized. Understanding what he means by the term, and its several variants, are essential to noting its relevance to this paper. In his conception, a "new era" is the "popular perception that the future is brighter or less uncertain than it was in the past" that have often marked "speculative market expansions" over history. Implied in the term is that such perceptions are illusory and eventually prove to have been overly optimistic. He derives the term from "the new era economy," its parent term, which was first popularized, he finds, in a July 1997 *Business Week* article that credited Alan Greenspan with using the term to describe the Internet-driven boom of the 1990s. It was first coined in two articles in the *Boston Globe* in June 1997, along with "new era thesis," "new era theorists," and "new era school" to describe the notion that "the arrival of the Internet in the 1990s […] was a fundamental change that would boost the productivity of the economy" as a long-term trend. The term had become enough a part of the investment-world lexicon by August 1997 that Paul Krugman, writing in the *Harvard Business Review*, attacked the "new era theory" specifically in criticizing equity market valuations at the time. It remained in regular use until the collapse of collapse of the tech bubble in 2000, when it ceased to be mentioned.

New era economic thinking refers to a shift in collective opinion that the fundamentals of the economy have or are undergoing a change that will lead asset prices to continue rising steeply for the foreseeable future (and perhaps perpetually). When such thought patterns take hold and proliferate, they can feed speculative bubbles. In such a

scenario, the general public "[overreacts] to the new era stories that become suddenly popular, missing the basic similarity between the latest stories and similar stories that appeared many times in the past." New era thinking "concentrates attention on the effects of events currently prominent in the news," rather than positing future alternative scenarios. New era theories emerge only after a stock market boom rather than as an entirely predictive theory of future economic behavior. That fact is important. Such theories are "after-the-fact interpretations" of market behavior. They do not originate until after the market experiencing the "new era" has already begun to show significant price advances in need of explanation. In Shiller's words, "a stock market boom is a dramatic event that calls for an equally dramatic interpretation." The advent of a new era provides such an interpretation.

The market does not just react to new era theories; it plays a critical role in popularizing them. In that sense, "the stock market often creates new era theories, as reporters scramble to justify stock market price moves." A positive feedback mechanism arises between rising price levels, which spawn sweeping theories justifying the booming markets, and the theories themselves, which support further price rises and more belief in the theories. The general public is more susceptible to believing new era theories of economic growth than experts are, according to Shiller, although experts typically have a role in articulating the theory and lending credibility to it among the public. There are always high-profile individuals ready to explain financial market price movements, not to mention low-profile individuals ready to become high-profile individuals by explaining financial price movements. As Shiller writes, "Whenever the market reaches a new high, public speakers, writers, and other prominent people suddenly appear, armed with

explanations for the apparent optimism in the stock market.[…] Although prominent people can certainly move markets, often their wisdom merely tags along with market moves." The theories and the markets can thus feed on each other.

Shiller documents how new era economic thinking has been prevalent during all four significant speculative market booms in the United States over the course of the twentieth century—1901, the 1920s, the 1950s and 1960s, and the 1990s. He defines a boom as a "major peak in the price-earnings ratio." Using newspaper and other first-hand accounts, he is able to shed light on how new era economic thinking propelled each of these historical bull markets. His account of these four periods provides empirical examples of new era thinking, which, in turn, is a highly relevant concept to the main argument of this paper. The following paragraphs summarize his account of the four periods.

The first of these bull runs occurred at the dawn of the century, the year 1901, which witnessed a tremendous increase in stock market prices. The new century seemed to many to herald a new age of high technology and futurism. Newspapers carried prophecies of what was in store: "trains [will be running at 150 miles per hour, … newspaper publishers will press the buttons and automotive machinery will do the rest, … phonographs as salesmen will sell goods in big stores while automatic hands make change." The feats of modern technology on display at the Pan-American Exposition in Buffalo, New York, from May to November, 1901, were a visual illustration of the nation's promise. It was enough, according to a 1901 newspaper account, to cause an "outburst of speculation … rarely paralleled in the history of speculative manias." The two most cited contemporary reasons for the market boom in 1901 were the proliferation

of new technology and the growing market power of "combinations, trusts and merger"—companies that appeared to be sure-fire bets for stock pickers. The speculative fervor hit a fever pitch in 1901 and then gradually cooled until the stock market crash of 1907. The crash ended the clamor over a new era of financial returns in a major way. But the over-optimism would return less than two decades later, and with force.

The bull market of the 1920s—and its crash in 1929—are the stuff of legend. The proliferation of highly public and exciting technologies, such as the automobile, rural electrification, the expansion of radio, and sound movies, defined the era for the American consumer. It was a time of substantial real economic growth. The growth bred optimism. A 1925 report declared triumphantly: "There is nothing now to be foreseen which can prevent the United States from enjoying an era of business prosperity which is entirely without equal in the pages of trade history." A new era was underway, in other words. John Moody, writing on the stock market in 1928, judged that "nothing now to be foreseen which can prevent the United States from enjoying an era of business prosperity which is entirely without equal in the pages of history." In 1929, Charles Amos Dice authored *New Levels in the Stock Market*, which predicted all sorts of new achievements in America—among them, a "new world of industry," a "new world of distribution," and a "new world of finance." Yale University's Irving Fisher, in August 1929, famously announced that "stock prices have reached what looks like a permanently high plateau." Dice and Fisher both had listed numerous reasons for why the seemingly new era of stock prices had arrived and would be sustained. Advances in the Federal Reserve, the rise of the holding company and growing economies of scale, improvements in investment banking, the discovery of principles of scientific management, most efficient agricultural

processes—all of these developments had led to a truly new age in stock market returns. Not all assessments were positive, of course. Several leading newspapers, the New York Times being one, argued that the markets were experiencing speculative excess. But they did not prevail in the battle of ideas—at least until October.

New era economic thinking reappeared in the 1950s. World War II had fueled extraordinary growth in national production in the first half of the 1940s. When it ended, many worried that the depression of the 1930s may reappear. But a near doubling in the value of the U.S. stock market (+94.3% in real terms), along with solid earnings growth, between September 1953 and December 1955 put such fears to rest. The bull run fostered "the sense that investors were terribly optimistic and confident of the market was in and of itself part of the new era thinking," according to Shiller. A number of demographic, socioeconomic, and technological factors buoyed the optimism. Just as the radio had done in the 1920s, the television was transforming mass national culture to an extent that "captured almost everyone." It was "evidence for technological progress that could not be overlooked," in Shiller's words. Inflation was mild, Baby Boomers were increasing demand for a variety of consumer goods, and Kennedy, "perceived as showing vision and optimism," was inspiring confidence, as of 1960. One news report went as far as calling the phenomenal stock run "the Kennedy market." "Businessmen can enjoy reasonably continuous prosperity indefinitely," proclaimed an American newspaper. And stocks appeared to be the asset class that would bring the average person that prosperity. When the Dow traded above 1,000 in 1966, it was as a national news item of the first order. But the exultant rise of the stock market would not last. No sharp correction occurred, but the

period from January 1966 to January 1992 was one of low annual stock returns—just 4.1%.

The stock market boom of the 1990s followed closely the "new era" pattern of the previous booms. In Shiller's words, "As with all stock market booms, there were writers during the 1990s who offered new era theories to justify the market." He mentions a few. Michael Mandel, in a 1996 article in *Business Week* entitled "The Triumph of the New Economy," cited five reasons—all fundamental economic, political, and technological ones—for "his belief that the market was not crazy": "increased globalization, innovation in the high-tech sector, moderating inflation, falling interest rates, and surging profits." Roger Bootle, author of the 1998 book *The Death of Inflation*, also attributed the new global "zero era" to the potent combination of privatization, capitalism, and liberal labor markets, which had permanently subdued inflationary pressures. Steven Weber's 1997 "The End of the Business Cycle" in *Foreign Affairs* foresaw a similar new era of prosperity, thanks to lower macroeconomic risks than in previous times. For Weber, the worldwide growth of the service sector vis-à-vis the manufacturing sector had led to a permanent softening of the boom-and-bust cycle of industrial output. Another common argument for permanently higher stock prices and earnings growth was that the Internet had lead to, and would continue to lead to, remarkable productivity gains. Shiller admits that "not all stories in the media in the 1990s were slanted toward new era emphases when compared with stories during earlier episodes of high pricing." The media's market optimism in the 1990s was more a "matter of background presumption" rather than the "bold assertion" it had been in 1901 or 1929. Many media accounts even portrayed investors as greedy, foolish, and excessive. Despite such stories, the "evidence in the

markets is that the public in the 1990s found these possibilities at best mildly amusing; they were far more swept up in the new era thinking symbolized for them by the coming of the new millennium."

How do speculative booms come to an end? Not in one "dramatic burst," argues Shiller. The change is more gradual. Drawing on the historical evidence, he notes some commonalities in the way public enthusiasm for the market has degenerated into bullish sentiment in each of the four business cycles. For one thing, new era thinking "does not end overnight." There is a time lag in the changing of long-term perceptions. Even one or two days of crashing stock markets do not cause people to up and sell once and for all. Even in the case of the stock market crash of 1929, the market had nearly fully recovered to its previous highs by early 1930. The change in perception, rather, is "generational in character." The sharper the correction, the speedier the change in perception. An overheated market may simply plateau for an extended period, which results in perceptions changing rather more slowly. When financial stocks lost more than half of their value between March and April 2000, the change in perception was rapid. The "fascination with the Internet stocks" went appearing to herald a new economic age to looking like "a silly, in fact embarrassing, fad." When bearish sentiment takes hold, it can be as hard to undo as the bullish sentiment had been in the boom years just prior. In the case of the 1930s, widespread concern arose among experts that the national economic system was failing. It appeared to be entering a period, in the words of a University of Chicago professor Shiller cites, "a stage of more or less permanent stagnation."

News commentary tends to go from enthusiastic and glowing to apocalyptic. Stories of hostility among business competitors, public anger at the government and

securities industry, and political strain are common. Other scares may arise that cause the market to go sideways. Inflation fears in the 1960s, widespread fear of overpopulation in the 1960s, and worry over the United State's loss of preeminence to Japan are examples. Convincing news stories that appear right at the peaking of the stock market seem to have a disproportionately large impact on public opinion. Such articles do not in themselves have the power to freeze the market's upward momentum, but they can begin a feedbac mechanism of public opinion that constitutes the end of new era economic thinking. Consumer confidence falls concurrently with the proliferation of negative stories, which then feeds back on itself, taking other economic indicators along with it.

Despite conceptualizing these general patterns, Shiller ultimately concludes that the mass switch from optimism to pessimism is, on some level, inexplicable; "market psychology somehow mysteriously changes," in his words. New era thinking ends "when the focus of the debate can no longer be so upbeat." The attention and emotional inclination of the public, once changed, is not easily, and perhaps cannot be, reversed. In Shiller's words, "there are times when an audience is highly receptive to optimistic statements and times when it is not."

Narratives of decline

A narrative of decline is a message expressing the "conviction that the culture of a nation, a civilization or of humanity itself is in an irreversible process of decline" (Bennett, 2001). It is the opposite of the "new economic" narrative described in the last section, which expresses the "popular perception that the future is brighter or less uncertain than it was in the past" (Shiller, 2000). The social mechanisms underlying the

transmission of narratives of decline mirror those that drive new era economic thinking in Shiller's conception of the latter. Like new era economic thinking, narratives of decline originate, grow, and eventually wane through the social exchange of information. News stories, academic research, best-selling books, public speakers, word-of-mouth communication, and other modes of transmission can all carry messages popularizing a particular decline narrative.

Narratives of decline rise and fall over the course of history in a similar fashion to new era economic thinking. Whereas new economy thinking expresses unbounded optimism in the future, narrative of decline are defined by their negative outlook. Just as new era thinking looks at things as being in a permanent upswing, decline narratives look into the future and worry that nothing will be as good as it once was. Like new era economic theories, some narratives of decline gain more believers and greater depth of belief than others. Some may also have an ideological motive or component, even though they purport to be utterly unbiased.

As Lieber (2008) writes, with reference to narratives of the decline of the geopolitical stature of the United States:

> Theories of America's obsolescence aspire to the status of science. But cycles of declinism tend to have a political subtext and, however impeccable the historical methodology that generates them seems to be, they often function as ideology by other means. During the 1980s, for instance, these critiques mostly emanated from the left and focused on Reaganomics and the defense buildup. By contrast, in the Clinton era, right-of-center and realist warnings were directed against the notion of America as an "indispensable nation" whose writ required it to nation-build and spread human rights. Likewise, much of today's resurgent declinism is propelled not only by arguments over real-world events, but also by a fierce reaction against the Bush presidency—a reaction tainted by partisanship,

> hyperbole, ahistoricism, and a misunderstanding of the fundamentals that underpin the robustness and staying power of the United States.

Although such narratives can be traced back to ancient times, Bennett (2001) argues that last decades of the twentieth century were peculiar in the abundance of decline thinking and theorizing.[5] His study of decline narratives, *Cultural Pessimism: Narratives of*

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[5] Lieber (2008) traces the successive rise and fall of various narratives of decline (or as he calls them, instances of "declinism") regarding the geopolitical future of the United States since the country's founding. His portrayal of these political-economic narratives captures them so elegantly that I am choosing to quote it at length. He points out a decline narrative that is currently in vogue, and in so doing helps readers to place the latest intellectual trend in historical perspective (and thus show it for what it is i.e. a *trend*). It is quite humorous besides:

"Is America finished? Respected public intellectuals, think tank theorists, and members of the media elite seem to think so. The scare headline in a recent *New York Times Magazine* cover story by Parag Khanna titled "Waving Goodbye to Hegemony" asks, "Who Shrunk the Superpower?" Almost daily, learned authors proclaim *The End of the American Era*, as the title of a 2002 book by Charles Kupchan put it, and instruct us that the rise of China and India, the reawakening of Putin's Russia, and the expansion of the European Union signal a profound shift in geopolitical power that will retire once and for all the burden of American Exceptionalism. America has become an "enfeebled" superpower, according to Fareed Zakaria in his book, *The Post-American World*, which concedes that, while the U.S. will not recede from the world stage anytime soon, "Just as the rest of the world is opening up, America is closing down." With barely contained satisfaction, a French foreign minister says of America's standing, "The magic is over . . . It will never be as it was before."

The United States does contend with serious problems at home and abroad, but these prophecies of doom, which spread like a computer virus, hardly reflect a rational appraisal of where we stand. Moreover, it is not too difficult to see the ghosts of declinism past in the current rush to pen America's epitaph. Gloomsayers have been with us, after all, since this country's founding. Late eighteenth- and early nineteenth-century European observers, especially royalists and reactionaries, commonly disparaged and discounted the prospects of the new American enterprise. (As the French author Phillip Roger has written in his insightful history of anti-Americanism, influential Parisian authors deprecated not only the new country, but also its animals and plants.) In the 1920s and 1930s, Communist and fascist critics alike offered sweeping condemnations of the U.S. as a degenerate nation. "The last century [the 19th] was the winter of the West, the victory of materialism and skepticism, of socialism, parliamentarianism, and money," proto-declinist Oswald Spengler famously wrote. "But in this century blood and instinct will regain their rights against the power of money and intellect. The era of individualism, liberalism and democracy, of humanitarianism and freedom, is nearing its end."

It was in the 1970s that declinism began to take on its modern features, following America's buffeting by oil shocks and deep recessions, a humiliating withdrawal from Vietnam, victories by Soviet-backed regimes or insurgent movements in Africa, Central America, and Southeast Asia, and revolution in Iran along with the seizure of the U.S. embassy there. A 1970 book by Andrew Hacker also announced *The End of the American Era*. At the end of the decade, Jimmy Carter seemed to give a presidential stamp of approval to Hacker's diagnosis when he used concerns about a flagging American economy, inflation, recession, and unemployment as talking points in his famous "malaise" speech calling for diminished national expectations.

By the early 1980s, declinism had become a form of historical chic. In 1987, David Calleo's *Beyond American Hegemony* summoned the U.S. to come to terms with a more pluralistic world. In the same year, Paul Kennedy published what at the time was greeted as the *summa theologica* of the declinist movement—*The Rise and Fall of the Great Powers*, in which the author implied that the cycle of rise and decline experienced in the past by the empires of Spain and Great Britain could now be discerned in the

Decline in the Postmodern World, is by far the most rigorous and complete chronicling and analysis of the entire history of written decline narratives in the West, with a particular focus on those of the twentieth century. This brief review of decline narratives—their history and form, in particular—will be derived from Bennett's study.

Gloomy prophecies of a future that is worse than the present have a long history in the Western world. They abounded in the classical world. Zoroaster, a central Asian mystic who lived around 1400 BC, promoted an eschatological faith. Predictions of inevitable decline punctuate the history of Judeo-Christian thought. The biblical prophecies of Daniel and Revelation are examples. Ancient Greece and Rome had its own pessimists as well. The Greek poet Hessiod and the Roman Seneca, both concerned with moral decay, believed themselves to be living in the "final and most degenerate historical phase" that humanity had ever known, and one that would inevitably end in catastrophe. Renaissance thought among scholars was characterized by its longing for the order and progress of Classical civilization amid what they judged to be the unending barbarism of their day. The mood in the eighteenth and nineteenth centuries tended to be optimistic. Pessimists existed, yes, but the paradigm of progress informed most intellectuals' views, whether based on technological, biological, and economic principles. Public faith in an "unbroken and progressive advance either in knowledge or in mankind's moral or spiritual condition" defined the era.

But the nineteenth century also spawned a new generation of discontents. In many ways, their works would inform the twentieth-century narratives of decline. The

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"imperial overstretch" of the United States. But Kennedy had bought in at the top: within two years of his pessimistic prediction, the Cold War ended with the Soviet Union in collapse, the Japanese economic miracle entering a trough of its own, and U.S. competitiveness and job creation far outpacing its European and Asian competitors."

relentless drive toward industrialization and its often degrading effects on the natural environment was a common cause of worry among intellectuals, beginning in the nineteenth century. Thomas Carlyle, in his famous "Signs of the Times" (1829), bemoaned the "industrialism" of the era as ushering in a new era of lessened "dignity of soul and character." Karl Marx (1848) judged the capitalist world to be traveling down the road to unavoidable collapse, though it would reborn in the purified form of communism. Bennett cites Marx's dour judgment in 1884 that "our civilization is passing like a blight, daily growing heavier and more poisonous, over the whole face of the country." Schopenhauer, then Nietzsche, Freud, Inge, and Weber—such writers cast doubt on the Enlightenment mission of liberating man from myth and superstition, arguing instead that the Western sense of societal progress had been fundamentally flawed. Spengler, in 1918, argued in *Decline of the West* that the West was coming to the end of its natural lifespan. The final phase had begun. The carnage of the First World War appeared to bear out his prediction; the end really was nigh. Several American thinkers around this time pushed similarly bleak views. The historian Henry Adams was an outspoken turn-the-century critic of America and the West. He criticized them as being "decadent to the core" and foresaw "an ultimate, colossal, cosmic collapse" within a hundred years' time.

Bennett's account of decline narratives that would be popularized over the rest of the twentieth century is much too detailed to recount here. Instead, the remainder of this section will focus on a subset of the decline narratives he analyzes. Classifying popular decline narratives during the latter half of the twentieth century according to their main theme, he finds that they tended to fit into one of four categories: a narrative of

environmental decline, of moral decline, of intellectual decline, and of political-economic decline. The two categories most relevant to the focus of this paper, the environmental-decline narrative and the political economic-decline narrative, will briefly be discussed here.

The narrative of environmental decline in the second half of the twentieth century argued that a variety of forces were irreversibly changing the ecology of the planet at an ever-accelerating pace. An incredible array of news articles, academic studies, non-governmental organization white papers, and even religious tracts gave birth to, and then spread, these views. The human population, growing at an exponential rate, would soon consume more food and drinking water than was sustainable. Rapid industrialization was using up non-renewable sources of energy so quickly, and causing so much pollution, that the ozone layer would soon be depleted and the world's climate changed catastrophically. It was also poisoning the planet. The wonders of the nature—its diverse species of plants and animals—were becoming extinct. In short, "the human species, growing to unprecedented numbers, was destroying the environment, threatening future generations and extinguishing other forms of life." The misdeeds of the few generations were causing more damage to the environment than it could sustain. The effect of their behavior would be a lasting blight on natural world and, indeed, dimmer prospects for the survival of the race itself.

The imminent shortage of non-renewable resources played a leading role in the tale of environmental decline. In 1968, Paul Erlich argued in *The Population Bomb* that traditional energy sources, like oil and coal, simply could not sustain the world population growth trajectory. High prices for such resources would be the first result of

the population squeeze; total extinction of the resources would follow on its heels. As a result this resource scarcity, a worldwide famine would ensue before the year 1985, he predicted. Erlich had a hard time reconciling what he viewed as indifference from elected officials and the public to what he foresaw as a doomsday scenario. John Leslie, in *The End of the World*, echoed his view in a statement that was typical of the period: "At least in the near future, a population as little as ten billion could be expected to cause desertifications and famines, intolerable water scarcities and levels of pollution, which virtually guaranteed wars." Global warming also featured prominently in public worries over the future of the planet. By the mid-1990s, scientific consensus held that carbon dioxide was the primary cause of global warming. Fossil fuels were thus the main culprit of the warming trend, which many view as capable of unlimited damage to mankind and potentially in too late a stage to arrest. The oil industry, and those who supported its products, bore much of the blame in these accounts. As Bennett writes, "Implicit in the narratives […] was a fundamental critique of a global civilization and economy built on the foundation of fossil fuels and synthetic chemicals."

Popular narratives of political decline in vogue during the latter half of the twentieth century (and still today) also saw the imminent shortage of oil resources as having disastrous political ramifications around the world. The shortage was predicted as causing future violence, for instance. Bennett quotes Gray (2000):

> We stand on the brink not of an era of plenty…but a tragic epoch in which anarchic forces and shrinking natural resources drag sovereign states into ever more dangerous rivalries…The likelihood must be that the laissez-faire regime will not be reformed. Instead, it will fracture and fragment, as mounting scarcities of resources and conflicts of interest among the world's great powers make

> international cooperation ever more difficult. A deepening international anarchy is the human prospect.

The exhaustion of oil—the most politically charged non-renewable resource for the duration of the twentieth century—is no doubt what Gray has in mind. The less accessible it is through free markets, the more likely war is to decide who its owner will be. Such thinking is buoyed by high oil prices, which engenders political friction among countries with clashing interests.

Bennett's narratives of decline can be seen as the flip side of Shiller's new era economic thinking—the former the depth of pessimism, the other the height of optimism. Both describe popular narratives, transmitted socially, that sway mass opinion regarding what the future holds. The concept of narratives of decline helps to illuminate how pessimism about the future of a non-renewable natural resource, such as oil, can originate and spread. They are valuable in understanding the lens through which market participants interpret current events and envision future ones.

Structure and methods

This section discusses the structure of the study and the research methods employed in crafting it. It begins by outlining the structure of the study by providing a brief overview of the three case studies that form the body of the dissertation. Then, in the second subsection, it details the research methods used in deciding on the central questions the dissertation would address, the theoretical propositions informing the study, and the methodological approach used (including focus, design, case selection criteria, and unit of analysis). Next, it analyzes the analytic logic linking the data to the study's theoretical propositions and the criteria for interpreting the findings, and discusses the methodological problems inherent in and overcome by the study's approach. Finally, the section lays out the key steps and methods used to craft the case studies, including the sources of evidence, data collection process, and application of analytic techniques.

Structure of the study

The text of the dissertation is divided into several sections. The first section reviews the scholarly literature to which the study responds and on which it is based, principally natural resource economic theory, behavioral finance and in particular new era economic thinking, and narratives of decline. The next section discusses the structure of the dissertation and the research methods employed in crafting it. It lays out the core theoretical questions that motivate the study, explains the methodological approach, and provides the case selection criteria. It also presents the analytic logic behind the study's approach and discusses the limitations of the study, then lays out the key steps and

methods used to craft the case studies, including the sources of evidence, data collection processes, and application of analytic techniques.

The next section summarizes the key findings from the case studies relative to the three key research questions driving the study. It then analyzes the implications of the findings for existing theoretical debates, particularly Shiller's (2000; 2005) concept of new era economic thinking as a behavioral phenomenon that has manifested itself during periods of soaring equity markets. It also argues for the relevance of the concept of narratives of decline, whose usage as a theoretical lens is primarily limited to critical literary theory, to the idea of new era economic thinking and the scholarship on investor psychology more broadly.

The body of the dissertation presents the three case studies chronologically. Chapter Four traces the genesis and popularization of oil shortage narrative from 1909 to 1927, as George Otis Smith and the United States Geological Survey, buoyed by the nascent American environmentalist movement, declared the imminent demise of American oil reserves, a view that gained traction as World War I and the dawn of the automobile age radically increased demand for domestic oil. Chapter Five shows the resurgence of an oil shortage narrative from 1940 to 1949. This time, soaring demand for U.S. crude to fuel the allied war effort set the context for frightening predictions by the U.S. military and industry experts of the near-term exhaustion of domestic crude oil, led by Secretary of the Interior Harold Ickes, the "representative of a new alarmism." Chapter Six, covering 1970 to 1986, traces the origins and development of President Carter's "problem unprecedented in our history," a narrative of national anxiety over an

ineluctable energy shortage and broader American decline, ignited by the rise of OPEC and heightened by Cold War fears.

A brief epilogue brings the narrative forward to present by summarizing recent disruptions in the global oil market, particularly the fall of Libyan exports over the spring of 2011, and exploring how market tightness this year has caused a resurgence in new era economic commentary regarding the future of global oil supply.

The first case study analyzes the evolution of an oil scarcity narrative in the United States from 1909 to 1927. Bleak assessments of domestic oil reserves from the United States Geological Survey, undertaken in the context of the nascent American environmental movement, led various government leaders and geological experts to warn the public that the country's reserves were dwindling rapidly. Booming demand and fuel prices appeared to reinforce their predictions, with US oil production increasing dramatically to fuel the Allied war effort in World War I and later the proliferation of automobiles on America's roads. The oil industry adamantly rejected these arguments. Technological advances and the discovery of vast new fields, both in the southern United States and overseas, led to a dramatic increase in crude oil production in the latter half of the 1920s, which, combined with a downward demand shock in the Great Depression, caused oil prices to crash. The oil shortage narrative subsequently fell out of public discussion.

The second case study analyzes the evolution of several intertwined oil scarcity narratives in the United States from 1940 to 1949. After an oil glut had weighed heavily on prices for most of the 1930s, World War II proved a stunning oil demand shock. Frightening predictions of a gasoline shortage along the East Coast in 1941 never

materialized, but the experience set the tone for the wartime rationing, imposed by the Petroleum Administration for War, that appeared to many to herald a new permanent shortage of oil in the country. With American oil fields primarily fueling the Allied war effort, government and military leaders publicly fretted that domestic oil reserves would run dry in a few years time. In most cases, the primary fear was not of a global oil supply shortage, but rather that the country's indigenous production would not be able to meet its own demand needs going forward. Still, the prospect of becoming a net importer appeared to presage a new era of higher prices and need for synthetic fuels. It was in the context of this disturbing realization—and of a dawning Cold War—that the American government began to actively assist domestic producers in acquiring acreage overseas. A brief but intense refined product shortage in 1947-48, caused by a variety of disruptions and extreme events, led to further doomsday predictions amid soaring retail fuel prices. By the close of the 1940s, however, an explosion in oil imports and production gains at home led to newfound abundance. Talk of an oil shortage again fell silent.

The third case study analyzes the wave of scarcity predictions and worries that arose in the 1970s, when a formidable set of forces combined to ignite intense supply fears that ebbed and flowed into the mid-1980s. Soaring demand caused the spare production capacity of American oilfields, once the marginal supplier to the Western world, to disappear by 1971. A handful of key producer countries, sensing their own geostrategic import to the West and tired of abiding by multinationals' posted prices, formed the Organization of Petroleum Exporting Countries (OPEC) in 1960, eventually prompting a wave of nationalizations in the 1970s. Expert predictions of a looming "energy crisis" first appeared in 1971, and grew more common over the next few years,

from the dire warnings of the U.S. State Department to the gloomy prophesies of the Club of Rome.

Amid these tensions, two oil crises during the 1970s caused government and public worry over permanent oil shortages to reach a fever pitch, the first in 1973 and later from 1979-80. The 1973 crisis was sparked when a group of Arab nations declared an embargo on oil exports to the United States in retaliation for Washington's support of Israel in the Yom Kippur War. The episode (particularly the retail fuel outages that ensued) had a tangible effect on the international energy order and on the Zeitgeist of the America of the 1970s. For the rest of the decade, predictions of an imminent, irreversible shortage of oil supply were ubiquitous in government, industry, and academic circles. Surveys suggested that the American public was increasingly under the impression that the country was "running out of energy." The fears would only worsen during the oil crisis of 1979-80, caused by the Iranian Revolution and the onset of the Iran-Iraq War. To many, this crisis appeared to be the fruition of the foreboding predictions made throughout the preceding decade. In the rush by consumers to build emergency stockpiles, the crisis became a self-fulfilling prophecy, and spot prices spiked as a result.

The higher price environment, however, tempered global demand by fostering substitution out of oil and improving energy conservation, while simultaneously stimulating record non-OPEC production. By the end of 1985, with its fellow OPEC member countries brazenly disregarding their agreed-to quotas, Saudi Arabia decided it had had enough of defending the price floor. By adopting netback pricing and ramping up production, it caused the market to collapse by mid-1986. The market became

oversupplied, which banished expressions of worry over whether future oil consumption needs could be met.

Methods

Three central questions motivate this study. First, what precedent exists in the United States for the wave of expert predictions and apparent public fear of an imminent, irreversible global oil supply shortage that has emerged since the 1990s, most vividly as the so-called "Peak Oil" movement? The second question derives from the first: do these historical episodes of heightened fear over the future of oil supply bear any relationship to short-term conditions in the oil market at the time? If so, under what market conditions, if any, have these fears appeared to emerge, thrive, and decline? The third and final question is, to what extent is the link that Shiller (2000, 2009) draws between the spread of what he terms "new era economic thinking" and coincidental booms in financial markets applicable to the apparent historical coincidence of short-term price conditions in the oil market and coincidental prophecies of permanent oil shortage? How do these historical episodes from the oil market contribute to our understanding of the social, cultural, and psychological forces that attend asset price booms?

The theoretical propositions that guide the study emanate from these three core questions. Explicitly stating those propositions here, as well as their attendant cases, units, and populations, may be useful in avoiding confusion (see Gerring, 2004).

The first question to which the study seeks to respond is: what precedent exists in the United States for the wave of expert predictions and apparent public fear of an imminent, irreversible global oil supply shortage that has emerged since the 1990s, most

vividly as the so-called "Peak Oil" movement? Preliminary investigation into secondary sources on the history of the American oil market indicated that historical precedent did exist for such phenomena. Many economists and historians have drawn attention to this fact since the mid-twentieth century (Williamson, 1945; Fanning, 1950; DeNovo, 1955, 1956; Wildavsky and Tenenbaum, 1982; Randall, 1983; Yergin, 1991; Adelman, 1995, 2004; Porter, 1995; Deming, 2003; Maugeri, 2006; Gorelick, 2009). So the working proposition, prior to undertaking the study, was that the definitive secondary sources were correct in claiming that certain periods of American history have witnessed a significant degree of expert prediction and public belief regarding an oil supply shortage since the origins of the industry in Pennsylvania (see Yergin, 1991). The number of times such periods can be said to have occurred, the way in which prior historians have periodized them, and the details of the predictions and beliefs that have occurred within them all remained to be discovered, however.

The second question arises naturally from this the first one, although addressing it requires additional methodological tools and introduces new dilemmas, which will be discussed in detail later in this section. To investigate whether historical episodes of heightened fear over the future of oil supply bear any relationship to short-term conditions in the oil market at the time, it is necessary to draw a connection between fundamental oil market conditions and the attitudes, beliefs, and judgments that were identified in the first question. That task adds a degree of difficulty to addressing this second question. The challenge becomes not only to identify these historical periods, as the first question stipulates, but to determine the extent to which contextual forces—in this case, the relative condition of supply-demand fundamentals in the oil market at the

time—may have played a role in spawning contemporary predictions and beliefs regarding an apparent impending, terminal shortage of oil.

Yergin (2005) provides insight into this question, which is the basis for the second proposition. Looking back over the long history of the American oil market, he observes that cries of shortage of the new twenty-first century were:

> not the first time that the world has 'run out of oil.' It's more like the fifth. Cycles of shortage and surplus characterize the entire history of the oil industry. A similar fear of shortage after World War I was one of the main drivers for cobbling together the three easternmost provinces of the Ottoman Turkish empire to create Iraq. In more recent times, the 'permanent oil shortage' of the 1970s gave way to the glut and price collapse of the 1980s.

Given that even the modern-day prophets of oil shortage do not dispute the fact that American history has seen spates of similar predictions before, and that Yergin's 1991 history of the global oil industry remains the definitive treatment of the subject, the link Yergin appears to imply between tight markets and the onset of widespread fear of permanent scarcity provides the second proposition. It is important to observe, however, that Yergin never draws that link explicity, although it can be induced via the narrative he spins.

The present study proposes that tight market conditions are more likely to lead to predictions of an imminent, irreversible shortage of oil, and that as the market loosens, those predictions should become relatively less frequent. That notion would imply that the forecasts themselves are not objectively removed from the market context in which they are made, but rather are influenced by market conditions at the time. In this formulation of the proposition, relative market tightness, or the prospect thereof in the

short-term, is a necessary, but not sufficient condition, for a notable increase in the number and frequency of predictions of a long-term shortage of oil and concurrent higher prices. The reverse would also hold (i.e., relative market looseness as a condition for a diminishment of such predictions). These propositions leads us to the third one, in which a theoretical basis for this reasoning can be examined.

The third and final proposition is that the connections that Shiller (2000, 2009) draws between the spread of what he terms "new era economic thinking" in American society and coincidental booms in the nation's financial markets have some degree of applicability to the apparent historical coincidence of short-term price conditions in the oil market and coincidental prophecies of permanent oil shortage. Investigating this theoretical proposition paves the way for the dissertation to address directly a current theoretical debate in the literature. To evaluate this proposition, the study will need to analyze the narrative constructed to answer the first two questions in light of Shiller's concept of new era economic thinking. This step requires matching observable patterns across time periods and then analyzing these patterns against, first, Shiller's description of new era economic thinking and, second, the mechanisms by which he sees such thinking as tying into contemporary aggregate asset price behavior.

It bears stating plainly that this study is not an effort to argue the existence of, let alone to identify empirically, 1929-esque speculative bubbles in the oil market. [6] It

[6] While exact definitions vary, a useful general definition of the term "speculative bubble" is an instance in which "the market price of an asset differs from its fundamental value – the expected present value of the stream of future dividends attached to the asset" (Iraola and Santos, 2008). These bubbles are "typically associated with dramatic asset price increases followed by a collapse" (Brunnermeier, 2008). Although the fundamental theorem of asset pricing (Dybvig and Ross, 1987) posits that an asset's equilibrium market price equals its fundamental value where there is a finite sequence of trading dates, where the sequence of trading dates is infinite, that result does not hold and prices may deviate from fundamental levels. In Harrison and Kreps (1978) definition of speculative behavior, investors may be inclined to purchase an

emphatically does not argue that what could be called a classic speculative bubble during the time period it covers, from 1909 through 1985. Moreover, the study is agnostic as to whether a speculative bubble occurred in the oil market during the 2008-09 price rise and subsequent collapse.

The structure of the crude oil market over the period of time covered in the three cases studies, from 1909 through 1985, was far different from the current international oil pricing system, wherein even retail investors can place directional bets on crude oil traded on the NYMEX or ICE just as stocks have been traded on the NYSE for many decades (Fattouh, 2011). A classic speculative bubble, as described by Kindleberger (1978) and Shiller (2000), takes the form of a groundswell of irrational exuberance from financial investors causes an asset's price to deviate from its fundamental value for an extended period, "typically associated with dramatic asset price increases followed by a

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asset whose price has exceeded its fundamental value when they expect to be able to sell it later at an even higher price.

Historical episodes in which asset prices rose suddenly, only to collapse in a dramatic fashion, are well documented. Examples include the Dutch tulip mania (1634-7), the Mississippi Bubble (1719-20), the South Sea Bubble (1720), and the 1929 crash. More recently, a similar pattern has played out in technology stocks as manifested by a dramatic run-up then collapse in the Nasdaq Composite Index (1996-2002) and in the U.S. housing market, which began in 2005 and may still have not hit rock bottom after peaking in 2008. (A similar phenomenon occurred in the global crude oil market between 2003 and 2009 took place, which will be discussed in depth in question 3 and in the fourth case study of this dissertation).

While the dramatic rise and fall of asset prices in these cases is an empirical fact and is suggestive of a speculative bubble, opinions differ over whether market-fundamental forces alone can adequately account for the volatile price behavior. Kindleberger (1978), for instance, argues that episodes such as Dutch tulip mania, the Mississippi Bubble, and the South Sea Bubble were classic speculative bubbles. Even in these famous cases, however, some scholars provide explanations for each of these cases using market fundamentals (see Donaldson and Kamstra, 1996; Garber, 2000; and Veronesi, 2006).

This disagreement is symptomatic of the fact that although asset prices appear more volatile than their fundamental values, a definitive empirical proof of the existence of speculative bubbles has proven elusive. Ultimately, the ability to argue persuasively for the theoretical existence of speculative bubbles depends on the assumptions made regarding actor rationality and information symmetry. But to address this issue in a more detailed manner, it is useful to divide the literature on speculative bubbles into four types of models, following the taxonomy of Brunnermeier (2008). The first two types both assume actors have rational expectations but differ in whether actors have the same or asymmetric information. The third group of models assumes the existence of rational and irrational investors. The fourth and final model assumes actor beliefs to be heterogeneous, possibly affected by psychological biases, and so they disagree over the fundamental value of assets. The convincingness with which speculative bubbles can be shown to exist, both theoretically and empirically, differs according to the which of the four types of models is used.

collapse." That phenomenon could not have occurred from 1909-1920, or from 1940-1949 , or from 1970-1986 (the time periods covered in the three cases), because the market-related pricing system was not the main method for pricing crude oil in international trade until 1988 (Brunnermeier, 2008; Fattouh, 2011). In sum, while claiming that today's oil prices are subject to speculative bubbles is extremely controversial, arguing that the major oil price moves prior to the 1990s were bubbles akin to a 1929 stock market crash or a 2009 housing market crash would be anachronistic.

That is certainly not to say that oil prices did not overshoot, were not exaggeratedly impacted by waves of greed and fear by commercial and political participants, or were even manipulated prior to 1988. They certainly were at times, as the case studies document and a host of secondary sources cited in the case studies attest. Consider the case of 1978 – 1979, when panic over the prospect of future shortage—as old as the oil industry itself—had moved prices much more dramatically than the loss in supply merited. As Parra puts it:

> [No physical factors] explain the tripling of oil prices that took place within a period of months in the absence of any shortage of crude. The economic disaster that took place in late 1978 was a triumph of mind over matter, faith over fact and belief over the drumbeat of contrary evidence. Panic in a chaotic market swept everything before it, consumers, producers, companies, governments; but there was never a shortage of crude.[7]

Stockpiling took place on a tremendous scale, both among retail and institutional customers, but driven by fear of future scarcity. As Yergin writes, "It was the buyers, stunned by the unfolding spectacle and fearing a repetition of 1973, gripped by panic, who inadvertently made the shortage worse by building up inventories—as they had done

[7] Parra 218.

in 1973.[…] It was the mechanism that drove the price from 13 to 34 dollars a barrel."[8] This judgment is hardly heterodox historiographically.[9] It illustrates the impact that fear of current or future oil scarcity could have on price behavior, even when the oil pricing system of the time did not allow for speculative bubbles to develop in the same way they are recorded and debated in the financial economic literature of today.

The question of the effect of financial market participant on price formation in the physical and paper oil markets has attained widespread prominence in the investor and academic finance communities alike since 2008. The issue of the extent to which financial layers and financial investors impacted oil price behavior during the sharp price swings of volatility of the 2008-9 price cycle has received a large number of lengthy treatments, both empirical and theoretical.[10] While some observers attribute the recent price cycle to structural transformations in the oil market, others contend that these changes cannot fully account for the price action witnessed over the past decade. Instead, they claim, the rise of oil derivatives markets have distorted medium-term price formation in what some have termed the "financialization" of the oil market.[11]

A careful reading of Shiller (2000, 2005, 2009) reveals that he does not use the concept of new era economic thinking to argue for the empirical reality or the theoretical possibility of speculative bubbles in the markets he analyzes. Nor does he infer strict causality between new era economic thinking and asset prices bubbles. Rather, he links

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[8] Yergin, 686-7.
[9] See also Adelman, 1983, 1993, 1995; Parra, 2004; and Skeet, 1988.
[10] See, for example, the International Monetary Fund World Economic Outlook (October 2008); the Commodity Futures Trading Commission's Interagency Task Force on Commodity Markets Interim Report on Crude Oil (2008); Hamilton (2009); Kilian and Murphy (2010)
[11] See, for instance, Greenberger (2009) and Yergin (2009). Yergin argues that the proliferation of oil-backed financial instruments "has helped turn oil into something new – not only a physical commodity critical to the security and economic viability of nations but also a financial asset, part of that great instantaneous exchange of stocks, bonds, currencies, and everything else that makes up the world's financial portfolio."

new era stories to the notion of economic confidence, defining them as "those that purport to describe historic changes that will propel the economy into a brand new era" (2009). What do these stories have to do with financial markets? He explains:

> Confidence […] is a view of the world—a popular model of current events, a public understanding of the mechanism of economic change as informed by the news media and by popular discussions. High confidence tends to be associated with inspirational stories, stories about new business initiatives, tales of how others are getting rich. *New era stories have tended to accompany the majors booms in stock markets around the world.* The economic confidence of times past cannot be understood without reference to the details of these stories (55, emphasis added).

In his formulation, the existence of a widespread kind of new era economic thinking is neither a precondition nor a trigger for a speculative bubble. Rather, new era stories accompany the booms, in his words. The phenomena are coincident but not strictly causal.

This study illustrates, at substantial depth, the repeated historical instances in which textbook examples of new era economic thinking – precisely of the kind Shiller chronicles in the equity and housing markets – have been expressed, promoted, and apparently believed by key constituencies of Americans. That claim has a notable implication for those who argue that oil market prices, in the current era of substantial and volatile participation by the financial community, may be subject to speculative bubbles, but it does not run afoul of those who would dispute the historical existence of such bubbles (see, among many others, Lehman Brothers, 2008; Krugman, 2008; Hamilton, 2009; Fattouh, 2010; Kilian, 2010). The reason is simple: this dissertation provides strong evidence of a social phenomenon (new era economic thinking) that

behavioral-financial scholarship has shown tends to accompany instances of irrational exuberance in the market. But it does not argue that the phenomenon has a causal relationship to the kind of sustained investor behavior that brings about a classic speculative bubble. Yes, it is often a feature of those episodes, but no study, of which this author is aware, has cited it as a necessary, let alone sufficient, condition for an asset price bubble.

The research design best suited to investigating the three questions that motivate the dissertation is a comparative-historical case study approach. The comparative method "follows directly from asking questions about empirically defined, historically concrete, large-scale social entities and processes" (Ragin, 1987). In this method, macrosocial units are employed to explain and interpret macrosocial variation, with the objective being an empirically grounded, inductively oriented scientific investigation. Within comparative methods, two principal research strategies exist: case-oriented and variable-oriented methods (Ragin, 1987). The present study draws primarily on the variable-oriented comparative method, although it is organized according to historical periods that can be considered stand-alone cases. In keeping with a variable-oriented comparative method, it draws on multiple cases, uses a theory-generated logic to test hypotheses derived from theory, and aims to keep explanatory variables to a minimum. It tends to avoid the kind of holistic analysis more typical of case-oriented comparative studies, although it does refer to the discrete historical periods that make up the empirical body of the study as "cases." A case study, as the term is used here, refers to "an intensive study of a single unit for the purpose of understanding a larger class of similar units," although other

definitions are also useful in describing the approach (see Campbell and Stanley, 1963; Eckstein, 1975; Yin, 1994; George and Bennett, 2004).[12]

Several factors make this design the most advantageous. First and perhaps most importantly, the challenging combination of temporal variation and across- and within-unit spatial variation in the data in this study requires a research design that can accommodate this complex dimensionality. The comparative-historical approach fits this requirement. The historical breadth of the project, spanning as it does an industry with a roughly 150-year history across varied geographies, coupled with the need for intensive scrutiny of the microdynamics affecting individual predictions and beliefs over that period, would not accommodate an approach that does not allow for both temporal and spatial variation. The comparative-historical approach is well suited to assessing covariation across and within units synchronically and diachronically (Gerring, 2004). Likewise, it allows the study to take in a broad enough swath of time to address a question that requires a wide lens historical perspective while simultaneously allowing for drilling down into the particulars of key historical moments, personalities, and judgments (Yin, 1998).

Moreover, the comparative-historical case study approach shares a number of methodological affinities with the theoretical propositions that this dissertation investigates. Gerring (2004) notes that the case study, as a research design, exhibits characteristic strengths and weaknesses relative to other social scientific methods. The

[12] Gerring (2004) breaks down previous definitions of the term "case study" as "(a) that its method is qualitative, small-N (Yin, 1994); (b) that the research is ethnographic, clinical, participant-observation, or otherwise "in the field" (Yin, 1994); (c) that the research is characterized by process-tracing (George and Bennett, 2004); (d) that the research investigates the properties of a single case (Campbell and Stanley, 1963; Eckstein, 1975); or (e) that the research investigates a single phenomenon, instance, or example (the most common usage). Evidently, researchers have many things in mind when they talk about case study research."

suitability of the case study approach tends to depend on six key elements of the investigation. These pertain to (1) the type of inference under consideration (descriptive rather than causal); (2) the scope of the proposition (depth rather than breadth); (3) the degree of unit homogeneity found among cases and between the sample and the population [case comparability (internal) rather than representativeness (external)]; (4) the causal insight desired (causal mechanisms rather than causal effect); (5) the causal relationship (invariant rather than probabilistic); and (6) the research strategy (exploratory (theory generation) rather than confirmatory (theory testing).

The present investigation is significantly better suited to a case study method along at least four of these six dimensions. First, rather than seeking to draw causal ties between market conditions and supply predictions or new era thinking, it seeks to describe the historical associations between these variables. In so doing, it agrees with Megill's (1989) objection to the notion that essential connections in a historical account must be causal, a bias attributable to modern historiography's undue influence by the legacy of Newtonian physics or positivistic determinism. Descriptive inference remains a vital yet undervalued object in social science (Gerring, 2001; King et al, 1994). Second, the propositions being researched require the scope of argument that the utility of a case study provides (although it simultaneously benefits from the ability to comprise a representative sample of the population it studies, which will be discussed later). Third, the study is more concerned with gaining insight – as far as possible given the source material – into the micro-level mechanisms underlying the relationships between the historical variables it analyzes, than seeking to demonstrate a probabilistic assessment of causal effect between them (King et al, 1994). The objective is to see how X and Y

interact in a process-tracing fashion, a process that Roberts (1996) describes as "the minute tracing of the explanatory narrative to the point where the events to be explained are microscopic and the covering laws more certain." Fourth, given that analyses of oil supply scares have been little studied through the lens of recent theoretical work on the history of finance, a close, case-driven, document-rich analysis of the qualitative and quantitative historical data stands to yield greater insight than what other research designs might offer.

Using multiple case studies, as this study does, also has the advantage of allowing for replication logic to increase the external validity of the findings (Rowley, 2002). The degree to which empirical findings generated through case study research can be generalized across a population, and thus form a basis for broader theory, has been extensively debated (Achen and Snidal, 1989; King et al, 1994; Lieberson, 1992, 1994; Njolstad, 1990). Drawing conclusions based on multiple case studies, rather than a single one, can significantly mitigate this problem by undercutting the view that a single observed case is unique, an aberration, and thus has limited external theoretical value (Nachmias and Nachmias, 1992; Rowley, 2002). In the case of the present study, the multiple case approach allows for the utilization of within-case analytical tools of pattern matching and process tracing. These tools help establish the internal validity of the findings across multiple historical periods (Mahoney, 2000).

The analytic techniques employed to establish the theoretical findings of the study are time-series analysis and pattern matching. Time-series analysis consists of "identifying theoretically proposed sequences of events that are expected to lead to a certain outcome. The identification of events must be done before the onset of the

investigation." This vein of analysis is well suited to research questions that aim to understand why an observed empirical phenomenon occurs—the "why"—and the mechanisms and dynamics that underlie it—the "how." Meanwhile, pattern matching across multiple cases involves comparing empirically based patterns with the predicted ones. It requires determining the key components of the empirical phenomenon in question, analyzing the phenomena across units or cases, and then drawing conclusions inductively regarding the phenomena based on variation of the elements across cases (Yin, 1994).

The efficacy a comparative-historical case study approach in the present investigation is demonstrated in Shiller (2000), which uses the same method, if only in a highly abbreviated form, to address an analogous research question. As described earlier, he employs a historical narrative to link the popularization of new era economic narratives to all four significant speculative market booms in the United States over the course of the twentieth century—1901, the 1920s, the 1950s and 1960s, and the 1990s. He does not address the methodological basis for his conclusion that "new era stories have tended to accompany the major booms in stock markets around the world" (Akerlof and Shiller, 2010), but does provide significant empirical evidence for the argument that these stories have tended to coincide with the equity market booms he identifies. Still, the analysis is too brief to provide much insight into the particulars of the new era beliefs themselves, the people behind such claims, or any contemporary rebuttals made to the claims. He also does not specify the methods he employed to craft the historical narrative. He does, however, clearly identify the price-earnings ratio of the S&P 500 as the quantitative measuring stick by which he identifies the four historical periods that make

up the narrative. Although the present study uses a comparative-historical approach that is similar to Shiller's, and owes the initial theoretical impetus for the study to this earlier work, it goes beyond this study in the level of historical detail it provides, the depth of the analysis it applies to the cases, and the application of existing theory to a new body of empirical data.

The study takes as its unit of analysis the supply-demand conditions in the oil market, crude oil prices, and long-term oil supply and price predictions over a specified period of time. All three of the study's primary research questions can be addressed by tracing the interplay of these variables across time within the broader institutional context of the historical period. While other events and personalities are also discussed, it is only done with an eye toward providing a broader cultural, political, and social backdrop against which the fundamental conditions in the oil market, oil prices, and perceptions regarding future oil supply can be understood. As noted above, the study does not necessarily seek to determine a purely causal relationship among these variables, but rather to explore them as a system of interrelated historical forces.

The question then becomes the case selection criteria. In the case of a comparative-historical study such as this one, selecting the cases also involves making subjective judgments to periodize the data. The approach used in this study was, as mentioned above, to begin by surveying the secondary literature that documents prominent examples of past predictions in the United States of an imminent, irreversible shortage of crude oil. While many such predictions have been made, the objective was to identify those historical periods, if any, in which predictions of or expressions of belief in such viewpoints seemed particularly preponderant or seemed to define the oil-related

public discourse of the time in a notable or significant way. Yergin (1991) is by far the most comprehensive account of the American oil industry, making his text the most fitting resource to conduct this search. He identifies four such instances – counting the peak oil scare of the 1990s and 2000s, he reckons six such waves of oil supply fear have occurred in the United States (Yergin, 2005). A host of other secondary sources from among the definitive scholarly works on the history of the American oil market agree with the general contours of the episodes that Yergin identifies, although few of them go into detail in chronicling all of them, as Yergin does (Williamson, 1945; Fanning, 1950; Olien and Olien, 1993; Adelman, 1995, 2004; Maugeri, 2006; Gorelick, 2009).

Three of these five periods were selected as cases for the dissertation based on three factors. First, primary source data on the first American oil scare is relatively scarce. Yergin (1991) argues that this first scare occurred during the 1860s and 1870s as production in the country's first oil fields, located in Pennsylvania, began to skyrocket. While there are several interesting and rather colorful examples of industry experts predicting that the best days of the global oil age were now behind it, the record for this period is not nearly as rich as it is for the subsequent oil panics.[13] This lack of primary source material would make a process tracing analysis of market conditions, oil prices, and forecasts of prolonged scarcity less fruitful than it would be for later periods. Second,

[13] Perhaps the most legendary story from the history of American oil scares is Andrew Carnegie's attempt to corner the oil market in 1863. Anticipating "the not far distant day" when "oil supply would cease," he and business partners bought 100,000 barrels of Pennsylvania oil and then hoarded it in a man-made lake they had dug just for this purpose. Unfortunately for them, the day of shortage they hoped for never came (while thousands of barrels of oil a day leaked and evaporated). Carnegie described his scheme years later in his autobiography: "The most celebrated wells were upon the Storey farm. Upon these we obtained an option of purchase for $40,000. We bought them. Mr. …proposed to make a lake of oil by excavating a pool sufficient to hold 100,000 barrels…and to hold it for the not far distant day when, as we then expected, the oil supply would cease. This was promptly acted upon, but after losing many thousands of barrels waiting for the expected day (which has not yet arrived) we abandoned the reserve. Coleman predicted that when the supply stopped, oil would bring $10 a barrel and therefore we would have a million dollars worth in the lake. We did not think then of Nature's storehouse below which still keeps on yielding many thousands of barrels per day without apparent exhaustion." (Carnegie, 1920)

recent claims that the world's oil supply has already begun or will soon begin an irreversible decline, which Yergin (2005) identifies as the fifth oil supply scare, have already received extensive attention from scholars. The fact that this purported supply scare is still underway also problematizes the effort to place it on an equal footing, from a historiographical standpoint, with the other cases. As a result of these drawbacks, the period seems less well-suited to inclusion as a case study than the others. Third, the three remaining cases – the 1909-1927, 1940-1949, and 1970-86 – exhibit a degree of representativeness of the broader historical phenomena and sufficient variation on the dimensions of theoretical interest that permit them to serve as a robust sample (Yin, 1994; Seawright and Gerring, 2008).

The three cases draw on an extensive body of primary and secondary source material. While a number of excellent secondary sources were used to provide insight into interpretive precedent with regard to particular events and shed light on the broader contours of the historical periods in focus, much of the value of the cases is made possible because of the originality of the primary source material. The richness of the source material strengthens and enlivens the case studies. The astounding incredulity of many of the predictions that have been trumpeted publicly, the larger-than-life personalities, the violent market reversals, and the unexpected turns of plot that have been the story of the American oil industry are the stuff of the narrative. Dozens of national and local U.S. newspapers were scoured in the process of research the cases, not to mention industry trade journals, Congressional records, company promotional material, memoirs and autobiographies, and television and radio transcripts. Newspaper accounts and other popular media, such as magazines, were particularly emphasized in

the cases given their superior ability to pull back the curtain on popular attitudes and views in a way that almost no other sources could. For a study that tries to gauge popular attitudes and beliefs, the abundance, accessibility, and detail of these sources were an invaluable advantage of these types of popular sources.

The goal was to craft three stand-alone narratives that stayed focused on tracing the key variables of the study—scarcity beliefs and predictions, fundamental supply-demand conditions in the oil market, and price behavior—while portraying the broader social climate in a way that illuminated the macro-level institutional forces at work. Generally speaking, more recent the time period, the easier it was to obtain and review the source documents. Little archival research was necessary, due to the fact that an overwhelming quantity of material on the twentieth-century history of the American oil industry is now accessible electronically or abundant in the collections of major libraries in the United States. The libraries at Columbia University in New York and the University of Utah in Salt Lake City were both used extensively for their excellent resources on the history of American business, particularly the petroleum industry. The libraries of the University of Oxford were also crucial resources.

Constructing the case studies inevitably required reconciling disagreements or omissions among sources. The challenge of maintaining equanimity and even-handedly assessing the evidence in composing the narratives in the case studies is perhaps especially difficult when the subject is as politically charged as the oil industry. Entire libraries could likely be filled with the vituperations against it that have accrued over the years—some merited, some not. Wherever possible, rather than try to arbitrate these debates retroactively in the narrative, the goal was to let the sources (and the actors

within them) speak for themselves while keeping the narrative focused on the key variables in the cases. Doing so makes the cases more colorful and allows the reader to get a feel for the degree of polarization and the hostility of the tone that have marked debate in America about oil. Besides, it would be impossible to discern fact from fiction in almost all of a vast quantity of charges of conspiracy, collusion, and obfuscation laid against the oil industry over the years. Local and federal politicians, environmental activists, oilmen and the oil industry, foreign political leaders and commercial interests – all of these groups were at times and at turns the persecutors or the persecuted.

As far as secondary sources are concerned, some were especially valuable for their depth and breadth of coverage. For the first two case studies, Harold Williamson's two-volume series, *The Age of Oil* (1963, 1981), which tells the history of the American oil industry from 1859 through 1959, was particularly helpful, given the detailed data it provides regarding the pre-World War II era in particular. For price data, particularly prior to the 1970s, the American Petroleum Institute's *Petroleum Facts and Figures* (1959) and DeGolyer and McNaughton's *Twentieth Century Petroleum Statistics* 50th ed. (1994) were indispensible. Yergin's magisterial *The Prize* (1991) was an invaluable reference work for each of the cases studies for the way in which it weaves the entire history of American oil into a single coherent narrative and has a skillful eye for the revealing anecdote or pregnant quote. Adelman's (1975, 1993, 1995) detailed accounts of the price spikes and panics of the 1970s were indispensible in making sense of the limited and/or contradictory primary sources from that tumultuous decade.

There are at least several important limitations of the study. The most basic of these stems from the inherently limited nature of the historical source material. Because

the study's findings are drawn inductively from the cases, and the material in the cases is based on historical evidence that is inevitably limited, the conclusions drawn from that evidence does not enjoy full and complete information. Because other potentially modes of gathering data for the cases, such as conducting interviews with the key historical actors involved, was not feasible, the extent to which the cases can query the wholly documentary data is limited. As a result, as in all historical writing, the problems of limited and imperfect data require the historian to fill in gaps and reconcile accounts. The study's theoretical propositions were designed bearing in mind the limitations of the source material.

A particular effort was made to design questions that could be rigorously addressed without falling prey to one of the methodological traps that many scholars claim exists in some of the behavioral finance literature – namely, that it rests on theory either built in the experimental lab rather than in an empirical setting or that its theoretical claims regarding investor decision-making in applied market settings are not based upon adequate data from a sufficient sample of the participants (Binmore and Shaked, 2010). In the case of this study, addressing the core research questions did not require systematic data gathering at the level of individual decision-making and cognitive processes, as is necessary in many behavioral studies (Barberis, 2002).

Of the three variables the study traces, none was always easy to measure. As for physical conditions in the oil market and the price of oil in the United States, the case studies draw on the best primary and secondary data available, but even that data was at times woefully insufficient, as in the case of the oil price spikes of 1973-4 and 1979-80). Gauging the third, beliefs in and predictions of an imminent exhaustion of oil, was only

possible to the extent that they could be identified through an extensive search of source material. Even when identified, however, a great deal of caution was exercised in reading too much into them or, even more dangerously, reading them onto too many people. Only for the third case study was there public-opinion survey data on the views of the general public regarding attitudes and beliefs about oil scarcity, thanks to polls conducted by *Time* magazine and other similar publications, which was a valuable tool for estimating the perceptions of a broader class of Americans than was possible through any other source material.

The study does not attempt – and perhaps more importantly, methodologically does not rely on – quantitatively measuring how representative the predictions or statements made regarding oil supply or the oil market that are included in the case studies are, in themselves, of public opinion. It would be an error to extrapolate the predictions or beliefs discussed in the cases as representative of the views of a broader group of people with justification for doing so, and every effort has been made in the cases to avoid falling prey to that mistake. Yet the study does not hinge on the existence of an exact metric for the prevalence of scarcity fears any more than Shiller (2000) hinges on a similar metric for new era thinking regarding the stock market. Rather, it aims to identify broader patterns of cultural and social attitudes and viewpoints regarding the current and future state of oil supply as an energy source by compiling and analyzing a vast array of statements made on these subjects during three periods of the twentieth century when expressions of such viewpoints and beliefs seemed particularly preponderant or seemed to define the oil-related public discourse of the time in a notable or significant way. The case studies accomplish this goal, allowing for a rich narrative

that reveals the key elements of these predictions and beliefs as they were expressed and retold at the time.

"A National Crisis of the First Magnitude": The United States Geological Survey in an Era of Booming Demand, 1909-1927

Abstract

This case study analyzes the evolution of oil shortage narratives that gained prominence in popular and political discourse in the United States from 1909 to 1927. Bleak assessments of domestic oil reserves from the United States Geological Survey, undertaken in the context of the nascent American environmental movement, led various government leaders and geological experts to warn the public that the country's reserves were dwindling rapidly. Booming demand and price fuel prices appeared to reinforce their predictions, with US oil production increasing dramatically to fuel the Allied war effort in World War I and later the proliferation of automobiles on America's roads. The oil industry adamantly rejected these arguments, dismissing the fears as unwarranted. Technological advances and the discovery of vast new fields, both in the southern United States and overseas, led to a dramatic increase in crude oil production in the latter half of the 1920s, which, combined with a subsequent downward demand shock caused by the Great Depression, which led to an oil price crash from their previous highs. With the market facing a crude oil glut, the oil shortage narrative quickly disappeared from the national conversation.

Fear of a day when oil was nowhere to be found would have been one of the last things on the American public's mind in the wake of the Spindletop, Texas, oil explosion of 1901—the first "gusher" in the nation's history. Spindletop marked the start of the Texas oil boom, and with it, of a definitive new period in the history of petroleum. The epicenter of American petroleum production no longer resided in Pennsylvania, but had moved "out west" once and for all. Rather than flowing at 50 barrels per day, as was typical of the Pennsylvanian wells familiar to American oilmen, Spindletop was capable of producing more than 75,000 barrels per day. The newfound riches of southeastern Texas transformed the humid, rural landscape into a riotous scene of frenetic drilling and money grubbing practically overnight.

Texas oil plays were prolific enough to transform the crude oil price environment almost immediately after being tapped. The voluminous flow of oil was simply too much for the local market to bear. An oil glut ensued, with the price of crude falling to as low as 3 cents a barrel by the summer of 1901 (Yergin 2008, 70). A string of big discoveries in the Gulf Coast, Texas, and Louisiana, which yielded similarly promising new sources of supply the southern United States over the next few years, only aggravated the price situation. A succession of large finds in Oklahoma, beginning in 1901, of which the 1905 discovery of the Glenn Pool field was the most notable, would make the state the top producer until it was overtaken once and for all by Texas in 1928.

But even as the supply side of the American petroleum industry was on a fundamentally altered course, another groundswell was taking place: the rising of the modern conservation movement in America. The intellectual foundations for the movement had come largely from American Romantic tradition of the nineteenth century—Emerson and his 1860 speech "The Succession of Forest Trees", Thoreau's 1854 *Walden*, among many others. Such works often sought to dislodge the quintessentially American view of the natural world as an endless source of plenty, vast beyond belief and bountiful beyond risk of exhaustion. *Man and Nature*, written by George Perkins Marsh in 1864, was the most direct call to the American people to reform their approach to natural resources. He emphasized the role that the depletion of natural resources of all kinds—forest, oceans, minerals, soil—played in causing the collapse of the classical civilizations of the Mediterranean. And so, he warned the burgeoning American Republic, awaits a similar fate any modern society that wastes its natural resources—a path, Marsh showed, the nation had already begun to travel down in its own

careless stewardship of its natural wealth. Marsh stressed that in a crucial sense, natural resources have no substitutes—once exhausted, they are gone forever, and are thus irreplaceable. As a result, resource endowments ought to be judged on the basis of their physical quantity, not their short-term financial value. Too little could mean too late. "The rottenness of private corporations," as he saw it, was an impediment to the safeguarding of nature's resources and could not be trusted to have the final word in their allocation and exploitation. Government intervention in the market for environmental goods was indispensable to the future of American society.

Public pressure mounted on government officials to enact stricter protections. "Scientific associations and government officials continue[d] to issue warnings," writes Williamson, echoed by "a veritable flood of magazine and newspaper articles and editorial comments pointing out the dangers of resource depletion and the necessity of preserving our national heritage" (Williamson 1945, 102). Early actions by the federal government included the creation of Yellowstone National Park, the first of its kind in the world, in 1872, and the passage in 1891 of the Forest Reserve Act, granting the President of the United States the authority to set aside public land for conservations' sake. The movement found its most effectual political champion in President Theodore Roosevelt, who gave priority to the conservationist agenda during this tenure. "We are prone to speak of the resources of this country as inexhaustible; this is not so," he famously instructed (Brands 624).

During Theodore Roosevelt's tenure in the White House, the federal government took unprecedented measures to try to ascertain the extent of the country's non-renewable resources. The President was very concerned about the "the enormous consumption […]

of resources and the threat of imminent exhaustion to some of them due to reckless and wasteful use" (Williamson 1945, 102). Roosevelt's right hand man in the conservation effort was Gifford Pinchot, who he appointed to serve as the first head of the United States Forest Service. On the back of the recent upsurge in popular support for the conservation agenda, Pinchot sounded an alarm over the petroleum situation in a report he published in February 1909 through the National Conservation Commission, which he chaired. The President had called for a fine-grained study of the ultimate crude oil reserves in the United States, including an estimate of when they would be exhausted should current trends hold. George Otis Smith, the director of the United States Geological Survey, assigned David T. Day to the task. The report was known as the Day Report.[14]

Its findings were startling. Petroleum production was permanently waning in every region of the country, the USGS concluded. There were somewhere between 10 and 24.5 billion barrels left, most likely no more than 15 billion. Extrapolating past production rates forward geometrically, there would be no more oil pumped in the United States after 1935. Reserves would be exhausted by that year, 26 years in the future. Day made a number of policy recommendations to the federal government in light of this bleak forecast. The American public should be urged to trim consumption wherever possible, given that the use of such a scarce commodity was equivalent to "waste." The remaining crude oil should be reserved for military purposes and industrial lubrication, above all else. The Day Report also suggested that the USGS be given jurisdiction over all federal lands with proven oil reserves to ensure that exploration and production

[14] Also known as the United States Department of the Interior's United States Geological Survey, Bulletin No. 394: "The Petroleum Resources of the United States." David T. Day. Washington, 1909.

happens in the most efficient and strategic way possible. Such land should not be handed over to private corporations. Only the USGS, it claimed, was capable of ensuring that domestic oil reserves would be developed in the manner that was most advantageous to the national interest (Olien and Olien 44). Instead of the passionate rhetoric of the conservation movement, the Day Report purported to be a purely scientific endeavor—a quantitatively derived matter of fact.

In reality, though, the Day Report was an imperfect study on a number of counts. Olien and Olien's analysis of the methodological weaknesses of the report is illuminating. They find that the study simplistically assumes a single national average porosity of oil plays, average yield per cubic foot of pay, average thickness of pay for all fields, and average rate of recovery for all fields. Such assumptions "in operational terms amount to nonsense" and are further undermined by the poor quality geological data on which the report was based and the short time in which it was prepared. Furthermore, the Day Report does not evidence any awareness of the effect of oil prices on recoverable reserve estimates or future production. It assumes one fixed rate of future extraction regardless of the market price of the good and fails to acknowledge potential future fluctuations in the country's consumption of oil. On top of all these shortcomings, the study did not view any future additions to petroleum reserves as likely enough to be factored into the supply equation. Neither the potential for finding additional oilfields, nor for improved recovery rates from or additional to existing fields, were reflected in Day Report's frightening conclusion that American oil would be completely exhausted by 1935 (Ibid. 43).

The cataclysmic conclusions about the future of the American oil industry contained in Day's report would receive wide airing in the two decades following its release. Part of that publicity can be attributed to the dogged efforts of George Otis Smith, whose lengthy tenure as the director of the USGS stretched to 1930. He followed up the report with an article touting the accuracy of its findings, lest anyone second-guess them:

> An inventory of the mineral resources of the nation recently made public by the National Conservation Commission owes its chief value to the fact that the data used had been in preparation for more than a score of years.[...] This bureau [the USGS] in its explorations and investigations, had accumulated quantitative data that became readily available at the time of popular awakening to the needs of national conservation.[…]. Herein lies the practical value of much of purely geologic study. Thus, an important part of the Survey's work through these years has been to keep the country informed as to the occurrence of economic minerals (G.O. Smith 1909, 679).

In other words, the USGS had the hard data, and it did not paint a very promising picture for the future of American oil.

Day's study was not the first such warning to the American people. Rather, its importance lay in the fact that it had the explicit backing of the federal government, which lent its findings an air of authority, while its apparently rigorous methodology suggested scientific credibility to its dire findings. The Day Report would serve to advance, rather than initiate, the perception among the general public that oil was on a near-term road to ruin in the years leading up to the First World War.

An exchange between a reporter for the *Hartford Courant* and J.J.C. Clarke, the "publicity man" for Standard Oil, in July 1910 shows that the shortage rumor began buzzing shortly after the time of the publication of the Day Report. Asking Clarke about

the "talked-of gasoline famine," the reporter prefaced his question by stating that "persistent reports in the daily papers state that it is in danger of becoming exhausted." Clarke's answer was hardly reassuring: "Although I cannot give you the exact figures at this instant, I am inclined to believe that the supply will hardly be equal to the enormous demand. It certainly will not exceed it to any great extent" ("Gasoline prices may rise with demand," *The Hartford Courant*, July 14, 1910).

The geologists of the USGS were not the only men of learning to prophesy doom, as a 1913 article in the *Christian Science Monitor* makes clear:

> Professor V. Lewes delivered a lecture recently at the Royal Society of Arts on "Liquid Fuel," in which he dealt with the problem arising from the increased consumption of oil. The demand for oil exceeded the rate of production, and a shortage seemed inevitable. It was doubtful if in 50 years time oil would be obtainable in sufficient quantities, and at a price that would enable it to be used commercially. There were grumblings with regard to rings and combines, but the simple explanation was that demand was getting ahead of supply ("Oil demand is exceeding the rate of production," *Christian Science Monitor*, March 14, 1913).

Such reports reaffirmed fears the public had harbored even before the 1909 USGS report. A news report in December 1912 that "the present oil situation recalls that of five years ago when word was passed about the land that the wells were running out. The price went up. When it reached the top notch oil men went into Texas, Kansas, Louisiana, and California, sunk wells, struck plenty of oil, sold it at big profit and the price dropped back" ("Gasoline to jump seven cents gallon on first day of year," *Christian Science Monitor*, December 16, 1912). So the pronouncement of the USGS stoked an existing but dormant fear among consumers that time was running out.

But these accounts also reveal a more subtle public perception: that the oil companies, led by Rockefeller's Standard Oil, were using foul play to push up the price of petroleum for their own gain. The dark hand of "rings and combines" was a public enemy more than familiar to Americans in this era of Rooseveltian trust-busting. "No general question of governmental policy," wrote framers of the soon-to-be Interstate Commerce Act of 1887, "occupies at this time so prominent a place in the thoughts of the people as that of controlling the steady growth and extending influence of corporate power and of regulating its relation to the public" (U.S. Senate 1886, 2-3). And Standard Oil, a veritable "cult of secrecy," was public enemy number one. It was the industry's undisputed goliath in the first decade of the twentieth century, controlling as much as 91% of oil production and 85% of final sales in 1904 (Yergin 2008, 37).

By 1909, fuelled by public outrage over recent allegations of illegal business practices, the United States Justice Department had brought a suit on Standard Oil on the basis of the Sherman Anti-Trust Act of 1890, for "restraint of trade" in the marketing of oil products. The suit cited a host of "unfair and discriminatory practices," "unfair methods of competition," "suppression of competition"—even "espionage" and the operation of bogus companies in pursuit of profits. Manipulating the price of oil to its own advantage was Standard practice, the government concluded:

> The evidence is, in fact, absolutely conclusive that the Standard Oil Company charges altogether excessive prices where it meets no competition, and particularly where there is little likelihood of competitors entering the field, and that, on the other hand, where competition is active, it frequently cuts prices to a point which leaves even the Standard little or no profit, and which more often leaves no profit to the competitor, whose costs are ordinarily

> somewhat higher (*Standard Oil Company of New Jersey v. United States* 1911).

Even after 1911, when the U.S. Supreme Court upheld a court order demanding the Standard Oil group be carved into pieces, the oil industry was hardly an object of goodwill in the public's eyes. When markets tightened, the leading vertically integrated American oil companies were never above suspicion of being responsible. The mistrust that characterized public opinion of Rockefeller and his Standard Oil Company has largely survived up to the present day, though the objects of suspicion—the major oil companies and the structure of the oil market—have certainly evolved.

Understanding the oil price setting mechanism in the United States during this period is crucial to appreciating that fundamental supply-demand forces had only a partial bearing on final retail prices. Beginning with the creation of the Titusville Oil Exchange in 1871, crude oil was traded through oil certificates on various exchanges throughout the country's producing areas, which were limited to a wide swath of land from Indiana to New York. The Standard Oil Company acquired most of its oil during the 1880s through these exchanges. Gradually, though, it began to buy crude directly from producers. As it did so, independent producers adopted the same tactic, leaving the oil exchanges defunct by the close of the nineteenth century. In 1895, Standard Oil, through its buying arm, the Joseph Seep Agency, decided it was no longer interested in competing on the exchanges for upstream oil. Standard, which by this time either owned or purchased between 85 and 90 percent of the oil in Pennsylvania and Lima-Indiana, would name its own price—the "posted price" of petroleum. "Daily quotations will be furnished you from this office," Standard reported. "The price paid will be as high as the markets of the world will justify, but will not necessarily be the price bid on the exchange for certificate oil."

In effect, Standard would now have the primary say in the upstream price of petroleum, "though always bound by supply and demand." It defended the arrangement to be only natural, as it had "before us daily the best information obtainable from all the world's markets. And we make from that the best possible consensus of prices, and that is our basis for arriving at the market price" (Hidy and Hidy 279; Montagu 132). Independent refiners were now forced to make deals with producers if they were to stay in business unless they could vertically integrate. This barrier to entry into the downstream portion of the supply chain proved a significant barrier to potential entrants.

Standard's share of upstream production and refined product output waned in the first decade of the twentieth century, and also varied from region to region. The sizeable crude discoveries in the first decade of the twentieth century happened to a large degree beyond Standard's Pennsylvania-centered kingdom. The Appalachian and Lima-Indiana fields, which accounted for a stunning 92.5 percent of crude petroleum production in 1899, had shrunk to just 18.9 percent in 1909 and a paltry 9.3 percent by 1919. Mid-continent and California fields had grown from just over 5.0 percent of production in 1899 to a whopping 77.7 percent just 20 years later.

The role of Standard Oil in setting prices for both crude and refined products from the 1880s to 1900 was virtually unchallenged. Due to its outsized role in the downstream market, it operated in such a way that the "petroleum market closely approximated the textbook price-leadership model" (Olmstead and Rhode 1049). As it adjusted its petroleum prices, competitors tended to match those prices immediately and almost without exception. The extent of Standard's control waned from 1900 to 1911, due to emergent challenges from independent fuel producers and distributors in prolific frontier

areas such as Texas and Calfornia. After 1911, as new discoveries continued to occur, the locus of production shifted to the Central plains of Oklahoma and Kansas, which challenged Standard's price setting authority. Wholesale and retail product prices began to adjust more rapidly to changes in the prices of crude oil, and firms took greater advantage of price cuts as a means of jockeying for market share.

Even after the dissolution of the Standard Trust in 1911, the former Standard companies continued to play a dominant role in setting downstream prices for the entire industry. Citing Standard's posted price for crude, as of the future date of delivery, as the contract price in their own transactions was common practice among American oil companies. Particularly when it came to adjusting prices in response to changes in fundamental supply-demand forces, the former Standard companies held sway (Williamson 1963, 235). The Federal Trade Commission found in 1920:

> Price initiative today seems left generally to the Standard companies. […] Competition is more directed to developing facilities for getting business than to seeking to obtain it by underselling. […] In most marketing areas east of the Rocky Mountains, as in California, Standard […] companies usually take the lead in announcing price changes while other companies usually follow. Occasionally the Texas Company and the Gulf Company, take the initiative. [More commonly] prices announced by the Standard companies are generally accepted as the market price (U.S. Federal Trade Commission 1922, 129).

Rather than encroach on each other's geographical spheres of influence at the retail level, these companies allowed their peer companies to act as uncontested price leaders within their own respective regional domains. The U.S. Fuel Administration found in 1919 that "under no circumstances do Standard Oil companies compete, even when a state line divides a town or community.[…] The separate units do not compete but, in general, limit

their activities to the territory in which they were in operation at the decree in the Standard Oil case" (Maguire 11).

Generally the Standard companies were loath to revise their posted prices downward, given the relative inelasticity of demand to price. They were similarly disinclined to adjust prices quickly due to shifts in the cost of refined products or demand unless there was clear evidence that the change would endure. On the relatively rare occasion when competitors would undercut their price schedule in an attempt to grab market share, the Standard companies were not below the predatory tactics Rockefeller had infamously employed before 1911. Still, with the price at the pump soaring from 15.4 cents in 1914 to 22.2 cents in 1919 due a near tripling in demand for gasoline to 87 million barrels, there was little need to rock the boat (Williamson 1963, 237). It did not hurt that the Independent Petroleum Marketers Association, still reeling from gasoline price wars in 1915, formally agreed to uphold the Standard companies' posted retail prices. Such a course of action, according to the president of Union Oil, was "natural and unavoidable" (Olmstead and Rhode 1049-50).

The advent of the First World War in 1914 brought a new urgency, for the federal government, to the question of whether American petroleum supplies could be counted on into the future. Petroleum was no longer just another commercial item, of interest merely to those seeking the new-found thrill of a "joy ride" or household illumination. It was now a strategic commodity. At the urging of Winston Churchill, then Vice Lord of the Admiralty, Britain suited its navy to gasoline instead of coal in 1913. The United States quickly followed suit. Military leaders knew that this war, for the first time in world history, was going to be won on the back of mechanized warfare. The products

wrought from petroleum—naptha, gasoline, and diesel, not to mention industrial lubricants, would prove crucial to the war effort.

Although the world's leading producer of crude oil during World War I, the United States oil industry strained to supply the Allies' needs. By 1914, the country produced more than 266 million barrels, amounting to 65 percent of the world total; by 1917, that figure would increase to 335 million barrels, or 67 percent. The United States would ultimately provide a full 80 percent of the Allies wartime requirement for petroleum (Williamson 1963, 283-7). As the war stretched on, European leaders grew increasingly panicked over a scarcity of fuel. Gasoline is "as vital as blood in the coming battles," wrote a fretting Clemenceau to Woodrow Wilson. "A failure in the supply of gasoline would cause the immediate paralysis of our armies," and could very well lead to "a peace unfavorable to the Allies" (Cited in Yergin 2008, 161).

And yet ever-escalating demands for petroleum products continued to push production capacity to its limit. The age of the automobile had arrived, forever transforming the use to which petroleum would be put in American life. A rarity just a few years earlier, more than a million cars had been licensed in the United States by 1914, with annual production running at over half a million. That figure would rise to 1.68 million cars just five years later (Cited in Williamson 1963, 189-90). Ford's 1908 Model T had launched a popular revolution in American travel. Just 8 years later, in 1916, 2 million had been sold, which would explode to more than 10 million by 1924 (Brinkley 272-3).

The proliferation of automobiles in America placed tremendous new demand on oil production—no longer for kerosene, as had been the case in the nineteenth century,

but for motor gasoline. In 1899, virtually all of the 156 thousand barrels per day of crude oil produced domestically were converted into industrial products, mostly as cleaning solvents and heating. But by 1914, motor gasoline made up 40 percent of retail petroleum products sold in the United States. Gasoline, about 25 percent of the value of total U.S. refinery runs in 1909, had shot to 85 percent by 1919 (Williamson 1963, 194-5). All in all, worldwide consumption of petroleum would increase by 50 percent between 1914 and 1918 (Maugeri 25). The demands of the war, coupled with the proliferation of automobiles on America's roads, were the primary demand-side factors that pushed the price of gasoline from 15 cents in 1914 to a high of 24 cents in 1918 (Williamson 1963, 195).

Meanwhile, reports of an imminent of exhaustion of American oil—and even of global oil supply—kept coming. Ralph Arnold, a USGS colleague of David Day, who had authored the famous 1909 report on dwindling oil reserves, had more bad news for the country in 1916. He reported that the country had pumped about 3.3 billion barrels since 1859—more than fifty percent of its total remaining resource, according to his calculations. Only 5.8 billion barrels were left. Were production rates to continue to increase at the rate they had up to 1915, the United States petroleum supply only had 22 more years to go (Porter 10; Arnold 274-87). A Bureau of Mines geologist had more dire news the following year: US oil production may irreversibly peak within 5 years. "With no assured source of [new] domestic supply in sight," the Bureau warned, "the United States is confronted with a national crisis of the first magnitude" (Requa 1916). The chances of finding new reserves to equal the past ones were slim, he went on to say. Only by going overseas in search of more crude oil could the situation improve.

A team of scientists sponsored by the Smithsonian, led by Chester Gilbert and Joseph E. Pogue, weighed in in 1918. Their verdict: 7 billion barrels of crude oil remained in American reserves, with no significant additions to ultimate recoverable reserves on the way. "There is no hope that new fields, unaccounted in our inventory, may be discovered of sufficient magnitude to modify seriously the estimates given.[…] [The war] has merely brought into the immediate present an issue underway and scheduled to arrive in a few years" (Gilbert and Pogue 20).

The death of domestic oil reserves was not a matter of if or even of when, but rather of short-term, calculable inevitability. A 1916 Senate inquiry into the matter judged American oilfields to 7.0 billion barrels remaining. That amount would be exhausted, given increasing rates of consumption based on past trends, in likely no more than 25 years—by 1941 (Mejcher 37). According to A.C. McLaughlin, an "oil expert" who testified at the hearing, "the United States was facing a shortage of oil, and that, unless production was greatly increased, the situation might become embarrassing" ("Oil Shortage Seen for United States," *Christian Science Monitor*, March 15, 1918).

Beginning in 1921, the USGS changed its forecasting methodology in an attempt to improve the accuracy of its official reserve estimations, which had continually proven to be too conservative. For one thing, it began to account for the discovery of new sources of supply in its official forecasts. It also conceded that earlier studies had been flawed in not acknowledging the positive role on ongoing improvements in recovery techniques in augmenting previous rates of recovery. For the 1921 report, the USGS partnered with the American Association of Petroleum Geologists to issue updated reserve estimates based on the improved methodology (U.S. Geological Survey 1922, 42-

6). Although each of these forecasts revised previous calculations of American oilfields upwards, none saw future supply keeping pace with the skyrocketing demand that occurred during the 1910s. America's time was up.

There was no doubt that the final years of the war placed tremendous strain on national production capacity. The stress on the market became increasingly visible. "Everything conspired against optimism," as one historian of oil has put it (Maugeri 25). In 1917, imports from Mexico had to fill the orders for fuel oil and gasoline that domestic producers could not. Soaring prices for crude, which doubled between 1914 and 1918, provided incentive for producers to wait for prices to rise even farther before ramping up production, which only made the situation worse for consumers. Discoveries of new fields lagged, notwithstanding a record number of wells being drilled in the late 1910s. Even the weather was uncooperative. An unusually cold winter in 1917/1918 sparked increased demand for coal, which was a primary source of industrial power and residential heating. Oil, a substitute product, saw increased demand as coal prices increased in the face of shortage. President Wilson took the dreaded step of imposing "Gasolineless Sundays" in 1918. Though they only lasted six Sundays in the late summer, the rationing policy drove home the fact that oil demand was exceeding ready supply. The shortage situation was even worse in Britain, and reports of its still more stringent rationing policy filled news reports in the United States.[15]

Oklahoma refiners, who just a few years earlier were feasting on the flow from the giant Cushing field, could not get their hands on enough crude oil to fully utilize capacity. Some obtained only enough to run at 50 percent of capacity. Their bidding war for raw crude shot the regional price per barrel up from $1.20 in 1916 to $3.36 in 1920

[15] See for instance "War hits nearer while oil fuel famine impends," *The Hartford Courant*, May 22, 1918.

(Yergin 2008, 178-9, 201). In Pennsylvania, the price of crude rose from $1.75 in 1914 to $4 per barrel by autumn of 1918, and in Illinois from $1.12 to $2.42 per barrel over the same period ("Gasoline scarcity rumor questioned," *Christian Science Monitor*, September 18, 1918). Prophecies of a lasting shortage hung in the air, and the situation on the ground appeared to bear them out.

Newspaper reports between 1917 and 1919 reveal a national atmosphere of intense worry over the energy situation. Government information sources were often the cause the panic. "Despite the fact that never before in the history of the United States has so much oil been produced as today," wrote the *Los Angeles Times*, "during the last decade the increasing price of oil […] has created what many gas men regard as a 'dangerous' situation" ("Scarcity of gas oil threatened," *Los Angeles Times*, December 27, 1914). One agricultural trade journal warned that "the country [is] facing a crisis such as it has never faced before," which could lead to widespread famine ("Gasoline for farmers," *Indiana Farmer's Guide*, March 9, 1918). "If the predictions made by the Fuel Administration are fulfilled, the country is face to face with a grave shortage of gasoline." Though the coal shortage in the winter of 1917 - 18 had passed, P.B. Noyes, the director of the Fuel Administration, viewed the shortage as bound to endure. It was a "catastrophe" and "a silent tragedy," in his words. "We are told that the total amount of these reserve stocks in the United States do not now amount to more than three months' supply for the country. A rather gloomy writing is appearing on the walls of the petroleum industry."

The decline of the oil industry, one editorial warned, was only the prelude to the trauma of a vastly altered national lifestyle:

> The importance of oil to the civilized world can best be grasped when we consider that the clothing we wear, all the articles on our person, the houses we live in and practically every article in our houses would not exist as we now have them were it not for lubrication. Picture to yourself our great cities, New York, Chicago, Philadelphia, Boston, and others.[…] Think for a moment what would occur to these great cities should the world run short of lubricating oil. Efficient lubrication is one of the controlling factors making possible the existence of our great cities.

The author of the editorial was optimistic enough to believe that "undoubtedly many other deposits of petroleum will be found in the world," and yet, notwithstanding, the petroleum age was coming inexorably to a close: "But nevertheless our best advised authorities agree that so few as 16 years may see the practical exhaustion of the United States' petroleum, and, further, they do not look forward to any foreign country surpassing in productivity that of the United States." And then the amusing line: "And still I am not a pessimist; far be it from me," but "I admit that if we judge solely by appearances the prospects do not look very bright and rosy for our children" ("Why coal and oil conservation," *Forum*, Edward G. Acheson, May 1919).

Some prominent observers spoke up in an attempt to correct what they believed to be harmful untruths about the future of oil in America. "Nothing is easier to get into circulation than a scare," said a *New York Times* editorial in January 1918. "Considerable concern has been aroused among automobile dealers over the rumor that the government would be compelled to establish restrictions on gasoline consumption.[…]Automobile dealers already harassed by rumors assumed looks of gloom." In fact, "there is ample supply of gasoline. Inquiry at authoritative sources proves this and automobile owners throughout the country can rest assured of this fact." A similar appeal for calm appeared

in the *Christian Science Monitor* early in 1918: "The recent announcement that there was a scarcity, with worse to come, was not accompanied by any explanation of the reason for this situation, and there are oil experts who simply think that there is no basis for such an assumption. One of these experts said that this is the time of the year when gasoline stocks always run low.[…] The statement, therefore, that there is a shortage in the supply of gasoline probably means that the stocks are running low, as they always do this time of year" ("Gasoline scarcity rumor questioned," *Christian Science Monitor*, September 18, 1918). According to an executive of the Packard Motor Car Company, "Not the slightest basis in fact exists for the rumor that a shortage of gasoline menaces the motor industry or the American way of life" ("Gasoline shortage made less probable," *New York Times*, January 19, 1918). All in all, though, the reporter does not sound entirely convinced—the article ended up being titled, "Gasoline shortage made less probable".

Of course, when such reassurances came from automobile industry insiders, let alone oil industry insiders, they were likely much less reassuring. A 1918 article claiming that "it is the aim of the Standard Oil Company and the federal government to keep gasoline prices as low as possible" would have been laughable—and rightly so. The two groups hardly had matching incentives when it came to gasoline prices, even during wartime.

Once World War I ended, the oil industry began looking increasingly hard at the idea of acquiring foreign oil as a way of meeting burgeoning domestic demand for petroleum products. American oil companies began to accept the fact that if new sources of supply were not brought on stream immediately to bring down prices, oil could lose its competitive position vis-à-vis coal and demand for gasoline and lubricating oil could be

destroyed (Williamson 1963, 295). Today, the thought of American oil companies operating abroad is second nature. But it was not always that way. The United States was producing as much as 70 percent of the world's oil during the 1910s. It was the country where everyone else wanted to come drill for oil, and its political leaders chaffed at the thought of going to foreign countries for oil, cap in hand, as Britain was obliged to do.

Yet, due to the exponential growth of worldwide demand during the 1920s, going abroad appeared the best way to keep reserve growth coming. In the words of one historian:

> It came as a bitter realization for American oil companies to find that by 1919 the British companies, which were currently turning out less than five percent of the world's production, had somehow acquired more than half the world's estimated future reserves. With the alarm over the depletion of American's domestic supply, the long-range future looked bleak to oil men, who saw that they might have to forego profits because of their failure to acquire abundant foreign reserves (DeNovo 1956, 856-7).

It did not help matters Sir E. Mackay Edgar, a British oil executive, informed *Sperling's Magazine*, in a widely circulated 1918 statement, of what sounded to American ears like a secret British plot to form a world oil cartel:

> To the tune of many millions of pounds a year, America, before very long, will have to purchase from British companies and to pay for in dollar currency, in increasing proportions, the oil she cannot do without and is no longer able to furnish from her own store.[…] There may be small isolated sallies, but there can never be a massed attack. The British position is impregnable.

As he saw it, Britain should take advantage of the fact that "the great oil fields of the United States are nearing exhaustion," since according to his contacts, "it is not believed the new ones that are being proved will yield anything like the old prodigal production."

Therein lay Britain's opportunity to squeeze its cross-Atlantic neighbor as it struggled it vain to acquire foreign oilfields, already under British control. Indeed, Mackay's analysis had disturbingly sinister overtones:

> We hold in our hands, then, the secure control of the future of the world's oil supply. We are sitting tight on what must soon become the lion's share of a raw material indispensible to every manufacturing country. […] It will be within the limits of the commanding position that the future has in store for us to hold up the entire world to ransom in the distribution and the price of this vital essential (White 132-3).

The dreaded specter of a global oil monopoly—run by some other than the United States, that is—was enough to spur America to action. Still, many domestic producers were adamantly opposed to the importation of foreign crude. Foreign oilfields, which tended to be operated in a more technically efficient way than American fields, yielded crude oil at a lower cost per barrel on average. Its cheapness relative to domestic crude made it more competitive than in the domestic market, and was thus a threat to the market position of the smaller American producers who derived their crude production from American fields.

Mark Requa, a California businessman and mining engineer, had been urging the industry to acquire overseas acreage for years to prevent exactly that scenario from coming to pass. Appointed as the director of the Oil Division of the wartime Fuel Administration in 1918, Requa and his strategy gained momentum. In Requa's judgment, Day's 1909 forecast had "terrible significance" for the future of the nation. The United States had "officially been put on notice," he had testified to Congress in 1916. "As a nation, we are wasteful, apathetic, and forgetful. We waste our natural resources with

shameful prodigality; we are apathetic of the future, and we forget that our reserves of natural wealth are by no means inexhaustible" (Requa 1917, 13).

The solution, as Requa saw it, was for "official Washington" to give "most hearty and sympathetic support" to American oil producers in their effort to obtain overseas oil concessions (Requa 1921, 272). The mainstream American oil industry agreed with Requa and his government colleagues that additional supplies did need to be brought to market if the industry was to avoid destroying demand for its products by letting prices remain at unheard-of levels. Where there was disagreement was over the percentage of future domestic demand that domestic supply was capable of sustaining at affordable prices. American crude oil production had not been able to meet domestic demand since before World War I, with imports making up the relatively small shortfall (Yergin 2008, 203).

But the American oil majors knew, of course, that gaining control over as much cost-competitive overseas oil acreage as they could was good business regardless of how long they believed domestic fields would last, especially since monopolized foreign oil could in theory undercut their market share back home. Even though it was true that "the bulk of oil men do not give any of these estimates [of dwindling reserves] serious consideration," oil executives appeared more than willing to leverage predictions of shortage if such ideas would impel the federal government to support their overseas endeavors. A.C. Bedford, an executive for Jersey Standard, made his case for the American government to intervene on behalf of companies like Jersey by noting that the USGS had, after all, estimated that over 40 percent of the nation's oil was already used

up. For companies like Jersey Standard, government backing for foreign exploration could only be a good thing (*Oil and Gas Journal*, June 11, 1920, 85).

Industry leaders rarely addressed the prophecies of shortage as a unified voice, even after forming a trade association, the American Petroleum Institute, in 1919. When they did address the issue, they typically offered a terse, even mocking dismissal of the notion that oil reserves would soon be exhausted, either globally or domestically. "The fear that there may not be a sufficient supply of oil for transportation and industrial purposes is groundless" was one of the "many objectionable matters [that should] be charged up to the conservationist movement," *Oil and Gas Journal* proclaimed. "Practical oil men" could not be fooled by forecasts that were no more than "fanciful guess work" (*Oil and Gas Journal*, February 24, 1916, 2). Public panic over what it perceived as the imminent depletion of oil was nothing new to them, as an oil industry trade journal wrote in 1918:

> At regularly recurring intervals in the quarter of a century that I have been following the ins and outs of the oil business there has always arisen the bugaboo of an approaching oil famine, with plenty of individuals ready to prove that the commercial supply of crude oil would become exhausted within a given time—usually only a few years distant (Fanning, 322).

Thomas O'Donnell, the first president of the API, conveyed disappointment in 1920 that "The public has frequently been alarmed by statements of well-meaning and learned scientists, predicting an early exhaustion of our petroleum resources.[…] Long after the time limit set for exhaustion by some of our experts," domestic production would continue to provide at least some portion of the country's needs. Yes, there had been a temporary shortage of gasoline on the West Coast, he acknowledged, but that "deplorable

situation" was due to the withdrawal of public lands and the creation of the naval oil reserves (*Oil and Gas Journal*, December 3, 1920, 3; Nordhauser 57).

That same year, H.G. James, the president of the Missouri Jobbers Association, heatedly addressed the topic of depletion forecasts:

> I am wholly out of sympathy with those croakers who are constantly keeping the public mind inflamed with dismal predictions of declining production and nearby exhaustion of the supply of petroleum. The surprising thing is that some oil men engage in the same sort of bunk or are persuaded to approve what is being said by others.[…] There never was a time when so many people who do not know anything about oil were giving expert testimony thereon (*Oil and Gas Journal*, April 23, 1920, 54).

Harry Sinclair, speaking at the API's annual meeting in 1921, showed the same impatience: "There is plenty of petroleum and always will be. Exhaustion of the world's supply is a bugaboo. In my opinion, it has no place in practical discussion" (*Oil and Gas Journal*, December 16, 1921, 78). Even the British oil industry, in its rush to acquire foreign petroleum, did not really believe the United States was running out of oil, idea they viewed with "varying mixtures of skepticism, injury, outrage, and implacability" (Yergin 2008, 178). "I don't expect you or any other oil man in American really believes that your supplies are going to be exhausted in the next 20 or 30 years," wrote the director of Britain's *Petroleum Executive* to an American colleague (Cited in Yergin 2008, 179).

As more and more Americans started driving longer and longer distances during the 1920s, trends in retail gasoline prices took on increasing importance to the American consumer. Cars were multiplying at a scale hard to conceive of. A total of 3.4 million automobiles registered in the United States in 1916 swelled to 23.1 million automobiles

by 1920. More than three-quarters of the world's automobiles resided in the United States. Not only were there more cars on America's roads, they were being driven ever-long distances. The average car traveled 4,500 miles in 1919, but it went nearly double that distance, 7,500 miles, in 1929. The entire orientation of the petroleum industry shifted with this new usage for crude oil. Drive-in gasoline stations sprung up overnight, from 12,000 in 1921 to 143,000 in 1929. More than four times as much gasoline was consumed during the final year of the 1920s than had been used a decade earlier (Cited in Yergin 2008, 191). As a result, gasoline purchases were taking up an ever-greater share of household spending. The average American was feeling the cost of gasoline in the pocketbook as he never had before. The future of crude oil supply, which in the era of Roosevelt had been more of an academic, or perhaps moral, concern, became an increasingly home-economic one.

Crude was as expensive in 1920 as it had been at any time in the prior two decades. In 2008 dollars, the price per barrel spiked from around $12 in 1915 to around $30 in 1920, more than doubling. It would collapse from the 1920 price to just under $20 the following year before falling to $15 in 1924. Then it resumed its upward path, this time stopping at around $20 in 1927, when a massive new discovery in Oklahoma cause it to fall sharply again (BP Statistical Review). As Yergin points out, as the number of Americans who bought gasoline—and in every greater amounts per automobile—increased, politicians faced ever greater rancor from their constituents when the price of gasoline would enter uncomfortably high territory. Gasoline prices became household conversation, reported by the press, subject to governmental investigations and scrutiny, and discussed by public officials at every level of authority.

With oil prices as high in 1920 in real terms as they had been in the two decades prior, public worry over oil depletion reached a fever pitch. An account from the *Wall Street Journal* captures the intense fear that gripped the country: "There has been true anxiety in the public mind over the fuel question, in some cases bordering on despair. There have been legitimate grounds for such apprehensions, and doubtless it was greatly accentuated by those who find their harvest in the extremity of others" ("Fuel scarcity," *Wall Street Journal*, October 27, 1920).

Alarm bells sounded at full volume. "The United States is face to face with a near shortage in petroleum supplies, so serious in character that it threatens the very economic fabric of the nation.[…] Unless immediate steps are taken to remedy this situation, the industrial, economic, and political existence of the United States soon will face one of the most serious crises in American history" ("Nation faces oil famine," *Los Angeles Times*, September 23, 1923). The death of the oil age was upon them:

> It is not impossible, and perhaps not improbable, that children now living will in their old age tell their grandchildren of […] an evil-smelling liquid called gasoline used for the propulsion of automobiles. As conditions of our daily life, we are prone to regard coal and gasoline very much as we regard air and water, as things that, because they now are, therefore must always have been and must always be. As a result of scientific and official surveys, we are told that our coal supply will last for many generations. The estimations of duration vary, but none threatens any early exhaustion. But the oil situation is quite different. Within the last few weeks the Director of the Bureau of Mines predicted that 'in less than twenty years the supply still underground will be exhausted' ("The fuel of the future," Albert G. Robinson, *Outlook*, July 21, 1920).

Failing American morals and the proliferation of automobiles most commonly took the blame for the crisis. “Indulgence” and “reckless living” were the specific names given to the moral lapse of excessive oil consumption. Recognized public authorities on oil, like George Otis Smith, the director of the United States Geological Survey, repeatedly inveighed against the “orgy of petroleum production and consumption […] as if there was no limit to supply.” No longer would there be sufficient gasoline for every whim: “In any weighing of the uses of petroleum, certain changes in practice appear inevitable. The use of gasoline to serve our pleasure cannot go on unchecked—the joy ride is not the kind of ‘pursuit of happiness’ regarded as an ‘unalienable right’ by our Revolutionary fathers” (G.O. Smith 1920, 99-1011).

Rumors soon emerged about the very rumors of oil shortage themselves. Was a sinister force behind such claims, manipulating the beliefs of American consumers for its own dark purposes? A few conspiracy theories, which Olien and Olien chronicle, were put forward arguing that such a puppeteer was indeed behind it all. During World War I, the *Oil & Gas Journal* said it had found the culprit: the “untiring German propagandist” was behind the persistent rumors of impending oil doom, intent on wreaking havoc on the industry powering America’s war effort and disheartening the country’s population. Three years later, in 1921, H.G. James alleged that coal producers were in fact the ones behind such stories. Worried that oil was overtaking coal in the energy mix, they were trying to scare people back into coal. Oil was going to be gone so soon, went their purported pitch, it was hardly worth investing in now. Or maybe the powerful oil companies were behind it all. That was the view of a group of Kansas oil executives, at least. If the companies with the largest market share could convince the independents to

overproduce, the market would be flooded and prices would collapse—leaving only the most powerful companies, who could supposedly withstand such an eventuality. A further conspiracy theory was put forward in 1923 by New York University professor Ernest L. Lilley. He claimed that the same charlatans who promoted shares in oil companies and lease salesmen were behind the perennially untrue predictions of shortage. They advanced the "exhaustion bogey" because of their "ulterior motives," trying to keep up the perception of a never-ending oil rush (Wildavsky and Tenenbaum 50-71).

Crude inventories in the United States more than doubled between 1918 and 1923 as oil refiners stockpiled crude out of fear of a possible upstream production shortfall. Between 1918 and 1923, domestic stocks rose from about 138 million barrels to nearly 377 million barrels (American Petroleum Institute 152, 160). Not everyone was convinced that a crude shortage was imminent, however. The issue was a polarizing one; skeptics of the shortage were just as fervent as were the believers in their attempt to set the record straight. J.L. Jenkins of the *Chicago Daily Tribune* called "Uncle Sam's highly disturbing gasoline famine […] purely mental." A rising tide of supplies meant the "world can now emerge safely from the cloud of gloom perpetrated by the premature prophets who for months have been drawing word pictures of a gasless universe." The "gasoline panic" was nothing more than a "specter which has swept the country, which caused no little amount of financial loss and anxiety in automotive circles generally. It has been purely psychological, in the opinion of the Federal Trade Commission" ("Gasoline famine panic exploded by U.S. reports," *Chicago Daily Tribune*, June 27, 1920). Mr. Jenkins was offering a radically positive view of the oil situation at a time when suspicion and fear reigned in the American public, spurred by government

assessments. As Walter Teagle of Standard Oil of New Jersey regretted, “pessimism over crude supplies had become a chronic malady in the oil business” (Cited in Yergin 201).

Public disapproval of the oil industry was about to get much worse. In 1923, the Teapot Dome scandal lit up newspaper headlines across the country. The Interior Secretary, Albert B. Fall, had accepted bribes from two oil executives, Harry F. Sinclair of Sinclair Oil and Edward L. Doheny, in exchange their companies’ receiving rights to government oilfields in Wyoming and California. These tracts of land had been transferred to the control of the U.S. Navy as a strategic petroleum reserve years earlier. The Senate investigation of the affair would endure as the most sensational story of fraud in twentieth-century American history until the Watergate scandal decades later.

Government attention to the issue of oil depletion continued unmitigated after 1923 despite the flood of oil that was beginning to hit the market that year. President Coolidge, acting on Doherty’s call for new government regulation of the oil industry, established the Federal Oil Conservation Board in 1924. He entrusted it with “safeguard[ing] the national security through the conservation of our oil” (*New York Times*, December 20, 1924). While the mainstream oil industry strenuously opposed government regulation over their business, there was no denying that current market incentives fostered cyclical overproduction, which amplified the boom-and-bust nature of the industry and hurt ultimate recovery rates. The FOCB was a forerunner to state and federal regulatory bodies that arose over the next decade to help mitigate the disastrous effects of overproduction on the oil industry. Its first report, released in 1926, concluded that the country could run out of oil in as few as 6 years, due to new discoveries not keeping pace with demand. What was more, it found, wasteful production practices were

hurting national security. Rampant overproduction showed that voluntary agreements to keep more oil in the ground were necessary, as was acquiring foreign reserves, especially in Latin America, to ensure a future for American oil firms.

Yet even as the report hit the presses, the oil kept coming. Overproduction, not undersupply, was the true enemy of American production during these years. Production from California oil fields shot up from 138.5 million barrels in 1922 to 262.9 million barrels the following year, flooding the market yet again. The price of California crude in 1923 was only 50 percent of what it had been in 1921 (American Petroleum Institute 152, 168-70).

And yet, notwithstanding the abundance of crude oil, public concern continued unabated. Regretting the abiding fears of an oil shortage, Howard Pew of Sun Oil reflected, "My father was one of the pioneers in the oil industry. Periodically ever since I was a small boy, there has been an agitation predicting an oil shortage, and always in the succeeding years the production has been greater than ever before" (Giebelhaus 118). That kind of scare was unfolding in the mid-1920s, despite the momentous production gains. As Williamson writes: "Throughout the 1920s, but particularly after 1924, as public officials, industry executives, and the man-on-the-street continued to speculate over whether or not the United States would soon run out of crude oil supplies, there was so much crude oil floating around in the States that such speculation seemed premature to say the least" (1963, 303). A rapid succession of new technologies and discoveries was bringing more oil to market than it could bear.

Technological advances in the 1920s transformed the way oil was located, extracted and refined. "Science has safeguarded us against an oil famine," declared the

New York Times triumphantly in 1926 "Science safeguards against oil famine," J.H. Struth, *New York Times*, August 22, 1926). No longer would oil hunters need to rely on their "good nose" to find oil, thanks to a host of techniques and tools developed for just that purpose. Seismic prospecting, first used by the oil industry in Eastern Europe, was brought to the United States in 1923. It proved wildly adept. The technology was responsible for finding the Greater Seminole field in Oklahoma, "one of the most rapid developments of an oilfield the world had ever seen." Aerial surveillance, which national militaries had put to use in tracking army movements during the First World War, was another means of better identifying promising geological formations, although from above ground. The magnometer, first utilized during this era in oil prospecting, helped locate oil by measuring changes in the vertical components of the earth's magnetic field (Maugeri 42-3). Drilling also improved markedly during the 1920s. In 1918, the deepest wells had a range of 6,000 feet. By 1930, that figure had reached 10,000 feet (Yergin 202).

The biggest breakthrough downstream was the development of thermal cracking in 1913. The process "made it possible to crack heavier oil molecules into lighter ones, which could then be further treated to extract additional volumes of gasoline and other light products." Thermal cracking allowed refiners greater freedom to produce a variety of final products in greater quantities (Maugeri 43). Technology on the demand side also made forward strides. Automotive fuel efficiency increased, in keeping with consumers' incessant demand for lighter cars that would enable them to receive the maximum gasoline mileage possible.

More oil than ever before was coming onto the global market, even as global demand was about to spiral downward. Oil discoveries flourished in the second half of the 1920s. The discovery of the giant Yates field in Texas soon established the Permian basin in the southwestern United States as one of the world's leading oil-producing regions. Oklahoma also boomed. The output of the Greater Seminole field was extraordinary, growing from 192,500 barrels per day in January 1927 leaped to over 490,000 barrels per day by July (Williamson 1963, 324). Foreign oil production also made new highs. Soviet oil production, which had nearly stopped as a result of the country's political turmoil, came back on in the 1920s. Production as low as 75,000 barrels per day in 1918 hit 275,000 barrels per day by 1929. Yet Mexico would surpass Russia in 1921, producing more than 100,000 barrels per day in 1921 (Maugeri 30). Production in Venezuela soared from just 19,000 barrels per day in 1919 to more than 500,000 barrels per day ten years later. Venezuela would become the world's largest exporter of crude by 1939 (Magueri 32). The discovery of the East Texas oil field in 1930, the largest American oilfield ever found outside Alaska, produced at the previously unimaginable rate of 900,000 barrels per day—when the total U.S. output was 2.4 million barrels per day.

Domestic production had done what many thought impossible, bringing annual production from around 450 million barrels to 1 billion barrels between 1920 and 1929, only to fall to 785 million barrels by 1932. Prices were a shadow of what they had been a decade earlier. $3 per barrel oil in 1920 had turned into $2 in 1925, only to collapse to just half a dollar per barrel the summer of 1931 (American Petroleum Institute 168-71). The oil world of the First World War had been turned upside down.

When the financial crisis of 1929 and the early 1930s broke out, it was simply too much for the oil market to bear. Demand for petroleum crumpled around the world. Along with the price of oil, the force behind the imminent shortage scare collapsed to a large extent under the weight of the new discoveries and drastically diminished demand. An article from the *Los Angeles Times* poked fun at the "Jeremiahs who periodically predict this fatal exhaustion" of oil. It concluded: "Perhaps we should not take these alarmist announcements of oil exhaustion too seriously. Perhaps, in spite of Mark Requa's predictions, we shall still be building new reservoirs to take care of the embarrassing surpluses, while someone else is assuring us that 'exhaustion' is at hand" ("Oil Famine Alarmists," *Los Angeles Times*, March 6, 1926).

Chapter 2
"A New Era of Scarcity and Higher Prices": Wartime Demand and the End of American Self-Reliance in Oil, 1940-1949

Abstract

This case study analyzes the evolution of several intertwined oil scarcity narratives in the United States from 1940 to 1949. After an oil glut had weighed heavily on prices for most of the 1930s, World War II proved a stunning oil demand shock. Frightening predictions of a gasoline shortage along the East Coast in 1941 never materialized, but the experience set the tone for the wartime rationing, imposed by the Petroleum Administration for War, that appeared to many to herald a new permanent shortage of oil in the country. With American oil fields primarily fueling the Allied war effort, government and military leaders publicly fretted that domestic oil reserves would run dry in a few years' time. In most cases, the primary fear was not of a global oil supply shortage, but rather that the country's indigenous production would not be able to meet its own demand needs going forward. Still, the prospect of becoming a net importer appeared to presage a new era of higher prices and need for synthetic fuels. It was in the context of this disturbing realization—and of a dawning Cold War—that the American government began to actively assist domestic producers in acquiring acreage overseas. A brief but intense refined product shortage in 1947-48, caused by a variety of disruptions and extreme events, led to further doomsday predictions amid soaring retail fuel prices. By the close of the 1940s, however, an explosion in oil imports and production gains at home led to newfound abundance. Talk of an oil shortage again fell silent.

As the 1940s dawned, neither the oil industry nor the federal government was aware of how sharply the global oil trade of the new decade would contrast with the previous one. Too much oil—not too little—had been the problem for oil-producing states and the producers in the early 1930s. Domestic reserves, which had exploded in the late 1920s and 1930s, looked increasingly plentiful going forward. Between 1935 and 1939, new discoveries exceeded current production at an average rate of 1.3 billion barrels per year. During the first half of the 1940s, the pace of that buildup would fall to just 0.4 billion barrels annually (Williamson 1963, 796). The magnitude of discoveries in

East Texas, which in 1929 began to break open what had been a tight market, had forced a newly contrite industry to finally acquiesce to government intervention. The development and adoption of new policy measures and industry regulations designed to meet the challenge of flooded markets were the order of the day from 1934 to 1939. Ultimately, such measures were successful enough to come close to restoring the national average price of a barrel of crude in 1939 ($1.02) to what it had been in 1929 ($1.27), after having sunk as low as $0.65 in 1931 (American Petroleum Institute 168-71). The epicenter of world oil production remained firmly in the United States. Its 3.6-million barrels per day of production constituted more than 60 percent of the world's 5.7 million. In terms of annual production volume, the Soviet Union was a rather distant second, followed by Venezuela, while the Middle East was something of an afterthought, at 330,000 barrels per day (Maugeri 51). In 1940, coal still accounted for 80 percent of world primary energy consumption, but it would yield its primacy to petroleum as a fuel over the next two decades in the United States.

The rapidly deteriorating peace in Europe at the close of the 1930s prompted the United States to review its own ability to help its allies in a possible war effort, should such actions prove necessary. World War I had etched in the minds of military leaders around the globe the vital importance of petroleum products to the successful execution of the war effort. Oil had gained a rightful status as a strategic commodity of the first order. And yet, notwithstanding the potential urgency of a war-driven demand for oil, industry and government leaders in the United States were supremely confident that they could produce enough to fuel a war effort. The testimony of Robert E. Wilson of the Office of Production Management to Congress typified this viewpoint: "the production

branch of the petroleum industry is today able to meet any increase in demand which may conceivably be placed upon it." Noting that total proven domestic resources were at an all-time high, he foresaw domestic production alone as able to meet consumption demands without resorting to imposing rationing measures of any kind (U.S. House of Representatives 1942, 4-6). Increasing production was just a matter of "opening the valves," in the words of one expert. Estimates placed the maximum potential flow increase at a whopping 745,000 barrels per day—more than a quarter of current production (Frey and Ide 172). The cushion between current rates of production and existing production capacity, even while operating within the maximum efficient rates needed to maximize long-term rates of extraction, kept confidence high about the country's oil situation going into an uncertain future.

The effects of the war on the American oil industry and the consuming public arrived in full force by 1941, prior to the country formally entering the conflict. In early 1941, the British tanker fleet responsible for transporting petroleum products from the East Coast of the United States across the Atlantic had suffered heavy losses inflicted by German U-boats. Roosevelt, in response to cries for assistance, loaned 50 American tankers to the British in an effort to reinforce their fleet. They would loan 50 more over the next six months ("Oil: Famine Closer," *Time*, July 28, 1941). The tankers were assigned to shuttle refined products from the Gulf Coast to the Eastern seaboard, a region that consumed a full 40 percent of domestic petroleum production. The loan reduced the number of tankers in maritime service by one-fifth.

The Office of Petroleum Coordinator for National Defense, or OPC, chaired by Harold Ickes, foresaw difficulty in meeting demand in the urban Northeast, and knew that

putting in place a substitute means of transporting the oil would be impossible in the short term. Expanding overland transportation by pipelines, rail, or truck could not be done at a moment's notice, and expanding the American tanker fleet to make up for the vessels on loan to the British would take time as well. Since the supply problem appeared intractable, the OPC considered how it might mitigate the demand side of the consumption equation. It lacked the authority to put in place a formal rationing program. The OPC opted for partnering with the oil industry to urge the American public to consume less voluntarily—never an easy sell. In the autumn of 1941, a barrage of paper and radio ads in the Northeast urged people to lessen their use of all oil-based products for the good of Europe's war. It was a rare instance in which the oil industry implored consumers to buy less of its products, not exactly a common corporate campaign.

Harold Ickes, the Secretary of the Interior who would serve as Roosevelt's point man on oil issues throughout the war, had been predicting this supply crunch since May. Ickes was not a popular figure among his fellow politicians or the public. Ridiculed by one senator as a "common scold puffed up by high office," Ickes had gained a reputation as a sort of conservationist prophet of doom. A long-time member of Roosevelt's New Deal team, he had frequently and outspokenly warned America of the bleak future that lay ahead for them unless they reformed their gluttonous ways and converted to environmental conservation. *Time* once referred to Ickes as "hot-headed Harold," who they predicted would "get even hotter" if Americans refuse to cooperate with his many voluntary rationing programs (Ibid.) In the words of one of his contemporaries, Ickes was "representative of a new alarmism," a man who had made his name, as well as many enemies, by raising his voice about the unsustainability of the American lifestyle

(Maugeri 52). Ickes was so unpopular among Republicans that the party's nominee for president in 1944, Thomas Dewey campaigned on the explicit premise of firing him if he were voted into office. He was capable of going to extremes in his cause, once threatening to arrest any driver who wasted oil by making "jack-rabbit starts" ("Ickes 'Gas' Shortage Scare Due to Anxiety Over Future," *Christian Science Monitor*, September 19, 1941).

Since May of 1941, he had told newspapers that the federal government would likely need to ration electricity and re-institute the World War I policy of "gasless Sundays" to prevent an oil shortage from occurring before the end of the year ("Ickes Urges National D.S.T.; Power, Oil Shortage Foreseen," *Christian Science Monitor*, May 31, 1941). When his summertime call to the public to voluntarily conserve gasoline went unheeded, he pushed for stronger measures. In August, the OPC initiated a program whereby oil companies would cut their deliveries to retail outlets by 15 percent. The intention was for gasoline to go only to essential users. By October, the War Production Board escalated these initiatives to a full-blown rationing program. Deliveries at every level of distribution were capped below pre-war volumes (Fanning 354; *National Petroleum News*, September 3, 1941, 10).

These successive moves toward rationing set off a firestorm of disbelief, anger, and confusion throughout the East Coast. While one local official who echoed Ickes's warning emphasized that "it is not my intention in any way to give any statement which will in the slightest degree alarm anyone," that was exactly the effect Ickes's statements had ("Mayor Warns of Probable Fuel Oil Shortage," *The Hartford Courant*, June 4,

1941). The public fear over the reports of a shortage was not surprising, given the starkness of the life-or-death terms in which the OPC described the crisis:

> The Eastern oil shortage has finally reached the acute stage.[…] We must conserve gasoline stocks now to avoid a drastic shortage this winter when our tankers must be used to haul fuel oils unless our people are to be left to freeze and our defense industry shut down for lack of power. This is the beginning of the sharp and serious drop in supplies that we forecast. The situation is perilous ("Oil Shortage Has Arrived, U.S. Aid Warns," *Chicago Tribune*, August 21, 1941).

But other government leaders responded by directly challenging such claims. The senators and representatives from the Northeast called a series of Congressional investigations throughout the autumn in response to their constituents' anger over the austerity measures. The shocking conclusion of their investigations was that no actual shortage existed—and not only that, but that the federal officials responsible for the shortage warnings and resulting rationing measures were attempting to deceive the American people for their own purposes. In the words of Representative Hamilton Fish of New York: "I have reached the definite conclusion that the shortage of oil in the east is phony and is being used as part of a program to create further war hysteria" ("Oil Shortages in the East Phony, Says Rep. Fish," *Chicago Daily Tribune*, August 26, 1941). Senator Francis Maloney implied that the Roosevelt Administration may be spreading the scare "for psychological reasons," in other words, to prepare the American public for an unpopular entry into the war in Europe ("A Shortage, But Not Of Gas," *Chicago Tribune*, August 25, 1941).

Some were more sympathetic. Senator David I. Walsh of Massachusets called the shortage predictions "a glaring example of bureaucratic blundering," implying

incompetence, but not deceit. One writer chided Ickes for "demonstrating how not to deal with the increasing shortages of materials that are certain to make themselves felt in the future," succeeding only in "frighten[ing] the wits out of the public" ("The Gasoline Anti-Climax," *Hartford Courant*, October 24, 1941). The bottom line for the Congressional investigators: "We are of the opinion that this unnecessary alarm was caused by over-enthusiasm on the part of those charged with the direction of the petroleum situation. There is no gasoline shortage in the East" ("Senate Committee Finds No Gasoline Shortage," *Los Angeles Times*, September 12, 1941). Ickes and his colleagues did not go down with out a fight. They accused the Congressmen who contradicted their shortage reports as being "near-sighted prophets" who were putting America in harm's way. Deputy Commissioner Ralph Davies went as far as to assert that "those who attempt to create confusion and dissension regarding the gasoline situation" were guilty of 'sinister and planned sabotage'" ("Davies Depicts Gasoline Crisis," *New York Times*, August 29, 1941). But the investigation's explosive verdict had done its damage. It severely undercut the case that Ickes and Davies were trying to put forward. As one observer described it: "To many, Ickes was just shouting wolf again" (Frey and Ide, 84, 119). It was a fatal blow to public belief in the reality of the shortage, and consequently, public support for the rationing.

If no shortage existed, as Congress had concluded, then who was to blame for the scare? Speculation about the cause of the shortage predictions abounded. Some reports claimed that the true cause of the impending shortage was that United States was running out of crude oil once and for all ("Mayor Warns of Probable Fuel Oil Shortage," *Hartford Courant*, June 4, 1941). In their view, the government was trying to conceal the true

nature of the problem by claiming that it was merely due to a transportation bottleneck. Other groups, such as the New York Oil Heating Association, saw in the forecasted shortage a conspiracy by the oil industry to "build up a panic among the fuel oil distributors and the public" in order to push up prices and gain exemption from antitrust laws for the duration of the war in Europe ("Says Oil Men Seek to Frighten Buyers," *New York Times*, June 15, 1941). Oil heater vendors had good reason to be upset at talk of an oil shortage, since the prospect of oil being more expensive or unavailable would likely lead to a loss in market share to coal-based heaters. James A Moffett, chairman of the California-Texas Oil Company, held a special press conference to present his case that the government's claims of shortage were nothing less than a dishonest and thinly veiled attempt to take over the oil industry entirely, once and for all. Ickes was constructing a "smokescreen," as he called it, behind which he was "hiding efforts to disrupt the industry," thereby tarnishing its reputation as reliable in an attempt to win public support for its nationalization ("Moffett Hints U.S. Control of Oil Motivates Claims Shortage Exists," *Wall Street Journal*, October 4, 1941). Skeptics rallied behind the railroad industry's insistence that it had 20,000 idle tank cars ready to solve the transportation bottleneck, but that the government refused their offer to put them in service. Like many members of Congress, they believed the government was stirring up the shortage fear as a means of conditioning the public for an unpopular entrance into the war ("Home Front: Oil or No Oil," *Time*, September 15, 1941; see also "A Shortage, But Not of Gas," *Chicago Tribune*, August 25, 1941).

The predicted shortage of oil in 1941 ultimately did not occur. The supply situation eased. Britain returned 25 of the 75 tankers it had borrowed throughout the

summer to their American operators. Rail shipments of oil from across the country to the East Coast increased from 40,000 barrels per day in June to 140,000 per day in October (Petroleum Administration for War, *Final Report* (Washington: USGPO, October 1945), 26). The construction and implementation of additional oil pipelines from the western and southern United States also helped to compensate for the drop in maritime oil delivery. The demand side of the oil equation also eased, as a result of the civilian rationing program in place during October and November, as well as the restrictions on gasoline deliveries to retail hubs. Once Ickes was satisfied that the dreaded shortage would not occur, and after a tremendous public outcry, the War Production Board's rationing order was revoked on November 30.

The United States had pledged to serve as the "arsenal of democracy," as Roosevelt put it, for the Allies in Second World War. And yet the sheer scale of the undertaking caught the nation off guard, requiring enormous investment in new infrastructure and record gains in industrial output and efficiency. The industrial capacity of the nation was severely tested. Of all the challenges the American private sector faced during the war, the oil industry's assignment to supply refined petroleum products in volumes sufficient to meet the Allies' astronomical demands was among the greatest. All in all, the United States would supply 6 billion of the 7 billion barrels of oil consumed by the Allies between 1941 and 1945 (Maugeri 53). American reserves during the war would provide over 80 percent of the Allies' needs (U.S. Senate 1944). Shortages of key materials, like steel, would plague oil companies' efforts at expansion throughout the war (Maugeri 52). Domestic production accelerated from 3.8 million barrels per day in 1941 to almost 4.7 million barrels per day by 1945 (Frey and Ide 185).

Crude processed in American refineries would also nearly double from 3.4 million barrels per day in 1939 by the end of the war. Overall, Domestic producers supplied almost all of over 6 billion barrels to world refineries between 1942 and 1945. The total amount of refined products supplied was staggering: 2.68 billion barrels of gasoline of all types, 2.6 billion barrels of fuel oil, and 172 million barrels of industrial lubricating oils. The industry contributed to the production of an extraordinary range of over 500 oil-based products to further the war effort, many of which few civilians were even aware of: synthetic rubber, toluene (an octane booster in gasoline fuels, an ingredient in TNT, and an industrial solvent), fuel oil for flame throwers and smoke barrages, range oil for stove and space heating, and medical products (Williamson 1963, 783-93). Achieving these gains in output necessitated a tremendous addition to the domestic oil infrastructure along the entire length of the supply chain. Over 17,000 miles of oil pipeline were relayed or reversed in the country during the war, with nearly 75,000 tankers mobilized to serve the East Coast market. The average size of refining plans rose from 9,000 barrels per day in 1939 to 13,4000 barrels per day by 1945, due in large part to equipment in obsolete plants being stripped down and moved to newer, more efficient refineries (Williamson 1963, 783; Fanning 364).

The war effort facilitated a closeness of partnership between the federal government and the domestic oil industry that would have been unimaginable in peacetime. Oil executives since the days of Rockefeller, who had seen his empire fractured by decree of the federal courts, were wary of government intrusion, even suspicious that federal attempts at regulation might mask a more ambitious agenda, like anti-monopoly action or even outright nationalization (Wildavsky and Tenenbaum 96).

That attitude of mistrust evaporated during World War II. The oil industry was more or less completely acquiescent to the idea of working under the control of the federal government's wartime oil department, Petroleum Administration for War, or PAW. Harold Ickes, who had led the Office of the Petroleum Coordinator for National Defense, was entrusted with the task of overseeing the domestic oil industry when the OPC became the PAW in 1942. The powers of the federal government during the war to regulate the American oil industry, through the PAW, were expansive. It reserved the right to fix prices at every stage of production, control production volumes, allocate resources, and supervise the refining, transportation, distribution, and marketing of petroleum. In the words of Wildavsky and Tenenbaum, "The exigencies of war required a command economy. Ideological and material disputes over this fundamental question were suspended for the duration. Inevitable disagreements took place in an arena where settlement, compromise, and concession were possible" (97-8). The PAW did help the transition from private to public control of the industry's operations that the PAW was staffed almost entirely with personnel from the oil companies themselves. Some would grumble over the arrangement, of course, given the obvious conflicts of interest. Congressman Jerry Voorhis, for example, decried that the "major oil companies have no hesitation about stressing again and again the importance of their work in determining a policy for the government. I fear the major oil companies are getting into the government in competition with the American people" (*New York World Telegram*, May 8, 1944). Despite its drawbacks, Ickes ultimately favored such an arrangement, given complexity and scale of the task of overseeing the entire American oil industry (Wildavsky and Tenenbaum 97-8).

The PAW began imposing rationing orders over the domestic consumption of petroleum products from the outset of 1942. Ballooning industrial, commercial, and civilian demand, made worse by a transportation bottleneck due to inadequate infrastructure, put pressure on inventories along the Atlantic coast and in the Pacific Northwest. Japan's capture of British Malaya, the source of much of the world's rubber supply, meant crude oil was in even greater demand, as it was a vital ingredient in synthetic rubber. The PAW began to call on civilians to decrease their consumption of petroleum products in February 1942. It encouraged Americans to opt for public transportation instead of their own cars and trucks (Williamson 1963, 774). Two months later, it ordered a one-third reduction in gasoline deliveries to the regions of highest demand. By May a full-blown gasoline-rationing program was in effect on the East Coast.

The rationing program was a chief reason aggregate consumption by passenger vehicles dropped by 40 percent between 1941 and 1943. The average annual consumption per passenger vehicle, which had climbed to 607 gallons in 1941, fell sharply to 416 gallons in 1943 (American Petroleum Institute 252-3). Per the dictates of the PAW, gasoline retailers required that customers present a government-issued coupon at the point of purchase. The system was not popular—"the outcry in the East was deafening," reported a contemporary historian (Fanning 355). Part of the public anger over the rationing program was that it was limited to the East Coast. The problem was not that there was not enough oil to go around; there was. It was just located in the wrong part of the country. The means of transporting the oil from the primary producing and refining centers (the Gulf Coast, the Midwest, and California) to the areas of greatest per-

capita civilian consumption were not available in sufficient quantities. Navy demand along the East Coast was also keen. Ickes, responding to loud complaints from Eastern politicians about the unfairness of their constituents being the only ones to face gasoline rations, extended the rationing to the entire domestic market in December 1942 (Williamson 1963, 770). The goal of the policy shift was to pool the nation's gasoline supply as much as possible so that areas of greatest shortage could draw from those of greater relative abundance.

The unintended consequence of extending the rationing order to the entire country was to ignite a widespread panic among the public that oil would soon run out due to runaway war demand. The strains of producing enough oil for 1942 had been hard enough; the prospect of fueling a war whose duration was unknown, largely on the back of the American oil industry, appeared overwhelming. The problem was primarily one of supply, according to Ickes and the Industry War Council American. Both parties felt that American oil reserves were in permanent decline. The demand side seemed stable enough; the rationing measures had moderated gasoline and fuel oil consumption at a level about on par with pre-war levels (Randall 371).

On the supply side, however, the discovery of new reserves was not keeping pace with production, despite the number of wildcat wells drilled jumping from 2,224 in 1937 to 3,045 in 1942 ("U.S. as an Oil-Importing Nation is Forecast by Technologist," *New York Times*, July 15, 1943). What had been a tight but manageable oil market in 1942 appeared increasingly grim entering 1943, even as the buildup of American troops in Europe and Asia accelerated. Ickes took to the airwaves in February of the new year to tell a national audience:

> If it were possible for me to tell you just how much oil will be needed to carry out the tremendous Allied offensives planned for 1943, you would readily understand my failure to be optimistic as to the future as far as concerns civilian supplies. However, I can tell you that doubling or trebling the amount of oil shipped across the seas will result in a great deficiency in civilian oil stocks. And this gloomy picture of the oil supply situation holds true for the West Coast as it does for the East Coast and the Midwest.

The problem, as Ickes framed it, was no longer merely one of transportation; rather, it was "the fact that the transport problem was beginning to be overshadowed by a growing concern over the total supply of oil" (*National Petroleum News*, February 24, 1943). This problem was not one that more pipelines or tankers could fix, according to Ickes, the federal government's chief oil expert and spokesman. PAW's director of reserves was no more optimistic: "The law of diminishing returns is becoming operative […] As new oil fields are not being formed and as the number is ultimately finite, the time will come sooner or later when the supply is exhausted." Oil production in the United States would never again be what it was in former times, he noted. "The bonanza days of oil discovery, for the most part, belong to history" (Cited in Yergin 2008, 377). Ickes had warned Roosevelt of the declining ratio of proven US reserves to annual production since 1941, but now the foreseen day of shortage appeared to be at hand. An article from a July 1943 issue of *Time* magazine, "Out of Gas?," put the issue starkly, and yet is characteristic of the worried outlooks in circulation at the time:

> Will the U.S. run out of oil in a few years? Yes, said Navy Secretary Frank Knox last week before the House Naval Affairs Committee. He predicted a serious shortage of crude oil within a year. Within 14 years the U.S. will be a "have-not" nation in oil, he said, when the last drop of its

> oil fields is drained (if the present rate continues). The same day, Assistant Deputy Petroleum Administrator Robert E. Allen warned that the U.S. is threatened in two years unless "miraculously prompt" discovery of new fields offsets declining production. The U.S. must bring in 20,000 new wells a year, said he, to maintain present production (July 5, 1943).

It was true that drilling activity had dropped sharply after 1941, with exploratory wells taking the hardest hit. This decline in exploration had reduced the rate of growth of domestic crude oil reserves to the point that 1943 production exceeded additions to new reserves by a small margin. Should this supply trend continue into the future, and the war-sparked demand growth continue unabated into the future, the PAW feared the Allies could indeed find themselves in serious trouble (Williamson 1963, 779).

Just a few years earlier, in 1935, the American Chemical Society had provoked a "violent controversy" over the future of oil in the United States by predicting a "new era of scarcity and high prices" due to arrive between 1940 and 1943. Now events appeared to be bearing out their gloomy vision, refocusing national attention on the details of their prophetic warning. The imminent permanent scarcity of crude oil, they had warned Americans, would translate into a permanent rise in gasoline prices—"when prices go up, they will stay up," they warned. This era of "scarcity and higher prices in petroleum products" would arrive "long before the total exhaustion of American oil fields," so the long-debated issue of how much oil was still in the ground was ultimately a moot point. Notwithstanding, they stated authoritatively that the total domestic supply was "fairly accurately known": 10 to 12 billion barrels. They outlined the profound consequences for the nation that this imminent and enduring tightening of oil markets would bring into effect. The American Navy and Air Force would be obliged to assume the "new and

onerous duty" of safeguarding the maritime oil trade. The auto industry would be forced to undergo a "radical shift toward light, cheap cars" able to travel further on a gallon of gasoline. Substitute products could not be brought to market quickly enough to avert the shortage. Even those substitutes they saw as the most promising—shale oil liquid coal—could not help the nation in an emergency, let alone in a war, the outcome of which would be finalized long before such products could be brought to market in significant quantities. And forget about ethanol, the much-vaunted substitute for gasoline that had gained an increasing number of supporters since the 1920s. It would not be viable until downstream prices were five times what they had been in recent years. The only way to avert this domestic shortage, they prophesied, would be through importing a significant share of the national oil requirement. South America appeared the most likely source of the imports, though Russia and Persia were possibilities as well ("Serious Petroleum Shortage Predicted in Near Future," *Science News Letter*, August 31, 1935). All in all, the American Chemical Society's 1935 warning had envisaged a new oil era about to overtake the country.

Oil industry leaders protested such predictions adamantly. Calling the 1935 prediction "exaggerated," they had derided the Society's report at the time of its release. In their opinion, "known" domestic reserves of 13.25 billion barrels would satisfy national demand for at least 13 years, even without any new discoveries. The 600 million barrels of crude discovered in 1934 alone, if representative of future reserve growth, were capable of satisfying demand well into the future without resorting to additional imports. What was more, even if prices should rise, higher prices ought not to have any impact on public consumption. They cited the work of "government statisticians" that has "not

discovered any link between gasoline consumption and price, or between petroleum supply and price" ("Fears of Petroleum Shortage Held Greatly Exaggerated," *Science News Letter*, August 31, 1935).

After 1943, the government's handling of oil prices during the war received most of the criticism. If the OPA and the PAW would allow market forces to operate more fully, they argued, the supply problem would solve itself. One of the Standard Oil Development Company's chief scientists, speaking as the president of the American Chemical Society, reasoned that it would be at least 300 more years "until oil runs out of this earth." His "temperately optimistic" view assumed current rates of production lasting indefinitely, new discoveries occurring "where they reasonably can be expected," and industry freedom from government meddling in production and distribution. According to his calculation, the United States had been blessed with 100 billion barrels of oil, of which nearly half had already been used. The rest of the world would likely yield some 500 billion barrels more all the oil was gone ("300-Year Oil Supply Believed in America," *New York Times*, September 26, 1943). No oil shortage was imminent, either domestically or abroad. The real problem, the oil industry asserted, was that the government was not giving the oil industry the incentives it needed to combat the supply problem. There was no question that market forces did not function during the war as they had in other times—this was a "command economy," as noted earlier, in which the oil industry partnered with the government to supply the war effort. During this period, the government, through the Office of Price Administration, or OPA, controlled the price of all petroleum products according to its own calculations. It reserved the right to place price ceilings on all non-agricultural commodities, as well as to subsidize the cost of

producing other commodities. All said, the OPA would only allow oil prices to rise twice during World War II.

The controversy over the government's fixed price for oil was the subject of a hearing before the Interstate and Foreign Commerce Subcommittee in 1943. Robert Fall, speaking for the oil industry, attributed the recent decline in production solely to the artificially low prices the government had fixed for oil products. He argued that plenty of oil was to be found, but that the current crude price ceiling, which had locked in 1937 oil prices, was inadequate to stimulate new discoveries.

The four years prior to 1943 had yielded fewer quality finds than expected, and without the OPA raising the price per barrel by $0.25, domestic production would dwindle. Walter Hallanan, president of the Plymouth Oil Company, issued a similar warning: "It is now a great national and international problem which seriously threatens the effective prosecution of the war and holds grave consequences for our domestic economy." Only a price increase, in his view, could do the trick. As for the OPA's assertion that such a price increase was "unnecessary and inflationary," it was "just plain bunk," remarked Hallanan. "What would it profit to hold the line against inflation and perhaps lose the war as a result, or at least prolong it at a terrible cost in the blood of American youth" ("Hallanan Calls Crude Oil Price Rise Necessary to Avert Shortage," *Wall Street Journal*, May 10, 1943). Despite the impassioned testimony, the OPA was not persuaded. While it did allow the price of some products to increase, it chose instead to attempt to stimulate production through granting subsidies for exploratory drilling and renewed attempts at pumping oil from older wells, known as stripping. The subsidy program paid out $64.9 million from 1944 to 1945 to 308 operating companies. It was

widely regarded as a success. One estimate attributed the production of 177 million barrels of crude as a direct result of subsidization (Frey and Ide, 186; Wildavsky and Tenenbaum, 100-1).

In one essential respect, the national debate over oil depletion during World War II began to differ fundamentally from previous eras. A growing consensus among policymakers, experts, and industry decision-makers began to emerge amid the strain of America's effort to fuel the Allied war effort. It was startlingly simple: domestic reserves were becoming increasingly insufficient for slaking the country's thirst for oil. Foreign reserves were the only and unavoidable answer, barring an unforeseen drop in demand. This new belief ascribed to the idea that, yes, the United States was running out of oil in the near term. As acclaimed American geologist Everett DeGolyer summed it up in 1943, "Our low rate of discovery seems not to be a result of slackening of effort so much as due to the low quality of prospects, which indicates an exhaustion of prospects discoverable by the present methods of utilizing known techniques". Unless the country stopped pumping oil soon, the stuff would be gone any day now. In their view, "the problem was believed to lie in the nature of the resource itself—the absolute quantity of petroleum available," which would soon be exhausted domestically (Cited in Wildavsky and Tenenbaum, 100-1).

And yet, according to this new consensus of opinion, domestic exhaustion did not mean the end of the global oil trade; it merely meant that locus of production would shift from the United States to those regions of the world that had not been pumped as long and as hard as the home reserves had. Their view was that the question of whether the United States could produce enough oil to cover its own needs had become a moot point;

that question had been answered—large quantities of foreign oil would indeed be needed. The real question was how much of it there was on a global basis, and what percentage of the country's needs would imported oil fill.

The thought of the country's becoming a net oil-importing nation was a hard pill to swallow for those who would be most affected by this new order. It was alarming news that there was "a real possibility," as one oil executive framed it, "that the day is not far off when the United States, long known as the world's greatest exporter of oil and oil products, may have to resort to the importing of that commodity to meet her needs" ("Plymouth Oil President Warns of Crude Shortages," *Wall Street Journal*, March 26, 1943). Government leaders—Ickes and PAW, Roosevelt, Congress—found the idea distasteful. For one thing, they had never needed to bother with it before. Yes, there had been forays into Mexico, Venezuela, and other oil-producing states prior to the 1940s. But those ventures were for corporate profit and preeminence, not for national need per se. Politicians favored their home-team oil companies acquiring overseas reserves—that could only increase the country's economic and political standing, if done prudently.

But actually depending on imports from foreign countries to satisfy the country's demand for a vital strategic commodity was another thing entirely. The prospect of a sudden and permanent dependence on foreign oil producers could mean a painful loss of leverage in their relationships with oil-producing states. The idea of economic self-reliance—the ability to fend for oneself—was an American virtue, and the fact that the country's oil industry had almost always produced more than enough to satisfy domestic needs was a point of pride. The military did not like the idea of needing to go to other nations, either. As they saw it, the country's ability to provide almost enough oil to meet

its domestic and military needs in both World War I and World War II would be hard to part with. The abundance of American oil was also an asset for its allies, who could depend on a reliable flow of oil to come directly from the United States in a time of war.

For the domestic oil industry, business was certainly easier when most of the world's prolific wells were to be found on the home front. The largest American oil companies, such as the former Standard firms, were vertically integrated internationally. Even if the hottest oil plays were overseas, they would be fine, given their adeptness at producing overseas. The large number of smaller-scale independent firms would have a more difficult time were domestic reserves to dry up. If domestic reserves were indeed nearing exhaustion, as many believed, these small firms would struggle to compete with the internationally integrated firms without rethinking their business model.

The new accepted wisdom—that American oil reserves could not continue to satisfy the war effort much longer and would likely be extinct before long if demand growth continued unabated—prompted government leaders to reevaluate their oil strategy. In a country of dwindling reserves, the wisest course of action appeared to many to be to conserve domestic supplies while buying up concessions and producing oil abroad as intensively as possible. A letter from Michigan Senator Prentiss Brown to Secretary Ickes in 1943 summed up this emergent line of reasoning:

> In your two letters you have dwelt at length on the necessity for increased domestic crude production, yet I believe your most recent approach to the supply problem, namely, through increased use of foreign reserves, constitutes the real answer. Since it is true that the reserves of this country are not inexhaustible, it seems only logical that our military and civilian requirements should be satisfied to the greatest extent possible through supplies available in other countries. If "oil is ammunition,"

> according to the popular slogan of the oil industry, let's conserve our ammunition to the greatest possible degree…Foreign crude oil and residual oils are available during the war emergency and should be used to the maximum possible extent in order to conserve our domestic resources for future years (Cited in Wildavsky and Tenenbaum 101).

The United States simply could not continue to produce as it had up to 1943, went the argument, without becoming a "'have-not' nation in oil," as Navy Secretary Frank Knox put it. American resources needed to be conserved and those abroad needed to be developed. At a Senate investigation of the National Defense Program in October 1943, several Congressmen issued a stern call for America to cease pumping its own oil rather than that of other countries. One senator from Georgia lamented that "up to now, we have been depleting our petroleum stocks at a ruinous rate, supplying not only our own forces but those of our allies. It is now time to utilize the petroleum deposits of other parts of the world. Otherwise, the end of the war will find our own deposits practically exhausted." Selfish Britain was especially at fault, in their view. It was said to have oil reserves "at least equal" to the United States, and yet "only 8 percent of the oil consumption of the United States is coming from British sources, while 80 percent is coming from United States reserves." If the trend continued, America may have to go hat-in-hand to foreign nations for oil, a "mendicant for petroleum at the council tables of the world," unable to supply its own needs after "another generation comes on stage" (Cited in Randall 384). Something needed to be done.

The oil shortage fears of 1943 took the attention of the United States government to a nation that Roosevelt had dismissed as "a little far afield" for political involvement of any kind only two years earlier: King Ibn-Saud's Arabia (Maugeri 54). Two American

oil companies, SoCal and Texaco, had struck oil there in commercially viable quantities in 1938. They had pressed their home government early on to support their venture, sensing both Nazi and British designs on the area, but to no avail. As the war advanced, however, Ickes asked Roosevelt to reconsider helping to secure the American oil operations there. The idea was to give direct financial aid to Ibn-Saud, the father of the new Arabian state, as a means of solidifying a political alliance between the two countries, or perhaps to have the United States government purchase SoCal and Texaco's operations there altogether. The federal government had a sense of what an enormous amount of oil existed in Saudi Arabia thanks to Everett DeGolyer, the preeminent petroleum geologist of the day and a deputy director to Ickes' PAW. Ickes had sent DeGolyer to the Persian Gulf in 1943 to assess the region's oil resources. He came home with an astonishing verdict that foreshadowed the drastic change in the economics of the global oil industry. DeGolyer estimated the already available resources in Saudi Arabia at roughly 25 billion barrels, with an overall reserve base of 100 billion highly likely. It was an estimation that exceeded both expectations and American reserve estimates by several orders of magnitude, and yet in hindsight the quantification was far too low. Current estimates of proven reserves in the Persian Gulf area come in at over 650 billion barrels, not including probable and possible reserves. DeGolyer's conclusion in 1943 about what such numbers meant to world oil geopolitics have proven spot-on: "The center of gravity of world oil production is shifting from the Gulf-Caribbean area to the Middle East—to the Persian Gulf area, and is likely to shift until it is firmly established in that area" (Quoted in Painter 52).

Further anxiety over an impending oil shortage in the latter half of 1943 led Ickes to conclude that the best course of action may be full-blown government control of the Saudi concession. The Army Navy Petroleum Board told the American public in 1943 that its projections for the following year were not looking good. “A serious shortage of oil was impending,” the Board reported, “which would threaten military operations” (Quoted in Yergin 379). The possibility of the Allied offensive stopping in its tracks due to the failure of the United States to fulfill its pledge of procuring the requisite products was unthinkable. In August, Ickes made a proposal to the presidents of Texaco and SoCal that took them completely be surprise: the federal government wanted to buy 100 percent of their Saudi operations. For the first time ever, it was going to enter the petroleum business directly—“an extraordinary departure” from its long-standing commitment to keeping the American oil industry in private hands. The government oil company operating abroad would be known as the Petroleum Reserves Corporation, Ickes told them. And it was also exploring a similar deal with Gulf for the Kuwait concession. Responding to the executives’ initial resistence, Ickes lowered his proposal for 100 percent ownership to a simple majority ownership of 51 percent. Finally, the deal was struck: the government would purchase one-third of Casoc (also known as California Arabian Standard Oil Company—Chevron and Texaco’s jointly owned Saudi Arabian concession) for $40 million, including the right to buy up to 51 percent of Casoc’s production in peacetime and 100 percent in wartime (Ibid. 380). When news of the acquisition spread, the rest of the oil industry exploded with protest. But Ickes, who was to be the president of the PRC under its charter, defended the move. He told oil executives gathered at the API annual meeting in the autumn of 1943: “The United States

is one of the few major countries which has not participated in foreign oil activities through governmental financing or direction,[…] To the extent that private capital and private initiative are unable to establish and maintain a national position in this field, government assistance and participation may be necessary. The PRC is available for these purposes whenever and wherever is necessary" (API Proceedings 1943). For Ickes and the Roosevelt administration, Saudi Arabia, 1943, was evidently the time and place necessary.

As Ickes continued to fashion the PRC in 1944, other officials came to the defense of the widely criticized plan. Ickes had decided to abandon the Casoc deal in the final months of 1943, facing intense pressure from independent oil producers and most of Congress. But he had not given up on the idea of the PRC getting involved in the oil trade. With the Casoc deal scuttled, he devised a new plan: a $120-million pipeline across the Arabian Peninsula, sponsored by the PRC, which would bring Persian Gulf oil to the Mediterranean for shipment to European markets. A Truman-led subcommittee report released in February 1944 raised support for the idea, even if it was a radical new form of state intervention in American oil affairs. The report cited a current oil "emergency," stating that the "critical importance of oil in the world economy" necessitated Congress joining the debate over energy strategy (U.S. Senate 1943). The preamble of the PRC agreement stressed the role of the organization in defending against a shortage of oil supplies domestically. It entered the oil business, it declared, "in appreciation of the critical importance of reserves of petroleum in war and in peace and of the necessity of assuring to the military forces of the nation and to the people of the United States adequate petroleum supplies" (Quoted in Fanning 358). The Joint Chiefs of Staff

seconded the call for intervention, describing the mission of the PRC as a "matter of immediate military necessity." The military pushed especially hard for the PRC to begin to establish foreign reserves and construct the proposed trans-Arabian pipeline. Secretary of the Navy Frank Knox, outspoken on oil issues, warned that the United States was depleting its oil resources "very rapidly." It was "selling its oil as if our supply was inexhaustible, but it isn't." The "dangerous rate" of extraction, he added, came as the result of letting "a lot of selfish oil companies" derail the implementation of a sound national energy policy, which for him included the establishment of the PRC (*New York Times*, March 22, 1944). Even Roosevelt, whose views on oil-related topics tended to stay behind closed doors, was reported as expressing worry "about the nation's petroleum supply—not in 5 or 10 years but over the next 50" (Quoted in Fanning 357). To supporters, the nationalization of Casoc, and with it the transfer of Arabia's mighty reserves to the wise control of the federal government, was the most sensible way of confronting the reality of shrinking domestic supply.

Yet Congressional and industry indignation at the nationalization plan eventually overwhelmed it. The oil industry deemed the recent spate of "alarmist" reports by the PAW and military as propaganda for the PRC. As they saw it, these groups had sought to scare the public over the state of the oil supply into acquiescing in their agenda for public control. As the *Oil & Gas Journal* wrote in March 1944:

> It is apparent that millions of consumers are convinced that a permanent shortage exists in this country, and it is on the fears that arise from this belief that sponsors of the governmental participation in oil operations here and abroad are largely backing their case. The average consumer still does not realize that petroleum rationing has been brought about entirely by the war's restrictions in

> operation. There is danger that he will support any program which he is led to believe will assure adequate petroleum supplies in the future, regardless of economic and political complications to him and to future organizations (March 2, 1944).

The Petroleum Industry War Council (or PIWC), the highest-ranking industry advisory committee to the government during the war, also roundly opposed the creation of the PRC. The PIWC, whose members Ickes had appointed, was made up of leading oil and gas executives from the major and independent companies. Each subset of the industry had its reasons for opposing the PRC. Domestic independents worried that the PRC's foreign operations might flood the market with cheap oil, due to the lower extraction cost of foreign oil relative to domestic oil, making their position in the market unsustainable. A government-run firm an unfair advantage might also benefit from government-subsidized operating costs, which could allow it to undercut private-sector competitors in competitive bidding and pricing all along the supply chain. In the words of the independent firms, the plan was a "threat to our national security" and a "move toward fascism" (Quoted in Yergin 2008, 381).

The majors, especially Standard of New Jersey and Socony-Vacumm, were also fiercely opposed to the idea, but for an entirely different reason: they wanted a piece of the action. They did not want to be locked out from the Arabian Peninsula. Were the government's deal with SoCal and Texaco to fail, they knew their chances of taking part in the Arabian oil play would increase. Superceding all of these concerns was a larger worry that the formation of the PRC may be a prelude to the nationalization of the entire American oil industry, which some industry insiders had long believed to be the government's dark plot for decades. Liberal Congressional leaders were outspoken in

condemning the plan. It was just another example of "big business" trying to cartelize, they shouted, and they were not buying it (Ibid. 380-1). The volume of the criticism eventually broke the PRC proposal. After months of trying to persuade Congress and the American public that nationalization was the right move, Ickes let the plan die out slowly and quietly in 1944. It would be the first and last time the United States government would attempt to get into the oil business.

Coming to terms with the implications of the war's end for the global oil market and taking stock of the thriving but dislocated industry's changed situation was a full time preoccupation for the oil community between 1944 and 1946. In the final analysis, the industry had been remarkably able to meet the strenuous demands that World War II had placed on it. Domestic production had increased from 3.8 million barrels per day in 1941 to 4.7 barrels per day in 1945. The jump had required slightly exceeding maximum efficient recovery levels (the rate of production above which the ultimate recoverable reserves in a given field begins to drop) by mid-1944 (Frey and Ide 444-5). Assessments of the future of domestic reserves were mixed. Victory had eased the demand equation. Gasoline rationing was lifted within 24 hours of Japan's surrender, in almost celebratory fashion. The days of endless worrying over the duration of the war—and whether Allied oil supplies could be maintained—were finally over. The long-range outlook for crude production also began to improve in 1944 thanks to several new developments. There had been a limited amount of steel and other materials needed to expand the petroleum supply chain during the war years, but expanded domestic output erased the supply constraints. PAW had gotten better and better at its job, allocating and delivering material resources to the oil industry more efficiently. Drilling activity also began to take off as the war

ended, beginning in 1944 (Williamson 1963, 812). All of these advances allowed all those concerned with supplying oil to the war effort and to the domestic consumer to let out a sigh of collective relief. The war crisis had passed. The wartime oil bureaucracy was all but completely dismantled by the close of 1946, as the OPA finally removed the price controls it had imposed during the war and eliminated the subsidy it had paid for the operation of stripper wells, reassigning to the market its former role in oil price discovery.

The scramble for foreign oil, which had been in full tilt since the days of World War I, took a new turn with the advent of the Cold War. The postwar world appeared to American policymakers to be splitting in two—one part American, the other part Soviet—and the world's oil supply, they believed, would likely be divided along with it. Were another global conflict to ignite, would America's allies have enough of this critical commodity to hold back Soviet forces? The schism heightened the urgency of the rush for securing oil supplies. Although one war had ended, the possibility of war—this time involving the Soviets, if indirectly—hung in the air. It was a matter of necessity that the United States "organize itself for a protracted confrontation with the Soviet Union," and oil had a "central place in strategy for security" in this nascent rivalry (Quoted in Yergin 2008, 388). In the words of a Senate report in February 1947, the country needed an oil policy meet for "this troubled world, which has not yet learned how to avoid war.[…] The oil policy of this nation while at peace must nevertheless be governed by the inexorable demands of self-preservation" (*National Petroleum News*, February 5, 1947).

The question of whether American oil supplies were sufficient for the task of defending the free world took on new urgency. "The Navy cannot err on the side of

optimism" in estimated domestic reserves, said Navy Secretary James Forrestal in 1945. "The prestige and hence the influence of the United States is in part related to the wealth of the Government and its nationals in terms of oil resources, foreign as well as domestic. The active expansion of such holdings is very much to be desired" (Quoted in Yergin 2008, 388). Forrestal expressed his worry to Secretary of State James Byrnes the following year:

> I am of the opinion that [Ickes] is right about the limitations of American oil reserves—in this I am influenced a great deal by the engineer that I used in private business, E.L. DeGolyer. If we ever got into another World War it is quite possible that we would not have access to reserves in the Middle East but in the meantime the use of those reserves would prevent the depletion of our own, a depletion which may be serious in fifteen years (Millis 81).

Data from the domestic upstream reinforced the tense climate. The annual net increase in proved reserves between 1935 and 1939 had averaged 1.3 billion barrels, a comfortable buffer. During the following six years, however, despite new discoveries averaging 1.9 billion barrels annually, the additional consumption demands of the war resulted in a net annual increase in known reserves of only 0.4 billion barrels. A United States Tariff Commission report in 1946 acknowledged two schools of thought regarding the future of American oil: while "many geologists and oil experts believe the United States will relatively soon be running short of crude oil and will have rely increasingly on imports," others argued that "the decline in discoveries during the last few years has been due largely to wartime conditions and that now that the war is over the rate of discovery will rise again" (U.S. Tariff Commission 16). The onset of hostility between the Soviet Union

and the United States with the winding up of the Second World War raised the stakes in the struggle for global oil preeminence.

A string of government statements in 1946 and 1947 revealed the concern national leaders felt over the oil question. In August 1946, top energy analysts from the State Department and members of the Army-Navy Petroleum Board went on the radio to warn that the nation faced an oil shortage in 20 years unless Congress passed the stalemated Anglo-American Oil Agreement. The intention of the proposed legislation was to develop a joint British-American decision-making body that would "balance discordant supply and demand, to manage surplus, and to bring order and stability to a market laden with oversupply" (Yergin 2008, 385). Leaders of the two countries feared that the tremendous reserves of the Near East might flood their home markets and lead to wasted production if the oil companies developed the fields without any government oversight. The strategy they used to stir up public support for the legislation was to highlight the uncertain future of domestic oil resources. The chief of the State Department's Petroleum Division warned, "I'm no prophet and I don't propose to get into a statistical battle. But I think it's safe to say that by 20 years from now, we shall have to import close to half the oil we consume—unless some large new oil fields are discovered, and we can't count on that" (U.S. State Department 1946). The broadcast, which "created a sensation," led the *National Petroleum News* to reassure the public that it "does not believe that any disastrous shortage of oil supplies will be on us tomorrow" (*National Petroleum News*, August 21, 1946).

The radio broadcast set the stage for Secretary Julius A. Krug to outline the Truman Administration's petroleum policy later that month. Krug had replaced Ickes in

March 1946. “Expert opinion as to the quantity of oil we may hope to find through future exploration indicates that we have reached the halfway mark in oil discovery in the United States,” he stated. The future would not be as rosy as the past: “Finding the second half will take much longer, and be much more costly.” The era of American dominance in oil was coming to a close; its current rate of production was no longer sustainable:

> Ultimate oil resources of the United States, according to the experts, will amount to about one-sixth of the total oil resources of the world, and we are producing and using about two-thirds of the worlds’ oil. This means that oil will be scarce in the United States long before there is a comparable scarcity in other important producing areas. I believe the industry must accommodate its thinking to the need for substantial petroleum imports which can increase our security without being any threat whatever to a healthy domestic industry (*Oil & Gas Journal*, August 17, 1946).

The country was coming to terms with the new reality that foreign oil supplies would make up a larger, perhaps even dominant, share of national oil consumption before too long.

Although many experts would agree that oil suppliers overseas were abundant, the overall supply picture would cause a final scare in the closing years of the 1940s before giving way to an era of plenty that would endure for two decades. The oil industry had sprung back to life, in full force, by 1947.

Demand soared. A boom in population growth multiplied by an expansion in disposable personal incomes drove the nation’s appetite for oil to record highs. Domestic demand would rise from 1.7 billion barrels in 1945 to 2.4 billion barrels by 1950 (Williamson 1963, 804-10). Between 1941 and 1947, the consumption of oil products

made by American refineries increased by nearly 50 percent. Demand for cars, trucks, and buses increased by 5.6 percent in 1947 alone—and more were sought, but manufacturers could not make them fast enough to fill the orders. The 26-million cars on America's roads in 1945 would turn into roughly 40 million by 1950 (Yergin 2008, 391). The same year, demand for oil space heaters grew 40 percent and oil burners by 20 percent. By the end of 1947, a huge shift away from steam locomotives to diesel-electric locomotives in the United States gave diesel-electric's 95 percent of the market, up 26 percent in just two years (Fanning 379-80). Facing this spike in demand, the industry struggled to develop the infrastructure it needed to accommodate the volume and nature of the change from a wartime to a booming peacetime economy. As Yergin describes, it took "time, money, and materials to redesign refineries to turn out the products that the civilian consumers wanted, such as gasoline and home heating oil, as opposed to 100-octane aviation fuel for fighter planes" (2008, 392). Steel, needed to expand the domestic oil infrastructure, was scarce, which made transportation bottlenecks a problem. Oil companies launched a multi-billion-dollar infrastructure investment program in 1947 to try to accommodate the emerging demand requirements, but it was too late. Though there was plenty of oil in the ground, not enough was of it available to meet consumer demand during the severely cold winter of 1947-1948. The spot oil market would run dry.

The long-prophesied day appeared to have arrived: an oil shortage was here. In the words of one historian, the shortage "gave the Cold War oil scare support of a most sensational and urgent, if circumstantial, nature. It not only appeared to the man on the street as if we *might* run short of oil but as if we *had*" (Fanning 370). For six months in mid-1947, the oil companies were forced to ration their resources, refusing to service new

retail accounts and keeping a close eye on the distribution of existing stocks. ("Oil Companies Discount Reports of Gas Shortage," *Christian Science Monitor*, October 14, 1947). The price of crude rose as the market tightened. By 1948 they would reach more than double the 1945 levels set by the OPA, peaking at $2.57 per barrel in April 1948. Gasoline prices rose from $0.14 per gallon in July 1946 to $0.18 per gallon in December 1947 (Yergin 2008, 391; Fanning 382).

Oil companies called for calm and conservation as prices rose. When summer came, the driving season put additional pressure on retail gasoline supplies across the country, but particularly in the Midwest. Standard Oil of Indiana had to resort to a gasoline allocation program by rationing the gasoline they provided retail outlets in the Midwest (*Chicago Tribune*, June 25, 1947). The oil industry forecast in June 1947 that an oil shortage might take place the upcoming winter, depending on a number of factors, such as seasonal weather patterns and the duration a maritime strike underway at the time (*New York Times*, June 18, 1947). When Army-Navy Petroleum Board announced that it was already reporting lacking sufficient aviation gasoline to meet the military's immediate needs, the Department of Commerce banned gasoline exports until the shortage was filled. The Navy was ultimately forced to import 3.4 million barrels from the Persian Gulf—a desperate measure, in its eyes ("Oil: Summer Shortage," *Time*, July 7, 1947). In a Cold War environment, the prospect of the military not having the petroleum products it needed to perform its duty—not to mention widespread civilian discontent at the prospect of a vacation-less summer and a heater-less winter—made the situation an explosive one.

As national discontent rose, the accusations flew. Congress held over twenty hearings about oil prices and the shortage during 1947 and 1948. The National Petroleum News joked that the previous week had been largely uneventful, just the same old routine: "The oil industry's supply and demand problem getting bigger and blacker headlines in the nation's newspapers and more space in the Congressional record this week" (*National Petroleum News*, June 25, 1947). Political leaders railed against the fact that American oil companies continued to export crude, despite the shortfall at home. Protectionist rhetoric escalated. The Commerce Department, in June 1947, denounced the fact that nearly 35 million barrels of oil and oil products had been shipped to Russia, Europe, and Canada that year—the same amount that had been shipped during 1946, when there was no shortage. One senator accused the oil companies of "feeding the war machine of Russia while Russia refuses to cooperate in the world program" ("Nation Warned It Faces Oil and Gas Shortage," *Chicago Daily Tribune*, June 18, 1947).

Oil companies responded to the aggressive indictments with barbs of their own. They lambasted the materials industry for failing to procure the necessary building supplies for their infrastructure development projects. "Communist Russia alone, in the last 20 months, has received 50,000 tons of pipe, casing, and other tubular goods," even while the American oil industry lacked those basic goods, railed the National Petroleum Council (Ibid.). They criticized Congress for making the oil industry a scapegoat for the understandably tight market conditions, and thereby turning a stressful few months into a full-blown public panic. As the *Oil & Gas Journal* described one Congressional investigation:

> [The committee] which is holding hearings in Chicago can serve the best interests of millions of consumers and the oil

> industry itself if it will drop politics and conduct an investigation from which comprehensive and constructive conclusions are possible. Up to now the hearings have amounted to nothing other than to smear the oil business (*Oil & Gas Journal*, August 30, 1947).

Oil executives had no patience for the "exaggerations" of media reports of a "gasoline famine," which had led to a widespread belief that service stations around the country may run completely dry at any moment ("Oil Companies Discount Reports of Gas Shortage," *Christian Science Monitor*, October 14, 1947). They appealed for calm, denying that the situation was serious—or even that there was a situation at all. "You hear the statement that there is an immediate danger of our running out of oil," said Harold B. Fell, the executive vice president of the Independent Petroleum Associations of America. "The fact is, there is no shortage of oil. Discoveries of new reserves are continuing. Known proved reserves are 22,000,000,000 barrels—an all-time peak. There is no danger of an oil shortage. Competent geologists have testified that there is at least as much to be found" ("Executive Sees No Danger of Oil Shortage," *Christian Science Monitor*, July 17, 1947).

Not all oil companies were on the same team. They often accused each other of dirty tricks and foul play when the industry came under pressure. A group of Chicago oil dealers, for instance, claimed the shortage was nothing but a "trumped up device of the major petroleum producers to drive independent distributors out of the business," according to the *Chicago Tribune*. They testified to Congress that the rumored shortage of fuel oil was all a hoax, which the majors had propagated for their own benefit.

As acrimonious as oil market rhetoric was in the summer of 1947, it would only get worse as the weather cooled. In spite of record crude production, government officials

warned that there was not enough fuel oil to meet the demands of a cold winter. Transportation bottlenecks around the globe were still a problem. Some reports claimed that a permanent shortage of oil had set in, while others attributed the gap in ready oil product supply to inadequate infrastructure. As the *New York Times* reported in November, "Today there is enough oil in proved fields throughout the world—50 billion barrels is a conservative figure—to meet all our needs. But there are not enough ships, pipelines, tank cars, barges and refineries to get it where, and in the form, it is needed" ("U.S. and Europe Face Oil Shortage," *New York Times*, November 16, 1947). Representative John W. Heselton of Massachusetts warned the nation that the country would completely run out of fuel oil by February 20, 1948, and there might not be anything anyone could do about it. Others doubted that the world could ever extract enough oil to keep up with "fantastically" rising domestic demand

Secretary of the Interior J.A. Krug was among them. "Today's oil shortage is not just temporary—it's for keeps, and it's going to get worse," reported the *Christian Science Monitor* in summarizing Krug's recent statements:

> It's finally happened—the thing geologists forecast for a quarter century and which the petroleum lobby said wouldn't occur for a hundred years. America's demand for oil finally has outdistanced supply.[…] Ever since the Indians discoved the first iridescent oil slick on the Pennsylvania marshes, it has been assumed the petroleum supplies would last indefinitely. In fact, American production is holding up, though its wells are being pumped unmercifully and its back is being flogged like a laboring horse. But one thing is moving faster—demand. In brief, what has happened in the cold winter of 1947-48 is that the United States has come to the end of an era.[…] The time has come when we cannot depend on natural petroleum alone to meet our needs, he said: we must start

> converting natural gas, shale and, above all, coal, into oil. 'The dawn of a synthetic-liquid-fuels era in the United States is coming—and coming fast,' the Interior Secretary declared ("Krug Warns Oil Shortage Here to Stay," *Christian Science Monitor*, February 16, 1948).

Responding to the winter threat, Truman ordered the temperature in all government office buildings to be lowered to 68 degrees to save fuel oil and placed a 40 mile-an-hour speed limit on government vehicles to save gasoline (*New York Times*, January 18, 1948). 40 million gallons of oil were released from the Navy reserve to supply New England in case of an emergency ("Probe Sought in Bay State Oil Shortage," *Christian Science Monitor*, January 13, 1948). The oil industry was able to secure additional tankers to make the Gulf Coast-East Coast supply run, which eased the situation that winter. A lack of fuel oil on the East Coast in February 1948 forced refiners to devote a greater part of product mix to fuel oil at the expense of gasoline production for a 60-day period. But even with domestic production at an all-time high of 5.3 million barrels per day in 1947, the country's demand for crude—14% higher that year than at the 1945 wartime high—exceeded what the country produced ("Oil: Cold Comfort," *Time*, February 2, 1948; "Oil: Petroleum Economy," *Time*, February 16, 1948).

The year 1947 had marked two new firsts for energy consumption in the United States. It was the first time that the country had generated more energy from petroleum and natural gas than from coal. Coal, which had overtaken wood consumption in urban areas around the country approximately 100 years earlier, would never again reach the heights of national per-capita consumption that it had attained in earlier times. The year also marked the country's permanent goodbye to being a net exporter of oil and oil products. Never again would the United States send out more petroleum than it received

from other countries. Although it was the first time American imports had exceeded exports, the transition would be a permanent one: its role as the world's oil supplier was finished (Yergin 2008, 392). Imports increased by an estimated 13.2 percent between 1947 and 1948, reaching an average of roughly 500,000 barrels per day. It would be an estimated 75,000 barrels per day more than exports would amount to over the same period ("Oil Curbs Seen Prolonging Shortage," *Christian Science Monitor*, January 29, 1948). From then on, the United States would have to rely on other nations for marginal production sufficient to meet its growing appetite.

Even when the winter of 1947-48 ebbed, and with it demand for fuel oil, almost every voice on record expressed skepticism that the oil shortage would ever be resolved, let alone in the next 5 years or so. It is unclear whether they understood the "shortage" to be a global supply-demand imbalance wherein available supply around the world simply could not match global demand, or, much less ominously, that domestic production could not meet domestic demand. The former would mean a worldwide lack of supply due to inadequate production either because of exhaustion or an untimely supply response to increased demand. The latter would mean simply increasing imports to fill the gap. Either way, Americans seemed to view the country's future demands as almost impossibly high for an exhaustible resource to meet, despite oil companies' heroic attempts at "performing miracles of production" ("Shortage Expected to Last Five Years," *Christian Science Monitor*, February 20, 1948). Many in the oil industry said the shortage would last three years or more ("Oil: Cold Comfort," *Time*, February 2, 1948). Others put the time horizon at 4 or 5 years. In the words of the *Christian Science Monitor*: "The fuel oil shortage is no passing seasonal emergency. It will not be over when the winter ends. Next

summer gasoline will be in short supply. There is every indication now that it will put a real crimp in pleasure driving. It may even mean rationing.[…] If next winter is a frigid one, there will be another scramble for fuel oil." The report portrayed the unprecedented levels of consumption as a kind of immoral implacability. It was just not right that, even with all the oil they already had, "Americans want more. They want millions of gasoline more than they ever had before" ("Shortage Expected to Last Five Years," *Christian Science Monitor*, February 20, 1948).

For the most pessimistic, there was only a glimmer of hope that any oilfields could ever produce enough oil to meet the country's escalating requirements. "The $64 question […] in the oil industry's future," asserted one author, "is 'Whence will the United States get its future oil supplies as its consumption rides steadily higher than its present and future fields can supply?'" They had gone into the Middle East and Venezuela, he noted, but those plans were not promising in his view. Their upbeat projections about the future of oil may have been nothing more than a façade:

> It now appears to be only a matter of time until big names in the oil industry begin to admit publicly that the United States can no longer hope to remain self-sufficient in petroleum supplies through the discovery of new oil fields and better ways to get the oil out of them.[…] It begins to appear that in expressing their one-time optimism petroleum executives not only spoke with fingers crossed but were actually hedging their optimism for getting oil from other sources than the fields in the continental United States ("Oil Men Face Dilemma in Meeting Shortages," *Christian Science Monitor*, February 25, 1948).

Oil executives continued to advance an optimistic view of future discoveries, both at home and abroad, despite the widespread skepticism. Eugene Holman, president of the Standard Oil Company of New Jersey, assured the National Press Club that "putting it

plainly, there is no crisis in oil." He did not share the gloomy views of oil's future that were circulating at the time. "I say this while fully aware of the great attention being given to supply difficulties, and also knowing that some people accuse me of being an optimist on the supply situation. I think there is a great deal to be optimistic about" (Quoted in Fanning 392).

When the summer of 1948 arrived, the oil industry declared victory. "Oil Shortage Over," proclaimed a headline in the *Oil & Gas Journal*. "There is plenty of gasoline for the remainder of the touring season, and there are ample supplies of heating oil in all parts of the country for the next winter," they proudly announced (August 17, 1948). But many influential government officials were not so optimistic. President Truman was among them. He firmly believed that the shortage of fuel oil would repeat itself on the East Coast during the coming winter, no matter what the oil companies might say (*Oil & Gas Journal*, September 2, 1948). No group was more outspoken in calling for emergency measures to meet a possible oil catastrophe than the American military establishment. The oil industry saw the military as its archrival in the national debate over oil, blaming "much of the public alarm as to oil supplies" on a "military source." The military, of any branch of government, was the most worried about what the ramifications would be in a clash with the Soviet Union if domestic reserves were drying up as quickly as many experts warned.

Responsive to the military's desperate plea for something to be done to protect the country's oil resources, the House Armed Services Committee released a report in May that amounted to a red alert about oil and the future of a country in jeopardy. "We want to make it as plain as words can—we want to emphasize," declared the Committee, "we

want each of you to carry this thought away with you above all others from this report—the nation is in a grave situation in respect to its petroleum." The United States had already been drained of "well over half" the total domestic supply of oil. "Only about a 12-year supply of oil remains," it warned. It urged the government to take emergency measures. Among its policy suggestions were a revival of voluntary rationing, military stockpiling, the setting aside of additional military reserves, funds for oil exploration in Alaska, development of the continental shelf, and additional research on synthetic fuels (*New York Times*, May 7, 1948).

Oil company spokespeople flatly rejected the findings of the new study. The director the Oil and Gas Division of the American Petroleum Institute, Max B. Ball, disagreed entirely with the notion that the oil industry, or the nation, for that matter, facing any kind of emergency due to oil supplies. Barring a full-blown war, he predicted, "the American public in the years ahead would receive a more abundant supply of better petroleum products at lower relative costs than it has ever known." The API dismissed the idea that "the petroleum supply would never again be abundant and that world demand would grow too fast for even the industry to satisfy." Ball waxed pedantic: "Such predictions ignore economic history, discount the vigor and enterprise of the petroleum industry, and underrate the driving force of competition." As long as "normal competitive forces are permitted to operate," the oil industry's future looked as bright as ever (Ibid.). It would have been difficult for him to articulate a vision of the future of oil more starkly dissimilar from what Congress had proffered just days before. In 1949, a spokesman for the Independent Petroleum Association of America testifying before the House Foreign Affairs Committee echoed Ball's assessment: there is no foreseeable exhaustion of

domestic oil resources. Indeed, as was the case in 1949, world markets are "faced with a surplus of oil which is reflected in the United States by rapidly increasing and unneeded imports of foreign oil." The Congressmen could not believe their ears. His statement was a "startling surprise" to them, as it stood "directly in opposition to testimony we have heard from responsible officials in government, including Mr. Krug," the Secretary of the Interior. The assessment was so opposite from that of other reputable experts that the officials were left baffled.

Even as the debate raged over whether there would be enough oil to keep America safe, the high price that oil products were commanding in the marketplace were beginning to have their magical effect on upstream operations around the country. Prices had risen astoundingly over the last few years. Between 1946 and 1950, prices at the wellhead had risen from $1.50 to $2.37 in Californian fields, from $1.70 to $2.65 in East Texan, from $1.62 to $2.57 at Midcontinent, and $3.55 to 4.10 in Appalachian (Williamson 1963, 811). The skyrocketing demand for crude oil continued in 1949 as it had in the previous few years, rising 12 percent that year alone. But the tide was turning against the tight market conditions that had characterized the oil world since World War II. New technologies were stimulating remarkable improvements in the ability of oil companies in the upstream. Offshore production came on stream during the close of the 1940s. Wells drilled from fixed platforms in stable, shallow waters, were nothing new—that had been done in Louisiana and Venezuela already. But Kerr-McGee's venture 10.5 miles off the coast of Louisiana was indeed new. When they struck oil, their incredibly risky venture paid off, enticing their competitors to follow suit and head offshore in a completely new way. Natural gas emerged as a potent new energy source in these years

as well. Transporting the stuff had been a challenge in the past, but thanks to the construction of two major pipelines in 1947 leading to major consuming areas in the Northeast, the gas trade took off. By 1950, the interstate gas trade had reached a flow of 2.5 trillion cubic feet—an astounding 2.5 times what it had been in 1946. This increase in natural gas flow curbed the demand on oil significantly. One estimate judged the additional volume of natural gas as lessening oil demand by as much as 700,000 barrels per day (Yergin 2008, 411-2).

In the end, the oil industry of 1949 and 1950 was virtually unrecognizable to those who had fretted over supply levels anxiously in 1947 and 1948. Domestic production jumped from 1.7 billion barrels in 1945 to 2 billion in 1950 (Williamson 1963, 810). Proved domestic reserves of crude oil and natural gas liquids jumped by more than 2 billion barrels in 1948, the biggest one year jump since 1937 (Fanning 395). The winter of 1949 saw the accumulation of record stocks of fuel oil. Gas oil and distillate fuel stocks at the height of winter were 50 percent greater than they had been the previous year. Gasoline stocks at the height of the summer season were more than 10 percent higher. A roughly 10 percent rise in crude production mirrored a similar rise in demand ("Shortages of Oil Disappear—Stocks on Hand Accumulate," *Christian Science Monitor*, January 3, 1949). J.C. Donnel, president of Ohio Oil Company, noted the reversal of circumstances and newfound abundance at the company's shareholder's meeting in 1949: "Last year at this time […] the industry was straining its facilities to meet rising demand. By late fall, however, capacity operations, output and stocks were at high levels and the shortages of petroleum were history" ("Ohio Oil President Sees Petroleum Shortages A Thing of the Past," *Wall Street Journal*, May 27, 1949).

The panic appeared to have past. The old worries about whether there was enough oil to feed American demand proved shortsighted. Yet it is also worth noting that those who had predicted a rising tide of foreign imports proved prescient. Net crude imports began to grow dramatically: 43 million barrels in 1945 grew to 143 million barrels in 1950. By 1959 that number would jump to 350 million barrels. The role of foreign oil in total petroleum supply would grow as well during these years, from 2.5 percent in 1945 to 6.2 percent in 1949, eventually nearly doubling to 11.9 percent by 1959 (Williamson 1963, 810).

If anything, the challenge facing the industry at the dawning of the new decade was one of overabundance, not scarcity. The old anxiety about demand for oil growing more quickly than production could possibly keep up with evaporated. In 1950, *Time* looked back at the oil fears of the previous years, noting how times had changed: "The U.S. oil industry thought a year ago that its long-gushing boom was trickling out. In its hell-for-leather expansion, the industry has overtaken all demand and for the first time since World War II found itself producing more oil than it could sell" ("Oil: Quick Change," July 24, 1950).

The 1950s and 60s would bring their own challenges for the oil industry—but a lack of oil would not be one of them.

Chapter 3

"A Problem Unprecedented in Our History": American Anxiety in the Early Days of OPEC, 1970 – 1986

Abstract

In the 1970s, a formidable set of forces combined to ignite intense supply fears that ebbed and flowed into the mid-1980s. Soaring demand caused the spare production capacity of American oilfields, once the marginal supplier to the Western world, to disappear by 1971. A handful of key producer countries, sensing their own geostrategic import to the West and tired of abiding by multinationals' posted prices, formed the Organization of Petroleum Exporting Countries (OPEC) in 1960, eventually prompting a wave of nationalizations in the 1970s. Expert predictions of a looming "energy crisis" first appeared in 1969, and grew more common over the next few years, from the dire warnings of the U.S. State Department to the gloomy prophesies of the Club of Rome.

Amid these tensions, two oil crises during the 1970s caused government and public worry over permanent oil shortages to reach a fever pitch, the first in 1973 and later from 1979-80. The 1973 crisis was sparked when a group of Arab nations declared an embargo on oil exports to the United States in retaliation for Washington's support of Israel in the Yom Kippur War. The episode (particularly the retail fuel outages that ensued) had a tangible effect on the international energy order and on the Zeitgeist of the America of the 1970s. For the rest of the decade, predictions of an imminent, irreversible shortage of oil supply were ubiquitous in government, industry, and academic circles. Surveys suggested that the American public was increasingly under the impression that the country was "running out of energy." The fears would only worsen during the oil crisis of 1979-80, caused by the Iranian Revolution and the onset of the Iran-Iraq War. To many, this crisis appeared to be the fruition of the foreboding predictions made throughout the preceding decade. In the rush by consumers to build emergency stockpiles, the crisis became a self-fulfilling prophecy, and spot prices spiked as a result.

The higher price environment, however, tempered global demand by fostering substitution out of oil and improving energy conservation, while simultaneously stimulating record non-OPEC production. By the end of 1985, with its fellow OPEC member countries brazenly disregarding their agreed-to quotas, Saudi Arabia decided it had had enough of defending the price floor. By adopting netback pricing and ramping up production, it caused the market to collapse by mid-1986. The market became oversupplied, which banished expressions of worry over whether future oil consumption needs could be met.

The landscape of oil in the United States—the players, prices, politics, and policies that had defined the industry for many years—underwent arguably the most radical transformation in the history of the industry during the 1970s. The preceding decade had been boom years for the industrial world. Economic growth was strong, propelled forward on a wave of cheap oil from the developing world. Petroleum products increased in variety as well as in usage, whether in factories, power plants, buildings, or automobiles. Free world demand for petroleum, which amounted to almost 19 million barrels per day in 1960, rocketed to more than 44 million barrels per day by 1972 (Yergin 2008, 567). The American economy and its citizens' lifestyles were becoming more and more oil intensive. The golden age of oil production that had defined the post-World War II order was in full swing in the 1950s and 1960s. Mighty American and European companies were firmly in control of global supply and ensured it arrived at U.S. ports and pipelines in sufficient quantity to allow for the suburban growth and bulky sedans that became hallmarks of the times. These companies, derisively termed the "Seven Sisters" by the Italian oilman Enrico Mattei, were vertically integrated powerhouses with the political backing and the financial heft to administer the global oil industry with unrivaled commercial latitude. The story of oil in the 1970s and early 1980s is the story of the demise of the Seven Sisters at the hands of Organization of Petroleum Exporting Countries (OPEC), with significant implications for oil markets and prices around the world. Underlying the radical changes of the era was a newfound fear that oil—perceived as plentiful, even overabundant during the 1950s and 60s—would never again be able to satisfy world demand. Oil appeared to many to be running out for good.

There was no question that domestic oil producers in the United States found themselves in an unfamiliar and altogether uncomfortable new position beginning in the late 1960s and early 1970s. These were the years in which the United States ran out of surplus capacity permanently. It was a shocking and worrisome realization to American oilmen and government geostrategists. Surplus capacity, in the oil industry, refers to the capability of the upstream oil apparatus to produce output over and above the level required by consumers or subsequent processes. Until this time, surplus capacity had always existed in the United States. There was too much cheap oil, and pumping it all would mean flooding the market—a nightmare scenario for industry participants all along the supply chain, and yet one that had occurred every generation or so in the United States since oil was first commercialized. Various regulatory bodies, such as the Texas Railroad Commission and the Oklahoma Corporations Commission, among others, had sprung up over the years to proration output so that actual production stayed low enough to ensure price stability and promote conservation.

Now, rising demand for crude, little recent investment in production due to the price environment, relatively low discovery rates, and import quotas combined to wipe out the domestic surplus capacity by March 1971. The major implication of the loss of surplus capacity in the United States was that the security cushion of oil in the ground on which the government could always draw in time of need had now vanished. There was no more security margin to be accessed in the event of an emergency, such as supply disruption or a spike in demand, such as in the event of war. The inevitable effects of this new development were that the Western world would rely even more on the oil of the

Middle East to supply growing demand and that there would be no potential for domestic wells to make up for a short-term jump in domestic demand.

Meanwhile, the global appetite for oil was growing by leaps and bounds, made possible by rising reserves of cheap oil in the Middle East. Between 1960 and 1970, free world demand for oil grew by 21 million barrels per day. Free world demand rose by 20 percent from 1970 to 1973 (Parra 149). Most of the new demand was being supplied by Middle Eastern (including North Africa) wells. There, production had elevated by more than 13 million barrels per day over the period from 1960 to 1970. New production had also come onstream from Nigeria and Indonesia, but these sources were insignificant in the emerging picture of global oil sources, where the Middle East was becoming truly the dominant marginal exporter. By 1970, oil was no longer being overproduced, thanks in large part to rising demand and moderating sources of new American supply. As a result, prices in the Persian Gulf hit an all-time low of $1.21 per barrel in 1970 (Adelman 1993, 2-3).

With this cheap oil flowing in increasing volumes, as it had done since World War II, the industrial nations had become accustomed to high rates of foreign oil consumption and excess availability of crude. Whatever determination they had made to wean themselves off foreign crude after World War II wore off as production growth in new low cost producing areas, especially the Middle East, greatly outpaced growth in higher cost areas, such as the United States. Import quotas, established by Eisenhower in the wake of World War II and intended to limit the nation's dependence on foreign oil, fell by the wayside as American oil proved unable to slake the country's thirst for greater quantities of oil (Maugeri 103). The federal government began to ease the import quotas

in 1971, once the nation's surplus capacity had disappeared. The effect on the balance of trade in crude oil was immediate. Imported oil, just 2.2 million barrels per day in 1967, rose dramatically to 6 million barrels per day by 1973. Accordingly, imports became more prominent in the national energy mix over the same period, moving from 19 to 36 percent of total oil consumption (Yergin 567). Demand for oil in the United States was growing at a healthy clip, but domestic sources of oil could not fuel the growth. The Middle East, once an afterthought to American policymakers and oilmen, had usurped the once-mighty United States as the key growth area in world oil.

By 1970, relations between the Western oil majors and the nations of the Middle East had been deteriorating over the previous two decades. Producing countries, aware of their growing importance to the industrial world, chaffed at the oil companies' practice of posting prices according to their own preferences and those of their home governments. Low posted prices meant less tax revenue for the state. The oil companies' bad habit of overproduction had depressed crude prices from the mid-1950s through the 1960s, cutting deep into the producing nations' revenues. Unable to control the multinationals' decisions about production volume, the countries could not accurately anticipate their future cash flow and protect against a race to the bottom in the global oil market. A new generation of nationalistic leaders in the leading exporting nations in the 1950s and early 60s, such as Qaddafi in Libya, Perez Alfonso in Venezuela, and Tariki in Saudi Arabia, tapped into public discontent over the perceived abuses of the oil multinationals. Rather than court oil company investment and support the concession system as it then stood, they articulated a new vision: the oil was theirs, not the West's. And the oil companies and Western governments were all too synonymous, they preached. The oil belonged to

the people of their nations; its ownership and exploitation was a matter of national sovereignty, not mere business.

Frustrated by a series of downward revisions to the posted price during the closing years of the 1950s, the governments of the principal exporting countries decided to act. The decision of Exxon's board to reduce its posted price yet again in September 1959, bringing the price of Arabian Light to $1.91 per barrel, led the other multinationals to follow suit. Then, in August 1960, the companies lowered posted prices by an additional 10 percent (Maugeri 84). That was the straw that broke the camel's back. Juan Pablo Perez Alfonso, the Minister of Mines and Hydrocarbons in Venezuela, had had enough of the Western firms controlling an industry whose destiny had such a disproportionate impact on that of his home country. He had authored the influential fifty-fifty profit-sharing formula for his home country some years before, but now he felt that more drastic measures were needed if the global price of oil was to be stabilized. In September 1960, he assembled representatives from Venezuela, Saudi Arabia, Iraq, Iran, and Kuwait in Baghdad to discuss how their governments could band together to take greater control over the oil trade, and in so doing, over the long-term future of their national economies and public finances. In the course of the meeting, OPEC—the Organization of Petroleum Exporting Countries—was born.

According to its founding vision, OPEC would serve as an instrument for collective bargaining and defense. It would reclaim from the oil companies the primary role in the decision-making process and management of oil activities in their territories. It would aid the group's effort to work together with the oil companies as a united force to negotiate prices, production, taxation, and policy (Adelman 1995, 90; Maugeri 84-5).

Finally, it seemed, the chief exporting nations had taken control of the means to stabilize prices and production over the long term, which would allow them greater control over their long-range fiscal position and economic development strategy. Although it hardly needs stating, the formation of OPEC would prove to have profound consequences on every aspect of the future of the oil industry around the world.

OPEC would not reach the height of its influence until well after its founding in 1960. In its first years, it was "all thunder and no storm," in the words of one historian (Maugeri 85). The five countries that comprised OPEC at this time had a harder time working together than they had envisioned in Baghdad in 1960, despite the potential for sizeable mutual gains. Iran and Saudi Arabia, bitter rivals in the oil trade, vied for supremacy as the West's most powerful ally in the Persian Gulf. Kuwait was eager to get a greater share of the pie. Internal jealousies led to squabbles that undermined the effectiveness of the still infant institution. But the principal actors who had formed OPEC pressed on, waxing increasingly bold in their dealings with the international oil majors in the 1960s and early 1970s.

Momentum seemed to be on their side. A single country's victory over the foreign oil companies caused a domino-like cascade among its peers for better terms from the majors. Thus, a nationalization or contract revision forced upon an oil company by one government tended to lead to better terms for producing countries across the board. In 1961, Iraq's revolutionary government, which had seized power in 1959, issued Public Law 80. In one fell swoop, it rescinded from the Iraq Petroleum Company all areas of the country that the company had not yet developed for oil production—no less than 99.5 percent of the original concession, all in all (Maugeri 87; Adelman 1995, 90). Qaddafi,

the head of Libya's autocratic government, called for a revision to the fifty-fifty profit-sharing contract that it, like most of other oil exporters, had struck with the Western companies. In September 1970, he secured an agreement with Occidental Petroleum, one of the country's principal producers, which granted the Libyan government 55 percent share of oil profits and mandated a 30 percent increase in the posted price for oil (Maugeri 101-2). Libya's success in renegotiating its contract at such strikingly better terms set off a chain reaction among the other oil exporting countries. Only two months later, Iran's Reza Pahlavi demanded that the oil companies in Iran matched Libya's terms. By mid-1971, OPEC had signed agreements with the oil majors that ensured them all 55 percent share in oil profits and a higher posted price for all producer countries. In a few of the countries, nationalizations were not far away. Algeria had expropriated 51 percent of all foreign company's hydrocarbon holdings by 1971. Qaddafi seized 51 percent of BP's assets in Libya that same year. Then Iraq, following Libya's lead, expropriated the Iraq Petroleum Company's assets in 1972 (Ibid. 107). The Western oil majors—squarely in control of the world oil trade going back several generations—were on the run. The command they formerly knew was gone for good.

These drastic revisions to the foundations of the Western energy architecture would have been dramatic under any circumstances. Given the supply and demand picture of the early 1970s, however, their unsettling effect on global markets was all the more profound. Demand growth into the foreseeable future called for truly massive volumes of oil over the next decades. World energy demand climbed inexorably upward at a rate of 4.4 percent a year between 1970 and 1973. Coal, natural gas, nuclear power, and hydroelectric power had difficulty growing quickly enough. Oil appeared to be the

most promising source of energy to fill the supply gap, but production would need to grow worldwide at a record pace of 7.6 percent a year to do it (Parra 161). No one knew how existing sources of supply could yield such astounding increases in production volume or where to find new sources of supply prolific enough to fill the gap. Production in the United States was clearly not up the task; the output of the lower 48 states had peaked in 1970 at more than 11 million barrels per day and entered a period of long-term decline (Maugeri 104). Alaskan sources were not yet on stream and the North Sea and Mexico were unable to significantly contribute to global supply. The Soviet bloc, once one of the world's great exporting regions, appeared poised to become net importers of oil (Parra 148). The Soviet Union's unwillingness to disclose data on its energy production and usage only made the picture all the hazier and more unpredictable. Even excluding demand growth in the Communist bloc, world demand shot up by more than 20 percent between 1970 and 1973 (Ibid. 148).

The oil industry was moving forward at a breakneck pace to meet the increasingly demanding production requirements. Investment all along the supply chain was going through the roof. From 1970 to 1973, it increased by almost 50 percent—14 percent per year—more than double the rate of the previous ten years, which had been a period of substantial growth in its own right. Even after 1973, oil industry investment around the world would rise by more than 20 percent per year until 1981. Were this number to be adjusted for inflation, it would be slightly lower—the 1970s, of course, were famously inflationary—and yet it remains powerful evidence of the a truly staggering growth rate for an already mature industry. Upstream investment was highly concentrated in the Middle East, the epicenter of supply growth in the 1960s and early 1970s. Production in

the Middle East rose by 52 percent between 1970 and 1973. It doubled in Saudi Arabia and the United Arab Emirates over the same period. Investment in expanding refining and transportation capacity was booming. As of 1970, over 70 new refineries were being constructed and 120 were being expanded to add an additional 11 million barrels per day of refining capacity around the world. By the end of 1975, world refining capacity was 30 percent higher than it had been in 1970. New tanker capacity was 22 percent higher by the end of 1971 than it had been the previous year, thanks to the development of 37 million tons deadweight over the course of those two years (Ibid. 148-9). All of these numbers speak to the industrial world's dependency on oil, at least in the near term, to fuel the engine of economic growth in the early 1970s. And production in the Middle East—now synonymous with OPEC, for all practical purposes—was virtually the only place to look to meet increases in world demand. Oil companies the world over had little alternative to these countries to secure crude.

Despite the oil industry's best efforts to bring greater volumes of oil to market, alarming forecasts about an impending oil shortage proliferated in the first few years of the 1970s. Projections of terrific future demand growth cast doubt on the industry's ability to keep pace and implied an inescapable gap in oil supply. To many, meeting forecasted demand over the next 10 years would simply not be possible. In July 1970, the Petroleum Press Service (PPS) wrote that "The suggestion has been made that oil consumption in the free world as a whole may nearly double [from 34 million barrels per day to 68 million barrels per day] once again, between 1968 and 1980.[…] The petroleum industry is faced with the task of finding large new reserves."

By 1970, worry over how the oil industry could possibly meet projected demand was heating up. In June, the PPS reported that energy economists believed that crude oil production would have to grow to two and a half times 1970 levels to meet projected demand for 1989—an increase of over 63 million barrels per day. Others forecast demand growth at a steady 5 percent until 1980. Mobil foresaw an increase in world production to 98 million barrels per day by 1990, up from 36 million barrels per day in 1969. In April 1971, BP's chief geologist, H. P. Warman, expressed skepticism that the oil industry could find the 900,000 million barrels of oil it would need by 1985, when world reserves at the time amounted to 620,000 million barrels. The U.S. National Petroleum Council estimated that the United States would need 300 percent more imported oil by 1985, or 14.8 million barrels per day, if it were to stay fully supplied. What was more, demand in the free world was projected to rise from 37 million barrels per day in 1970 to 92 million barrels per day by 1985, a seemingly impossible demand to meet. Walter Levy, an influential oil consultant, warned that world demand was set to increase by 35 million barrels per day by 1980—an 80 percent jump from 1970. Shell and Texaco both warned that world oil demand would nearly double, from 40 million barrels per day in 1970 to between 70 and 79 million barrels per day in 1980, and that imports to the United States would need to rise by more than 6 times to meet domestic demand by 1985 (Ibid. 115-7).

These forecasts were typical of a generation of oil market projections in the 1970s, almost all of which contributed to unease among the oil industry, national governments in both oil exporting and importing countries, and the general public over whether oil would be a viable energy source in several years' time.

Such gloomy forecasts, which appeared to foreshadow the inability of the United States to meet its energy needs over the next decade and beyond, contributed to the phrase "energy crisis" entering the American cultural lexicon. Opinions varied as to the seriousness of the situation, though in Yergin's judgment, "In limited circles, there was agreement that the US faced a major problem" (2008, 590). Demand for all forms of energy was growing briskly—that was an accepted fact. Nixon's domestic energy regulatory policy was only making things worse. Price controls on oil at the wellhead and burner tip, which he had imposed in 1971 to curb inflation, had the unintended consequence of discouraging oil exploration and production, encouraging consumption of unrealistically cheap oil, and adding to import volumes. Even the natural elements seemed to conspire to make the energy situation more pressing. The winter of 1969 – 1970, the coldest in thirty years, had resulted in utilities being forced to interrupt service due to oil and natural gas shortages. Additional new demand for low-sulfur oil, which was needed to fuel a growing number of electric utilities that had switched from coal- to oil-burning generators, meant that imports from Libya and Nigeria, producers of low-sulfur oil, had to increase. The following summer, in 1970, brownouts were common along the Atlantic Coast. The regional electricity infrastructure was simply incapable of providing enough power to meet rising demand. The shortages brought the much-publicized specter of an "energy crisis" closer to home. Talk of an energy shortage was no longer an academic matter; it was now a public issue, gaining the attention of the average American consumer and moving to center stage as a national news item.

Among the national figures most vocal about the "looming storm" on the American energy landscape was James Akins, the State Department's Middle East expert

and later advisor to Presidents Nixon and Carter. Akins had been an authority in federal government circles on the oil market since the late 1960s. Thanks to his unparalleled influence, Akins' writings provide a valuable "window" on the "ideas and assumptions governing U.S. polities toward the oil markets" during the 1970s, which would otherwise remain opaque. According to Adelman, what Akins wrote was what the State Department bureaucracy "thought and assumed" (1995, 85). When it came to the future of oil supply, he was hardly an optimist. Akins "repeatedly warned that the world would risk running out of oil in a few years if there was not an immediate shift to other sources of energy" (Maugeri 105). Writing as the head of the Office of Fuels and Energy in 1969, he argued that the country was going down a dangerous road. "By 1975," Akins wrote, "and possibly earlier, we will have entered a permanent sellers' market, with any one of the several major suppliers being able to create a supply crisis by cutting off oil supplies" (Quoted in Yergin 2008, 591).

Three years later, Akins warned OECD officials that a worldwide shortage of 20 million barrels per day would arrive by 1980 (*New York Times*, May 27, 1972). But even by 1976, he foresaw, "our position could be nothing short of desperate." He doubted the Arabs would be able to raise the funds necessary to increase their production as much as was needed. As a result, he declared, Persian Gulf reserves would decline after 1980 (*Oil & Gas Journal*, May 15, 1972). Since the Persian Gulf was the very region on which the West was depending for reserve growth, Akins was prophesying no less than catastrophe. Yet senior policymakers were slow to implement his proposals. Finally, Akins decided to take his admonitions public. Published in *Foreign Affairs* in 1973, its title left little room for doubt about where Akins stood on the oil issue: "The Oil Crisis: This Time the Wolf

is Here." His message was clear. The current demand growth was simply unsustainable, would lead to shortage, and ran the risk of a tremendous crisis in the industrial nations should OPEC ever decide to punish the United States or its allies.

Akins was not alone in his pessimism about the sustainability of the trajectory of the world's natural resource consumption. A broader shift of mindset in the industrial countries gained traction in the mid-1960s and early 1970s: the environmental movement. Environmental issues were making their way to the forefront of American political consciousness, challenging deeply held views about man's relationship to the natural world and drawing attention to forces seen an anti-environment. "Big Oil" was considered chief among these no-good-doers, as it remains today. A number of pro-environmental policy campaigns were making headlines at this time. In 1967, the U.S. Senate overwhelmingly passed a clean air bill, following New York City's lead in limiting coal consumption in urban settings. Three years later, federal legislation mandated the use of environmental impact statements as a legal prerequisite for major development projects. Earth Day was also born in 1970, heralded by a parade of over 100,000 people in New York City in support of environmental awareness.

One notable publication, *The Limits to Growth: a Report for the Club of Rome's Project on the Predicament of Mankind*, tapped into public worry over the future of the environment by calling into question the sustainability of the modern industrial world. The tremendous public response worldwide to the study's cautionary message both reflected and fed widespread anxiety over the plight of mankind. Published in 1972, it presented a model of several historical trends—among them, industrialization, pollution, food production, mortality and fertility rates, resource depletion (including oil and natural

gas)—from 1900 until 1972, then projecting them to the year 2100. The model's forecasts were sobering. Resource depletion would leave non-renewable energy sources all but extinct by 2050, by which time exponential growth in pollution and rapidly declining food availability per capita would result in an explosion in the death rate. Oil would be scarce by the mid-1990s. Then, after the human population had peaked in 2050 and began to decline precipitously, it would fall in half, having reached its "limit to growth." Industrial output per capita, pollution, services per capita, food per capita, and resource depletion would all level off at very low levels sometime between 2050 and 2100. A new stasis for the human population would settle in, defined by exceedingly low levels of non-renewable energy usage and food production would occur.

The study did not predict the exact timing of future crises, but it did warn of the dangers of a hydrocarbon-based economy as unsustainable and soon to be exhausted. In hindsight, the bedrock assumptions about the future of oil supply and demand, however, were deeply flawed. *Limits to Growth* assumed the world's remaining oil reserves amounted to 550 billion barrels and projected average yearly compound growth rate of demand at 4 percent until 1992. The reality would prove to be far different—a fate not uncommon to oil forecasts in every age. Over that same period, demand increased at less than half the projected rate, even as the world produced more than 700 billion barrels between 1972 and 2004. Even after those billions of barrels had been pumped, proven reserves would still exceed 1.38 trillion barrels in 2010 (*BP Statistical Review of World Energy 2011*).

What was perhaps most unsettling to the general public about *The Limits to Growth*, as Yergin points out, was that its dire predictions appeared in 1973 to be already

coming true. The economy of the 1950s and 60s had indeed been booming on the back of escalating resource use, particularly in oil and natural gas. Not only had global demand for petroleum products risen noticeably, but the energy intensity of the industrial economies—in other words, the quantity of energy needed to fuel a unit of economic output—had risen along with it. Just as the Club of Rome had predicted, energy sources appeared to be getting more and more scarce. America's oil wells seemed to be running dry, having peaked in the lower 48 states in 1970. Imports were increasing as a percentage of domestic oil consumption, even as other nations were in greater and greater need of crude oil. Pollution was getting worse. And global population was rising, just as the authors had foreseen. The prophesied crises appeared to be just around the corner. All in all, the arguments of *The Limits to Growth* were a "potent element in the fear and pessimism about impending shortages and resource constraints that became so pervasive in the 1970s, shaping the policies and responses of both oil-importing and oil-exporting countries" (Yergin 2008, 569).

What was more, other studies, forecasts, and experts in the early 1970s corroborated its conclusions. The director of the U.S. Bureau of Mines, speaking in September 1973, predicted that by the end of the century, the United States "will be competing for those foreign mineral products with other mineral hungry nations all over the world. The situation could lead to a global minerals shortage that would make our current energy crisis look like the good old days by comparison" (*Petroleum Intelligence Weekly*, September 10, 1973). That same month, Secretary of State Henry Kissinger bemoaned the "crisis" as "the inevitable consequence of the explosive growth of world-wide demand outrunning the incentives for supply" (*Petroleum Intelligence Weekly*,

September 17, 1973). To many, the wolf was indeed at the door. It was just a matter of when he would decide to let himself in.

Even before the political fireworks began going off in the final months of 1973, oil prices had been trending upward and become increasingly volatile. Between December 1970 and September 1973, official oil prices for Arabian Light crude leaped from $1.21 to $2.90 per barrel. But the pressure from a tight market and the uncertainty over the future of supply made for greater dislocation in world oil markets than even these numbers can convey. Even the previously simple job of tracking and publishing price movements in the oil market—the work of various petroleum journalists and industry newsletters—proved vexing, so schizophrenic was the market. Differentials among the prices for various refined products, spot barrels, and other discounts and pricing schemes made prices all but "imprintable," according to *Petroleum Intelligence Weekly* (Quoted in Maugeri 108). The Seven Sisters had managed to keep oil prices within a carefully defined range for several decades. Political events had obliged, leading to relative stability in the market. Now, however, the market was one of "extraordinary fragmentation and volatility" (Quoted in Yergin 2008, 591).

A fundamental change in the oil market had taken place. For the first time, market prices exceeded official posted prices over a sustained period. Demand was bumping up against the limits of available supply, and oil refiners' fears of the possibility of a shortage of oil in the near term led to increased demand for free crude. As a result, more and more oil—though still only a small percentage of total transactions (less than 3 percent)—was being purchased on the spot market rather than through long-term contracts at official posted prices. As unintegrated refiners scrambled to get their hands

on all the barrels they could, the cost of spot market crude shot up. The price of spot crude was exceeding $5, even $6 per barrel, according to some sources, at a time when posted prices were never higher than $3 (Maugeri, 107; Yergin, 591). In August 1973, *Petroleum Intelligence Weekly* reported "near-panic buying by US and European independents as well as the Japanese," which was pushing spot prices higher and higher. Import volumes rose from 3.2 million barrels per day in 1970 to 4.5 million per day in 1972, only to spike to 6.2 million by the summer of 1973 (Yergin 591). The exploding spot market was making the oil producers all the more confident about their position. OPEC, well aware that spot crude prices were commanding a premium relative to the posted price, took spot prices as a signal that perhaps their posted price was not high enough after all (Parra 179). If consumers were ready to pay well above official prices, how high could the official prices go without spoiling demand? The producers realized that they were in the driver's seat.

Meanwhile, trouble was brewing on the global political front during the summer and fall of 1973. Anti-Israeli sentiment was running at a fever pitch in the Arab world. At the Munich Olympic Games in August 1972, Palestine Liberation Organization (PLO) members took hostage several members of the Israeli Olympic team, in a shocking and highly publicized act of terror. The old wounds of the 1967 Six-Day War, still festering, had spread violent anti-Western radicalism across the Middle East. A new Egyptian leader, Anwar el-Sadat, was conferring with other government leaders in the region about launching a new military campaign against Israel to retake the territory Israel had taken from Egypt in 1967 and, in so doing, proactively respond to nationalistic fervor at home. Sadat was convinced that the chances of the Arab states, banding together, being

victorious over Israel in an armed conflict would be much higher if they were to wield what he felt was their strongest source of leverage against the West: the "oil weapon," as he called it. He knew that the United States, a staunch ally of Israel, would likely come to its aid in a war against one or more of the Arab states. Oil, he was convinced, could keep Nixon and Kissinger at bay. To wield the oil weapon, all he would need was the agreement of the key Middle Eastern oil producers to boycott oil imports to the United States should it interfere in the war against Israel. In May 1973, King Faisal of Saudi Arabia ensured Sadat that his country would cut off oil supplies to any Western country helping Israel. Syria had already agreed to provide Egypt with military aid.

On October 6, 1973, war broke out between Israel and an alliance of Egypt and Syria. It would become known as the Yom Kippur War. Golda Meir, the Israeli prime minister, pleaded with Nixon for military assistance for her country on what appeared to be the verge of collapse. He capitulated, sending what he intended to be a secret airlift of munitions to Israel. The U.S. planes were discovered, however. The plan was foiled. OPEC's threat to boycott the exportation of oil to any country that aided Israel in the war had been triggered, and it responded quickly. On October 16, a delegation of Persian Gulf countries—Saudi Arabia, Iran, Iraq, Kuwait, the United Arab Emirates, and Qatar—all OPEC members, announced a unilateral increase in the benchmark price of Arabian Light crude from $2.90 to $5.11 a barrel.[16] The whopping 76 percent price hike shook the oil industry the world over, but for more than just the higher price. Perhaps more significantly, OPEC's announcement on October 16 would mark the end of the era in which oil companies had any say in posting prices. The practice of setting prices, begun

[16] Parra gives slightly differing figure, claiming the price increase was from $3.01 to $5.11 a barrel. (178-9).

by Rockefeller more than 50 years earlier, was over. But OPEC was just getting started. The following day, members of the Organization of Arab Petroleum Exporting Countries (OAPEC) announced that it would begin lowering, effectively immediately, its production volume by 5 percent every month until Israel relinquished to Egypt the territory it had occupied since the Six-Day War in 1967. Only states that supported Israel would be subject to those cuts in production, they asserted. It was a "selective embargo" against Israel and its allies. Nixon's airlift of war supplies to Israel the week prior meant that the United States would ineluctably be subject to the embargo.

The effects of the announcement of the embargo on the oil market were convulsive and immediate. Prices went wildly higher. By the end of 1973, Libyan crude was reported to be commanding $9 per barrel, whereas it had only garnered $2.80 a year earlier. Iran lifted the price of its November crude to Japanese customers from $2.88 to $3.85. Iraq raised the posted price of its crude to around $9 per barrel. A November 16 auction of spot Tunisian crude reportedly sold for $12.64 per barrel. Such reports, not surprisingly, only pushed prices higher. No one knew what the exact market price of crude was, but no company that depended on it to do business—whether an airline, an energy brokerage, or a refining operation—was going to go without it, even at what it would have considered an unconscionably high price only weeks earlier. And still prices pushed higher. Iran obtained a price of $17 per barrel for 450,000 barrels at an auction in mid-December. Nigerian and Algerian crude passed the $16 per barrel mark that same month, while a new round of Iranian sales surpassed $17 per barrel once again. A Japanese trading operation, under heavy pressure to supply their home market and in competition with over eighty other buyers, bid $22.60 per barrel at a Nigerian auction

(the deal was never consummated, but news of the bid certainly made the rounds). OPEC, unfazed by the skyrocketing prices despite their potentially dampening effect on longer-term demand, decided in December to double the posted price of their benchmark crude. It was now $11.65 per barrel. In light of posted prices only a short time before, it was a truly staggering development. The $11.65 per barrel price was four times higher than the posted price only four months earlier—and a full ten times higher than the 1970 price. The new price would go into effect January 1, 1974 (Parra 182-3; Maugeri 114; Yergin 2008, 615).

Any certainty over the future of oil—its price, the quantity that would (or even could) be supplied down the road, the true extent of the embargo—vanished in the hectic environment of October through December 1973. Rumors and stories—some true, others not—about the price points of oil products for various transactions flew among traders, executives, producers, consultants, brokers, and the media. In one observer's words:

> Talk of market-oriented prices vanished. No one knew what "the market" was, or where it was going, or how it could serve as a guide for the cartel's price. In fact, the market was still thin. It was not institutionalized. There was simply no solid reference point, just a bunch of disparate deals erratically reported in the trade press. People's knowledge of the market was confined to the deals they did themselves, what they read in the trade press (not necessarily accurate and almost always with insufficient detail), and what they could glean from their business and personal contacts (information to be treated with great caution) (Parra 183).

Some of the demand for crude and its derivatives was "precautionary," in the words of Adelman. No one knew how bad the crisis would get, and no one wanted to be caught on the wrong side of the shortage. The crisis was "driven by the fear of dearth" by those consumers who would suffer if future production did not meet their commercial needs

(Adelman 1995, 110). In this sense, the buying was a sort of "expensive insurance" against an unknown, but highly dubious, future supply flow. In Yergin's assessment, the "fear and uncertainty pervasive" at the time "had a self-fulfilling effect: both oil companies and consumers frantically sought additional supplies not only for current use but also for storage against future market shortages and the unknown" (2008, 615). As they bought against the chance of shortage, the price rose.

Other demand was more speculative in nature. The fact was, the short-term elasticity of demand for oil meant that OPEC was making more money by cutting back on volumes and selling it at a much higher price. OPEC could "sell less and still earn more." Taking that into account, buyers feared that OPEC had the frightening incentive to keep production down permanently. They had reason to worry that the embargo was merely the first chapter in an era of permanent shortage and hence higher prices (Ibid., 614). Seen in this light, not all "panic buying" was as irrational as the word "panic" would suggest. Rather, from the speculator's standpoint, it was a directional bet in favor of the possibility of higher prices later on, at which time the contracts or even the physical oil could be resold (Adelman 1995, 110). Were OPEC to raise the price again, speculative oil bought at the close of 1973 might have been sold at a sensational profit. Fear of the future loss of supply was moving the market in a gravity-defying way.

The denouement of the embargo turned out to be somewhat more mundane than its violent beginning. It went out with a whimper. On December 4, the Saudis announced that they would no longer go forward with the month's scheduled 5 percent production reduction. They gave no reason for their refusal to continue their participation in the embargo, but some speculated it came as retribution for Iran and Iraq's failure to cut back

their production (*New York Times*, December 18, 1973). By the latter half of December, the tension was easing. The possibility of shortage, the subject of intense worry only weeks earlier, appeared to be dimming. The *New York Times* reported on December 29 that tankers were lined up off the coast of the major refining ports of the Atlantic seaboard, awaiting their turn to dock. By early 1974, the production cutbacks were over. There was never any formal announcement or official reconciliation between the pro-Israeli bloc and the OAPEC to mark the end of the embargo. The OPEC nations that had initiated the embargo made it known to industry insiders that they were abandoning the cutbacks. The policy of cutbacks was simply reversed. Arab oil ministers, meeting in Kuwait on December 25, now called for a 10 percent production increase in January. No further mention of cutbacks arose. The conditions that the Arab countries had imposed were never met. Israel won the Yom Kippur War, largely on the back of the military support of the United States. By the first few months of 1974, it was clear that the oil crisis was over.

When the dust settled, the reality of the 1973 oil crisis was that a physical shortage of oil had never in fact occurred—"crisis" notwithstanding. There was never any resource shortage between 1971 and 1974. Oil market data was so spotty during the embargo that no one could tell at the time where supply levels actually stood, although the truth of the situation was becoming clear to some experts by late December (See *Economist*, December 15, 1973). The full story became discernable only after the fact. Inventory that had been built up over the year more than made up for the approximately 340 million barrels of oil that the embargo kept from world markets from October through December (Adelman 1995, 110). Non-embargoed oil, which came from the non-

Arab world, provided an additional supply cushion. There are no authoritative figures for how the embargo affected the oil trade, but most estimations fall within a close range. Total production in the Persian Gulf was 19.4 million barrels per day in September 1973. At the peak of the embargo, that number fell to 15.4 million barrels. The output from other world producers, many of which shrewdly upped their prices to take advantage of the stratospheric market, added around 900,000 barrels per day. Thus, around 3.1 million barrels per day were taken from the world market on average during the embargo. The lost oil amounted to approximately 5 percent of daily world consumption and 10 percent of global trade volume (Maugeri 113).[17] Inventory figures at the end of the embargo made it clear that there was still oil to spare. Heating oil stockpiles in the United States were higher in January 1974 than they had been a year earlier. West German inventories also increased over the second half of 1973 (Adelman 1995, 115).

There was no question that the embargo pressurized the market late in the year. Production cuts had occurred, resulting in an aggregate loss of oil—there also was no question of that. There had been shortages of gasoline at retail outlets, which had spawned lines of people and automobiles waiting their turn to fill up. Relative shortages of specific grades of fuel hamstrung efforts to refine sufficient quantities of product on schedule. But the overwhelming consensus was that these retail shortages were due to bad domestic economic policy, not an actual shortage of crude (Ibid. 112). Price controls and allocations, put in place by the Nixon administration in an attempt to benefit consumers, turned out to have the opposite effect. Poor information and the disruption of established trade networks, "overlaid by rabid and violent emotions," were at the heart of

[17] Yergin puts these figures slightly higher. He calculates that the net loss of supply constituted 9 percent of the total barrels per day relative to the quantity supplied in September 1973, or 14 percent of the total global trade volume.

the crisis. Compounding it all, in one analysis, was the "inevitable tendency to exaggerate the loss" (Yergin 2008, 614). The endless parade of forecasts over the previous few years predicting unmitigated demand growth over the next several decades heightened fears about the magnitude of the future shortage in store.

Had the embargo been a success? Had the Arab producers effectually wielded the "oil weapon," as they had threatened to do? The embargo had indeed succeeded in raising the market price of oil—there was no doubt of that. Buyers' fears of a lack of oil set off a wave of precautionary demand, which sent the price of oil up. Then OPEC, having ignited the fear with its threats of future cutbacks, ratcheted up the posted price of its benchmark crude. Raising posted prices locked in the high prices that it had instigated through its threats. In so doing, they had unquestionably placed a severe burden on the net-importing countries. But the embargo had failed to bring about the political objectives for which it had been initiated—namely, to quash foreign support for Israel and reclaim Egypt's lost territory in the Sinai.

Ultimately, what many failed to realize at the time was that a "selective embargo," as it had been conceived, was impossible to implement. Try as they might, the Arab allies lacked the power to cause a real shortage of oil in a group of countries of their choosing. The reason was fairly simple. The oil trade is a complex network of producers, transporters, refiners, and retailers, woven together by a sleepless horde of brokers and traders. An embargo by a select, though influential, group of producers could not truly target a discrete group of nations. The producers could take oil off the world market, and so raise the price generally and even cause a general shortage of oil, but it could not focus the shortage in any particular country or group of countries. The retail oil market drew its

supplies from wherever in the world it could find them; it was neither obligated, nor restricted, to source oil from any particular producer. A rather poetic description of the world oil market likens it to "a sea, drawing water from many rivers, each with its own tributaries, and whatever the course it follows, all water will ultimately find its way to the sea" (Maugeri 113). In the heat of the moment, however, this fact was lost on most all American politicians. As Kissinger would reflect years later, "The structure of the oil market was so little understood that the embargo became the principal focus of concern. Lifting it turned into almost an obsession for the next five months.[…] In fact, the Arab embargo was a symbolic gesture of limited practical importance" (Kissinger 873). Yamani, Saudi Arabia's key decision maker on oil policy, would later make a similar concession. The embargo "did not really imply that we could reduce the imports of oil to the United States," he admitted. "The world is really just one market. So the embargo was more symbolic than anything else" (Quoted in Taylor and Van Doren). Whether the key parties involved believed the embargo was mere symbol, at the time of the embargo itself, is difficult to judge.

The oil crisis of 1973 had a tangible effect on the international energy order and, just as importantly, on the Zeitgeist of the 1970s United States. The institutional results of the 1973 scare are straightforward and yet profound in their implications for the future of oil supply. For one thing, the political rallying cry of "energy independence," which survives to this day, was born in 1973. In a November 7 broadcast, Nixon took to the airwaves to call for a new era in American energy policy. "Let us set as our national goal," he declared, "in the spirit of Apollo, with the determination of the Manhattan Project, that by the end of this decade we will have developed the potential to meet our

own energy needs without depending on any foreign energy sources" (Nixon). Although few considered it a credible goal, the speech was the first articulation by an American president of an energy mindset that is profoundly significant to this day.

Another effect of the 1973 crisis was the creation of the International Energy Agency (IEA) in 1974. Kissinger lauded the IEA as an institution capable of countering OPEC, even overcoming it. Formally, the IEA was an association of the most powerful net-importing countries. Although only a research hub and technical forum in its early years, it would grow to constitute a formal institutional means whereby participating states managed an emergency stockpile of oil to guard against future supply disruptions. In the United States, the crisis had inflamed public distrust of the oil companies. Highly publicized Congressional investigations in 1973 and again in 1974 revealed widespread distrust of the their motives and practices, as well as Washington's dislike of them. Press reports went as far as to question whether the oil "strike" had been a global conspiracy by the oil companies, in league with the Arab nations, to defraud the consumer. According to the theory, oil multinationals had secretly plotted with the Arab nations involved to carry out the embargo as a means of lining their own pockets. The Senate investigation of 1974 looked into that very question, among others. It ultimately decided against the conspiracy theory.

Opinion polls and other surveys of the American public taken during 1973 – 74 provide invaluable insight into popular views of the energy situation. Gallup polls never found the public to rank energy among "important problem facing the nation" until 1974 (Gallup Jr.). Before then, no substantial effort appears to have been made to quantify American opinions on the subject. Once energy issues crossed a threshold of public

attention, public opinion regarding it received much greater scrutiny, as evidenced by the number of polls that attempted to gauge it. Media interest in public opinion about energy issues would remain strong throughout the 1970s, but especially in times of "crisis." A Harris survey from April 1973 is among the earliest on record that focuses specifically on energy. Among poll respondents, a full 51 percent believed that "the U.S. was running out of oil and natural gas." 47 percent of respondents described the 1973 – 74 "energy crisis" as "very serious." Another 30 percent called it "somewhat serious." When asked what they believed to be causing the crisis, a plurality (75 percent) attributed the situation to the "expectation of sharp price rises in the cost of gasoline and heating and air conditioning." According to 20 percent of respondents, the reason for the energy crisis was that "large companies are conspiring to raise prices through scaring the public." Only half of those surveyed believed that "U.S. know-how is so good we'll find enough energy to meet our needs without a lot of trouble." Others believed that permanent scarcity or permanently higher prices were in store (*Washington Post*, July 26, 1973; Isser 245).

Perhaps most importantly, the 1973 crisis catalyzed the emergence of OPEC as a powerhouse in most every aspect of global oil affairs. In 1974, OPEC controlled just over half of world crude production, as they would do for the remainder of the decade (Maugeri 121). Having seen their power over the importing nations and the multinational oil companies, the OPEC nations were newly emboldened in their dealings with the oil companies operating within their borders. Kuwait nationalized the Kuwait Oil Company, a BP-Gulf joint venture that owned the Kuwaiti concession, in 1974. Venezuela nationalized its oil industry, which Exxon and Shell had dominated since the 1930s. As of January 1, 1976, it became the Petróleos de Venezuela, or PDVSA. The next domino to

fall was the crown jewel of the oil world—Aramco in Saudi Arabia. The Saudi government took control of 60 percent of the company in June 1974, cautiously choosing to finalize full nationalization on a rolling basis until completion in 1981.

But beyond the dramatic changes to the world oil landscape that the events of 1973 ushered in, the crisis had caused a second alteration to the energy issue in the United States. It was perhaps more subtle, but ran just as deep, and had tremendous implications for future oil price volatility. This second change was a change in national attitude—in national psychology, so to speak. The turmoil of the early 1970s was exceptional: war, violence, political scandal, collusion, profiteering. The Watergate scandal marked a new low in the nation's public confidence in its elected officials. (The last crisis of such magnitude, arguably and quite ironically, had been the Teapot Dome scandal). The gas lines of 1973 were tangible evidence to the world of an American economy turned on its head. They were a vivid symbol of a new dependence and insecurity for the average consumer. As Yergin puts it:

> In the United States, the shortfall struck at fundamental beliefs in the endless abundance of resources. These were convictions so deeply rooted in the American character and experience that a large part of the public did not even know, up until October 1973, that the U.S. imported any oil at all. But inexorably in a matter of months American motorists saw retail gasoline prices climb by 40 percent—and for reasons they did not understand. No other price change had such visible, immediate, and visceral effects as that of gasoline. Not only did motorists have to shell out more money to fill their tanks, they also passed stations that upped the price of gasoline as often as once a day (Yergin 2008, 616-7).

The price of oil was not like the price of other assets. It was more visible, more attention-attracting, and awe-inspiring than other goods. Skyrocketing gasoline prices caused

public worry—not just about pocketbooks, but also about the future of the superpower nation.

The uncertainty the oil crisis had caused the American public to feel, of which the relentlessly elevating price of oil was both symptom and cause, seemed to corroborate the gloomy oil forecasts of both past and present. The Club of Rome, which had chastened the West for its unsustainable economics in 1972, appeared prescient. The authors of *Limits of Growth* had foreseen an era in which the price of non-renewable resources would rise uncontrollably as supply slipped away for good. Now, the world appeared to have crossed the point of no return. E. F. Schumacher, author of the 1973 *Small is Beautiful*, had warned the West that economic growth and industrial bigness was taking it in the wrong direction and could have dire consequences. He had expressed worry over the perpetual rise in oil demand across the globe. Now, that demand appeared to have exceeded the bounds of nature after all. "The party is over," Schumacher famously announced to the world (Quoted in ibid. 616). The findings of a public opinion survey, commissioned by the Nixon administration about its popularity among American voters, revealed the depth of the strain the crisis had place on the nation's sense of well-being. There were "incipient signs of panic" among the public, the report found. "People are growing fearful that the country has run out of energy. A combination of circumstances has shaped an unstable mood compounded by misinformation, mistrust, confusion, and fear" (Quoted in ibid. 618). Even the Shah of Iran believed that the oil industry's days were numbered. In private correspondence with Nixon in December 1973, he chastised the United States' role in world consumption of oil, a "noble product," at a rate that would "finish" it in "30 years' time." The old order of energy—sufficient oil at a low

price—was over. "[Americans] will have to realize that their terrific progress and even more terrific income and wealth based on cheap oil is finished. They will have to find new sources of energy. Eventually they will have to tighten their belts" (Quoted in ibid. 626). That time appeared to be at hand.

Predictions of impending shortage kept coming. In fact, the volatile markets of 1973 had spawned a proliferation of a relatively rare commodity in the oil world up to this time—oil price forecasts. Government agencies, nonprofit organizations, private sector oil companies and consultancies, independent experts—a wide-ranging chorus of actors began issuing a growing number of prognostications regarding a wide range of topics related to the energy world (Brodman and Hamilton). *Oil and Gas Trends*, a monthly industry newsletter, summed up the burgeoning new field: "Everybody's doing it. There are now so many energy forecasts around that people have started compiling opinion polls based on them.[…] Among the most recent comparisons is the IEA's monograph entitled A Comparison of Energy Projections to 1985. Now the distinctive thing about opinion polls is that they tell you quite a lot about people's opinions and blessed little about the subject of their opining" (Quoted in Parra 218). The IEA publication to which the article referred culled figures from nearly 80 forecasts, which were all published between January 1977 and June 1978. Among the forecasters were the IEA, foundations (The Petroleum Research Foundation, The Rockefeller Foundation, et al.), corporations (Exxon, Shell, Sun Oil, et al.), U.S. government bodies (the CIA, Department of the Interior, et al.), foreign government bodies (Japan's Ministry of Trade and Industry, Canada's National Energy Board, et al.), among countless others. One major figure that most of the forecasts estimated was OPEC production in 1985.

Forecasts ranged from a low of 32 million barrels per day to a high of 49 million barrels per day. The average was 41 million barrels per day. The real number turned out to be 17 million barrels per day—well shy of the aggressive production schedule every forecaster believed OPEC would need to reach to prevent a worldwide oil shortage.

The reason for the development was simple: the price of oil, a figure of major economic importance to a host of groups worldwide, was making bigger moves than most anyone could remember. The days of cent-by-cent adjustments seemed distant; interested parties wondered whether the future held another 1973 in store. And, if so, a wise word about when and how much the price of oil would change was worth paying for so that they could prepare for it. The problems endemic to the growing number of oil price predictions were the same ones that had plagued earlier attempts. Technical difficulty, subjective judgments and assumptions, and the inherent unpredictability of major price factors, such as political developments, made the attempts at forecasting more art than science. As with more recent attempts at forecasting in financial markets, the tendency toward consensus was strong—though the consensus inevitably changed every so often.[18]

In the case of oil forecasting in 1978, a consensus had indeed developed, according to Yergin (2008, 671). In his analysis, the "central themes" of the forecasts displayed tremendous unanimity, despite disagreement over the particulars: "While Alaska, Mexico, and the North Sea would together add six to seven million barrels per day to world market by the early or mid-1980s, those new sources were expected to serve only as a supplement and a sort of modern-day Fabius, holding off and postponing, but not decisively banishing the inevitable day of shortage and reckoning." An assumption

[18] See the literature review for a detailed analysis of the literature on forecasting in financial markets, especially the empirically demonstrated tendency toward clustering or herding.

the forecasts shared—namely, that GNP growth rates determined energy consumption growth rates on a nearly perfectly positively correlated basis (the "Iron Law" of energy consumption)—was a key reason behind the similarity of the conclusions about oil demand growth the forecasts tended to reach. Because oil demand worldwide had been growing at about 4 percent per annum between 1976 and 1978, which the forecasts tended to extrapolate out over the next decade, it seemed reasonable to assume that energy demand growth would grow at a very similar rate. Such a trajectory would have indeed created an extraordinarily tight market, had it occurred (which it did not) and production figures proceeded as estimated (which they did not). Most forecasters saw another oil crisis occurring "within another decade or so hence, in the second half of the 1980s, when demand would once again be at the very edge of available supply." Even if physical supplies were sufficient, political factors could also constrain supply. The forecasts had a powerful influence over decisions of the parties involved, from government policymakers to oil industry leaders. The sway these predictions held over oil world in the 1970s would prove pivotal in the dramatic events that would occur in the world oil market.

Several forecasts made in 1977 and 1978 were especially notable. In April 1977, the CIA issued a report on the world oil situation that would be widely cited over the following few years. It stated that world oil demand would soon overwhelm production. OPEC could not keep up its current pace, the Agency argued, and the Soviet Union's best oil producing years were already behind it. All in all, oil would be scarce and quite expensive by 1985 (U.S. CIA). The fact that the CIA's name was behind the rather bleak forecast lent it credibility. Six months later, in October 1977, U.S. Secretary of Energy

James Schlesinger put the warning in even more dire terms, as reported in the *New York Times*. A "major economic and political crisis in the mid-1980s" was on its way, "as the world's oil wells start to run dry and a physical scramble for energy develops" (*New York Times*, Oct. 6, 1977). An IEA assessment of the future of oil, published in 1977, saw no end in sight to OPEC's control over the West's supply within the next ten years. The Middle East's control over the political economies of the greatest net oil importers had no end in sight. The reality would prove to be quite different (Broadman and Hamilton 1-15). By 1985, OPEC would be obliged to cut production to half of what it had been in 1979 as a result of market miscalculations and a lack of internal discipline. The Rockefeller Foundation also issued a warning to the world about the dire future of oil supply. The end of sufficient supply was near, it foresaw. The global market was "heading toward a chronic tightness, even severe shortage, of oil supply" by the late 1980s. It continued: "The world community could be confronted by an unprecedented situation. Available oil supplies will be insufficient to sustain economic growth and achieve political and social objectives or even, perhaps, to maintain existing standards of living" (Rockefeller Foundation).

These gloomy visions evoke the contemporary national mood of the latter half of 1977 through 1979. They came to typify the rampant pessimism about the future of the United States that prevailed during the years of the Carter presidency. In the words Dr. Francisco Parra, the 1968 Secretary General of OPEC:

> What gripped Carter's imagination was the dreaded pincer movement of rising U.S. demand for oil and declining domestic production. The inevitable result would be rapidly increasing imports, made all the more dangerous because it spelled growing dependence on the Middle East. This scenario was set in context of

> a world supposedly running out of oil, even eventually in the Middle East (253).

Carter's "unpleasant talk," regarding the looming oil catastrophe, as he called it in the speech's opening line, was nationally televised on April 18, 1977. His address highlighted his desire to wean the United States economy off imported oil. Though disturbing and fearful, the essence of his message was corroborated by a substantial body of expert opinion regarding what the future held for an increasingly oil-dependent nation. President Carter opened his remarks by calling the energy situation "a problem unprecedented in our history." It was as though this was the first oil scare the nation had faced. He went on:

> With the exception of preventing war, this is the greatest challenge our country will face in our lifetimes. The energy crisis has not yet overwhelmed us, but it will if we do not act quickly. It is a problem we will not solve in the next few years, and it is likely to get progressively worse through the rest of this century.[…] We could use up all the proven reserves of oil in the entire world by the end of the next decade.[…] If we wait, we will live in fear of embargoes.[…] Our factories will not be able to keep our people on the job with reduced supplies of fuel.[…] If we fail to act soon, we will face an economic, social, and political crisis that will threaten our free institutions (Annals of America).

It was a dark speech, and yet Carter was hardly alone in worrying over the near future of American energy. The mindset of shortage was "unshakeable" in 1978, Parra would later write.

If such thinking had primed the American public for an oil crisis, the political turmoil of 1979 and 1980 set a match to the gunpowder. The rolling wave of dramatic events would lift the price of crude and its products to their highest real levels ever. Without question, the major force behind the 1979 oil crisis was the Iranian Islamic

Revolution in Iran, which began in late 1978 and was consummated with Ayatollah Khomeini proclaiming a theocratic government in March 1979. The fall of the 50-year Pahlavi dynasty shook the Middle East. Khomeini rose to power on a broad-based popular revolution, marked by violent riots and fueled by the Shah's brutal attempts to repress the uprising. The revolution called into question the future of Iran's oil production, one of the largest oil producing nations at the time. Production in late 1978 accounted for 10 percent of the world total, at 5.5 million barrels of crude per day. It was the fourth largest producer in the world, surpassed only by the United States, the USSR, and Saudi Arabia. As the revolution in Iran took hold, with the Shah fleeing the country in January 1979, Iranian oil production crashed to the floor—just 40,000 barrels per day over the course of the month. Production would bounce back to 4 million barrels per day by April, but the damage was done. 5.5 percent of world oil demand was stripped from the world market at the apex of the crisis, causing, as a result of worldwide panic, prices to spike 150 percent higher (Maugeri 127).

The revolution was the first of a series of events that would trigger a new tension in world oil markets. Over the course of 1979 and 1980, a perfect storm of foreign policy catastrophe, in the eyes of the United States, threatened to overturn the very moorings of the international energy order. The near meltdown of Three Mile Island, a nuclear reactor in Pennsylvania, cast doubt on whether nuclear energy would ever be a viable substitute to oil. The occupation of the American Embassy in Tehran in November 1979 escalated tensions between Iran and the United States. An attack of radical Islamists on the Great Mosque in Mecca called into question whether Saudi Arabia would be the next country to fall to a popular revolution. The Soviet Union invaded Afghanistan in December 1979.

Given the shared border between Iran and Afghanistan, the war made U.S. policymakers wonder whether the move signaled the USSR's intent to capture the Persian Gulf's oil reserves for the benefit of the Communist world. On top of those events, the outbreak of the Iran-Iraq War in September 1980 denied the world oil market around 3 million barrels of oil from the two countries.

The crisis passed through two phases, according to several historians (see Parra 222-3; Yergin 2008, 685). The first phase lasted from December 1978 until the autumn of 1979. During this phase, a drastic reduction in Iranian production caused by the revolution, resulted in so little oil produced in the country that none was exported for several months. Other countries, most notably Saudi Arabia, boosted production to compensate for the lost Iranian production, although it could not fully make up the difference. Oil production in the free world fell by 2 million barrels per day from the last quarter of 1978 to the first quarter of 1979. The loss of supply triggered a panic buying as downstream operators hurried to put crude and products into storage. Storing oil in case prices went higher or a shortage of supply became prolonged lasted until storage facilities filled up and spot oil supply tightened. The second phase of the crisis began in the autumn of 1979, as spot prices for products and crude began to ease. While the Iran-Iraq war arrested the downturn in prices, pushing them higher for several months, they soon renewed their fall as demand was dropping and inventory was bursting at the seams. During the war, OPEC production was 4 million bpd lower in August 1980 than it had been at its peak in 1979 due to a fall in production from Iran and Iraq. The other OPEC member countries were able to supplement the lack of production from the two countries, however. Once their production began climbing to its pre-war levels, prices began a

decline that would last for the better part of a decade. The second phase of the crisis was thus over by the close of 1980. Whereas OPEC had been proactively steering the 1973 crisis, even instigating it through announcing cutbacks, the 1979 crisis was a much different scenario.

Six factors set off this second oil crisis of the 1970s, in Yergin's judgment. First, global oil demand had been on the rise for several years, and it was widely expected to continue unabated over the next decade. The market had been preparing for tight conditions in light of what appeared to be unyielding demand growth into the future. Second, contractual supply channels the world over had been destroyed by the Iranian revolution. The severing of Iran's production ties to the rest of the industry, if only short-lived, caused a domino effect of disruption among the complex ties of suppliers, producers, refiners, and transporters, among others, that existed in the gigantic world oil trade. The seamlessly integrated world of the Seven Sisters, broken by the wave of nationalizations in the 1970s, was now in complete tatters. Furthermore, additional nationalizations in 1979 and 1980 resulted in the major oil companies' share of trade volume falling by 10 percent between 1978 and the end of 1979 (Parra 228). Third, consuming-country governments did a poor job of cooperating with the major oil companies to ensure energy security. Fourth, many of the oil exporters exploited the upheaval to reap windfall profits. Opportunistic behavior on their part moved prices higher. Yergin goes as far as arguing that some producers "manipulated supplies to further agitate the market and gain additional revenues." Fifth, the "sheer power of emotion" led to exaggerated price movements. A potent blend of "uncertainty, anxiety, confusion, fear, [and] pessimism" underlay the behavior of the key parties in the crisis,

from producer governments to the American public. The reality of the crisis was not nearly as bad as it seemed in the moment, yet the emotions on which the panic turned were real. It appeared as though this crisis was the ugly realization of the previous years' gloomy forecasts. In Yergin's words, "What gave the emotions additional force was the conviction that a prophecy had been fulfilled. The oil crisis expected for the mid-1980s had arrived in 1979, the second phase of the turmoil unleashed in 1973-74. This was not a temporary disruption, but the early arrival of a deeper oil crisis, which would mean permanently high prices." Sixth, a lack of information helped turn a chaotic market into a panicked one. "If there had existed timely, credible, reliable, widely accepted data, companies would have recognized earlier that they were increasing stocks to an unnecessarily high level and that the underlying demand was weakening." Excessive stockpiling throughout the crisis amplified the price effects of the crisis. It heightened spot demand, which pushed prices higher, only to have prices come crashing down once production and inventories were greater than later demand warranted (Yergin 2008, 685-6).

The oil crisis succeeded in forging a fairly strong consensus among key leaders in the private and public sectors (in both exporters and importers) that a permanent shortage of oil had struck. James Schlesinger, departing from his post as the Secretary of Energy in the summer of 1979, opted to air his views on oil in a farewell speech: "Today we face a world crisis of vaster dimensions than Churchill described half a century ago—made more ominous by the problems of oil." It was a losing battle, in his view. "There is little, if any, relief in prospect. Any major interruption—stemming from political decision, political instability, terrorist acts or major technical problems—would entail severe

disruptions." In short, "The energy future is bleak and is likely to grow bleaker in the decade ahead" (Quoted in ibid. 698). Schlesinger would tell the *Wall Street Journal* in August 1979 that the Carter administration was quite sober about the impact of the energy crisis on the future of the nation. "Oil […] will no longer be available in increasing quantities to fuel the further growth of the world's economy. Prices will inevitably reflect the increasing pressures of demand against constrained supply." And then the kicker: "Quite bluntly, unless we achieve greater use of coal and nuclear power over the decade, this society just may not make it" (*Wall Street Journal*, August 23, 1979).

Private sector forecasts tended to agree. Exxon's 1979 annual report, which came out in the spring of 1980, foresaw "the balance between world energy demand and available supplies" being "precarious" in the following years. The old era of cheap oil was over. Now, "virtually all new petroleum reserves" would be "expensive to find and develop" (Quoted in Maugeri 130). A 1979 British Petroleum report on the oil crisis underway held that oil supply outside the Soviet bloc would peak by 1985, forcing supply levels to fall 25 percent lower in 2000 than they had been in 1979. According to Gallup poll findings of the American public over the course of the 1970s, the turmoil of 1978 and 1979 generated more worry about the energy situation than had existed since 1974. A greater percentage of respondents ranked energy as the "most important problem" facing the United States in 1979 than they had at any time since 1974, which constituted an all-time high. Inflation was the only problem more pressing in the minds of Americans in 1978 – 79. During the 1973 -74 embargo, Gallup polls found that a full 50 percent saw the "energy situation" as a "very serious problem," with another 37 percent viewing it as

“fairly serious.” The worry died down after the embargo ended, only to gradually build in 1975 and 1976. From then on, until 1980, roughly 40 percent of respondents described the energy situation as a “very serious” problem and an additional 40 percent as a “fairly serious” one (Quoted in Farhar et al 58).

Many viewed the events of 1979 – 80 as the first stage in a protracted drama of shortage and violence, rather than merely a discrete episode of panic. Kissinger did not believe the crisis would be over any time soon. “All the preconditions exist,” he would write on July 31, 1980, for “the next four to five years” to be a “period of crisis” (Quoted in Parra 223). The CIA, echoing its famous 1977 report, would make similarly bleak prognostications for world energy supply in reports published in August 1979 and May 1980. The 1979 report warned that “the gas lines and rapid increases in oil prices during the first half of 1979 are but symptoms of the underlying oil supply problem—that is, the world can no longer count on increases in oil production to meet its energy needs” (CIA). The truth was that in no country besides the United States, where gasoline was subjected to strict price regulation and a complex allocation scheme, did gasoline lines ever occur. In the 1980 report, the CIA wrote that “oil production is probably at or near its peak.[…] Simply put, the expected decline in oil production is the result of a rapid exhaustion of accessible deposits of conventional crude oil.” The oil situation would become stark enough to lead that war over natural resources appeared imminent: “Politically, the cardinal issue is how vicious the struggle for energy supplies will become” (U.S. Senate May 1980). A staff report to the U.S. Senate’s Committee on Energy and Natural Resources, “The Geopolitics of Energy,” would second the CIA’s view. It appeared three months after the Iran-Iraq War. “The world will witness a growing struggle to secure

access to oil through the end of this century and into the next. This gathering energy crisis deserves the highest priority in the councils of government. Few other problems are more complicated; few other problems will be more difficult to solve" (U.S. Senate December 1980).

The International Energy Agency also saw more trouble on the horizon. In mid-1980, it sounded a warning about an energy "gap" that would likely arrive in 1985. James Akins, the Nixon administration's voice in the wilderness before the 1973 crisis, raised his voice again in 1979 so that the country would escape the evil that was to come. Soon, he predicted, "we shall enter a period of permanent oil shortage" and "semi-anarchy in energy, with the richest and strongest of the consumers making bilateral deals with OPEC. When that day comes oil may no longer be offered for any amount of paper currency" (Quoted in Adelman 1995, 178).

The major net-importing economies, for which oil was such a vital resource—the United States, Europe, Japan—were not the only ones whose leaders were concerned about depletion. Even the leaders of the OPEC nations were highly fearful about the future of their own wells. In his comprehensive insider account of OPEC's mindset in 1979, Parra calls premature depletion its greatest fear in those days. According to him, this fear on OPEC's part was one of the driving forces behind its relentless refusal to lower posted prices and remove production ceilings during the oil crisis, despite the tightness of the market. Saudi Arabia refused to raise Aramco's production allowance beyond the 8.5 million-barrel-per-day limit it had set in 1978, well before the Iranian revolution. (They finally agreed to raise the production ceiling to 9.5 million barrels per day in the third quarter of 1979). The OPEC producers feared opening the faucet too

much, lest they might precipitate their own demise. For this refusal on their part "to be fully appreciated," writes Parra, "it must be seen against the background of an almost universal belief in industry and consuming government circles that energy would soon be in permanently short supply." These powerful producers feared military action against them by the West should they prove uncooperative, and yet they bristled at the thought of being forced to produce beyond their revenue requirements—that perhaps, "after a period of disorderly development, they would be left depleted and cast aside" (216-7).

Saudi Arabia had feared the early depletion of its reserves as far back as the early 1970s. A 1979 U.S. Senate Committee on Foreign Relations report, *The Future of Saudi Arabian Oil Production*, expressed skepticism about whether the Saudis could continue their production output. According to Parra, the Saudis took its words to heart. And the Saudis were not the only ones who feared imminent depletion. He cites a telling story that was in circulation among the OPEC countries at the time. Reportedly, "a group of Arab officials from Kuwait undertook a special visit to the ghost mining towns of the western United States to see their future for themselves. They returned, not surprisingly, shaken" (Parra 216-7).

The story of the 1979 – 1980 crisis was a small drop in production levels that resulted in a major market panic. Panic buying transformed a rather insignificant market disruption into a full-blown "crisis," roiling the world oil market. Production fell twice, for two entirely different reasons, over the course of the crisis. The first time, from January to March 1979, the revolution in Iran was responsible for the oil flow out of Iran ceasing. About 5 percent of world production volume failed to come to market during that episode. The second time occurred during the Iran-Iraq War in 1980, during which

those two countries exported 3 million fewer barrels (Maugeri 129). The truth in that case, however, was that other producing nations, especially Saudi Arabia, were more than able to make up for the diminished output from Iran and Iraq during the war.

Although these two events had the potential to truly damage world oil supply, had they worsened or spread, in reality only one of them even resulted in the net loss of oil supply. Panic over the prospect of future shortage—as old as the oil industry itself—had moved prices much more dramatically than the loss in supply merited. As Parra puts it:

> [No physical factors] explain the tripling of oil prices that took place within a period of months in the absence of any shortage of crude. The economic disaster that took place in late 1978 was a triumph of mind over matter, faith over fact and belief over the drumbeat of contrary evidence. Panic in a chaotic market swept everything before it, consumers, producers, companies, governments; but there was never a shortage of crude (218).

Stockpiling took place on a tremendous scale, both among retail and institutional customers. As Yergin writes, "It was the buyers, stunned by the unfolding spectacle and fearing a repetition of 1973, gripped by panic, who inadvertently made the shortage worse by building up inventories—as they had done in 1973.[…] It was the mechanism that drove the price from 13 to 34 dollars a barrel." The worst-case scenarios of the forecasters played themselves out in real time by means of a full-blown oil market panic. It was a run on the bank, so to speak—but instead of withdrawing cash, buyers withdrew oil, then hoarded it. Consumers all along the supply chain, believing higher prices and/or more shortage awaited them, bought as much oil as they could get their hands on. That way, should prices go up, as they expected them to, they could dump the barrels back on the spot market for a terrific profit. Motorists, industrial users, utilities, and refiners were all to blame. According to one estimate, a rush to build inventories and store gasoline

took a full 3 million barrels per day off world production volume. Thus, Yergin can justifiably assert "the panic of 1979-80 saw self-fulfilling, and ultimately self-defeating, prophecy on a truly colossal scale" (2008, 686-7).

As with all panics, the oil crisis had sown the seeds of its own demise. All of the inventoried oil and products would eventually have to come to market; it was expensive to keep them tied up. Spot prices rose sharply throughout 1979, finally peaking at almost $40 per barrel for Arabian Light crude toward the end of 1979. Inventories, filled obsessively beginning in 1978 with the first sign of trouble, were at an all-time high. The trouble was, demand was not keeping pace with forecasts. $40 per barrel near the end of 1979 slid to $32 one year later. OPEC began to take steps to moderate production, in line with reduced demand. Member countries brought production down from 32 million barrels per day in 1979 to 27 million barrels per day in 1980, and promised a further 10 percent reduction over the course of 1981. Spot prices continued to trend downward. They briefly spiked to $41 per barrel in the Persian Gulf with the outbreak of the Iran-Iraq War, but quickly returned to pre-war levels as other producers demonstrated their ability to make up for the supply shortfall. By mid-1981, prices appeared to have regained long-term calm. The crisis of 1979 – 80 was over. Consuming nations breathed a sigh of relief as market volatility subsided.

How had the American public viewed the oil crises? Did the average American believe the news of an oil shortage and the gloomy prophecies in the national media—or was she skeptical, perhaps even dismissive, of such claims? A body of polling data gathered by Roper, Opinion Research Corporation, CBS/New York Times, and Cambridge Energy Research Associates between 1974 and 1981 sheds light on the

question. Interestingly, two of those four polling organizations framed the question as a binary choice between believing that the oil crises were in fact caused by shortage or that the oil companies had conjured them up as a means of manipulating the global market for their gain. The Roper poll, for instance, asked those surveyed the following question: "Some people say there is a real shortage of gasoline and fuel oil because demand has outrun supply. Others say there really isn't a shortage of gasoline and fuel oil and the big companies are holding it back for their own advantage. What do you think?" The CBS/New York Times put it slightly differently: "Do you think the shortage of energy we hear about is real or are we just being told there are shortages so oil and gas companies can charge higher prices?" In the 22 surveys the four groups conducted between 1974 and 1981, respondents were asked if they believed the shortage was "real," whether they were "just being told" it was real, or whether they had "no opinion." The percentage of those surveyed who believed the shortage was "real" was ballooned from 18 percent in February 1974 to 61 percent in May 1977.

Belief in the reality of an oil shortage rose appreciably from February 1974 to a peak of 61 percent in May 1977, the month after Carter's first national address on the subject. It then declined to just 20 percent by March 1979. It did not rise above 36 percent (the October 1979 figure) for the remainder of the survey period, which ended in July 1981, as product prices began to fall considerably. The polls also revealed how deeply suspicious the American public was of the oil companies. A series of annual Roper polls from 1974 through 1979, which tried to gauge which group Americans felt was most responsible for the energy crisis, was solid evidence of that. Oil companies were viewed as more responsible for the crisis in every year's poll than any other

group—more than environmentalists, Congress, consumers, the Administration in power, or even OPEC (Richman 577; Isser 246).

But the price action was not over yet—at least not on the downside. In fact, it was just beginning. A fall in global oil demand, coupled with an increase in production for non-OPEC areas, was already underway. Demand decreased for two reasons. First, energy conservation efforts, which the developed world had begun putting in place in the mid-1980s, were starting to bear fruit. The Energy Policy and Conservation Act, passed in 1975, was a landmark reform. It mandated that the average efficiency of American-made passenger vehicles doubled within ten years. The mile-per-gallon requirement went from 13 to 27.5 by 1985, as stipulated. By 1981, it was already beginning to have a material effect on gasoline consumption in the United States. Second, demand for oil decreased as other energy sources were substituted for oil. The events of 1973 – 74 had catalyzed the switch. Nuclear power was taking the place of oil in generating electricity in the 1970s and early 1980s. Of the 243 nuclear plants in operation in 1980, 162 of them had been built in the 1970s. Yes, Three Mile Island did dampen American enthusiasm for nuclear energy. Yet, by 1990, nuclear power was producing nearly 3 times as much electricity worldwide as it had in 1980. All in all, the effect of energy conservation and energy-source substitution brought demand down abruptly by an astounding 6 million barrels per day from the 1979 peak (Mauger 134-6).

What was more, oil from non-OPEC areas was flowing into global supplies at a record pace and from a variety of new sources. The high price environment had spurred exploration and production in previously unprofitable regions around the world. Some required technical expertise that had not existed until recently. Although it had taken a

few years for the new wells to have a significant impact on demand, the oil did eventually come to market in scale. Fields in Alaska, the North Sea, Mexico, and the USSR were the principal sources of the new oil. Alaska's gigantic Prudhoe Bay, the largest oil field in North America, went into operation in 1977. By 1983, it was producing almost 2 million barrels per day, or nearly 20 percent of total output in the United States. Mexico had been all but given up on after the nationalizations there decades earlier. But the 1974 discovery of sizeable fields in southern Mexico and the loosening of the country's conservation policy changed that. Between 1972 and 1983, production jumped from 500,000 barrels per day to 2.7 million barrels per day. The North Sea oil fields, shared by Britain and Norway, also began producing. Discovered in 1970, the fields would climb to production of 3 million barrels per day by 1983. Production in the USSR also made tremendous gains. By 1981, it was up to 12 million barrels per day, an astounding increase of 40 percent over the 1973 figure (Ibid. 135-6).

The OPEC member countries, realizing that demand was falling and production from outside their countries was reaching the market in record volumes, struggled to act in a unified fashion to stabilize prices. At a meeting in October 1981, OPEC agreed on a benchmark price of $34. It hoped that by lowering the benchmark price it could successfully bring spot prices, which were drooping, in line with the higher posted prices. The expectation was the lowering prices would be a welcome sign to the market that demand was keeping pace with supply. The spot price continued falling, however, into 1982. OPEC decided to act more aggressively. In March, for the first time, it forged an agreement among its member countries to adhere to a strict production limit of 17.5 million barrels per day. No more producing beyond the agreed-upon quotas, the Saudis

ordered, which was set at 50 percent of 1979 production levels. Not long after the decision had been ratified, Iran announced that it would not abide by the production limit. Khomeini would produce as much oil as he desired. Iranian production, true to Khomeini's defiant position, raised production from 1.1 million barrels per day in March 1982 to nearly 3 million barrels per day by the end of 1982. But the problem was far worse than just Iranian disobedience. Many of the OPEC countries still sold as much crude as they desired on the spot market. Not surprisingly, the spot market sagged even further. OPEC tried to bring its benchmark price in line with the spot market to arrest the sliding market. It took the drastic step of reducing its posted price by $5. Arabian Light now stood at $29 per barrel.

OPEC struggled from 1983 through 1985 to hold back the onrush of oil to a market that simply could not bear supply in such quantities. North Sea oil, which had only begun flowing in significant quantities a few years earlier, was beginning to flood the market. Just the British portion of the North Sea fields was putting out more crude that Algeria, Libya, and Nigeria combined. The Saudis were forced to cap 1983 production at the lowest level it had been since 1970 in an effort to stem the tide. OPEC realized that its posted price was no longer realistic, given the potentially catastrophic overhang of supply. It cut prices from $34 per barrel to $29 per barrel in a March 1983 meeting in an effort to bring posted prices more in line with spot prices. But Yamani, ever fearful that OPEC had lost touch with market reality, did not believe that OPEC was doing enough to prevent an oil price crash. Saudi Arabia had been trying to do its part, cutting average daily production from 10.5 million barrels in 1980 to just 2.2 million barrels in May 1985 (Ibid. 135-6). And still the kingdom's oil leaders felt frustrated that

the other member countries were not matching their austerity. Iran and Iraq, perpetual antagonists, hamstrung efforts at consensus. Cheating on quotas was rampant.

Finally, Yamani and the Saudis appeared to have had enough of it. He announced at the Oxford Energy Seminar in 1985 that the kingdom would no longer shoulder the burden of price stability through restricting its own share of the pie. “Most of the OPEC member countries depend on Saudi Arabia to carry the burden and protect the price of oil. Now the situation has changed,” he declared. “Saudi Arabia is no longer willing or able to take that heavy burden and duty, and therefore it cannot be taken for granted. And therefore I do not think that OPEC as a whole will be able to protect the price of oil.” The Saudi leaders were fed up with having to reduce their share of the global crude market to prop up the price of oil. It was as though they were being forced to subsidize the bad behavior of their irresponsible peers at their own personal expense—and for several years now. They had had enough. The full implication of Yamani’s message would soon become clear.

Saudi Arabia, OPEC’s key swing producer, began to open the spigots. It also adopted netback pricing, a pricing system that directly relates upstream prices to those of refined products. The formula “fixed the price of oil at the sum of its costs of production, transport, and refining, plus a predetermined profit for buyers.” The result was “no less turbulent and dramatic than the crises of 1973-4 and 1979-81 had been.” A “Third Oil Shock” was at hand. Only this time, much to the dismay of producers and joy of consumers, “all the consequences ran in the opposite direction” (Yergin 2008, 750). Many in the oil world had seen the previous years’ market conditions as a bad omen. Some, such as Yamani, had even opined that the writing was on the wall—the oil market

was headed for a crash. Still, the severity of the crash and the abruptness with which it materialized were stunning. The price of West Texas Intermediate collapsed from $31.75 per barrel in November 1985 to just $9.83 per barrel in July 1986. U.S. refiners acquired crude in 1986 for less than half the real price they had in 1985, and less than a third of what they had paid in 1981. Dubai oil struck bottom at $7 per barrel (Parra 287; Maugeri 139). Prices bounced back and forth as producers tried to retake the reins. By September 1986, prices had risen to $14.36, only to drop back to $13.33 in November (Isser 170).

The volume of surplus oil was not exceedingly large—OPEC production during the first four months of 1986 was on average 9 percent higher than 1985 production—and yet the additional 3 percent in supply it constituted had finally broken an already leaky dike. The tables had turned. Exporters, rather than importers, were in the precarious position of worrying over where to place their oil and how their revenue stream would be affected. As prices spiraled downward, buyers were locked in a race to the bottom, a feedback loop of price collapse. Oil producers could not contain the chaos. They tried to structure contracts in innovative ways to lock in market share at a price they could countenance. They tried netback deals, spot deals, spotback deals, barter deals, processing deals, "topping off" deals, all in an existential fight for a dependable future revenue stream (Yergin 750-1). The OPEC nations had good reason to be worried about their state coffers. OPEC revenue in 1985 was only a quarter of what it had been in booming 1980, when the figure had reached a record $275 billion (Maugeri 139, 296). Prior to OPEC's rise to power in the 1970s, various means had existed to stop this very thing—overproduction—from occurring. Now, no such institutional mechanism existed. There was no Texas Railroad Commission, Seven Sisters, or John Rockefeller to put

things back in place, as their had been in earlier times. Prices reeled, mostly downward, as a result. OPEC official prices even ceased to be, for the time being.

Prices may have been bouncing everywhere, but predictions of shortage, abundant just a couple of years earlier, were nowhere to be found. Their well had run dry—at least for the time being.

Findings and scholarly contribution

This section summarizes the key findings from the case studies relative to the three key research questions driving the study and the theoretical propositions put forward in the Methods section. It analyzes the implications of the findings for existing theoretical debates, particularly Shiller's (2000, 2005) concept of new era economic thinking as a behavioral phenomenon that has manifested itself during periods of soaring equity markets. It also argues for the relevance of the concept of narratives of decline, whose usage as a theoretical lens has thus far been limited to the realm of critical literary theory, to the concept of new era economic thinking and the behavioral finance scholarship on cognitive biases and heuristics affecting investor psychology.

Findings

Recalling the three fundamental research questions motivating the study serves as a useful starting place for this discussion. These were, first, what precedent exists in the United States for the wave of expert predictions and apparent public fear of an imminent, irreversible global oil supply shortage that has emerged since the 1990s, most vividly as the so-called "Peak Oil" movement? The second question derives from the first: do these historical episodes of heightened fear over the future of oil supply bear any relationship to short-term conditions in the oil market at the time? If so, under what market conditions, if any, have these fears appeared to emerge, thrive, and decline? The third and final question is, to what extent is the link that Shiller (2000, 2009) draws between the spread of what he terms "new era economic thinking" and coincidental booms in financial markets applicable to the apparent historical coincidence of short-term price

conditions in the oil market and coincidental prophecies of permanent oil shortage? How do these historical episodes from the oil market contribute to our understanding of the social, cultural, and psychological forces that attend asset price booms?

Based on these three questions, three corresponding theoretical propositions were derived. The first of these propositions was that certain periods of American history have witnessed a significant degree of expert prediction and public belief regarding an oil supply shortage since the origins of the industry in Pennsylvania, as Yergin (1991) identifies. The second was that tight market conditions are more likely to lead to predictions of an imminent, irreversible shortage of oil, and that as the market loosens, those predictions should become less frequent. In this formulation, relative market tightness, or beliefs regarding the future direction of market fundamentals, is a necessary but not sufficient condition for a significant increase in the number and frequency of predictions of a long-term shortage of oil and concurrent higher prices. That the reverse should hold was also hypothesized. The third and final proposition was that the connections that Shiller (2000, 2005) draws between the proliferation of what he terms "new era economic thinking" in American society regarding the future of the economy and coincidental booms in the nation's financial markets have some degree of applicability to the apparent historical coincidence of short-term price conditions in the oil market and coincidental prophecies of permanent oil shortage.

These propositions can be evaluated in light of the data from the case studies. With regard to the study's first proposition, the case studies strongly support the conclusion that public expressions of worry over and expert predictions of near- and long-term shortages of oil have indeed at times been a defining force in the national

conversation about the future of oil supply. These shortage fears have not been evenly distributed chronologically over the course of the twentieth-century oil industry, but rather have occurred in waves, with the frequency, time horizon, and urgency of the predictions and worries reaching a sort of critical mass during three approximate periods: the First World War and the 1920s, the Second World War and remainder of the 1940s, and the 1970s and first half of the 1980s. While contemporary popular media during these periods evidence the fact that strong concern over the future availability of oil was a matter of local and everyday concern for normal Americans across various regions of the country, it is clear that such fears were also a lively force in policymaking and energy-related discussion within the upper echelons of government, including presidential administrations, the Department of State, the United States Geological Survey, the Central Intelligence Agency, and top officials in the country's armed forces. In all three of the case studies, the forecasts of experts – whether from the United States government, academic institutions, the oil industry, or merely self-appointed learned men – were a widely circulated force in igniting broader fears and tended to serve as a respected reference point for subsequent like-minded claims during the period. In all three of the case studies, the oil industry, whether through the American Petroleum Institute or company executives, vocally derided many of these narratives and the quantitative evidence on which they were based.

Regarding the study's second proposition, the evidence from the case studies shows that many of the most salient predictions of an imminent, irreversible shortage of oil actually preceded periods of true supply tightness by several years. Then, once supply-demand fundamentals tightened and prices rose accordingly, these recent

predictions received greater attention and a growing chorus of similar predictions of and expressions of fear regarding an impending long-term, even permanent, oil shortage followed suit. This pattern occurred prominently at least once in all three cases. In the first case, the United States Geological Survey's Day Report, released in 1909, although moderately well publicized at the time it was published, only grew to receive enormous attention in the national press, among national policymakers, and among subsequent forecasters of shortage once the First World War and the technological innovations of the 1920s brought about a meteoric rise in the country's demand for oil and a coinciding tightening in the crude oil market. In the second case, Harold Ickes, Franklin D. Roosevelt's Secretary of the Interior and point man on oil issues throughout the war, was pilloried in the national press in 1941 when "the beginning of a sharp and serious drop in supplies" that he forecast failed to materialize. But as oil demand boomed during World War II and the remainder of the 1940s, his vociferous insistence that a severe oil shortage was on the horizon became an influential voice in Washington policy circles and was widely echoed by various parties between 1944 and 1948. In the third case study, the Club of Rome's *Limits to Growth*, published in 1972, assumed its status as an icon of the zeitgeist of the 1970s United States only after the 1973 oil crisis, after which a flood of bleak oil prophecies proliferated in the country's media and even extended to supply forecasts by Western oil companies. Notably, however, in all three of the cases, the oil market reverted from tightness to glut within the space of no more than two decades from these notable forecasts, and the frequency of the appearance of such shortage predictions in the American media dropped off markedly, and in some cases nearly disappeared altogether until the market eventually tightened again.

In terms of the third proposition, all three of the case studies reveal that the empirical association between the relative tightness of the oil market, and the attendant upward movements in oil prices, and the frequency, urgency, and influence of expressions of belief in and predictions of an imminent, irreversible shortage of oil in the United States tended to closely match the theoretical link that Schiller (2000, 2009) draws between stock market booms and the simultaneous proliferation of instances of new era economic thinking in American media. However, the case studies also show noteworthy divergences from and additional key aspects of the empirical link between these two variables that Shiller describes.

To assess whether the association between new era economic thinking and market conditions holds in the oil market, as Shiller argues that it does for comparable episodes of periods of high equity market valuations in the twentieth-century United States, it is necessary to specify the essential characteristics of new era economic thinking. New era economic thinking, in Shiller's conception, has six key components. It is 1) a "popular perception" that 2) "the fundamentals of the economy have or are undergoing a change that will lead asset prices to continue rising […] for the foreseeable future (and perhaps perpetually." When these stories take hold, 3) the general public "misses the basic similarity between the latest stories and similar stories that have appeared many times in the past." New era thinking 4) "concentrates attention on the effects of events currently prominent in the news" rather than positing future alternative scenarios. New era theories are 5) post hoc in nature, emerging only after a stock market boom begins rather than as an entirely predictive theory of future economic behavior. Finally, a 6) positive feedback loop arises between rising price levels, which spawn sweeping theories justifying the

booming markets, and the new economic theories themselves, which support further price rises and more belief in the theories.

While the first two case studies show strong evidence of five of the six elements of new era economic thinking that Shiller describes, the third case study clearly portrays all six elements. In the first two case studies, there is no evidence of the sixth element of new era thinking – namely, that a feedback loop existed between new era economic thinking regarding a shortage of oil and a boom in oil prices. There is evidence in the two case studies that the prevalence of new era economic thinking on the oil issue tended to rise and fall in association with fundamental supply-demand conditions in the oil market. Tracing the link between oil price activity and the prevalence of new era economic thinking—the link asserted by Shiller—is problematized in all three case studies by the fact that the market-related oil pricing system was not in place during the time period in question. Regarding the fifth element of new era thinking, all three cases reveal a notable difference from the pattern that Shiller describes. Rather than being post-hoc, the most widely cited and influential new era predictions tended to occur prior to the shortage (and corresponding boom in prices) that they declared was on the way. These statements, made in times of relative market softness, were generally ignored until the market tightened and they began to appear prescient. Then, as fundamentals appeared to bear them out, they were cited by a chorus of like-minded new era thinkers, who echoed these earlier predictions.

In the first case study, covering 1909 through 1927, a host of national publications, including major newspapers and newsweeklies, trumpeted the fact that the country was “facing a crisis such as it has never faced before” with regard to the

availability of petroleum products (*Los Angeles Times*, 27 Dec. 1914). The convening of Senate hearings on the matter confirms newspaper accounts that a "scare" had "gotten into circulation," according to the *New York Times* in Jan. 1918, due to "recent announcements that there was a scarcity, with worse to come" (*Christian Science Monitor*, 18 Sep. 1918). The remark by the president of the American Petroleum Institute in 1920, lamenting the fact that the "public has frequently been alarmed by statements of well-meaning and learned scientists predicting an early exhaustion of our petroleum resources," reveals that these concerns were indeed popularly held (*Oil and Gas Journal*, 3 Dec. 1920). These and similar accounts point to the existence of the first two elements of new era thinking during this period.

There is little mention of any prior scares during this period, in keeping with the third characteristic of new era thinking, although Yergin (1991), Carnegie (1920), and Fanning (1950) show conclusively that similar panics had occurred in the closing decades of the nineteenth century. What is more, the news media of the day made little effort to portray differing points of view on the subject, although oil company representatives, industry spokesmen, and independent geology experts were sometimes cited. Typically, however, their views were discounted as biased as a result of their commercial background, and the specter of the almighty John D. Rockefeller was seldom far from the public imagination. This failure to give similar attention to alternative views of future oil supply in the popular press fits the fourth element in new era economy stories.

Within the context of the first case study, the data show that while the fifth element of new era thinking was present in this episode (although with a critical distinction), the sixth was not. The USGS's 1909 Day Report, whose fear-inspiring

conclusions were given special weight due to the explicit backing of the federal government, and the tireless work of George Otis Smith, director of the USGS, were not followed by a proliferation of similarly dire predictions until the oil market tightened dramatically at the outset of the First World War. Thus, in contrast to the dynamic Shiller describes, some of the most influential new era predictions were actually made prior to the market's tightening and oil prices moving upward. But, crucially, these predictions did not receive widespread attention until the market subsequently tightened. Only after the market had tightened considerably and prices had risen to apparently alarming levels were they joined by a flood of similarly dire predictions of exhaustion.

With regard to the sixth element of new era thinking, there is no evidence that a feedback loop existed between new era economic thinking and oil price activity in the first case study, but the prevalence of such thinking was associated with fundamental supply-demand conditions in the oil market. While ample evidence of new era thinking exists in the case study, as detailed already, no data from the case study provides support for concluding that these beliefs pushed oil prices upwards. This finding is relatively unsurprising, given that the crude oil pricing system that existed in the United States at the time covered in the first case study was governed by the posted price system, which was governed by Standard Oil (and its successor entities after Standard's court-order breakup in 1911). In the posted price system that prevailed throughout the time period covered in the first case study, public perceptions of current or future shortages did not necessarily translate into higher product prices. The pricing of crude oil and refined products was not necessarily affected by public perceptions of supply-demand fundamentals, but was administered and controlled by the Standard companies. The

common practice among retailers during this era was to accept the crude and product prices posted by the Standard companies as the market price. What is more, the Standard companies were loath to revise their posted prices downward or to adjust prices quickly due to shifts in the cost of refined products or demand unless there was clear evidence that the fluctuation would endure. This system is discussed in detail in the case study. Clearly, this system differs fundamentally from the twentieth and twenty-first century equity market in the United States, which is the market on which Shiller's analysis is based. No evidence exists of the Standard companies manipulating prices based on these waves of public fear or of physical oil being hoarded by firms or members of the public in order to take advantage of these shortage fears, although these groups certainly would have had the financial incentive for such actions.

It is apparent from the case study, however, that the prevalence of new era thinking regarding the future of oil tended to increase as fundamental supply-demand conditions in the oil market tightened. The early 1920s are a clear example of this association between physical market conditions and examples of new era thinking in the national media of the day. With oil prices as high in 1920 in real terms as they had been in the two decades prior and crude having spiked from $12 in 1915 to around $30 in 1920 (2008 USD), public worry over oil depletion reached a fever pitch. An account from the *Wall Street Journal* is one of many, during this time of severe market tightness as automobiles took to the streets in record numbers, that captured the intense fear that gripped the country: "There has been true anxiety in the public mind over the fuel question, in some cases bordering on despair. There have been legitimate grounds for such apprehensions, and doubtless it was greatly accentuated by those who find their

harvest in the extremity of others" (27 October 1920). Alarm bells were sounding at full pitch. "It is not impossible, and perhaps not improbable, that children now living will in their old age tell their grandchildren of […] an evil-smelling liquid called gasoline used for the propulsion of automobiles," an article in a July 1920 *Outlook* wrote, citing a recent prediction by the Director of the Bureau of Mines that domestic oil reserves would be exhausted in 20 years' time (21 July 1920). "The United States is face to face with a near shortage of petroleum supplies, so serious in character that it threatens the very fabric of the nation," wrote the *Los Angeles Times* (23 September 1923).

The same five elements of new era economic thinking present in the first case study were also exhibited in the second case study. As for the first two elements, the documentary evidence presented in the case shows that concern among the American public, federal officials, and the top brass in the armed forces over an imminent, irreversible shortage of crude oil supply flared up between 1943 and 1948. From the Secretary of the Navy's 1943 prediction that the "last drop" of the country's oil would be drained "within 14 years" to an *Oil & Gas Journal* article lamenting that "it is apparent that millions of consumers are convinced that a permanent shortage exists in this country" (March 1994) to a House Armed Services Committee report published in May 1948 imploring listeners to "carry this thought away with you above all others […] – this nation is in a grave situation with respect to its petroleum," it is abundantly clear from the data that the shortage fears took in national officials as well as some portion of the general public. Of the many shortage prophecies that appear in the case study, many refer not to an absolute shortage of global crude supply, but rather that the country's indigenous production would not be able to meet all of its consumption needs going

forward. Still, given how unpalatable many government and military leaders found that emergent reality—mainly for geostrategic reasons—the prospect of becoming a net importer did appear to presage a new era of higher prices and a need for developing synthetic fuels.

What is more, the historical record shows evidence that these new era predictions did at times include an explicit forecast of a long-term, if not perpetual, increase in the price of oil, although the price controls in place between 1942 and 1946 would have made such predictions relatively uncommon during those years. In 1935, for example, the American Chemical Society predicted a "new era of scarcity and high prices" that would arrive sometime between 1940 and 1943. "When prices go up, they will stay up," the Society warned. The new era would arrive "long before the total exhaustion of American oil fields" (*Science News Letter*, August 1935). It is vital to recall, however, that for much of the time period the case study covers, petroleum prices were not governed by the posted price system, as they were in the first case study—let alone driven by relatively pure fundamental supply-demand forces. Rather, the wartime Petroleum Administration for War, which enjoyed expansive powers between 1942 and 1946 to regulate the American oil industry, determined prices and allocated physical oil volumes. The PAW only raised petroleum prices twice during its four-year existence, in an effort to contain inflation. Thus, given the near complete unresponsiveness of oil prices to market realities, it is hardly surprising that predictions of higher prices in the future were not a common element of new era thinking during much of the 1940s.

The second case study also shows that the third and fourth elements of new era economic thinking were present during the supply scares of this period. The vast majority

of the news and other media coverage regarding the purported impending oil shortage facing the United States from 1941 through 1948 did not point out any similarities between the current wave of fear and the one that had occurred only two decades prior, despite their many similarities. Both were overwhelmingly due to the failure of domestic oil supplies to respond immediately to a war-driven spike in demand, which put pressure on domestic production. Both caused the federal government, including the nation's military leaders, to fret over the security implications of inadequate access to oil supplies should another such war break out. Yet one major difference between the two episodes was the degree to which, by the 1940s, the concern of the government officials was generally that the country would become a "have-not nation" in oil—in other words, that it would become a net importer, an unthinkably dangerous and likely costly development, in the view of the federal government's energy officials—rather than that the entire world was running out of oil. Neither price nor technology could help the matter, either. Rather, the problem "was believed to lie in the nature of the resource itself—the absolute quantity of petroleum available" (Wildavsky and Tenenbaum, 101). The federal government's decision to assist oil majors in gaining greater access to foreign oil concessions was largely rooted in these beliefs.

The second case study, however, does reveal how vociferous the corporate leaders and official representatives of the oil industry tended to be in their condemnation of the various shortage predictions that were made. The industry's relatively cornucopian views tended to receive far less press than the more pessimistic predictions, however. When they were aired, they tended to find space in the industry's own trade journals, rather than in the popular press, which likely sharply limited their public impact. Many examples of

this antagonism between the oil industry and those who preached shortage can be found in the second case study. For example, in 1935, several oil industry leaders discredited the American Chemical Society's prediction of a "new era of scarcity and higher prices" as "exaggerated" (*Science News Letter*, 31 August 1935). In 1943, one of the Standard Oil Company's chief scientists, responding to the Society's 1935 prediction, judged that it would be at least 300 more years "until oil runs out of this earth" (*New York Times*, 26 September 1943). Consider further an editorial in the *Oil & Gas Journal* in March 1944, which sought to disabuse the "millions of consumers" in the country of the idea that "a permanent shortage exists in this country."

Many other examples of the oil industry acting as a robust, if unpopular and little cited, opposition to those who claimed an irreversible shortage of oil can be cited from the case. Later, in 1946, after the chief of the State Department's Petroleum division told the public in a radio broadcast that "I'm no prophet and I don't propose to get into a statistical battle. But I think it's safe to say that by 20 years from now, we shall have to import close to half the oil we consume" (U.S. State Dept., "Our Foreign Policy," 17 August 1946). The *National Petroleum News* countered that it "does not believe that any disastrous shortage of oil supplies will be on us tomorrow" (*National Petroleum News*, 21 August 1946). In 1947, as fears of a "gasoline famine began to cause a panic, the industry pushed back hard against "the statement that there is an immediate danger of our running out of oil." As the president of the Independent Petroleum Association of America told the *Christian Science Monitor*, "in fact, there is no shortage of oil. Discoveries of new reserves are continuing" (17 July 1946).

The oil industry was correct in declaring that the so-called gasoline famine was not due to an irreversible shortage of oil that had struck the nation, but rather insufficient infrastructure to transport the quantities of crude and products being demanded by consumers during the post-war economic boom. The president of Standard Oil of New Jersey, Eugene Holman, assured the National Press Club in 1948 that "putting it plainly, there is no shortage in oil." He continued: "I say this while fully aware of the great attention being given to supply difficulties, and also knowing that some people accuse me of being an optimist on the supply situation. I think there is a great deal to be optimistic about" (Fanning, 200). In May 1948, after the House Armed Services Committee had released a report claiming that the nation's oil reserves would be exhausted in about 12 years, the American Petroleum Institute's director of oil and gas told the *New York Times* that "such predictions ignore history, discount the vigor and enterprise of the petroleum industry, and underrate the driving force of competition." Indeed, barring another world war, he confidently proclaimed, "the American public in the years ahead would receive a more abundant supply of better petroleum products at lower relative costs than it has ever known" (*New York Times*, 7 May 1948). He was right.

In terms of the fifth element of new era economic thinking, the second case study shows that two of the most influential and widely cited shortage predictions during this period were actually made when fundamental supply-demand conditions in the market were fairly loose. Then, as the market tightened, other forecasters followed suit en masse. In essence, a very small number of new era predictions were not in fact post hoc, as Shiller describes them, but rather ex ante. But once market conditions appeared to move in their favor, a wave of like-minded thinking hit the national media. In the case study,

the American Chemical Society's 1935 prediction of a "new era of scarcity and higher prices" in oil came at a time of relative market softness. It did not generate almost any press at the time it was made. Likewise, Secretary of the Interior Harold Ickes, who had warned Roosevelt that a declining ratio of proven US reserves to annual production as early as 1941, was dismissed and derided by critics as "hot-headed Harold' – the Cassandra of Washington – until 1943, when the demands of World War II caused many of his peers to begin to believe that he was, in fact, right. By July of 1943, *Time* magazine, and many others, were airing breathless predictions, made by government leaders and other purported oil experts, of the nation's crude reserves being depleted in as few as 14 years (5 July 1943).

There is no compelling evidence in the second case study of the sixth element of new economic thinking—namely, that a positive feedback loop existed between oil prices and public perceptions of increased oil scarcity. No loop existed because there was no direct mechanism for shortage fears to feed back into price. As noted earlier, domestic oil prices were set by the federal government of the United States, rather than the posted price system (let alone a market-related oil pricing system, as currently exists), from 1941 through 1946. The wartime Petroleum Administration for War enjoyed expansive powers between 1942 and 1946 to regulate the American oil industry, determine prices, and allocate physical oil volumes. Thus, given the extreme unresponsiveness of oil prices to market realities, it is impossible to identify any relationship between public perceptions of shortage and oil price activity from 1941 through 1946.

That said, the national fervor over a reported long-term shortage of gasoline that took place from 1946 through 1948, which the popular media tended to attribute to an

irreversible shortage of crude oil, certainly rose in tandem with booming oil prices. The correlation between the two is striking, even though no causal relationship is evident. This is a crucial point. Booming gasoline prices between 1946 and 1948 certainly appeared to stock public fears that the so-called "gasoline famine" was indeed a long-term reality. By 1948, crude oil prices reached more than double the 1945 levels set by the OPA, peaking at $2.57 in April 1948. Gasoline prices rose from $0.14 in July 1946 to $0.18 in December 1947 (Yergin, 1991, 391; Fanning, 382). The shortage of retail refined products "gave the Cold Ward oil scare support of a most sensational and urgent, if circumstantial, nature. It not only appears to the man on the street as if we *might* run short of oil but as if we *had*" (Fanning, 370).

A spike in these types of shortage predictions occurred simultaneously with a spike in crude oil prices. Between 1946 and 1950, prices at the wellhead had risen from $1.50 to $2.37 in Californian fields, from $1.70 to $2.65 in East Texan, from $1.62 to $2.57 at Midcontinent, and $3.55 to 4.10 in Appalachian (Williamson, 1963). The price rise prompted a number of Congressional inquiries and worried statements from national political leaders, which made the long-term situation appear all the more dire. In the words of the Secretary of the Interior, J. A. Krug, which appeared in the *Christian Science Monitor* in February 1948, "Today's oil shortage is not just temporary – it's for keeps, and it's going to get worse." In fact, in even more terror-inspiring language, Krug made the following statement: "It's finally happened – the thing geologists forecast for a quarter century and which the petroleum lobby said wouldn't occur for a hundred years. America's demand for oil finally outdistanced supply. […] The time has come when we cannot depend on natural petroleum alone to meet our needs" (16 February 1948).

In the third case study, which analyzes the time period from 1970 to 1986, all six elements of new era economic thinking are evident. The first two elements of Shiller's conceptualization of new era economic thinking are both strongly apparent in the documentary history of the period. A formidable set of forces combined in the 1970s to ignite intense supply fears that ebbed and flowed into the mid-1980s. Soaring demand caused the spare production capacity of American oilfields, once the marginal supplier to the Western world, to disappear by 1971. A handful of key producer countries, sensing their own geostrategic import to the West and tired of abiding by multinationals' posted prices, formed the Organization of Petroleum Exporting Countries (OPEC) in 1960, eventually prompting a wave of nationalizations in the 1970s.

Amid these tensions, two oil crises during the 1970s caused government and public worry over permanent oil shortages to reach a fever pitch, the first in 1973 and later from 1979-80. The 1973 crisis was sparked when a group of Arab nations declared an embargo on oil exports to the United States in retaliation for Washington's support of Israel in the Yom Kippur War. The episode (particularly the retail fuel outages that ensued) had a tangible effect on the international energy order and on the Zeitgeist of the America of the 1970s. For the rest of the decade, predictions of an imminent, irreversible shortage of oil supply were ubiquitous in government, industry, and academic circles. Surveys suggested that the American public was increasingly under the impression that the country was "running out of energy." The fears would only worsen during the oil crisis of 1979-80, caused by the Iranian Revolution and the onset of the Iran-Iraq War. To many, this crisis appeared to be the fruition of the foreboding predictions made

throughout the preceding decade. In the rush by consumers to build emergency stockpiles, the crisis became a self-fulfilling prophecy, and spot prices spiked as a result.

Expert predictions of a looming "energy crisis" first appeared in 1969, and grew extremely common over the next decade, from the dire warnings of the U.S. State Department and the gloomy prophesies of the Club of Rome to countless other official public-sector forecasts from around the world and even various long-term industry supply estimates. James Akins, the State Department's Middle East expert and later advisor to Presidents Nixon and Carter, announced in 1969 that "by 1975 and possibly earlier, we will have entered a permanent sellers' market, with any one of the several major suppliers being able to create a supply crisis by cutting off oil supplies" (Yergin, 1991, 591). He would repeat that prediction of crisis loud and clear throughout the decade. The Club of Rome, for its part, foresaw in 1972 oil being in perpetually short supply by the mid-1990s, which would result in a free-falling of the world's population after it peaked in 2050 (Meadows, 1972). The Central Intelligence Agency in each year of the latter 1970s, President Carter in 1977, U.S. Secretary of Energy James Schlesinger in 1977, the Rockefeller Foundation in 1978, James Akins in 1979 – all struck a similar note: "The energy future is bleak and is likely to grow bleaker in the decade ahead" as the country entered "a period of permanent oil shortage" (*Wall Street Journal*, 23 August 1979; *Genie*, 1995). Indeed, the Carter administration saw the oil issue "in the context of a world supposedly running out of oil, even eventually in the Middle East" (Parra, 2004). A host of other pessimistic new era predictions spanning the 1970s and spilling over in the early 1980s, published in the major American newspapers and periodicals of the day,

could also be cited. Space does not allow for the new era predictions to be summarized here, given the enormous volume of literature written in that vein during this period.

Data from public opinion surveys make plain the fact that perceptions of an imminent, irreversible shortage of oil were widely held among the American public. A body of polling data gathered by Roper, Opinion Research Corporation, CBS/New York Times, and Cambridge Energy Research Associates between 1974 and 1981 sheds light on how the public viewed oil supply issues in the 1970s. A Harris survey from April 1973 is among the earliest on record that focuses specifically on energy. Among poll respondents, a full 51 percent believed that "the U.S. was running out of oil and natural gas." More than 75 percent of respondents described the 1973 – 74 "energy crisis" as either "very serious" or "somewhat serious" (Isser, 1996). The Roper poll, for instance, asked the following question: "Some people say there is a real shortage of gasoline and fuel oil because demand has outrun supply. Others say there really isn't a shortage of gasoline and fuel oil and the big companies are holding it back for their own advantage. What do you think?" The CBS/New York Times put it slightly differently: "Do you think the shortage of energy we hear about is real or are we just being told there are shortages so oil and gas companies can charge higher prices?" In the 22 surveys the four organizations conducted between 1974 and 1981, respondents were asked if they believed the shortage was "real," whether they were "just being told" it was real, or whether they had "no opinion." The range of "real" responses jumped from 18 percent in February 1974 to 61 percent in May 1977. According to the polling data, belief in the reality of a prolonged oil shortage hit an all-time high of 61 percent the month after President Carter presented his famously gloomy perspective on the subject in early 1977.

Regarding the third and fourth element of new era economic thinking, there is no mention in any of the source material from the American popular media from 1970 to 1986 of any of the prior oil shortage scares. Their absence is quite striking. The waves of fear of an imminent exhaustion of oil that rolled across the country during the close of the nineteenth century, the 1910s and 20s, and the 1940s were totally missing from popular discussion of the "oil crisis" during the 1970s. That is not to say, of course, that everyone was taken in by the shortage argument. Certainly not. But those who adamantly opposed the neo-Malthusian view of natural resource economics, such as Adelman (1972) and Stiglitz (1974), were featured in academic venues, not the popular media. These neoclassically rooted economists rejected the assertion that scarcity limits would be a significant constraint on the long-term growth frontier (Solow, 1974; Dasgupta and Heal, 1974). They found little persuasive in the Club of Rome's report (see Beckerman, 1972 and 1974). But these scholars were at the fringes of popular discussion, which tended overwhelmingly to discuss the country's oil situation in dramatic, intense, and sharply negative terms.

With regard to the fifth element of new era economic thinking in the third case study, the historical data reveal a pattern that departs notably from the one Shiller proposes but matches closely the one observed in the other two case studies. Two new era predictions -- the first being those of the State Department's director of the Office of Fuels and Energy, James Akins, which began in 1969, and the second the Club of Rome's *Limits to Growth* in 1972 – were made at a time when the real price of oil (Arabian Light posted at Ras Tanura in constant 2010 USD) had been trending steadily downward since 1947 (BP Statistical Review, 2011). Akins, for instance, "repeatedly warned that the

world would risk running out of oil in a few years if there was not an immediate shift to other sources of energy" (Maugeri, 2006). The Club of Rome, for its part, calculated the world's remaining oil reserves to be 550 billion barrels, foresaw oil being "scarce" by the mid-1990s, and all non-renewable energy sources going all but extinct by 2050 (Meadows, 1972). In fact, prices in the Persian Gulf hit an all-time low of $1.21 per barrel in 1970 (Adelman, 1993). Although global demand had indeed grown sharply in the 1960s, jumping from almost 19 mb/d in 1960 to more than 44 mb/d in 1972, the relatively unfettered access to the major producing regions that the Seven Sisters enjoyed until the wave of nationalizations in the early 1970s had resulted in a well-supplied market, despite the extinction of the United States' spare production capacity in 1971. So it was not, in fact, in a climate of booming oil prices that these two notable predictions were made.

It was the case, however, that these predictions gained mainstream notoriety and were widely echoed only after oil prices had shot upwards. As Yergin (1991) rightly observes, the public's attention to *The Limits to Growth*, and the unsettling effect it had, occurred only after 1973, when its dire predictions appeared to be coming true (569). Indeed, Akins, whose classified policy proposals fell on deaf ears in the State Department from 1969 through 1972, appeared to contemporary observers to be completely vindicated by the dual oil crises of the 1970s. The oil crisis of 1973-74 saw oil prices shoot upwards from around $15 in 1975 to more than $96 in 1980 (2010 USD). The tidal wave of new era predictions that are detailed in the case study occurred within this market climate of tightening supply-demand fundamentals, widespread public fear over the future of the country and world's resource base, and a dramatic leap in oil prices in

the United States. These instances of new era economic thinking typified the kind of post hoc analysis that Shiller cites as the fifth element of such thought patterns. Yet they sometimes referred back to, and certainly followed closely in the vein of, the pre-price boom predictions of Akins and Meadows, which became the rallying cries of the decade's subsequent disciples of prolonged shortage.

The third case study is the only one of the three cases in which something akin to a positive feedback loop appeared to exist, in brief intervals, between new era predictions of an impending, prolonged oil shortage and oil prices. These intervals occurred during the two so-called "oil crises" that took place in 1973-74 and 1979-80, respectively. The association that Shiller posits between the prevalence of new era beliefs and a boom in prices is clearly identifiable during these episodes and are corroborated by leading secondary interpretations of these crises. Unfortunately, the historical data are not granular enough at the level of individual market participants to allow for a robust micro-level analysis of whether beliefs in or predictions of a new era of prolonged shortage were the proximate cause of a significant portion of market demand for spot during these episodes. Nevertheless, it is clear that fear of future shortages fed demand for petroleum among both commercial and speculative buyers during these times of extreme market uncertainty. It is also clear that the broader economic, social, and cultural context in which these periods of panic buying occurred was largely defined by widespread public and expert predictions of a prolonged, if not permanent, shortage of oil facing the United States. This observation would suggest that the shortage fears known to have been playing into market participants' behavior during the crises may be directly traceable to the larger new era thinking in widespread circulation at the time.

In 1973-74, any certainty over the future of oil—its price, the quantity that would (or even could) be supplied down the road, the true extent of the embargo—vanished in the hectic environment of October through December 1973. Rumors and stories—some true, others not—about the price points of oil products for various transactions flew among traders, executives, producers, consultants, brokers, and the media. In one observer's words:

> Talk of market-oriented prices vanished. No one knew what "the market" was, or where it was going, or how it could serve as a guide for the cartel's price. In fact, the market was still thin. It was not institutionalized. There was simply no solid reference point, just a bunch of disparate deals erratically reported in the trade press. People's knowledge of the market was confined to the deals they did themselves, what they read in the trade press (not necessarily accurate and almost always with insufficient detail), and what they could glean from their business and personal contacts (information to be treated with great caution) (Parra, 12).

Some of the demand for crude and its derivatives was "precautionary," in the words of Adelman. No one knew how bad the crisis would get, and no one wanted to be caught on the wrong side of the shortage. The crisis was "driven by the fear of dearth" by those consumers who would suffer if future production did not meet their commercial needs (*Genie*, 110). In this sense, the buying of spot oil was a sort of "expensive insurance" against an unknown, but highly dubious, future supply flow. As a result, more and more oil—though still only a small percentage of total transactions (less than 3 percent)—was being purchased on the spot market rather than through long-term contracts at official posted prices. In Yergin's assessment, the "fear and uncertainty pervasive" at the time "had a self-fulfilling effect: both oil companies and consumers frantically sought additional supplies not only for current use but also for storage against future market

shortages and the unknown" (Yergin, 615). As they bought against the chance of shortage, the price rose.

Other demand was more speculative in nature. The fact was, the short-term elasticity of demand for oil meant that OPEC was making more money by cutting back on volumes and selling it at a much higher price. OPEC could "sell less and still earn more." Taking that into account, buyers feared that OPEC had the frightening incentive to keep production down permanently. They had reason to worry that the embargo was merely the first chapter in an era of permanent shortage and hence higher prices (Yergin, 614). Seen in this light, not all "panic buying" was as irrational as the word "panic" would suggest. Rather, from the speculator's standpoint, it was a directional bet in favor of the possibility of higher prices later on, at which time the contracts or even the physical oil could be resold (*Genie*, 110). Were OPEC to raise the price again, speculative oil bought at the close of 1973 might have been sold at a sensational profit. Fear of the future loss of supply moved the market in a gravity-defying way.

In the third case, the story of the 1979 – 1980 crisis was a small drop in production levels that resulted in a major market panic. Panic buying transformed a rather insignificant market disruption into a full-blown "crisis," roiling the world oil market. Production fell twice, for two entirely different reasons, over the course of the crisis. The first time, from January to March 1979, the revolution in Iran was responsible for the ceasing of the oil flow out of Iran. About 5 percent of world production volume failed to come to market during that episode. The second time occurred during the Iran-Iraq War in 1980, during which those two countries exported 3 million fewer barrels (Maugeri, 129). The truth in that case, however, was that other producing nations, especially Saudi

Arabia, were more than able to make up for the diminished output from Iran and Iraq during the war.

Although these two events had the potential to truly damage world oil supply, had they worsened or spread, in reality only one of them even resulted in the net loss of oil supply. Panic over the prospect of future shortage—as old as the oil industry itself—had moved prices much more dramatically than the loss in supply merited. As Parra puts it:

> [No physical factors] explain the tripling of oil prices that took place within a period of months in the absence of any shortage of crude. The economic disaster that took place in late 1978 was a triumph of mind over matter, faith over fact and belief over the drumbeat of contrary evidence. Panic in a chaotic market swept everything before it, consumers, producers, companies, governments; but there was never a shortage of crude (Parra, 218).

Stockpiling took place on a tremendous scale, both among retail and institutional customers. As Yergin writes, "It was the buyers, stunned by the unfolding spectacle and fearing a repetition of 1973, gripped by panic, who inadvertently made the shortage worse by building up inventories—as they had done in 1973.[…] It was the mechanism that drove the price from 13 to 34 dollars a barrel" (Yergin, 686-7). The worst-case scenarios of the forecasters played themselves out in real time by means of a full-blown oil market panic. It was a run on the bank, so to speak—but instead of withdrawing cash, buyers withdrew oil, then hoarded it. Consumers all along the supply chain, believing higher prices and/or more shortage awaited them, bought as much oil as they could get their hands on. That way, should prices go up, as they expected them to, they could dump the barrels back on the spot market for a terrific profit. Motorists, industrial users, utilities, and refiners were all to blame. According to one estimate, a rush to build inventories and store gasoline took a full 3 million barrels per day off world production

volume. Thus, Yergin can justifiably assert “the panic of 1979-80 saw self-fulfilling, and ultimately self-defeating, prophecy on a truly colossal scale” (686).

As with all panics, the oil crisis had sown the seeds of its own demise. All of the inventoried oil and products would eventually have to come to market; it was expensive to keep them tied up. Spot prices rose sharply throughout 1979, finally peaking at almost $40 per barrel for Arabian Light crude toward the end of 1979. Inventories, filled obsessively beginning in 1978 with the first sign of trouble, were at an all-time high. The trouble was, demand was not keeping pace with forecasts. $40 per barrel near the end of 1979 slid to $32 one year later. OPEC began to take steps to moderate production, in line with reduced demand. Member countries brought production down from 32 million barrels per day in 1979 to 27 million barrels per day in 1980, and promised a further 10 percent reduction over the course of 1981. Spot prices continued to trend downward. They briefly spiked to $41 per barrel in the Persian Gulf with the outbreak of the Iran-Iraq War, but quickly returned to pre-war levels as other producers demonstrated their ability to make up for the supply shortfall. By mid-1981, prices appeared to have regained long-term calm. The crisis of 1979 – 80 was over. Consuming nations breathed a sigh of relief as market volatility subsided. By July 1986, WTI would bottom out at $11.58.

Given these findings, this study makes three major arguments. First, the proliferation of vivid, widely disseminated instances of new era economic thinking – which Shiller (2000, 2005) demonstrates accompanied the major speculative booms in American equity markets over the course of the twentieth century – has also accompanied periods of extreme supply tightness and rising prices in the American oil market.

Whereas Shiller conceptualizes new era economic thinking as excessive optimism about the future, the present study shows that, in the case of these oil scares, the reverse was true: excessive fear over the apparent waning of global oil supply became an entrenched narrative that in some cases appeared both to justify recent price increases and to herald a prolonged or even permanent rise in prices in the future.

Second, new era economic narratives about the oil market tend to contain a strong normative element, which is omitted from Shiller's conceptualization of the new era phenomenon. These moral judgments – in particular, condemnation of the oil industry's perceived degradation of the natural environment and propagation of unsustainable anthropological practices – have often intertwined with predictions that the oil supply was more limited than widely believed and that prices were destined to continue rising.

Third, in the case of oil supply scares of the 1940s and the 1970s, the oil shortage narrative fed into, and was in turn fed by, a much larger narrative built on fears of the permanent decline of the relative power of the United States – primarily at the hands of the Soviet Union in the former period and by a defiant band of key oil-exporting countries in the Middle East in the latter. This finding suggests that the concept of narratives of decline, as formulated by Bennett (2001) and Lieber (2008), constitutes a powerful lens through which to understand trends in popular opinion with regard to asset price movements, which has gone unrecognized.

The case studies also provide an empirical illustration of the conceptual link between new era economic thinking, à la Shiller, and narratives of decline. As stated in the literature view, a narrative of decline is a message expressing the "conviction that the culture of a nation, a civilization or of humanity itself is in an irreversible process of

decline" (Bennett, 2001). Conceptually, it is the pessimistic yang to the new economic yin that Shiller describes, or the notion that the "popular perception that the future is brighter or less uncertain than it was in the past" (Shiller, 2000). Narratives of decline take the form of a popular perception that the future is darker or more uncertain than it was in the past. The social mechanisms underlying the transmission of narratives of decline mirror those that drive new era economic thinking in Shiller's conception of the latter. Like new era economic thinking, narratives of decline originate, grow, and eventually wane through the social exchange of information. News stories, academic research, best-selling books, public speakers, word-of-mouth communication, and other modes of transmission can all carry messages popularizing a particular decline narrative.

Bennett's political-economic narrative of decline can be seen as the flip side of Shiller's new era economic narrative—the former the depth of pessimism, the other the height of optimism. A close analysis of Bennett's political-economic decline narrative shows that it contains at least five of the six essential characteristics of Shiller's new era economic narrative, although one of them is the mirror image of that contained in the new era narrative. Like new era economic narratives, narratives of decline are 1) a "popular perception" that 2) "the fundamentals of the economy have or are undergoing a change that will lead asset prices" to shift course "for the foreseeable future (and perhaps perpetually)." But whereas new era economic narratives posit a continual rise in asset prices, decline narratives see the economy heading continually downward, similarly, "for the foreseeable future" and even permanently. Moreover, narratives of decline 4) "concentrate attention on the effects of events currently prominent in the news" rather than positing future alternative scenarios. Furthermore, these narratives are 5) post-hoc in

nature, emerging only after a polity or economy begins to slide, on a relative or absolute basis, rather than being a predictive theory of future course of events.

While new era economic narratives and rising price levels contain a positive feedback loop, according to Shiller, Bennett draws no explicit link between the popularization of decline narratives and concurrent asset price movements. Perhaps more fundamentally, and in contrast to Shiller, Bennett sees decline narratives as reflections of, rather than influences on, the societies in which they are popularized. Thus, while a worsening economy may cause a political-economic decline narrative to proliferate, the narrative itself does not necessarily have any effect on real-world political-economic conditions, according to Bennett.

Bennett shows that a purported impending irreversible shortage of non-renewable resources played a leading role in tales of environmental decline in the United States in the second half of the twentieth century. In 1968, Paul Erlich argued in *The Population Bomb* that traditional energy sources, like oil and coal, simply could not sustain the world population growth trajectory. High prices for such resources would be the first result of the population squeeze; total extinction of the resources would follow on its heels. As a result this resource scarcity, a worldwide famine would ensue before the year 1985, he predicted. Erlich had a hard time reconciling what he viewed as indifference from elected officials and the public to what he foresaw as a doomsday scenario. John Leslie, in *The End of the World*, echoed his view in a statement that was typical of the period: "At least in the near future, a population as little as ten billion could be expected to cause desertifications and famines, intolerable water scarcities and levels of pollution, which virtually guaranteed wars."

Global warming also featured prominently in public worries over the future of the planet. By the mid-1990s, scientific consensus held that carbon dioxide was the primary cause of global warming. Fossil fuels were thus the main culprit of the warming trend, which many view as capable of unlimited damage to mankind and potentially in too late a stage to arrest. The oil industry, and those who supported its products, bore much of the blame in these accounts. As Bennett writes, "Implicit in the narratives […] was a fundamental critique of a global civilization and economy built on the foundation of fossil fuels and synthetic chemicals."

The case studies provide an empirical illustration of the conceptual link between new era economic thinking regarding the United States oil supply and other societal narratives of decline. In two of the three case studies, an oil shortage narrative fed into, and was in some instances fed by, broader narratives of other aspects of societal decline in the United States. From 1909 to 1926 and again from 1970 to 1986, widespread predictions of and belief in an imminent, long-term oil shortage in the United States sprung from similar worries over the fate of the country's (and in the case of the 1970s, the world's) natural environment more generally. In the third case study, a positive feedback loop existed between neo-Malthusian worries of an impending global oil shortage and prevalent fears among the American population that the country had begun a long-term political-economic decline.

The first case study shows that the oil shortage narrative that arose during that era was prompted in part by the influence of the American conservation movement, which warned of a new era of environmental decline and resource scarcity unless the nation improved its stewardship of its natural wealth. The relationship between the two

narratives was readily identifiable to contemporary observers, as an editorial in an oil industry trade journal in 1916 illustrates: "The fear that there may not be a sufficient supply of oil for transportation and industrial purposes is groundless" was one of the "many objectionable matters [that should] be charged up to the conservationist movement," *Oil and Gas Journal* proclaimed. "Practical oil men" could not be fooled by forecasts that were no more than "fanciful guess work."[19] Perhaps unsurprisingly, the author of the editorial was hardly sympathetic to the objectives and claims of the American conservation movement, given its frequent opposition to the business practices of the oil industry during these decades. But link the author posits between the conservation movement's narrative of environmental decline and the closely related oil shortage narrative that developed contemporaneously was very real.

Understanding the intellectual foundations and claims of the conservation movement helps illuminate how it gave rise to widespread worries over an impending shortage of exhaustible resources. The scriptural texts of the conservation movement, many of them from the American Romantic school of thought, often sought to dislodge the quintessentially American view of the natural world as an endless source of plenty, vast beyond belief and bountiful beyond risk of exhaustion. *Man and Nature*, written by George Perkins Marsh in 1864, was the most direct call to the American people to reform their approach to natural resources. He emphasized the role that the depletion of natural resources of all kinds—forest, oceans, minerals, soil—played in causing the collapse of the classical civilizations of the Mediterranean. And so, he warned the burgeoning American Republic, awaits a similar fate any modern society that wastes its natural resources—a path, Marsh showed, the nation had already begun to travel down in its own

[19] *Oil and Gas Journal*, February 24, 1916, 2.

careless stewardship of its natural wealth. Marsh stressed that in a crucial sense, natural resources have no substitutes—once exhausted, they are gone forever, and are thus irreplaceable. As a result, resource endowments ought to be judged on the basis of their physical quantity, not their short-term financial value. Too little could mean too late. "The rottenness of private corporations," as he saw it, was an impediment to the safeguarding of nature's resources and could not be trusted to have the final word in their allocation and exploitation. Government intervention in the market for environmental goods was indispensable to the future of American society.

Public pressure mounted on government officials to enact stricter protections. "Scientific associations and government officials continue[d] to issue warnings," writes Williamson, echoed by "a veritable flood of magazine and newspaper articles and editorial comments pointing out the dangers of resource depletion and the necessity of preserving our national heritage."[20] Early actions by the federal government included the creation of Yellowstone National Park, the first of its kind in the world, in 1872, and the passage in 1891 of the Forest Reserve Act, granting the President of the United States the authority to set aside public land for conservations' sake. The movement found its most effectual political champion in President Theodore Roosevelt, who gave priority to the conservationist agenda during this tenure. "We are prone to speak of the resources of this country as inexhaustible; this is not so," he famously instructed.[21]

This environmental narrative of decline, which the American conservation movement popularized, was the primary impetus for the federal government's unprecedented efforts to quantify the country's oil reserves and warn the public of the

[20] Harold F. Williamson. "Prophecies of Scarcity or Exhaustion of Natural Resources in the United States." *The American Economic Review*. Vol. 35, No. 2. (May 1945), 102.
[21] H.W. Brands. *T.R. The Last Romantic* (New York: Basic Books, 1997). 624.

imminent, irreversible shortage of oil it was facing. During Theodore Roosevelt's tenure in the White House, the federal government took unprecedented measures to try to ascertain the extent of the country's non-renewable resources. The President was very concerned about the "the enormous consumption […] of resources and the threat of imminent exhaustion to some of them due to reckless and wasteful use."[22] On the back of the recent upsurge in popular support for the conservation agenda, the newly appointed of the nascent United States Forest Service sounded an alarm over the petroleum situation in a report he published in February 1909 through the National Conservation Commission, which he chaired. The USGS's so-called Day Report in 1909, which declared to the American public that the country's oil reserves would disappear in just a few years' time, was published in response to President Roosevelt's call for a study of the nation's resource base. The report was the first of many similar reports issued by various bureaus and agencies within the Department of the Interior that sounded a warning to the American people over the imminent decline of its crude oil supply. These government reports were enormously influential in public debates over the future of oil supply. The explicit backing of the federal government they enjoyed lent their findings an air of authority that few other studies, if any, could match.

In the third case study, from 1970 to 1986, a positive feedback loop existed between a narrative built around widespread predictions of and expressions of belief in an imminent, long-term oil shortage about to strike the United States and two other decline narratives. The first was a narrative of environmental decline, which foresaw a looming permanent despoilment of the world's natural environment at the hands of a neo-Malthusian mix of population overgrowth, corporate greed, and political

[22] Williamson, 102.

mismanagement. The second narrative was one of political-economic decline, which also became a defining vein of national discourse. This strand of thought emanated from a fear of the permanent decline of the relative power of the United States at the hands of both the Soviet Union and also a defiant band of key oil-exporting countries in the Middle East.

The notion that the world was running out of oil, a belief that became popularized in the United States during the 1970s, developed within the context of a broader shift of mindset in the industrial countries that gained traction in the mid-1960s and early 1970s: the environmental movement. Environmental issues were making their way to the forefront of American political consciousness, challenging deeply held views about man's relationship to the natural world and drawing attention to forces seen an anti-environment. "Big Oil" was considered chief among these no-good-doers, as it remains today. A number of pro-environmental policy campaigns were making headlines at this time. In 1967, the U.S. Senate overwhelmingly passed a clean air bill, following New York City's lead in limiting coal consumption in urban settings. Three years later, federal legislation mandated the use of environmental impact statements as a legal prerequisite for major development projects. Earth Day was also born in 1970, heralded by a parade of over 100,000 people in New York City in support of environmental awareness.

It was within the context of this environmental movement that the first alarms over an impending global oil shortage were sounded. *The Limits to Growth: A Report for the Club of Rome's Project on the Predicament of Mankind* is perhaps the best example of the kind of resource shortage argument that both fed into, and saw increased public receptivity as a result of, public concern over environmental decline. The report tapped

into public worry over the future of the environment by calling into question the sustainability of the modern industrial world. The tremendous public response worldwide to the study's cautionary message both reflected and fed widespread anxiety over the plight of mankind. Published in 1972, it presented a model of several historical trends—among them, industrialization, pollution, food production, mortality and fertility rates, resource depletion (including oil and natural gas)—from 1900 until 1972, then projecting them to the year 2100. The model's forecasts were sobering. Resource depletion would leave non-renewable energy sources all but extinct by 2050, by which time exponential growth in pollution and rapidly declining food availability per capita would result in an explosion in the death rate. Oil would be scarce by the mid-1990s. Then, after the human population had peaked in 2050 and began to decline precipitously, it would fall in half, having reached its "limit to growth." Industrial output per capita, pollution, services per capita, food per capita, and resource depletion would all level off at very low levels sometime between 2050 and 2100. A new stasis for the human population would settle in, defined by exceedingly low levels of non-renewable energy usage and food production would occur. The study did not predict the exact timing of future crises, but it did warn of the dangers of a hydrocarbon-based economy as unsustainable and soon to be exhausted.

What was perhaps most unsettling to the general public about *The Limits to Growth*, as Yergin (1993) points out, was that its dire predictions appeared in 1973 to be already coming true. The economy of the 1950s and 60s had indeed been booming on the back of escalating resource use, particularly in oil and natural gas. Not only had global demand for petroleum products risen noticeably, but the energy intensity of the industrial economies—in other words, the quantity of energy needed to fuel a unit of economic

output—had risen along with it. Just as the Club of Rome had predicted, energy sources appeared to be getting increasingly scarce. America's oil wells seemed to be running dry, having peaked in the lower 48 states in 1970. Imports were increasing as a percentage of domestic oil consumption, even as other nations were in greater and greater need of crude oil. Pollution was getting worse. And global population was rising, just as the authors had foreseen. The prophesied crises appeared to be just around the corner. All in all, the arguments of *The Limits to Growth* were a "potent element in the fear and pessimism about impending shortages and resource constraints that became so pervasive in the 1970s, shaping the policies and responses of both oil-importing and oil-exporting countries."[23]

The oil shortage narrative of the 1970s existed in a positive feedback loop with a second popular decline narrative that had currency in the United States at the time, which interpreted the country as beginning to slip into a long-term political-economic decline. The logic was simple: the loss of American access to ready supplies of crude oil, due to geological and geopolitical constraints, would inevitably lead to permanently higher prices for essential petroleum products domestically even as the country's demand for the products continued to soar. Higher energy prices would put a drag on the country's oil-intensive economic growth while transferring power and wealth to net-exporting and less oil-dependent nations, such as the OPEC member countries and the Soviet Union. As its relative standing in the world declined, the United States would be increasingly unable to exercise sway over the future trajectory of energy markets and over world affairs more generally, thus fueling its further decline. In this sense, the idea that the United States as a

[23] Yergin, 569.

political, economic, and military force was in decline, and the notion that the country faced a permanent shortage of oil, were mutually supportive narratives during the 1970s.

To a significant portion of Americans, including its top political leaders, the gasoline shortages and spiking oil prices that occurred during the 1970s were more than mere one-off inconveniences. Rather, they were symptomatic of an America whose power and prestige, relative to the other nations of the world, was waning. The country appeared to be losing its grip on world affairs—undermined by a recently emboldened OPEC, intimidated by the Soviet Union, and plagued by severe domestic economic ailments for which its political leaders had no remedy. Oil prices were the driving force behind some of these problems, such as inflation and malaise in the equity markets. But the so-called "energy crisis" of the 1970s also appeared to many to validate the popular narrative that the country was facing a long-term political-economic decline. After all, there did not appear to be any end in sight to OPEC, oil prices certainly did not appear to be headed downward any time soon, and the country's brightest minds and top brass, most notably President Carter, appeared completely powerless to help the situation. Indeed, they were some of the bleakest prophets to hit the airwaves during this gloomy chapter in American history.

The dramatic changes to the world oil landscape that the events of 1973 ushered in—to say nothing of the 1978-79 oil crisis—appeared to change in national attitude, in national psychology, so to speak. The turmoil of the early 1970s was exceptional: war, violence, political scandal, collusion, profiteering. The Watergate scandal marked a new low in the nation's public confidence in its elected officials. (The last crisis of such magnitude, arguably and quite ironically, had been the Teapot Dome scandal.) The gas

lines of 1973 were tangible evidence to the world of an American economy turned on its head. They were a vivid symbol of a new dependence and insecurity for the average consumer. As Yergin puts it:

> In the United States, the shortfall struck at fundamental beliefs in the endless abundance of resources. These were convictions so deeply rooted in the American character and experience that a large part of the public did not even know, up until October 1973, that the U.S. imported any oil at all. But inexorably in a matter of months American motorists saw retail gasoline prices climb by 40 percent—and for reasons they did not understand. No other price change had such visible, immediate, and visceral effects as that of gasoline. Not only did motorists have to shell out more money to fill their tanks, they also passed stations that upped the price of gasoline as often as once a day.[24]

The price of oil was not like the price of other assets. It was more visible, more attention-attracting, and awe-inspiring than other goods. Skyrocketing gasoline prices caused public worry—not just about pocketbooks, but also about the future of the superpower nation.

The seemingly perpetual rise in oil prices with which the country was trying to come to grips was not just about oil prices, or even about energy supply, for that matter. It was about national security; it was about America's standing in the world, especially relative to those countries who would seek to do it harm. The oil crisis succeeded in forging a fairly strong consensus among key leaders in the private and public sectors (in both exporters and importers) that a permanent shortage of oil had struck, and that as a result of that crisis, the nation was likely facing a long-term decline. James Schlesinger, departing from his post as the Secretary of Energy in the summer of 1979, opted to air his views on oil in a farewell speech: "Today we face a world crisis of vaster dimensions

[24] Yergin, 616-7.

than Churchill described half a century ago—made more ominous by the problems of oil." It was a losing battle, in his view. "There is little, if any, relief in prospect. Any major interruption—stemming from political decision, political instability, terrorist acts or major technical problems—would entail severe disruptions." In short, "The energy future is bleak and is likely to grow bleaker in the decade ahead."[25] Schlesinger would tell the *Wall Street Journal* in August 1979 that the Carter administration was quite sober about the impact of the energy crisis on the future of the nation. "Oil […] will no longer be available in increasing quantities to fuel the further growth of the world's economy. Prices will inevitably reflect the increasing pressures of demand against constrained supply." And then the kicker: "Quite bluntly, unless we achieve greater use of coal and nuclear power over the decade, this society just may not make it."[26]

The economic uncertainty that the oil crisis had caused the American public to feel, of which the relentlessly elevating price of oil was both symptom and cause, seemed to corroborate the gloomy oil forecasts of both past and present. The country's energy problems appeared to evidence that its best days were behind it, as President Carter infamously implied in his 1979 address. The Club of Rome, which had chastened the West for its unsustainable economics in 1972, appeared prescient. The authors of *Limits of Growth* had foreseen an era in which the price of non-renewable resources would rise uncontrollably as supply slipped away for good. By the end of the decade, the world appeared to have crossed the point of no return. The self-righteous warning the Shah of Iran offered confidentially to President Nixon in December 1973 is one of the best encapsulations of the common view in the 1970s that the world order was shifting away

[25] *Ibid*., 698.
[26] *Wall Street Journal*, August 23, 1979.

from the United States; an exhaustion of oil reserves, as he saw it, was both cause and effect of the decline of the decadent West. He chastised the United States' role in world consumption of oil, a "noble product," at a rate that would "finish" it in "30 years' time." The old order of energy—sufficient oil at a low price—was over. "[Americans] will have to realize that their terrific progress and even more terrific income and wealth based on cheap oil is finished. They will have to find new sources of energy. Eventually they will have to tighten their belts."[27] In the late 1970s, that time appeared to be at hand, and there did not appear to be an end in sight to the problems facing the United States. The "energy crisis" narrative fed into and was propelled by national fears over a United States in political, economic, and military decline.

Scholarly contribution

This study contributes to existing theoretical debates in three key ways, which are detailed in this section. It discusses the implications of the study's findings on the relevant scholarly literature in the fields of economic history, financial economics, and cultural theory.

This study contributes to existing theoretical debates in three ways. First, by providing a comparative historical portrait of cyclical patterns in public and expert beliefs regarding non-renewable resource availability and long-term price behavior, the study puts contemporary debates over the future of oil supply in historical perspective. It allows the rampant claims of, and widespread belief in, a global shortage of oil that have gained popularity over the last decade—most notably, in the so-called "peak oil" movement—to be situated within a broader chronological context. It also extends and deepens earlier

[27] *Ibid*., 626.

historical work analyzing oil shortage scares in the United States, both in terms of their underlying dynamics and their effect on federal government policy relative to the oil industry.[28]

Second, the study establishes the link between fundamental supply-demand conditions in the oil market, generally reflected in oil prices, and the degree of media attention given to, and apparent public belief in, an imminent, irreversible shortage of oil in the United States over the course of the twentieth century. In so doing, it demonstrates the applicability of Shiller's (2000, 2005) conceptualization of new era economic theory formation and popularization to observed phenomena in the oil market. It suggests two modifications to the concept that enhance its greater explanatory leverage with regard to exhaustible resource markets: one, that often the new era predictions most widely cited during shortage scares were actually made prior to the boom in prices, to little fanfare, but subsequently deemed prophetic by new era proponents; and two, that the new era narratives often contained normative elements. Moral judgments – in particular, condemnation of the oil economy's degradation of the natural environment – have often intertwined with predictions that the oil supply was more limited than widely believed and that prices were destined to continue rising.

Third, the study demonstrates that the concept of narratives of decline, as described by Bennett (2001) and Lieber (2008), constitutes a powerful theoretical lens through which to understand trends in popular opinion with regard to non-renewable resource availability, and to asset prices more generally—a link that has heretofore gone

[28] These works include Williamson (1945), Fanning (1950), DeNovo (1955, 1956), Wildavsky and Tenenbaum (1982), and Randall (1983) Yergin, (1993), Adelman (1993, 1995), Parra (2004), Maugeri (2006), and Gorelick (2009).

unrecognized. It finds that a positive feedback loop tended to exist between popular fears of a new era of oil shortages, marked by a long-term rise in prices, and related narratives of the environmental and relative political-economic decline of the United States.

Discussion and Conclusions

This chapter serves two purposes. First, it discusses the implications of the three historical case studies that appear in the previous chapters to the most recent—and indeed ongoing—wave of widespread fear over a new era of prolonged, if not permanent, shortage of oil. Echoes of these episodes from history still resound in current debates in and about the oil industry. Indeed, the similarities between the contours of modern media-hyped fears of a global oil shortage and today's public discourse is striking. Renewed concerns in the United States (but extending globally) that the world is running out of oil, a view that has been encapsulated most vividly in the Peak Oil movement of the post-2000 years, and that has become a forceful voice in the energy community since the price run-up of the last decade, are the focus of this brief chapter. The chapter also endeavors to look ahead at the future of oil supply in the coming decades and discusses the implications of the historical lessons from the dissertation to current debates.

The second purpose of the chapter is to offer some concluding remarks regarding the choice of theoretical framing in Shiller's (2000, 2009) concept of new era economic thinking, to ground the idea more fully within the behavioral economic scholarship, and to examine its assumptions. The chapter also suggests several further avenues for research.

Abbreviated case study: 2001—present (Dec. 2011)

After a decade of muted prices, the onset of the twenty-first century saw the oil market starting to sing a different tune. Real oil prices actually declined through the 1990s, trending downward from an average of $23.73 in 1990 to $12.72 by 1998. In real

terms, the average cost of benchmark crude in 1998, at $17.01, was the cheapest it had been since before the onset of the oil crisis in 1973 (BP; 2010 U.S. dollars). That year was to mark a low point, with the price pendulum swinging dramatically over the next ten years. In fact, average annual nominal prices would nearly double three times over that time period—first in 2000, then again in 2005, and once again in 2008, with Brent crude oil hitting roughly $97 in 2008. In 2011, they will be even higher: approximately $111, the highest in nominal and real terms since the beginning of the modern oil industry in the 1860s.

A potent mix of forces lay behind the historic price rise. Robust economic growth in developed and emerging economies pushed global oil consumption nearly 18 percent higher between 1998 and 2007. At the heart of that deepening thirst for oil was China, with its 1.3 billion-person population accounting for 39 percent of that growth, making the country the world's second largest oil importer in 2008 after it had been self-sufficient in oil only fifteen years earlier. Geopolitical conflict—both the threat and the reality thereof—shattered the old order in the oil-producing world in this decade. Six notable events and trends added a risk premium to the market due to heightened supply concerns. 9/11 and the birth of the global war on terrorism in 2001, an attempted coup on Hugo Chavez and the dismantling of Petróleos de Venezuela S.A., Venezuela's state-owned oil company, in 2002, the 2003 U.S.-led invasion of Iraq, constant questions over the nuclear ambitions of Iran and the possibility of an attack by Israel (which are at peak intensity today), the fall of Muammar Qaddafi's regime in Libya in 2011 and the rise of the so-called Arab Spring. What was more, oil production outside of OPEC, hampered by years of underinvestment in the upstream sector during the tepid prices of the 1990s,

continually disappointed. As a result, and perhaps most importantly of all, the cushion of spare production capacity that had once enabled OPEC countries to keep prices at bay, gradually wore away in the face of runaway demand and poor production growth elsewhere. What was once a spare capacity of 6 percent or so, as a percentage of global demand, had all but evaporated away by 2008, and then again due to the outage of Libyan production through much of 2011, leaving the Saudis straining to pump nearly 10 million barrels per day to compensate for the shortfall.

It was within the context of the sharp tightening of the market that occurred during this decade, which climaxed in a spectacular rise in prices through 2008 and once again after 2009, that worries over whether or not the world's oil production could meet these challenging new conditions began to take hold in a powerful way. A few lone voices had warned that the industry would soon bump up against unyielding geological constraints in the late 1990s. Writing in *Scientific American* in March 1998—the very time at which real oil prices were the lowest they had been in 25 years—two petroleum engineers, Colin Campbell and Jean Laherrère, made an elegant case as to why the period of low prices the world had enjoyed up to that point was about to change—for good. As Campbell and Laherrère saw it:

> The rate at which any well—or any country—can produce oil always rises to a maximum and then, when about half the oil is gone, begins falling gradually back to zero. From an economic perspective, when the world runs completely out of oil is thus not directly relevant: what matters is when production begins to taper off. Beyond that point, prices will rise unless demand declines commensurately.

After estimating the current reserves of conventional oil and the amount still left to be discovered, they had some unfortunate news: the world's oil production would begin to

decline irrevocably no later than 2010. “The end of the abundant and cheap oil on which all industrial nations depend” had finally come (“The End of Cheap Oil”).

The notion, that global production had or would soon enter a fundamentally new era of decline due to natural depletion, would come to be known as the peak oil theory. According to Campbell’s own definition, “the term Peak Oil refers to the maximum rate of the production of oil in any area under consideration, recognizing that it is a finite natural resource, subject to depletion” (Association for the Study of Peak Oil and Gas). In other words, the world was on the brink of reaching its maximum output, which would be followed by an inevitable and likely painful decline. Proponents of peak oil tend to argue the fact that production in a given area inevitably reaches a zenith before tapering off is not a theory, but rather an age-old pattern, best displayed by the long-term production profile of crude oil in the United States. They tend to disagree on two fronts, though: the implications of oil peaking on society more broadly and when the peak will occur. In the words of Robert Rapier:

> The beliefs among people who are concerned about resource depletion cover a wide span. There are those who believe that a peak is imminent, followed by a catastrophic decline. Included in this group are people who have vocally and (to this point) wrongly predicted dates and catastrophic consequences as a result of peak oil. These are the real targets of those who claim that peak oil is nonsense. What they really mean – but perhaps don’t say due to misconceptions about peak oil beliefs – is that the idea of imminent, catastrophic decline is nonsense. But that isn’t the same thing as arguing that peak oil is nonsense.
>
> But there are also people who believe peak oil will inevitably lead to cleaner environments, closer communities, and healthier food. Then there are those who believe that peak oil will lead to a dirtier environment as we become more desperate for energy and turn to more oil sands and coal to replace declining oil supplies. There are people who

> believe peak oil will be a minor inconvenience because there are plenty of sources capable of replacing oil. And there are those who believe certain elements of all of the above ("Five Misconceptions about Peak Oil").

While that summarization of the peak oil literature is technically true, it conveniently glosses over the fact that popular descriptions of peak oil by many of its most venerated apostles during the run-up to 2008 were nearly always attached to dire predictions of a new era of scarcity either already upon the world or soon to strike, with dystopian visions of perpetually rising oil prices and societal calamity. These same voices tended to pinpoint the date of oil's peak as just having occurred or very soon to come to pass. Rapier's assessment of the general attitude within the peak oil community in the mid-2000s makes plain the level of fear that permeated the movement. Describing a conference of the Association for the Study of Peak Oil and Gas in 2011, he writes:

> The mood seemed remarkably calmer than in 2008. That year, oil prices were just coming down from record highs, a pair of hurricanes were causing spot gasoline shortages, and the economy was headed into the toilet. The general mood was that things were rapidly unraveling. Three years later, the long-term outlook isn't really any different, but I think some who predicted imminent doom are starting to change their views on how things are going to play out ("Five Misconceptions about Peak Oil").

In other words, once the prophecies did not come to pass on schedule and prices collapsed, the tone of the movement moderated. That should come as no surprise. Believers still await the first coming of global peak oil, but no longer are its mainstream adherents as vocal about the peak's dreadful consequences and as sure that it will arrive any time soon.

As oil prices climbed in the early-to-mid 2000s, the notion that the world had entered a new age of scarcity caught on like wildfire, first inside the industry, and then in

the media more broadly, as oil prices climbed in the mid-2000s. Beginning in 2001 or so, the number of books, articles, and op-eds on the topic—the world's "oil crisis," "the end of oil," "the last oil shock," or "the end of the oil age"—began to grow exponentially, with the frenzy reaching its zenith as Brent crude oil prices shot up to $143 in the summer of 2008. Discussion of the idea was not limited to the printed page, but also the subject of conferences, documentaries, and novels.[29] It found prominent supporters in the academy, such as Princeton geologist Kenneth Deffeyes, on Wall Street, in energy investment banking magnate Matthew Simmons, both of whom authored popular books and articles on the coming oil shortage. It found a captive audience in leading public officials and organizations, which led to reports investing the impending oil emanating from the U.S. Department of Energy, U.S. Army Corps of Engineers, the Naval Advisory Research Committee, the U.K. Energy Research Centre, and others.

This strain of discourse, which reached a fever pitch in 2008, fell into relative silence in the major media when benchmark Brent prices suffered a stunning collapse to $36 by early 2009. But it would not take long before the market fundamentals, marked yet again by rapid demand growth in the emerging world, geopolitical uncertainty, tightened once again, sending crude prices into three-digit territory by 2011. As of writing, crude oil prices in 2011, in both real and nominal terms, will be the highest ever since the beginning of the American oil industry in the 1860s.

The dramatic events in the Middle East and North Africa played a key role pushing prices higher in 2011. Unrest ranging from protests to outright rebellion and civil war has erupted from the Persian Gulf to the Atlantic, with reverberations of this

[29] An exhaustive list is simply impossible to provide here due to the sheer scale of the literature on the subject. For a good starting point, see http://www.peakoil.net/publications.

upheaval stretching to the halls of power in the Far East. The earthquake and tsunami in Japan in March 2011, and the subsequent nuclear crisis there, have wrought an unfathomable human and economic toll on the world's third-largest economy. And over the course of the next two weeks, Nigeria, Africa's most populous country and largest oil producer, will reach the climax of a hotly contested and controversial election season. In short, since Mohamed Bouazizi's self immolation on December 17, 2010, governments and economies incorporating 10 percent of the globe's population have been thrust to the brink of turmoil or into outright chaos.

Concern over the future availability of oil, even among the savviest investors on Wall Street, came roaring back amid the price spike caused by the Arab Spring. Jeremy Grantham, for instance, widely regarded as among the most prescient observer of global markets, has sounded once again the generational cry: the world is running out of oil. In his *GMO Quarterly Letter*, published in April 2011, he rings the age-old alarm. "Time to wake up," Grantham warns. "Days of abundant resources and falling prices are over forever." This is no short-term price dislocation, but rather a *permanent* change. He continues: "The world is using up its natural resources at an alarming rate, and this has caused a permanent shift in their value. We all need to adjust our behavior to this new environment. It would help if we did it quickly." In other words, a new era of resource scarcity, in particular a shortage of crude oil, has arrived. He pins the trend largely on the same demand-side factors that analysts tended to cite as behind the crude price run-up of the 2000s: a rising and ravenous China, exponential global population growth, and a burgeoning new middle class worldwide. The current bull market in commodities is merely indicative of this Malthusian trend—"the Mother of all price signals", as he terms

it—which will lead to “price pressure and shortages of resources” becoming “a permanent feature of our lives.” Things are going downhill fast, says Grantham. So “there is little time to waste.”

And yet, in the midst of these proclamations, transformative events are underway on the supply side that many analysts believe have the potential to turn the tide from scarcity to abundance once again. In the United States and Canada, the application of new drilling technologies and techniques to onshore fields once considered marginal, sparked by higher prices, have yielded previously unimaginable gains in oil production in the region in the course of just a few years’ time. “Use whatever hackneyed phrase you want, like tectonic shift or game-changer,” Edward L. Morse, global head of commodity research at Citigroup, said in December 2011. “These sources will dramatically change the energy supply outlook, and there is little debate about that” (“New technologies redraw the world’s energy picture,” New York Times, Oct. 25, 2011). Crude oil production in the United States has climbed by 18 percent since 2008. In 2011, unconventional oil production in North America is set to equal the entire output of Norway, at 2.3 million barrels per day. Net oil imports into the United States, since trending upwards to a peak of 60 percent in 2005, have quickly reversed course to 47 percent over the last six years. The natural gas market in the United States, for its part, has witnessed a dramatic reshaping by the so-called “shale gale,” or the extraction of natural gas from shale rock using hydraulic fracturing and horizontal drilling. After nearly touching $13 per MMBtu in the summer of 2008, spot prices at Henry Hub have been hard pressed to move above $5 per MMBtu since 2009.

Some readers might ask whether the fact that previous supply scares have ultimately been washed away by an eventual wave of oil and subsequent crash in prices means that this study is suggesting that the current supply fears to meet a similar fate. That question is a legitimate and an important one.

The fact that the Cassandras warning the world of an impending era of oil scarcity and ever-higher prices have been wrong in the past hardly means that they are wrong this time. An oil-colored black swan for which the world is unprepared may yet lurk. And yet, as this dissertation shows, eras of profound and widespread fear over the future availability of oil—and its future price—that were every bit as real as the present one, themselves informed by the best available analysis at the time, well intentioned, and soberly delivered, ultimately proved profoundly and repeatedly wrongheaded. The moderating influence of high prices on demand, coupled with advances in technology that assist both in greater energy efficiency and greater production growth, ultimately proved able to tame high prices. That trend should give pause to the apostles of a new era of scarcity—but by the same token, so too should it persuade those who see endless abundance when prices are low to rethink their outlook. The lesson of history has been that the tables can turn in either direction.

The oil market, and supply outlook that partly underpins it, can change radically in an unforeseen way, both higher and lower, in a short period of time. At the very least, it should remind policymakers that what appear to be the immutable laws of gravity today with regard to the oil industry and the oil market will not necessarily hold even a decade or two later. Even some of the best informed judgments about the future of oil, not to mention their attendant recommendations for U.S. policy, have ultimately been proven

decisively wrong. The correct posture, then, takes into account the fact that what is one day a reality of the oil market—whether the seemingly endless abundance of Pennsylvania wells, the primary use of petroleum as being an illuminant, the United States as the world's biggest oil producer, the impossibility of drilling for oil deep in the ocean, a concession system run by the world's oil majors, the influence of the U.S. over the Shah of Iran, OPEC's desire and ability to wield an "oil weapon" against the West, the self-sufficiency of China in oil, or the has-been status of the oil fields in the U.S. Midcontinent—can all come undone in what is historically speaking a relatively brief period of time.

These days, the primary obstacle standing in the way of a radical flipping of the global oil balance from scarcity to abundance—the kind on display in each of the three case studies—is not geological but rather political. OPEC, which controls 77 percent of the world's proved reserve base, has demonstrated a relatively strong degree of cohesion over the last decade in acting to keep oil prices well above their historical average by limiting access to their prolific resources and only conservatively increasing their production capacity, notwithstanding brisk emerging world demand growth of nearly 4 percent annually on average since 2001. Driving the past decade of high prices has not been so much the world's ability to produce more oil, but rather OPEC's unwillingness to do so, in a world where oil consumption growth in the some of the most populous countries is taking place at an astounding scale. This strategy on the part of OPEC may remain largely successful in coming years at blunting the ability even of rapid production gains elsewhere to prompt anywhere near the sort of crash in oil prices that the case studies show has tended to occur after a prolonged period of high and rising prices. So

despite the transformative production gains that appear to be waiting in the wings—a pattern that perfectly mirrors historical experience, as the dissertation shows—beyond OPEC's borders, they still may prove unable to bring prices sharply lower from their current three-digit territory over a sustained period.

The conclusions of the present study would imply that public and expert claims that the world faces a perpetual shortage of oil will continue to receive broad airing if prices once again begin to move quickly upward. The circulation of these stories is more a function of current oil prices than they are of geology, according to the present study. But predicting oil prices out into the distant future has never been easy. Indeed, forecasting oil prices has consistently managed to defy the experts since the dawn of the industry itself in the mid-nineteenth century. The major upward move of prices over the last decade may yet be reversed. Should these production gains in North America continue and spread to other parts of the world, OPEC's decision-making may well come under pressure in a way it has not in decades. Its member countries' policies with regard to how they develop their own domestic resources are hardly set in stone, nor is the price floor they attempt to defend in the global marketplace. The world may yet be surprised.

Whether the unfolding chapter of the history of the oil market will end in prices falling lower as supply begins to outpace demand is impossible to say. Were one to pen a denouement to the current oil shortage scare based on the lessons of history, though, one could scarcely do better than to begin it with the unforeseen transformation just underway in the North American oil landscape.

Shiller's (2000, 2009) new era economic thinking: looking back and looking ahead

At the conclusion of the present study, it is sensible to return to the economic concept that informs the theoretical lens through which these four case studies are analyzed—namely, Shiller's (2000, 2009) notion of new era economic thinking—to make some final remarks. The purpose of these brief remarks is to provide a preliminary starting point for the author's future work by grounding Shiller's work referenced in this study more fully within the behavioral economic scholarship and examining its assumptions, and to reflect on the overall relevance of the concept to the oil market and the narratives that have been built around it over the last century.

In composing this concluding section of the study, turning to Shiller's own analysis in 2008 about how "new era stories" may have caught hold within the oil market and be affecting price behavior is a good starting place:

> There is something about the current collection of easily recalled views and ideas that encourages bubble thinking about homes and, apparently, as well about oil prices and grain prices, though it is hard to pin down.
>
> The new era story about the emergence of capitalist institutions over much of the world—notably emerging countries like China and India—has captured the imagination of speculators, and their imagination connects this story with prices in many different markets, including energy, grains, even gold and other metals. The exaggerated attention to this story is behind the world energy crisis and the world food crisis as well as the housing bubble.
>
> Most analysts do not see the link between all these speculative events. For example, some analysts—notably Paul Krugman—have claimed that there can be no bubble in oil prices because oil stockpiles have not soared, implying that speculators are not actively affecting the demand for oil. But, despite the evidence from the stockpiles, the price of oil is, just as the price of housing, inherently and deeply speculative. The popular opinion that oil prices will be very high or even higher far into the

> future—as evidenced by oil futures prices—reduces incentives for producers to invest aggressively today in new extraction facilities, or for regulators to allow the environmental impact of rapid exploitation of oil sands, drilling oil offshore, or building new pipelines. The speculative stories of oil are mostly in the ground, and people are happy to leave them there for now despite higher prices because they think prices may go higher, not lower (62-4).

For Shiller, the investment narrative that surrounded the 2008 oil price run-up fits squarely within the typography of new era stories that have been associated with financial market bubbles in the past. The narrative is built around a "collection of easily recalled views and ideas that encourages bubble thinking" about the future direction of oil prices. At the heart of this vivid and memorable narrative about oil prices, which carries what behavioral economists would term the salience necessary to stick in investors' minds and thus bias their judgment, is the rise of the world's emerging market economies. Shiller sees that storyline as "behind" the high and rising energy prices of the last half-decade or so. In attributing an element of causality to such stories, he goes beyond his 2005 claim that such new era thinking is merely "associated" with bubbles. In this more recent theorization, he appears to imply that such stories actually play a role in driving speculative bubbles, whether in the global housing bubble or the oil market bubble. He rejects the view that because oil prices are ultimately a physical asset they are immune to bubbles—a charge that could equally be made to the housing market—seeing them instead as similar to the housing market in their "inherently and deeply speculative" nature.[30] He then posits a mechanism through which popular opinion about oil prices in

[30] Whether (and in what sense) the 2008 oil price spike may justly be called a bubble is still the source of tremendous debate in the energy-finance community and among academics working in the field. The liteature review in this study points to several works that should be consulted on this topic. A fuller account of this debate, as well as its implications for the present study, are beyond what is feasible here, but will

the future translates into supply-reducing decisions in the present, and so become a self-fulfilling prophecy.

What role do catchy, memorable stories and views about supposed new eras in a given market, whether for houses or for oil, play in Shiller's conception of financial bubbles? And how do this conception of bubbles derive from the theoretical assumptions that underpin the field of behavioral finance, from which they spring? Answering these questions requires returning to Shiller's (2005) definition of a speculative bubble:

> A speculative bubble is a situation in which news of price increases spurs investor enthusiasm, which spreads by psychological contagion from person to person, in the process amplifying stories that might justify the price increases and bringing in a larger and larger class of investors, who, despite doubts about the real value of an investment, are drawn to it partly through envy of others' successes and partly through a gambler's excitement. (2)

According to this view, stories are the mechanism through which people provide a verbal justification of asset prices increasing far beyond what would have been deemed their fair value prior to the run-up. They describe the fundamental conditions that appear to warrant the move, which proponents inevitably argue as a trend that will continue far into the future. Both their memorability and the ease with which they are communicated make them capable of proliferating much more quickly and broadly than would raw numerical data. In speculative bubbles, stories form a key part of a positive feedback loop along with prices. Price increases spur the initial interest in the investment opportunity around which the story is built, and the popularization of the story then pushes prices even higher.

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figure prominently in an expanded version of the fourth case study that will be added prior to the anticipated publication of this study in the coming year.

The dynamic underlying speculative bubbles that Shiller describes is built on at least one assumption that is at odds with traditional financial theory: that investors are not fully rational. In this paradigm, rather than being able to quickly and fully update their beliefs as they receive new information, human decision makers reliably show cognitive biases that lead to systematic errors in judgment that can leave markets, in some cases, informationally inefficient. These biases can lead to mistaken beliefs and interfere with attempts at forecasting the future. Humans are prone to see trends where there are none, which they envision as a new equilibrium—or a "new era." In a speculative bubble, the thinking goes that some trend in prices will continue and so the risk of jumping on the bandwagon should not be a source of concern. As the literature review earlier in this study describes, this core assumption of behavioral finance has been hotly contested for many years. The debate has only gotten fiercer since the Great Recession, which spawned countless articles in the popular press declaring the death of the notion that markets are efficient.

The evidence from the four case studies contained in this study show the utility of Shiller's conception of new era economic thinking as it applies to the generational pattern of fear of an impending persistent shortage of oil in the United States. That is no small feat, given the century-long span of time involved and the deep structural differences between the oil market and the market from which Shiller derived the new era concept, the U.S. stock market. The greatest triumph of the new era concept, as Shiller (2000, 2005) spells it out, is the extent to which it maps very closely onto the scale of mass media coverage of the oil market during periods of rising prices. In each case, high and rising prices led to a chorus of both expert and non-expert testimonies that the country

was facing a new era of greater scarcity and soaring oil prices, often asserting that prices were destined to keep rising perpetually in the future. Supposed lack of supply was judged to mean the end of the oil era by numerous commentators in the highest levels of government and relayed by the popular press, although roundly derided by those with the best real-time information—the oil industry itself. The components of new era thinking that Shiller identifies during the major equity market booms of the twentieth century United States tended overwhelmingly to exist during the oil shortage scares, from the belief that prices would continue to rise due to a fundamental change in the market and the failure to identify the basic similarity of these stories to those from the past to the concentration of attention on current events rather than alternative scenarios and the generally post-hoc nature of the new era beliefs, if not always the theories themselves. Unlike in Shiller's findings, however, the present study generally does not allow for a reliable judgment that the first two of the four cases showed a positive feedback loop between prices and new era thinking.

One shortcoming of the new era concept, however, is that it is not fine enough to gain a purchase on the rich micro-level aspects of new era theorizing by the historical actors involved. The first three case studies, which operate at some degree of depth, show that those historical episodes were made up of competing voices from various stakeholders putting forward contrasting narratives with regard to the oil market and its future direction. A strong, persistent strand of new era theorizing was one of the chief of these narratives, but it was not the only one. as the case studies show. New era proponents often had their own specific incentives for making the claims they did, as did those who argued against it, as time and again voices from the oil industry rejected the

new era claims while environmentalists and government leaders spread them. A more robust concept of new era thinking would seek to ground these competing narratives in their institutional context. Shiller's concept does not accomplish that contextualization. Important questions, as a result, go unanswered: Why do new era theories emerge? Who tends to create and spread them, and why? When do new era theories actually affect market outcomes, and when are they swallowed up by other voices? Addressing any of these questions requires an understanding of new era theorizing in history that operates at the level of the individual and interest groups, rather than seeing the market as dominated at times by a sole theory. It may prove fruitful to look to the extensive body of theory in the field of sociology on the behavior of crowds, fear, and rumors, for instance—and to psychology on interpersonal influence and persuasion—for further insight into the interpersonal dynamics by which and institutional settings in which new era theories tend to emerge, gain currency, and then fade.

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