Introduction
Calculated Wagers and Hedging

All organizations must cope with future uncertainties. These uncertainties affect the strategic choices they make. They must commit scarce organizational resources to future outcomes which they have little assurance will come into being. This book explores how decision makers in the energy industry made choices in the face of such uncertainties. Specifically, it deals with two major uncertainties they confronted in the 2012–2018 period – that is price volatility and climate change. This period was one in which the price of oil slipped from a high of about $100 a barrel to a low below $30 a barrel, in the process of wiping out about 30 percent of the revenue of the large integrated oil and natural gas companies and providing opportunities for automotive firms to sell more SUVs, pickups, crossovers, and light duty trucks. This period was also one of mounting pressure on energy companies to respond to climate change, which culminated in the Paris climate change agreement of 2015 in which nearly all countries in the world committed to lower their carbon footprint by introducing tight new fuel efficiency and air quality standards.

In the face of these challenges, companies in the energy industry hedged their bets by staking out paradoxical positions.[1] On the one hand, they focused on capturing as much gain as they could from the world's current dependence on fossil fuels, and on the other hand, they made preparations for a future in which fossil fuels might not be the world's dominant energy source. This book tells the story of how different sectors in the energy industry and different companies – ExxonMobil, BP, Shell, and TOTAL in the integrated oil and natural gas sector and GM, Ford, VW, and Toyota in the motor vehicle sector – responded to these uncertainties. They had to make long-term strategic investments without knowing what future conditions would be and if these investments would pay off. Their investments in fuels and in vehicles not only had major effects on the companies, but also on society at large as they would play an important role in determining

the degree to which humans would be able to cope with climate change, one of the most pressing issues of the twenty-first century. If the energy industry companies discussed in this book miscalculated and made imperfect choices, the effects could be devastating for them and for the planet. On the other hand, their choices could also have the beneficial effect of bringing about needed adjustments in the global economy and company business models.

The Motivation for the Book

In other words, the stakes involved were high, and how companies in this industry made their decisions was of the utmost importance. Thus, my reasons for writing this book were very compelling. The immediate motivation came when I was asked to design a new course for a special industry-based MBA the Carlson School of Management offered to Washington, DC Congressional staffers. I have subsequently offered and am offering this course as an elective to other Carlson School MBAs. I feel capable of writing on this topic, as I have a long history in researching energy policy. In 1992, I wrote a book called *Controversial Issues in Energy Policy* (Sage Publications) in which I tried to explain the sudden decline in energy prices in the 1980s, and in 2015 I wrote *Innovations in Sustainability* (Cambridge University Press) in which I tried, among other things, to explain the rise of alternatives to fossil fuels and the movement toward cleaner energy among startups and venture capitalists.[2] In between, I have written many academic articles about the energy decision making of governments and companies.[3] This topic has been a nearly life-long obsession which began in the mid-1970s when I wrote my dissertation at Harvard on the US Environmental Protection Agency's origins and its early attempts to implement major new clean air and clean water legislation.[4] I subsequently worked for five years as a research consultant in the late Carter and early Reagan presidencies analyzing a host of issues relating to energy and business from the commercialization of then new technologies to the costs and benefits of forest practices to the dangers of accidents at nuclear power plants and how to mitigate these dangers through better management practices. In the 1990s, along with co-authors, I participated in an attempt by the Clinton administration to reform environmental regulation by relying on companies going beyond what was required by law in exchange for regulatory leniencies.

The book we wrote, *Reinventing Environmental Regulation*, documented the difficulties of business–government cooperation to achieve environmental goals they both considered important.[5]

In addition, I have been intrigued by the problem of uncertainty in strategic management as I have taught the strategic management course for almost thirty years starting at MIT where I did my sabbatical in 1991–1992 and also at the University of Minnesota Technological Leadership Institute as well as the Carlson School, and the Technion, where I have also served as an adjunct professor. I have written a strategic management textbook, many strategic management cases, and a trade book in strategy, *Big Winners and Big Losers*.[6] In my work in strategy, the question that I keep coming back to is how businesses make long-term and expensive strategic investments, when their understanding of the conditions that will prevail in the future, when the decisions have to pay off, are uncertain. This question is a classic one in business literature, one that University of Chicago economist Frank Knight raised in his early twentieth-century book, *Risk, Uncertainty, and Profit*.[7] It is quite clear that grappling with future uncertainty is a major challenge that managers of almost all organizations confront. If they miscalculate and make the wrong choices, their organizations can go out of existence, a not uncommon event in the history of companies. On the other hand, if they somehow intuit correctly what is to come next, their companies can thrive. The key strategic choices involve making the correct bets on the future. However, as Knight argued so persuasively, the data to understand the future well and correctly does not typically exist and the future is unknown so that decision makers' guesses often go awry. They make wrong choices and their companies suffer, often with broader negative social impacts of dislocated workers and other malaises.

Thus, my motivation for writing this book has also been to better understand how decision makers in the energy industry confront long-term choices when the future is uncertain. The energy industry is a particularly apt one for such an analysis as the decisions are long term in nature and socially impactful. Thus, this book analyzes the uncertainties that managers in the energy industry faced in the turbulent period from 2012 to 2018 when the rules governing their behavior were changing. Energy prices were flip-flopping in ways they almost had never before done in history. Global regulation of companies in the energy industry was stiffening, but in different ways in different parts of

the world, with respect to fuel efficiency and air emissions. As businesses, energy industry companies were experiencing poor results, overcapacity, stiff competition, and somewhat declining demand, with the exception of China and eastern Asia. How should managers of energy companies respond to this situation and make long-term, expensive capital intensive, often irreversible, investment decisions in energy assets when they operated in a situation of great upheaval and uncertainty? This book tries to answer the question, given the extent of uncertainty that existed, how did they cope? What strategies did they employ? How did these strategies affect their organizations financially, and, as importantly, the broader societies of which we are a part?

The Key Features

Here are some of the key features of this book. It proposes a new strategic management approach to managing uncertainty, a theory of hedging, and illustrates the theory with examples from the energy industry, in particular from these sectors within this industry, the integrated oil and natural gas and motor vehicle sectors. It explores in depth major uncertainties that companies in these sectors faced, that is energy price volatility – booms and busts in prices and the threat of climate change. It explores these uncertainties while at the same time depicting the difficult business conditions that prevailed in these sectors – weakening demand, increasing competition, and adverse events like major accidents, recalls, and scandals. The book shows how major companies in the integrated oil and natural gas and motor vehicles sectors – ExxonMobil, BP, Shell, TOTAL, GM, Ford, VW, and Toyota – developed ways to cope with these issues, that is, how they reacted to the uncertainties they confronted, and made wagers on the future. Thus, the book is an important contribution to the literature on the strategic management of uncertainty, which is probably the most important issue in strategy, as well as the literature on sustainability due to its focus on climate change. The book provides an up-to-date analysis of the three major sectors in the energy industry – electrical generation, as well as oil and natural gas, and automotive – and offers case studies on the following major oil and natural gas and motor vehicle companies in the period before and after oil prices plummeted – ExxonMobil, BP, Shell, and TOTAL in the oil and natural gas sector

and GM, Ford, VW, and Toyota in the automotive sector. The analysis is up to date in that it includes an assessment of the divergent strategic paths of these eight firms in 2017–2018 and reveals the differences in their strategic responses to the challenges of price volatility and climate change. It contributes to the institutional literature on strategy, in that difference in responses, or heterogeneity, has become a major theme in this literature.[8]

Calculated Wagers

Part I of this book lays out the main theme of risk and uncertainty brought on by growing price volatility – the booms and busts of 2012–2016 – and climate change. It points to major miscalculations energy companies made in the past and to the unsettled issues they confront in the future. In managing risk and uncertainty, energy industry managers cannot anticipate with assurance what is to come next. They have to make calculated wagers. These gambles are not unbiased but are subject to the individual and organizational shortcomings that affect nearly every decision that an individual or organization makes as laid out in behavioral psychology and behavioral theories of the firm. Specifically, they cannot be certain of where the world is heading, what the impact of these changes will be on their industries and on their sector, and how to respond to what is taking place now and what might take place next. Under these conditions, because they do not know the chances of payoffs and losses or their magnitude, they cannot simply rely on rational/analytical decision making, but must bring to bear their hunches and intuition or what Keynes referred to as their "animal spirits."[9] Despite good efforts, they are subject to minor and serious miscalculations and can make major mistakes. They tend to recognize the limitations, and the less they feel they are able to avoid error, the more cautious they become – that is, the more they try to protect their organizations from harm by hedging their bets. In these circumstances, they may become defensive and try to delay or avoid departures from the status quo unless there are strong factors that mitigate such caution. Unless they feel they have no choice and they have been backed into a corner, or they have relative assurance that they can exploit the situation they perceive is emerging for gain, hedging their bets prevents them from making bold new moves.

Yet, this book shows that by 2018, almost all the major energy companies that it scrutinizes – ExxonMobil, BP, Shell, and TOTAL in the oil and natural gas sector and GM, Ford, VW, and Toyota in the automotive sector – made or were on the verge of making such moves.

- ExxonMobil adjusted its stance, however slightly, on climate change and widely publicized an effort on its part to develop petro-algae.
- BP disgorged large amounts of its fossil fuel assets to save itself from bankruptcy after the Deepwater Horizon oil spill.
- Shell also restructured, letting go of large amounts of its oil assets and acquiring natural gas assets instead, which led to a major commitment to build liquefied natural gas (LNG) infrastructure.
- TOTAL moved in a different direction than other integrated oil and natural gas companies, as it owned advanced battery and solar panel companies and started to secure European electric utilities for itself.
- GM upgraded its product safety and quality policies after a major ignition-sticking recall, introduced an electric plug-in and the all-electric Bolt, and made the unprecedented move of leaving Europe entirely, selling its European division to Peugeot, and in the process of abandoning hope of ever regaining the position of being the world's largest auto maker.
- Ford, wavered in the face of weak financial results unsure how much it should commit to its global bestselling F-150 series light truck versus moving to hybrids and to the opportunities of new transportation models, but it did make a number of important decisions, both in making the F-150 series lighter with an aluminum body replacing some of the metal body and in effect departing completely from the North American sedan market.
- VW, with its back against the wall because of a blatant disregard for law and ethics and its cheating on diesel emission standards, reversed its commitment to proclaiming that diesel was the world's greenest solution, and promised that it would make almost all its models available in some type of electric option no later than 2030.
- Toyota facing challenges to the quality and safety of its vehicles for virtually the first time and confronting weakness in the US market because it did not have a large selection of small trucks, tried to position itself as a leader in crossover vehicles, and in the future promised the most far-reaching transformation of any automaker with regard to offering for sale hybrid and fully electric vehicles.

Hedging

This book explores the broad context in which these companies in the energy industry found themselves, the specific conditions they faced with respect to energy prices and societal pressures around climate change, and their use of hedges as a way to strategically deal with these uncertainties. Firms in the energy industry faced at least two major uncertainties with which this book grapples. The first of these uncertainties had to do with volatile prices, the boom and bust conditions that prevailed from 2012 to 2016, when oil prices plunged from a height of about $100 a barrel and fell to a low of about $30 a barrel, in the process of wiping out about a third of major integrated oil and natural gas company revenue and providing motor vehicle companies with the opportunity to sell more highly profitable light duty trucks, pickups, SUVs, and crossovers. The second of the major uncertainties was the ongoing threat of climate change brought about by the incessant burning of fossil fuels that the integrated oil and natural gas and motor vehicle companies facilitate. Climate change introduces physical uncertainty in that meteorological conditions in the world which allow the global economy to function will no longer be operable, and legal uncertainty in that almost every government in the world tightened its standards on fuel efficiency and air emissions and stretched the technological capabilities of integrated oil and natural gas and motor vehicle companies to their limits in trying to arrive at ways to comply with the laws the world's governments have enacted. All of the firms in the integrated oil and natural gas and motor vehicle sectors were preparing for a future in which fossil fuels will be less dominant, but their preparations for this future differed in significant ways that this book helps to clarify. Some acted more than others on the assumption that reduced reliance on fossil fuels was imminent, and this assumption led them to make different strategic investments and bets than those of their peers. How companies reacted to the dual uncertainties of price volatility and climate change are this book's major theme.

Given the uncertain future conditions they faced, the companies examined in this book had assumptions about the future that led each to adopt a strategy of hedging their bets in somewhat different ways to ensure that their organizations would survive, if not prosper, regardless of what happened. This book introduces and develops the concept of hedging as a method companies used to manage the risks and

uncertainties they confronted. Hence, hedging strategies are a major topic of the book.

It is worth pointing out from where I started to derive my thinking about hedging as a means to grapple with company uncertainties. For the book *CSR and Climate Change Implications for Multinational Enterprises* (edited by McIntyre, Ivanaj, Ivanaj, and Kar), I wrote a chapter with Joel Malen called "Techniques for Navigating the Risks of Investing in Cleaner Energy Technologies."[10] In that chapter, we tried to encapsulate conclusions from my earlier book about hedging, *Innovations in Sustainability*.[11] In *Innovations in Sustainability*, I started to develop a theory of hedging.[12] My aim in writing *Strategies for Managing Uncertainty: Booms and Busts in the Energy Industry* was to understand how key players in the oil and natural gas and automotive sectors hedged their bets in making long-term decisions, when the results of those decisions were unknown in advance. Hedging is a theory of decision making that is different from the efforts corporations make to optimize returns. It also differs from bounded rationality, which claims organizations cannot optimize, though they may attempt to do so, because they lack knowledge, their time is limited, and they suffer from other decision-making shortcomings.[13] Hedging is more akin to the risk-averse biases that prospect theory has proposed, but it applies the notion of risk aversion to organizations as a whole and attempts to define the mechanisms organizations use to protect themselves from losses and ensure their survival when the future is unknown and they cannot predict with certainty whether the strategic bets they have made will pay off, or instead turn out to be grave miscalculations, which can end their existence.[14]

The term "hedging" is borrowed from finance, where it means moving in more than one direction at once to offset the chance of adverse movements in markets. Technically, to hedge means to make investments that have a negative correlation. That is, it means, to use the literature of strategic management, to take the ambivalence felt about the future direction of the state of the world and to make simultaneously contradictory bets about what is to come next. Hedging is a way to manage paradox. When the future is unknown an organization cannot responsibly or prudently place all its eggs in one basket; it must bet on *more than one world* coming into being at the same time, in the hope that its positive bets will more than offset the negative ones, or that its bets will alternately sustain it in moments when different future

conditions prevail. Uncertainty about the future leads to ambivalence about which strategic moves to make and this ambivalence leads to contradictory choices and hedging. The purpose of this book has been to uncover the hedging mechanisms of integrated oil and natural gas and motor vehicle companies in the energy industry. How have they tried to shield themselves from disastrous consequences in the event that the vast strategic bets they make go awry? This book suggests that their goal is not necessarily to maximize returns to shareholders, but to survive whatever contingency takes place and with some luck to prosper if the best of conditions they assume might take place actually arise. The track record of energy industry company decision making in the past has been anything but perfect, and serious miscalculations have put nearly every firm in jeopardy and on the brink of demise at some point in time. However, there has not been any major demise of an energy industry company, even in the face of bankruptcy (GM). In this sense, the hedges of the companies in this industry have succeeded in protecting them.

How the Book Is Organized

This book contributes to the literature on strategic management and sustainability by investigating how companies made decisions, against a background of uncertainties with which they had to grapple, by relying on hedges.

- Part I of the book sketches out the problem of risk and uncertainty in the energy industry, the management of this risk and uncertainty in general, hedging, and the industry's recent history of booms and busts.
- Part II examines the challenges to three major sectors in the industry – oil and natural gas companies, motor vehicle companies, and electric utilities.
- Part III depicts the strategies of four of the world's largest integrated oil and natural gas companies – ExxonMobil, BP, Shell, and TOTAL – before and after the 2014–2015 price collapse. How did they hedge their bets in this period of intense uncertainty?
- Part IV depicts the strategies of four of the world's largest motor vehicle companies – GM, Ford, VW, and Toyota in the same period. How did they hedge their bets in this period? While the precipitous fall in energy prices was a major threat to the oil and natural gas

companies, it was an opportunity for the motor vehicle companies to sell more profitable SUVs, pickups, crossovers, and light duty trucks, particularly in the US market.

- Part V updates the strategies of the oil and gas companies and the motor vehicle companies in 2017–2018 and indicates how each of them pivoted from prior strategies and adjusted to new realities. In light of the institutional literature's concern with this issue, the heterogeneity of their responses is a matter of great interest.[15] These companies did not respond similarly to conditions they confronted. Their strategies diverged more than they converged. This divergence had implications both for the companies and society at large.

The importance of the companies' divergent strategies is an important theme of the book.

The book ends with a discussion of how ambivalence about what to do, given the uncertainties the companies confronted, influenced their strategies. As indicated throughout this introduction, these companies set out on paradoxical paths simultaneously. These paths, one may say, had one foot in the past and one foot in the future. The companies wanted to protect their assets and current position while preparing their organizations for a time when their current operating assumptions and business models would no longer be relevant. In the future, demand for petroleum might peak, electric vehicles might become very common, autonomous driving might be the norm, and ride-sharing could largely replace private vehicle ownership. This world might be very different from the world that the oil and natural gas companies and motor vehicle companies previously occupied. How they coped with this situation by hedging their bets is this book's main theme.

Notes

1. Farjoun, Moshe. "Beyond Dualism: Stability and Change as a Duality." *Academy of Management Review* 35.2 (2010): 202–225.
2. Marcus, Alfred A. *Controversial Issues in Energy Policy*. Los Angeles: Sage, 1992; Marcus, Alfred A. *Innovations in Sustainability*. Cambridge, UK: Cambridge University Press, 2015.
3. For example, see Ginsberg, Ari, and Alfred Marcus. "Venture Capital's Role in Creating a More Sustainable Society: The Role of Exits in Clean Energy's Investment Growth." In *Sustainability, Stakeholder*