"Adam Smith did not see the Industrial Revolution coming"—so said my undergraduate teacher in economic history in 1985. In his seminal book *The Wealth of Nations* (1776), Smith lays some of the crucial groundwork for the modern science of economics, but he does not systematically address innovation. Yet parallel to his writing this treatise, the British production system began to usher forth profound changes in the organization of production and in the goods produced. While Smith discussed efficiency, the Industrial Revolution involved innovative change that radically shifted what was achievable in terms of the production of wealth.

During the latter half of the eighteenth century the Industrial Revolution was in embryonic form, so it is understandable that Smith might not have discerned the potential of his very own conception, the natural system of liberty. Yet he did write profoundly about the possibilities of economic change (in particular specialization and how specialization might lead to innovation) and growth. Compared with many modern economists his is a broad and historical approach. Yet economies—with its account of the mechanisms that create balance between what is produced and what is consumed (or, more correctly, between supply and demand)—is hardly able to grasp the many and messy undertakings that alter the supply system, that part of the economy that creates and produces the goods and services under the demand of consumers.

Creativity and innovation help to increase productivity, thereby changing the way in which people earn their livelihoods as well as the goods and services they enjoy. To understand creativity and innovation one must move beyond standard models employed by economists. One must consider, for example, the transformative possibilities engendered by science as well as the ways in which politics and law function to allow, encourage, or incentivize creative acts and beneficial interactions (Fagerberg et al. 2005).

Over the last quarter century new fields of research have emerged that seek to understand positive change in the economy (Fagerberg et al. 2012). The common agenda is to find out how and why innovation, in the broadest sense, happens. The scholars who pursue this agenda range from those interested in corporate success to those who want to understand why nations and societies grow rich. This is, therefore, a vast and heterogenous arena, but this chapter will concentrate on what may be termed *Schumpeterian* innovation, after the Austrian-American economist Joseph Schumpeter. The chapter will, therefore, focus on processes of creativity and entrepreneurship that have, either through intended purpose or as actual result, effected real
Changes in the production of goods and services—innovation. These sorts of innovations may arrive in a cluster, accumulating during a discrete slice of time, and lead to such radical changes of the economy that we may speak of an "industrial revolution."

Schumpeter contributed at least three concepts that guide much research on innovation: the "entrepreneur" as agent of innovation (Schumpeter 1934, but see Hébert and Link 2009 for predecessors); a distinction between adaptive and creative economic behavior (Schumpeter 1947); and the idea that innovations be institutionalized within large corporations (Schumpeter 1943/1976). Schumpeter places these concepts in larger economic landscapes, revealing thereby how processes of creativity and change prove relevant to the whole society. A very important distinction in Schumpeter's definition of innovation is that invention and innovation are not the same. A new chemical entity, a new way to produce energy, or a novel food recipe, are inventions until the required processes of commercialization turn them into innovations. Indeed, the definition of an innovation is the introduction of something new in the economy (even if the new entity is but a novel reconfiguration of old entities).

While Schumpeter was active in the first part of the twentieth century, his rise to the center stage of a scholarly enterprise devoted to the study of innovation and change is a consequence of the shift from post-war growth to crises and volatility that occurred from the 1970s onwards (Van der Wee 1986). Innovation has been seen as more than a necessary tool to solve issues of economic stagnation or to redo old economic structures that contribute to climate change and pollution. In fact, innovation may be regarded as a new tool to achieve economic equality. While revolution and redistribution were leftist political goals for centuries, innovation is a new tool to change the society for the better (Phipps 2013; Mazzucato 2014).

This chapter offers an historic introduction to the broad field of innovation studies with an eye towards ethical matters. Four fundamental issues are highlighted. In the first section, I delineate how the concept of innovation has little place within the framework of standard economic models, yet innovation is crucial to the total economy. In the second section, I take up some theoretical approaches, emerging in the 1980s, that construe the phenomena of innovation as occurring within specific circumstances. This is the "interactive" approach. In the subsequent section, I focus on how innovation has been seen, by some, to be institutionalized within the large corporation or, in other cases, within clusters of small companies or even the nation state, noting as well how some scholars have argued for cultural or ethical frameworks as catalysts of innovation. In the final section, I canvas some of the debate as to whether or why innovation has failed to return economic growth to the wealthy nations.

Innovation and neoclassical economics

Whether the global economy is assessed over time or over geographical space, creative change is both apparent and, for the most, welcomed. Over the last two centuries the global economy has grown, and large populations, though not in all regions, increasingly have become accustomed to a comfortable life. But, as Schumpeter argued, economics as a science provides little entrance to the idea of economic or productive creativity. Striving to be an exact and encompassing science, economics has been long concerned with static efficiency, namely how best to use available resources to produce some given product (Baumol 2002). The standard model in contemporary economics requires that companies take prices as given and behave in the most efficient way. To this end, the standard models require economic agents, whether individuals or firms, to adapt to a given set of production goals in the most efficient manner.

Much—but certainly not all—of how economists see the world goes back to Adam Smith (Smith 1776/1981; Roncaglia 2001). The wealth of nations, Adam Smith claimed, was
measured against the background of a country's population (per capita), and was the result of
division of labor and specialization. By dividing work processes into several different tasks and
having the workers specialize in specific operations, productivity (production measured against
effort) would rise. This, of course, entailed a kind of innovation. Smith was concerned, in par-
icular, about labor productivity, i.e., the amount of labor going into the production of a unit of
something. Efficiency was the goal. The wealth of nations was not, consequently, dependent
on balance of foreign trade or on amassing trade surpluses, two contentions defended by Smith's
mercantilist predecessors. Foreign trade is only a part of what goes on in an economy, but Smith
set out to cover the whole picture.

Smith's approach shifts the balance of economic thinking on growth and wealth from focusing
on the guidance of the state or the directives of a ruler (not to mention the accrual of gold via
exports) to a framework that emphasizes law, competition, and the improvement of individual
lives. The processes of corporate expansion and growth that led to a division of labor is part of
what is referred to by Smith's famous appeal to the "invisible hand": An economy characterized
by acts of self-interest and the pursuit of profit leads actors and companies, via the mechanisms
of the market economy, to put their efforts into activities that best serve society. The potential
problem of a society where every actor seeks profit maximization is countered by competition
within the rule of law that prohibits fraud and coercion. Competition among companies to sup-
ply a certain product increases supply and thereby lowers prices. The involved companies then
adjust the supply accordingly. These mechanisms work throughout the economy and, in the
end, profits for the sale of all products reach the same natural level. Economic actors constantly
adjust their behavior according to the natural profit rate. The totality of adjustments of sellers
and buyers reaches, thereby, a level of balance, in technical terms, an "equilibrium."

Smith argued against state-led economies and for the benefits of the free market. In a free
market economy, each agent may employ his or her own local or situational knowledge in the
pursuit of self-interest (broadly understood). The cumulative result is a powerful dynamic force
for creating wealth; in the long run, a centrally directed economy is unable to duplicate or
match this result. The only real direct role for the state is to thwart collusion and provide cru-
cial public goods. Smith—who readily acknowledged the presence of self-interest as a potential
problem—was under no illusion that companies would not try to avoid competition. For Smith
the counteractive mechanism of competition is the key that justifies the self-interest promoted
by a free market economy.

In a market economy, the balance achieved between supply and demand, and the underly-
ing mechanisms described by Smith, gives an approximation of where economics has devel-
oped up until the present. The understanding of the economy as a system that balances supply
and demand in a sort of a circular flow proceeds from Smith's earlier analyses, even as current
economics is much more detailed and technical, and capable of taking into account aspects
not addressed by Smith. The current model of perfect competition makes assumptions that
Smith did not employ: No firm is large enough to dominate price setting; each has the same
information, the same cost structure and produces equivalent goods and services, all per-
formed in conditions with freedom of entry and exit. These mechanisms lead to situations
where every company would experience prices as given. Companies are adaptive, but they are
certainly not innovative.

It is against this model that Joseph Schumpeter's idea of "creative response" acquires its
force: "And whenever the economy or an industry or some firms in an industry do some-
thing else, something that is outside the range of existing practice, we may speak of creative
response" (Schumpeter 1947: 150, italics original). Creative responses are actions that forge
new paths, for example, moving from horse-drawn wagons to steam trains or to the internal

Knut Sogner

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Creativity, innovation, and the production of wealth

combustion engine in automobiles. A creative response is, in fact, an act of entrepreneurship, a term that Schumpeter uses in a wider and more profound sense than simply as a new venture creation. Schumpeter views creativity and innovation as tightly interwoven. Creativity—entrepreneurship—drives innovation.

In his path-breaking book *The Theory of Economic Development* (1934), Schumpeter treats the entrepreneur as having a dual role. The entrepreneur is a flesh and blood human being who takes risks and acts in an intentional and creative way. However, the entrepreneur's action fulfills a function that could almost be termed a systemic and integral part of Schumpeter's approach to macroeconomics. Indeed, group entrepreneurial actions, motivated by economic circumstance, prove powerful enough to be the drivers of economic cycles. Crises create opportunities, and the entrepreneurs take them. Joseph Schumpeter also coined a phrase, “creative destruction,” to emphasize, thereby, the need for an economy to renew itself (Schumpeter 1943/1976; 83). Economic crises may “rinse” the economy of old methods and products and usher forth novel approaches and goods, aided throughout by entrepreneurial activity.

Schumpeter's creative response is also applicable to the role of the business firm. The business firm may in principle perform exactly the same entrepreneurial role as the individual entrepreneur, and with their extra clout their impact is often greater. There is, of course, a literature about business innovation—innovation within the firm—and how companies may organize themselves better through the use of the resources they possess and the capabilities they contain (Penrose 1959/1995; Lazonick 2005; Barney and Clark 2007; Teece 2009). But there exists no easy recipe for how to facilitate growth-creating business innovation throughout society. (For the purpose of this chapter, the business firm is included in the discussion alongside individual entrepreneurs.)

Schumpeter offers a break with the neoclassical model. Creative behavior, he maintains, is about individual acts and novel practices; these new acts and activities rely, in part, on differences in belief (including information, hunches, and knowledge). Yet individual innovations cannot be foreseen or anticipated, only explained after the event itself. For these reasons, innovation is difficult to include in models of the economy, whether a part or a whole. In this sense, neoclassical economics assumes that all producers simply produce the same goods and do so in an efficient way. Yet for the entrepreneur products are not the same and it may be worthwhile for the creative person to consider how or whether new techniques or products might prove viable. The entrepreneur faces uncertainty, not risk, a distinction characterized aptly by Frank Knight:

The essential point for profit theory is that insofar as it is possible to insure by any method against risk, the cost of carrying it is converted into a constant element of expense, and it ceases to be a cause of profits and loss. The uncertainties which persist as causes of profit are those which are uninsurable because there is no objective measure of the probability of gain or loss.

(Knight 1951/2013: 116)

It remains true that Schumpeter's entrepreneurs may create what in certain instances (temporal or geographical) amount to monopolies. The aim of monopoly profit is one of the main attractions of innovation. Those who come first on the market with a brilliant new product may reap enormous profits because of the lack of competition. Not simply self-interest but greed is not unknown in the entrepreneurial world. If one places uncertainty of outcome at center stage, then a pursuit of profit, including a putatively monopoly profit, suggests that processes of innovation may come fraught with difficult and morally ambiguous challenges.
Entrepreneurial people may not necessarily be nice. The fulfilment of novel projects and processes may require a firm and steady hand; in fact, the sort of “creative destruction” described by Schumpeter may also lead to the neglect of ethical sensitivity. It may turn out that self-interest is not fully constrained by competition. In such cases, there is an argument that the sort of rule breaking that may take place may be ethically defensible because it can create new paths of actions, both morally and economically (Brenkert 2009). But being close to strong-minded entrepreneurs can expose employees, collaborators and relatives to ruthless or cold obsession. These dimensions are not much included in the histories and handbooks of entrepreneurship (Casson et al. 2006; Hébert and Link 2009; Landström and Lohrke 2010), though some of the American “robber barons,” active during the turn of the twentieth century, were entrepreneurs. If there is this “dark side” to entrepreneurship, then it might be approached through the consideration of these questions:

For example, when does persistence become rigidity that stifles the building and sustaining of nurturing relationships? When does entrepreneurial passion turn into a dysfunctional obsession? . . . Finally, when does the entrepreneur’s need for dominance and achievement lead to engaging in fraud and corruption that undermines the well-being of the community and society?

(E Wright and Zahra 2011: 4)

Even taking the above into account, the creative entrepreneur by and large remains a heroic figure because of his—and increasingly her—role as promoter of change in the economy. Fulfilling an entrepreneurial role has been increasingly valued in society, even if there is a “dark side.”

The importance of entrepreneurial innovation has re-emerged since the decade of the 1970s. During the immediate post-war era, the economies of the Western nations were characterized, for almost two decades, by solid economic growth led, in part, by governments’ fine-tuning their budgets, as well as corporate willingness to play along with government objectives. However, from the late 1960s, growth became more difficult, and ever since the steep rise of oil prices in 1973 many of the rich countries have struggled with unemployment and stagnation. The economic crisis of the 1970s changed many people’s (not necessarily economists’) perception of the value of economics as a predictive and useful science in a national planning sense. Economists such as Ludwig von Mises (1949), F.A. Hayek (1960) and Milton Friedman (1962), who for a long time had criticized post-war Western economics for being too dominated by the state and for ignoring the role of decentralized decision-making for allocating resources, came to prominence (Van der Wee 1986). Schumpeter and his ideas were mere shadows in the background, however, in the turn to market-based solutions and deregulation of the late 1970s and early 1980s (Frieden 2006). This was an era of highly visible political reformers such as Ronald Reagan and Margaret Thatcher, and most Western countries tried their hand at withdrawing the state from taking direct action in the economy. By and large, this was a political and economic undertaking to promote international competitiveness and entrepreneurship: trim the public sector and thereby increase the room for private entrepreneurship. Even so, in most countries economic growth remained lower than in previous decades. There was no new industrial revolution in the form of solid and transformational economic growth. There was a need for new thinking about how innovation and creativity could promote economic growth.

The interactive approach to innovation

Individuals such as Bill Gates, Steve Jobs and others are often seen as “game-changers” in the economy, creative agents emblematic of the innovative entrepreneur. However, the academic context of entrepreneurship focuses on innovation and the role of the entrepreneur. Such a focus is clearly evident in F.A. Hayek (1952) and Mises (1949) who argued that the entrepreneur, through his pioneering role, is the major determinant of economic growth and development.

Although entrepreneurship may be perceived as a source of economic growth, it is often associated with risk-taking and uncertainty. Schumpeter (1934) emphasized the role of the entrepreneur in creating new industries and new products, and he argued that entrepreneurship is the key to economic growth. However, entrepreneurship also involves failure, and many entrepreneurs fail to achieve their goals.

Entrepreneurship has been studied extensively in recent years, and there is a growing body of evidence to suggest that entrepreneurial activity is a key driver of economic growth. Entrepreneurs are often able to identify and exploit opportunities that others miss, and they are willing to take risks in order to achieve their goals.

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In conclusion, entrepreneurship is a vital component of economic growth, and it is important that we continue to study and understand the factors that drive entrepreneurial activity. This will enable us to develop policies that can support entrepreneurship and help to promote economic growth.
understanding of innovation has moved beyond the heroic individual to develop a more contextual approach to understanding innovation and entrepreneurship. This sort of approach focuses on circumstance and how situational opportunity provides conditions for innovation. Often called the “interactive approach,” because of how situational opportunity presents connections and relations among individuals, companies, and circumstances, this perspective also focuses on how the people involved in these creative processes are generally normal wage-earning employees who are, so to speak, “just doing their jobs.”

Such an approach gained prominence in the early 1980s with the evolutionary account of innovation offered by two economists, Richard R. Nelson and Sidney G. Winter. In *An Evolutionary Theory of Economic Change* (1982), they built on earlier work by Armen Alchian (1950), who had argued that the economy should be construed as an evolving system with analogies to biological evolution: selection mechanisms for actions from units or organisations (companies) that have established routines and are searching for new and better ways to do business.

Although influenced by Alchian, and by Schumpeter as well, Nelson and Winter also acknowledged their debt to two other economists, whose work exemplified the Austrian School of economic thought rather than the neoclassical. These were Israel Kirzner and F.A. Hayek. Kirzner has long recognized the signal importance of entrepreneurship to the economy. It is, he argued, through the actions of entrepreneurs that opportunities are recognized and acted on. Kirzner criticizes Schumpeter’s approach to entrepreneurship as not sufficiently attentive to the dynamic of the market economy and to the crucial role of entrepreneurial alertness: “Instead of identifying the profits captured ex post by the entrepreneur, we must focus attention on the profit possibilities which serve to attract the entrepreneur” (Kirzner 1971: 208; see also Kirzner 1973). Kirzner shares with his forerunner Hayek a micro understanding of the economy’s core processes. Hayek characterizes the economy not as one coherent whole, oriented to a specific end, but as several smaller “economies” connected by the price mechanism. Price changes are bits of information that lead to changes in the actions of individuals, organizations, and firms. The actual market order is not a world of perfect information. Competition is not, therefore, a static state but a process for discovering facts in the form of what is desirable and achievable, and how (Hayek 1945, 1978). Together Kirzner and Hayek portray the economy as a constantly changing entity in which entrepreneurship is an important way of achieving change.

For Nelson and Winter, innovation is a result of corporations striving to improve their profits through new products. The economic actors are profit seekers, as in mainstream economics. But they are acting in a world of bounded rationality—a world without full information—in which striving for innovations creates differences among companies. Learning from interacting with the environment is important. Companies develop unique knowledge that creates differences among firms and among their products; such differences, mutations in the biological jargon, are either selected or discarded in the market based on their specific characteristics. This is a model of an evolving and changing economy, with companies that act differently from each other, within an economy operating with “selection mechanisms” in addition to price.

During the 1980s, Nelson and Winter’s approach was developed in close communication with Chris Freeman and Nathan Rosenberg, scholars who, among others, were influenced by Schumpeter. A British economist, Chris Freeman, perceived that Schumpeter’s cycles of creative destruction were parts of long waves resting on shifts in technological foundations (Freeman and Soete 1997; Freeman and Louçã 2001). Fundamental kinds of technology were introduced into the economy as innovations altering long-term growth patterns. Freeman identified several such historical waves, two of which merit notice. The second great wave of innovation, taking place from the 1840s to the 1890s, rests on the industrial revolution with its resultant growth in the numbers of professional engineers, institutes of technology, as well as in the steady rise of mass
primary education and the emergence of railways, telegraph, and the use of steam power, coal and iron. In the 1990s, according to Freeman, a fifth long wave came forth based on global research and development networks, lifetime education and training, information highways, digital networks, microelectronics, and gas and oil. The technical and institutional context provided by Freeman and associates could be combined with the evolutionary approach of Nelson and Winter.

For several decades Freeman has developed and maintained a global center for innovation studies, namely the Science Policy Research Unit (SPRU) at University of Sussex in Brighton, UK. Together, Freeman and the SPRU blended Schumpeter and science and technology studies (STS), as originally influenced by Thomas Kuhn’s book, *The Structure of Scientific Revolutions* (1962). Kuhn demonstrated that science was not developing only according to its own internal logic, but through the formation of paradigmatic regimes involving subjective beliefs that were not necessarily rooted in unquestionable scientific facts. Freeman’s long waves could be seen as “techno-economic paradigms” (Freeman 1989), an expression that for a time was much employed in the field.

During the 1980s several independent academic developments came to support the approach of Nelson and Winter, and Freeman too. A common theoretical position was to place particular emphasis on different types of contextual features: locality, nation-state, communication networks, or institutional settings. Innovation was seen as a result of interactive processes of various kinds in which “learning” is the key, often via a feedback mechanism, through personal communication, or from a particular situation, be it geographical, national, legal, or cultural. Market-signal, technological knowledge, access to skills, initial markets, illustrate the advantages that firms and individuals could gain from positive interactions within such situations.

The appeal to situation or context provided, in effect, a critique of another view propagated first by Vannevar Bush in 1945: that the root cause of technological and economic progress was science (“Science as the Endless Frontier”), and that a nation would advance so long as science progressed. But in fact many students of science and technology rejected Bush’s theory. The influential historian of technology Thomas P. Hughes wrote a book about the electrification of Western society called *Networks of Power* (Hughes 1983; see also Hughes 1986) in which he emphasized not the advance of science itself but the complex web of actors and processes of technology and their responses to different circumstances.

Possibly the seminal contribution to the interactive approach is one that takes into account both economics and business—that of Stephen J. Kline and Nathan Rosenberg. In their essay, “An Overview of Innovation” (Kline and Rosenberg 1986), they summarize recent work on economics and technology (to which Rosenberg in particular had contributed significant elements, even influencing Nelson and Winter, as in Rosenberg 1976, 1982). Kline and Rosenberg point out that a central assumption of much science policy was that science and technology developed in tandem: as suggested by Vannevar Bush, science provided a basic input that laid the groundwork for technology and development, and from that would follow production and marketing. However, according to Kline and Rosenberg, this assumption of linearity was not correct. As they contend,

An improved model of innovation indicates not one, but rather five major pathways that are all important in innovation processes. These paths include not only the central-chain-of-innovation [research-development-production and marketing], but also the following:

numerous feedbacks that link and coordinate R&D with production and marketing;
side-links to research all along the central-chain-of-innovation;
long-range generic research for backup of innovations;
potentiation of wholly new devices or processes from research; and much essential support of science itself from the products of innovative activities, i.e., through the
tools and instruments made available by technology.

(Kline and Rosenberg 1986: 303)

From the perspective of a company, Kline and Rosenberg proposed a more complex process
of interaction than the traditional view that gave a special role to science. Innovations coming
out of companies were not necessarily an application of a scientific insight, but of longer and
more complex processes that involved very different departments and included both internal
and external relations. The department of marketing, for example, could be the initial mover of
something that would lead to a number of further responses and developments over time.
In the end, marketing could influence the direction of science. An illustrative example of how
the interactive approach turns traditional presuppositions on their head might be glimpsed in
the simple fact that the science of thermodynamics developed beyond the existence of the
steam engine, not the other way round as the conventional view had assumed (Nelson 1993: 7).

Out of the interactive approach grew the recognition of the economic relevance of feedback
mechanisms, intentional communication, even unintended and positive spillovers from
activities, also called externalities—whatever one called the relations between companies, their
networks, customers, and their wider surroundings, be they other companies, universities,
suppliers, or individuals. Yet this sort of approach to innovation did not point only to seemingly
opaque or difficult-to-understand micro processes but to larger patterns as well. In this sense,
the interactive approach also could be seen as indicative of larger patterns of economic develop-
ments: The interactive approach was coupled with institutional analyses; in this way, national,
regional or local environment became relevant to innovation studies. This contextual emphasis
led, in the late 1980s, to the concept of a “system of innovation.”

Innovation institutionalized

The rise of institutionally focused innovation studies changed the field. Schumpeter had iden-
thified the elusive entrepreneur, but the institutional approach made it possible to look for
complex business and social arrangements; suddenly, law, regulations and public policy mat-
tered. There was a clear shift from the uneasy search for the creativeness of the individual to the
attempt to identify what kind of stable arrangements held the key to institutionalize positive
processes of innovation.

In fact, Schumpeter did influence the turn to institutionalization. Although his last important
book, Capitalism, Socialism and Democracy (1943/1976) did not focus on innovation, Schumpeter
predicted there that innovation would be increasingly institutionalized in the research and
development function of large corporations. He did not mince words:

The perfectly bureaucratized giant industrial unit not only ousts the small or medium-
sized firm and “expropriates” its owners, but in the end it also ousts the entrepreneur and
expropriates the bourgeoisie as a class which in the process stands to lose not only
its income but also what is infinitely more important, its function. The true pacemakers
of socialism were not the intellectuals or agitators who preached it but the Vanderbilts,
Carnegies and Rockefellers.

(Schumpeter 1943/1976: 134)
Knut Sogner

If innovation could be institutionalized in large corporations, then in Schumpeter’s estimate there was no need for independent entrepreneurship. While Schumpeter’s earlier book introducing the entrepreneur was written as a young man early in the twentieth century, *Capitalism, Socialism and Democracy* came more than thirty years later, after he was established as a professor at Harvard. The rise of American big business had influenced Schumpeter to such a degree that he made quite a turnaround. And Schumpeter, the macro analyst, did indeed, unlike most of his pupils, name some of the “robber barons” among the important entrepreneurs of the past. Entrepreneurship (also) called for forceful people.

**Innovation and the corporation**

One of the most powerful arguments for the innovative might of the large corporation came from the Harvard Business School historian, Alfred Chandler. Through several articles and three important books, with the telling titles *Strategy and Structure* (1962), *The Visible Hand* (1977), and *Scale and Scope* (1990), Chandler argued that the rise of the large vertically integrated corporation in the USA created economic advantages that explained why the United States became the richest economy in the world. Combining large marketing operations, strong research and development, and an elaborate and meritocratic management structure, the large corporation was able to reach a level of efficiency no other corporate system could. Large American corporations had lowered unit costs so much that they offered cheaper and often better products than would a competitive market constituted by smaller companies. This outcome ran counter to the standard economics argument that such a situation—oligopolistic competition—would in itself lead to higher prices. Chandler acknowledged that (large) firms would benefit from smaller transaction costs than otherwise obtainable through market transactions. However, his main argument was that big businesses not only appropriated the innovative work of smaller corporations but also created functions and capabilities that were not available in the market—hence the title *The Visible Hand* (Chandler 1977).

In 1977 when *The Visible Hand* was published, the belief in the superiority of the large corporation was beginning to crumble. By 1990, when Chandler published *Scale and Scope*, the vertically integrated large-scaled American corporation was hardly a model any more. It was associated with the Keynesian economic policy of the postwar period whose fine-tuning of the economy had catered to stable political and economic conditions for large corporations. Already in the 1980s an important critique had claimed that the success of Chandler’s big companies was as much a result of ideology and fashion as real economic forces (Piore and Sabel 1984). Through flexible specialization, it was argued, communities of companies located within easy distance of each other could utilize scale and scope advantages while also providing a flexibility that proved to be a comparative advantage to the big business corporation in the face of unexpected and changing market conditions.

The rise of the huge information technology (IT) sector in Silicon Valley was based on such a flexible specialization concept. Companies were smaller, people moved between companies, universities provided knowledge, and vertical specialization replaced vertical integration as some companies provided components for many other companies. Of course, no one would call Silicon Valley an example of flexible specialization any more. Apple, Intel, Cisco, Google, to name a few, have become giants that outwardly resemble Chandler’s big businesses (although they are very different from the traditional large corporation in that the firms of Silicon Valley are financially orientated, vertically specialized and innovate in part through the acquisition of firms).

Within mainstream economics, Chandler’s positive view of large corporations has hardly been taken seriously. One important exception is the influential economist William J. Baumol, who writes in *Innovation and Learning*, (Christensen, 2000) that

> technology provided companies with an opportunity to change industries and even new products of the same segment. The new firm can lower its costs. The old trap of listening to past customers and making products for older needs is broken. (p. 206)

**Systems at work**

One of the particularly influential clusters companies by “flexible specialization” stood within the Harvard Business Schools in the early 1990s. Two new approaches were: (1) the concept of the “flexible specialization” (Porter); (2) the concept of the “entrepreneurial environment”. Porter maintains that economies of scale are less important than local market dynamics. In these new companies, flexibility is a critical factor in the successful creation of new products and services. Although Porter himself remains reluctant to call these companies “innovative” (Schumpeterian) in any way, they remain significant because they represent a new model of entrepreneurship. The changes that Porter has identified can be seen in the way that Silicon Valley companies are organized and operate. The new model is based on a combination of flexibility, entrepreneurship, innovation, and market-driven growth. The success of these companies is due to their ability to quickly adapt to changing market conditions and to take advantage of emerging technologies.

However, the approach that Porter’s work was influential in economics, in particular, the development of the theory of the firm. It provided a new framework for understanding the relationship between firms and their environments, and the role of entrepreneurship in economic growth. The approach has also been applied to other sectors, such as the automobile industry and the financial services sector, and has helped to shape policy discussions on issues such as innovation and entrepreneurship. Overall, the work of Porter has had a significant impact on the field of economics and has shaped the way that we think about the role of firms and their environments in shaping economic outcomes.
who writes about corporations, and in particular those of a certain size (see The Free-Market Innovation Machine 2002). Chandler’s younger colleague at Harvard Business School, Clayton Christensen, has argued that large and established corporations are inherently vulnerable (Christensen 1997/2006). He cites examples of larger and successful corporations with leading technology that, in the longer run, fall victim to disruptive innovation. Smaller less established companies that get a foothold in the market with cheaper and less advanced products in the same segment may build their positions gradually and in the end assume a dominant position. The new firms have a different customer base and have a different product strategy and lower costs. The old firms might be aggressive, change-oriented and resourceful, but may fall into the trap of listening too intently to (part of) their customer base (a “squeaky wheel bias,” see Heath 2006), leading them on what in the longer run is an unproductive path.

**Systems and clusters of innovation**

One of the pivots to institutionalism emerged with a focus on complex aggregations of firms, particularly those called “systems of innovation” or “clusters.” Explanations of these systems or clusters combine an interactive approach with the institutional-political approach exemplified by “flexible specialization” noted above: Communities or networks of companies are understood within political and institutional contexts. The system of innovation approach, applied by several authors coming from the SPRU-based network (see above, p. 332), and utilized in Harvard-based Michael Porter’s cluster theory, emerged in tandem in the late 1980s and early 1990s (Dosi et al. 1988; Lundvall 1992; Nelson 1993; Porter 1990). By and large, the two approaches are similar in that each emphasizes interactions between companies and their environments—including other companies and organizations, as well as the legal and regulatory context. In early formulations each approach had a clear footing in national (and regional) institutions. For example, factor conditions (education levels, infrastructure), the initial market, relevant business surroundings, and patterns of governance and labor relations reflected national laws and historical traditions. Many countries, in the latter part of the twentieth century, also enacted industrial policies whose assumptions and constraints reflected national priorities.

Although there are great similarities between Porter and the SPRU-based network, there remain significant differences. For Michael Porter a cluster represented local aggregations of companies in the same sector. A combination of intentional collaboration and unintentional knowledge flows from the local activity of people changing jobs, interacting with subcontractors (who in turn cater to more than one customer), and communicating with the community. Schools, universities and a specialized infrastructure would give the companies in these clusters additional advantages compared with companies without such fruitful surroundings. For Porter competition among companies within the cluster was also important. Porter’s approach was reminiscent of the famous and influential English economist Alfred Marshall’s concept of industrial districts, back when the British industrial company—located in particular areas, characterized by vertical and horizontal specialization, as well as a competitive climate—represented the state of the art in global production systems. In the British industrial districts, Marshall said, “mysteries of the trade become no mysteries; but are as it were in the air” (Marshall 1961: 271, quoted from Lazonick 2005: 35).

However, the theories of the SPRU scholars emphasized a national-systems-of-innovation approach that was much more loose-knit and flexible than Porter’s clusters. It is fair to claim that Porter’s approach represented a more neoclassically inclined approach in which competition was included, while the SPRU approaches were more or less influenced by evolutionary economics. In the evolutionary perspective, developments would prove more random than in
a tightly knit Porter-cluster, but the broader national institutional setting would be a strong
constraining factor. Two of the pioneers in this national approach, Bengt-Åke Lundvall and
Charles Edquist, provided an interpretation of Danish innovative developments:

The process of technical change in Denmark is organized neither by big firms nor by
the state. It is quite self-organized. The only reasonably strong coordinating block in the
economy has been the export-oriented, and cooperatively organized, agroindustrial sector.
(Edquist and Lundvall 1993: 281–2)

As noted previously, much work has been done to develop the perspective of innovation as
local, regional or sectoral systems (Asheim and Gertler 2005; Malerba 2005). To render the
interactive perspective relevant to local, regional or sectoral requires examining smaller entities
with numerous interactions. Such an approach may be employed in a different research envi-
nronment, such as the examination of long-term innovation processes in the state of Minnesota,
as detailed by Andrew Van de Ven and colleagues in *The Innovation Journey* (1999).

**Open innovation and aggregations**

Another and related approach that has gathered a lot of interest outside of academia is Henry
Chesbrough’s “Open innovation”: if companies open up their processes of innovation and
bring others in, they can share the burden and stimulate each other (Chesbrough 2003). To
invite others in may serve as a tool with which a common solution, brought forward by several
partners, stands a better chance to succeed as a viable product or a process. Open innovation is
also a way of sharing or spreading risks: putting one’s economic eggs in more than one basket
through establishing external relations. The ideas behind open innovation are very similar to
the innovation/cluster-approach, and reflect as well the older notion of flexible specialization.
Clearly, much of what has been written and thought about innovation over the last thirty years
plus is inspired by the remarkable rise of the IT businesses of Silicon Valley in California.

Aggregations are good at a particular type of innovation—small and gradual improvements
that spread among companies, where no single company or innovation is of particular impor-
tance. Such piecemeal and accumulated improvements are found in the progressive devel-
opment, over the twentieth century, of cars and airplanes, goods typically manufactured by
international businesses whose breakthroughs (some more important than others) exemplify
gradual or incremental development (Nelson 1993). Positive changes are often the result of every-
day work by normal employees, not the outcomes of risk-taking entrepreneurs obsessed by
some particular idea. The other type of innovation is the radical sort—a new drug, or a remark-
able new innovation that changes the rules of the game in a specific sector. For either kind of
development, piecemeal or revolutionary, the chances of success are greater if the firm is located
within the right region and nation for that kind of activity. The support of the surrounding fac-
tors, firms, and people are important for the whole process from breakthrough through product
development and marketing.

**Law, culture, and ethics**

Constructing aggregations may seem like a good idea to promote economic development.
However, the examples of the successful institutionalization of innovation in these clusters and
systems come from Western countries. This fact points to a larger institutional framework dis-
tinct from locality and the interactive support therein. Without a well-functioning legal system

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336
Creativity, innovation, and the production of wealth

... (the rule of law), entrepreneurial activities and processes of innovation are hardly possible. Many countries have the right legal frameworks, at least in script, but poor countries often lack the means—including the actual political willingness—to enforce effectively the property rights and contract law essential for economic experimentation, development, and innovation (Cooter 2005). Without these basic protections of one’s efforts and of potential rewards, why should anyone undertake to develop new ideas or experiment with new techniques of production? After all, as Schumpeter reminds us, innovation challenges the status quo and defies those whose power rests on the preservation of the status quo.

Framing innovation as nationally facilitated and constrained leads to the grand synthetic grasps of, for example, David S. Landes’ *The Wealth and Poverty of Nations: Why Some Are So Rich and Some Are So Poor* (1998), or Daron Acemoglu and James A. Robinson’s *Why Nations Fail: The Origin of Power, Prosperity and Poverty* (2012). Approaches such as these introduce into the discussion different cultural habits and institutional settings among the nations and regions and treat these as relevant to innovation and the realization of economic growth. Landes’ book in particular has been controversial because he explains that the West is richer than the rest through the early adoption of a capitalist culture with a technological aptitude. Acemoglu and Robinson argue, on the other hand, for an institutional explanation, dividing countries between those that have inclusive and those that have extractive economic and political institutions. The latter countries, which are also poorer, function for the benefit of an elite rather than for industrious people.

In a recent three-volume account of the great economic growth experience of the last 200 years, Deirdre McCloskey has argued that shifts in ethical values explain how ingenuity through individual effort has been unleashed. The rise of individual liberty through new political constitutions (as in France, and the United States, Norway, among other nations) and the ensuing development of ideas, gave rise to what McCloskey calls “the double ideas of liberty and dignity” (2016: xxxiii). Dignity incorporates both a pride and a moral fulfillment in one’s work and effort, especially of the commercial sort. The rise of the new, proud, and commerce-orientated individual emerged most fully in the eighteenth and nineteenth centuries but these ideas found their earliest roots in England and the Netherlands. The changing ideas about the moral value of commerce as a human activity (from being disreputable and unproductive activity to a worthy and creative pursuit reflective of the Judeo-Christian idea that human beings are made in God’s image) would inspire waves of innovation that account for the wealth of the West today. McCloskey’s twin appeals to specific political institutions and ethical ideas serves to directly refute Landes’ long-term cultural approach. Her argument against Acemoglu and Robinson’s institutional explanation suggests, similarly, that it omits the constitutive role of ethics in guiding and justifying the everyday activities of individuals. For McCloskey, differences in productive capacity rests in very significant part on whether political institutions allow the freedom to produce and exchange and whether the majority of the people believe in and work for the principles that such institutions express (McCloskey 2006, 2010 and 2016, and see especially her “Exordium,” in the book of 2016).

Living in an unsuccessful age?

So mankind, especially in the Western nations, has grown richer. But what is happening in the world today? Do communities of companies—a system, cluster, or ecosystem—belonging to a kind of geographical entity create more economic growth than the companies not situated within such contexts? It is fair to say that they do, at least in most circumstances. To a great degree, these institutionalized arrangements have grown up through long term and
complex processes. They have stood the test of time and the test of competition. But are they reflective more of successful and particular historical processes than of examples that may be, so to speak, exported as solutions for less successful localities, regions, or companies? One cautionary note is that economic growth in the Western world has not been impressive over the last couple of decades.

In a recent book the American economist Robert J. Gordon argues that the American economy since about 1970 has not produced the same economic growth as in previous decades (Gordon 2016). The innovations of the last four to five decades are simply not up to the standard of the innovations of the special century following the American Civil War. This is not an entirely new argument, as Tyler Cowen has argued a similar conclusion (Cowen 2011), but Gordon supports his argument with massive empirical work. As Gordon summarizes,

Our central thesis is that some inventions are more important than others, and that the revolutionary century after the Civil War [for example, the introduction of electricity into daily life] was made possible by a unique clustering, in the nineteenth century, of what we will call the “Great Inventions”. This leads directly to the second big idea; that economic growth since 1970 has been simultaneously dazzling and disappointing. This paradox is resolved when we recognize that advances since 1970 have tended to be channeled into a narrow sphere of human activity having to do with entertainment, communications, and the collection and processing of information. For the rest of what humans care about—food, clothing, shelter, transportation, health, and working conditions both inside and outside the home—progress slowed down after 1970, both qualitatively and quantitatively.

(Gordon 2016: 2)

Gordon finds that the contributors to growth have changed over time. For example, inventions (which, in the terminology of this article are innovations, i.e., they are taken into use in the economy) and technical change have contributed less since 1970 than in the period before. He draws this conclusion by comparing what is called “total factor productivity”—the contribution of everything that is not labor, and capital, often understood to be improvements in techniques, methods, knowledge and such.

Gordon believes the potential for continued improvements has decreased because so many fundamental advances (for example, safe drinking water, improvements in transportation) can happen only once. He paints a grim picture of our current age, and points to the growing social divide in the USA. He suggests that a second industrial revolution, starting at the end of the nineteenth century and extending into the twentieth, should be recognized as particularly important when compared with what went on before and what came after.

Whether the American economy (or that of other nations) will explode again with productive creativity will have to resolve itself. Gordon does not really explain why such a special century emerged or why he is pessimistic about the future possibility of presently unknown and important innovations. His book details the improvements that contributed to the special century, but there is not one clear lesson to be taken from his account, a point iterated by a fellow economist (Margo 2016).

What is particularly noteworthy from the perspective of this chapter is the overlap in time frame of the perspectives of Gordon and Alfred Chandler. Gordon’s special century matches Chandler’s claim that the rise and innovative efficiency of big business was an important growth factor for United States. Does Chandler’s rise of big business help explain Gordon’s special century? And, consequently, when the fortunes of big business waned during the troubled times of the 1970s, never really to come back in favor, does that explain the lack of rise in productivity?
Creativity, innovation, and the production of wealth

There is no easy answer to those questions, but there is another theme that Gordon and Chandler share about development in the USA and the Western world since the 1970s: The rise of inequality. For Gordon this is manifest in the per capita living standards. For Chandler, the power shift from a meritocratic leadership group to shareholders was a negative move undermining the grasp and innovative strength of big business (Chandler 1990). Shareholder value, as a concept, has become isolated as singularly important but in previous periods it was part of a larger concern—the creation of corporate value, comprising shareholders, managers, and other employees working together as a whole. Efficiency seems to be prioritized in shareholder capitalism, possibly to the detriment of innovation.

Gordon is right in emphasizing future unpredictability. The essence of innovation is unpredictability. The reason "the unforeseen innovations" are not already here is because of our inability to imagine them. That is the core of what innovation is. But it is food for thought that our preoccupation with innovation comes at a historical time when, seemingly, not enough innovation is delivered to keep the economy growing as fast as we became accustomed to up until the 1970s.

Concluding remarks

Innovation and creativity are at the same time alluring and frightening. On the one hand, innovative goods and processes, and the aspirations to realize these, suggest progress; they renew hope and offer something to strive for or to anticipate. On the other hand, they also suggest the crumbling of known entities, with its concomitant uncertainty, anxiety, and apprehension. Whether such processes and novel events pose more difficult psychological if not ethical challenges than more stable economic situations is difficult to say.

It is a well-known fact that change may be challenging. It is worth remembering that the mighty movement forward for long-term economic growth, the Industrial Revolution of the late eighteenth century, was shaped by an earlier period known as the Enlightenment (Mokyr 2009). For all the harsh conditions and tragic individual outcomes of the long ascent of the industrial economy, the development of the economy was shaped by attitudes and ideas of how better societies could be created. These aspirations played a role in making industrial society sustainable, and such positive caution should be applicable to our own future. Maybe Robert Gordon’s "slow growth" conclusion should be seen as proof of the failure of the economic policies created in the 1970s for increased competition. In particular, an attempt to capture ways that innovation may be institutionalized can appear as futile in light of that slow growth. Perhaps even the attempt to realize clusters, systems of innovation, even specific benefits from the free market may remain difficult to realize. No wonder some innovation scholars are crying for more action from the state (Mazzucato 2014; Schot and Steinmueller 2016). Yet, in a genuinely liberal economy there will always be a need for Schumpeter’s entrepreneurial action and for creative responses, at least if the economy is to continue to grow.

Essential readings


For further reading in this volume on the nature, ethics, and conditions of innovative entrepreneurship, see Chapter 16, *The ethics of entrepreneurship. On the role of the entrepreneur in society*, see Chapter 7, Can profit seekers be virtuous? On the ways in which current economics has influenced our understanding of business ethics, see Chapter 17, *The contribution of economics to business ethics*. For a discussion of economic motivation and obstacles to economic progress, see Chapter 21, Regulation, rents, and business ethics. For an account of recent innovations in the organizational forms of corporations, see Chapter 15, *Alternative business organizations and social enterprise*. On intellectual property rights, see Chapter 18, *Property and business*.

**Note**

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**References**


Creativity, innovation, and the production of wealth


Contents

List of figures xiii
List of tables xiv
List of contributors xv
Acknowledgements xix

Introduction 1
Eugene Heath, Byron Køldis and Alexei Marcoux

PART I
The discipline of business ethics 5

1 The history of business ethics 7
Bernard Mees
The "idol of origins" 8
Critics of capitalism 10
Business ethics becomes a field of study 12

2 Theorists and philosophers on business ethics 23
George Bogues
Ancient and medieval suspicions of commerce 24
The modern approval of business 27
The late modern attack on business 31
The philosophic epoch of business ethics 33

3 Theory and method in business ethics 38
Nicholas Capaldi
Hostility to business and business ethics 39
The philosophical background 41
The Enlightenment Project and contemporary ethics 44
Exploration: the "new" normative methodology 46
Two competing narratives of philosophical exploration 49
An alternative method: explication 51
Contents

4 Teaching business ethics: current practice and future directions
   Darin Gates, Bradley R. Agle, and Richard N. Williams
   Business ethics: education vs. training 60
   The why, what, how, where, and when of business ethics education 62
   Strengthening a student's moral sense and commitment 67
   Moral blindness, self-deception, and unethical actions 70

PART II
Moral philosophy and business: foundational theories

5 Consequentialism and non-consequentialism
   Andrew Gustafson
   A brief overview of ethical theories 80
   Ethical theories of non-consequentialism and consequentialism 81
   Non-consequentialism and consequentialism in business ethics 85

6 Social contract theories
   Pedro Frncés-Gómez
   A taxonomy of social contract approaches 96
   Justification of the social contract theory of business ethics 98
   How does it work? The elements of CBE 99
   Integrative Social Contracts Theory (ISCT) 103
   Application and criticism of Integrative Social Contracts Theory 105
   Other social contract theories in business ethics 106
   Concluding remarks: criticism and new directions 108

7 Can profit seekers be virtuous?
   Michael C. Munger and Daniel C. Russell
   Can profit seekers be virtuous? 114
   Profits in the entrepreneurial process 116
   Virtuously seeking profits 122
   Entrepreneurial virtue in commercial society vs. rent-seeking society 125

8 Feminist ethics and business ethics: redefining landscapes of learning
   Ming Lim
   Feminist ethics and the ethics of care 133
   Feminist ethics and business ethics 134
   Ethics of care: a way forward? 136
   Virtue, self, and other: implications for business ethics 137
   Etienne Wenger: learning a (virtue) ethics of relationship 140
9 Business ethics and religious belief
   Kenneth J. Barnes
   The Hebrew tradition 148
   The Christian traditions 151
   Islam 158
   Religions of Asia 159

PART III
Business ethics theories 165

10 Social responsibility
   Florian Wettstein
   Social responsibility defined 168
   Can corporations have moral responsibilities? Corporations as moral agents 169
   What are the social responsibilities of corporations? 171
   Making sense of CSR theory and practice 172
   New directions in CSR 176

11 Stakeholder thinking
   Kenneth E. Goodpaster
   Setting the stage 185
   Conscience: personal and institutional 187
   Is stakeholder thinking more an obstacle than a proxy for corporate conscience? 188
   From stakeholder to comprehensive moral thinking 194
   Implications for business education 197
   Appendix: the MBA Oath 203

12 Integrative Economic Ethics: concept and critique
   Alexander Lorch and Thomas Beschorner
   Integrative versus applied ethics 205
   Discourse, legitimation, and responsibility 207
   The micro level: the ethics of economic citizens 210
   The meso level: normative stakeholder management 211
   The macro level: republican liberalism and regulatory ethics 213

PART IV
Conceptual considerations 221

13 What is business?
   William Kline
   Business as an organization 224
   Business as an activity 228
   Stakeholder theory, participation rights, and fair decision procedures 232
## Contents

### 14 The corporation: genesis, identity, agency

*Gordon G. Sollars*

- Origins of the corporation 239
- Theories of the corporation 243
- Corporate moral agency 248

### 15 Alternative business organizations and social enterprise

*Dana Brakman Reiser*

- The US experience described 258
- A critique of US specialized forms 263
- The European environment explored 265
- Evaluating European social enterprise forms 269

### 16 The ethics of entrepreneurship

*Christian Lautermann and Kim Oliver Tokarski*

- Conceptions of entrepreneurship 276
- Expanded conceptions of entrepreneurship 277
- Core elements of entrepreneurship 279
- Ethical entrepreneurship: empirical considerations 280
- Ethical entrepreneurship: normative considerations 283

### 17 The contribution of economics to business ethics

*Joseph Heath*

- Skepticism about business ethics 291
- The rational choice revolution 295
- The new modesty 300

## PART V

### Economic institutions: operations and effects

### 18 Property and business

*Bas van der Vossen*

- Forms of ownership 309
- Two kinds of justification 311
- The conventionalist objection 317
- Intellectual property 318
- Concluding remarks: business and property 321
<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>19</td>
<td>Creativity, innovation, and the production of wealth</td>
<td>326</td>
</tr>
<tr>
<td></td>
<td>Knut Sogner</td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Innovation and neoclassical economics</em></td>
<td>327</td>
</tr>
<tr>
<td></td>
<td><em>The interactive approach to innovation</em></td>
<td>330</td>
</tr>
<tr>
<td></td>
<td><em>Innovation institutionalized</em></td>
<td>333</td>
</tr>
<tr>
<td></td>
<td><em>Living in an unsuccessful age?</em></td>
<td>337</td>
</tr>
<tr>
<td>20</td>
<td>Money and finance: ethical considerations</td>
<td>343</td>
</tr>
<tr>
<td></td>
<td>Antonio Argandoña</td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>The legal and institutional framework</em></td>
<td>344</td>
</tr>
<tr>
<td></td>
<td><em>The ethics of financial intermediaries</em></td>
<td>346</td>
</tr>
<tr>
<td></td>
<td><em>The ethics of financial markets</em></td>
<td>351</td>
</tr>
<tr>
<td></td>
<td><em>Alternative finance</em></td>
<td>353</td>
</tr>
<tr>
<td>21</td>
<td>Regulation, rent seeking, and business ethics</td>
<td>359</td>
</tr>
<tr>
<td></td>
<td>Christel Koop and John Meadowcroft</td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>A typology of business ethics and regulation</em></td>
<td>361</td>
</tr>
<tr>
<td></td>
<td><em>The business ethics of rent seeking</em></td>
<td>367</td>
</tr>
<tr>
<td></td>
<td><em>Regulation, rent seeking, and institutional design</em></td>
<td>371</td>
</tr>
<tr>
<td>22</td>
<td>Business, nature, and environmental sustainability</td>
<td>376</td>
</tr>
<tr>
<td></td>
<td>Joseph DesJardins</td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Environmental goods as economic resources: where markets can work</em></td>
<td>377</td>
</tr>
<tr>
<td></td>
<td><em>Environmental goods and intrinsic value: where markets won’t work</em></td>
<td>378</td>
</tr>
<tr>
<td></td>
<td><em>The ethics and environmentalism of sustainable development</em></td>
<td>381</td>
</tr>
<tr>
<td></td>
<td><em>What sustainability is not</em></td>
<td>386</td>
</tr>
<tr>
<td>23</td>
<td>The economic crisis: causes and considerations</td>
<td>393</td>
</tr>
<tr>
<td></td>
<td>Randall G. Holcombe</td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Ethics and economics</em></td>
<td>394</td>
</tr>
<tr>
<td></td>
<td><em>Public policy on mortgages and the 2008 crisis</em></td>
<td>395</td>
</tr>
<tr>
<td></td>
<td><em>The role of the Fed in the crisis</em></td>
<td>398</td>
</tr>
<tr>
<td></td>
<td><em>The financial industry bailout</em></td>
<td>399</td>
</tr>
<tr>
<td></td>
<td><em>The auto industry bailout, and more</em></td>
<td>402</td>
</tr>
<tr>
<td></td>
<td><em>The ethics of the policy response</em></td>
<td>403</td>
</tr>
<tr>
<td></td>
<td><em>Housing policy and the political process</em></td>
<td>404</td>
</tr>
<tr>
<td></td>
<td><em>Political capitalism</em></td>
<td>405</td>
</tr>
</tbody>
</table>
PART VI
Roles and responsibilities within the firm 411

24 Corporate governance
Ann K. Buchholtz
The primacy debate 416
Issues surrounding shareholders 418
Issues surrounding boards of directors 420
The nature and role of the CEO 422

25 Leadership and business ethics: are leaders wolves for business ethics?
Valérie Petit and Sarah E. Saint-Michel
Theoretical foundations: desperately seeking ethics in leadership 431
The moral manager: navigating ethical leadership 433
The moral person: exploring the character of business leaders 437
Ethical leadership in the age of corporate social responsibility 438

26 Theoretical issues in management ethics
Joseph A. Petrick
Major management theories 447
Major ethics theories 450
Selected theoretical issues in management ethics 452

27 The ethics of managers and employees
Linda Klebe Treviño
Ethical awareness, judgment, motivation, and action 460
Managing ethical conduct through ethics and compliance programs 462
Ethical culture 463

28 Employee ethics and rights
Jeffrey Moriarty
Freedom of contract: Lochner’s shadow 474
Starting and terminating the employment relationship 475
Compensation 478
The nature of work: meaningful work and workplace democracy 480
Privacy 482
Whistleblowing 484

29 Exploitation and labor
Benjamin Ferguson
How are laborers wronged? 491
What do firms owe their employees? 493
Who is responsible when workers are wronged? 501
<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>Ethical issues in marketing, advertising, and sales</td>
<td>506</td>
</tr>
<tr>
<td></td>
<td><em>Minette Drumwright</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Marketing, ethics, and marketing ethics</em></td>
<td>506</td>
</tr>
<tr>
<td></td>
<td><em>Critics of marketing</em></td>
<td>508</td>
</tr>
<tr>
<td></td>
<td><em>Conceptual and theoretical perspectives on marketing ethics</em></td>
<td>515</td>
</tr>
<tr>
<td>31</td>
<td>The accounting profession, the public interest, and human rights</td>
<td>523</td>
</tr>
<tr>
<td></td>
<td><em>Ken McPhail</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Introducing accounting ethics</em></td>
<td>524</td>
</tr>
<tr>
<td></td>
<td><em>Introducing professions and the public interest</em></td>
<td>525</td>
</tr>
<tr>
<td></td>
<td><em>Expressions of the public interest</em></td>
<td>527</td>
</tr>
<tr>
<td></td>
<td><em>Accounting and human rights</em></td>
<td>529</td>
</tr>
<tr>
<td></td>
<td><strong>PART VII</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Multinational corporations and globalization</strong></td>
<td>541</td>
</tr>
<tr>
<td>32</td>
<td>The globalization of business ethics</td>
<td>543</td>
</tr>
<tr>
<td></td>
<td><em>Kirk O. Hanson</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Business ethics emerges in US business schools</em></td>
<td>544</td>
</tr>
<tr>
<td></td>
<td><em>A focus on business ethics emerges in US corporations</em></td>
<td>544</td>
</tr>
<tr>
<td></td>
<td><em>Interest in business ethics beyond the United States</em></td>
<td>545</td>
</tr>
<tr>
<td></td>
<td><em>Globalization becomes an economic reality</em></td>
<td>547</td>
</tr>
<tr>
<td></td>
<td><em>The growth of corporate global ethics programs</em></td>
<td>548</td>
</tr>
<tr>
<td></td>
<td><em>Defining a global ethic for business: challenges</em></td>
<td>550</td>
</tr>
<tr>
<td>33</td>
<td>Cross-cultural management ethics in multinational commerce</td>
<td>556</td>
</tr>
<tr>
<td></td>
<td><em>Terence Jackson</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Foundations: Hofstede’s cultural values approach in international management studies</em></td>
<td>556</td>
</tr>
<tr>
<td></td>
<td><em>Building on Hofstede’s foundations</em></td>
<td>561</td>
</tr>
<tr>
<td></td>
<td><em>World Values Survey and modernization theory</em></td>
<td>563</td>
</tr>
<tr>
<td></td>
<td><em>Ethical judgments, algorithms, and codes of ethics</em></td>
<td>565</td>
</tr>
<tr>
<td>34</td>
<td>Corruption, bribery, and moral norms across national boundaries</td>
<td>573</td>
</tr>
<tr>
<td></td>
<td><em>Wesley Crag</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Bribery and gifts</em></td>
<td>575</td>
</tr>
<tr>
<td></td>
<td><em>Bribery: inherent characteristics</em></td>
<td>577</td>
</tr>
<tr>
<td></td>
<td><em>Bribery: a complex social, economic, and political reality</em></td>
<td>579</td>
</tr>
<tr>
<td></td>
<td><em>Addressing the paradox of bribery through legal reform</em></td>
<td>580</td>
</tr>
<tr>
<td></td>
<td><em>The pursuit of integrity in business and government: lessons and challenges</em></td>
<td>582</td>
</tr>
<tr>
<td></td>
<td><em>The character of corruption</em></td>
<td>585</td>
</tr>
</tbody>
</table>
PART VIII
Business ethics across the globe 591

35 Business ethics in China 593
   Yuqiao Xiang
   The new era in China and the rise of business ethics 593
   Theoretical trends in Chinese business ethics 598
   The future challenges of business ethics in China 602

36 Business ethics in South Asia: Gandhian trusteeship and its relevance for the twenty-first century 606
   S. Ramakrishna Velamuri
   Business ethics in South Asia: scholarship, teaching, and practice 608
   Gandhi’s trusteeship framework 610
   Trusteeship: a critical appraisal 615
   Applicability of Gandhian trusteeship in the twenty-first century 617

37 Business ethics in Africa 624
   Minka Woermann
   Business ethics developments in Sub-Saharan Africa 625
   Business in Africa: contextual considerations and challenges 628
   Towards an African business ethics 634

38 Business ethics in Latin America 641
   Álvaro E. Pezoa
   Business ethics in Latin America: an approach to reality through the press 641
   Comparative data on public corruption 644
   Teaching and research 647
   Corporate practices, Non-Governmental Organizations (NGOs) and government initiatives 648
   Appendix: press citations 652

39 Business ethics in transition: communism to commerce in Central Europe and Russia 657
   Rodica Milena Zaharia
   Business ethics under communism 658
   Similarities among former communist countries 660
   Differences among former communist countries 664
   Business ethics and the EU 667

Index 674

xii