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**A Capability Theory of the Firm:
An Economics and (Strategic) Management Perspective**

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Abstract

The business enterprise is the prime institution in economic development and growth; yet, until recently, mainstream economics has mostly treated firms as homogeneous and therefore interchangeable black boxes managed by untrustworthy, opportunistic agents. Using economic principles, the field of strategic management has developed a nuanced approach to the understanding of how firms are created, organized, and grow, how they innovate and compete, and how managers manage. That approach has yielded a theoretical framework known as “dynamic capabilities.” Contrasts are drawn between dynamic capabilities and other approaches to the theory of the firm, including transaction cost economics and agency theory. Dynamic capabilities, and capability theory more generally, abandon the homogeneity assumption of microeconomic theory. This allows intellectual blinders to be removed and an understanding of differential firm-level performance to emerge. Capability theory recognizes that firms often have capability gaps that need to be remedied to build long-term competitive advantage. A richer conceptual understanding of the nature of the business enterprise and its management consistent with evolutionary and behavioral economics arises when capabilities are center stage. Policy insights into governance, inequality, economic development, and the wealth of nations follow.

Key words: firm heterogeneity; dynamic capabilities; transaction cost theory; agency theory; x-inefficiency; d-ineffectiveness; strategy; entrepreneurship; evolutionary economics; uncertainty; inequality.

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1. Introduction

The pursuit of profit is core to capitalism, as is the innovation that takes place in the business enterprise. They are core to creating value that is, in turn, shared between society and the various stakeholders (including both shareholders and employees) associated with the enterprise.

Some firms prove to be far more competitive than others. While this fact will be self-evident to most observers, economic theory has surprisingly little to say about why this might be so.

Economists can no longer claim to analyze certain major economic issues while relying on black-box models of the firm. A growing body of empirical research on income inequality, for example, has established that an understanding of firm-level differences is critical because wage differences are larger between companies than within them (e.g., Barth et al., 2016; Abowd, McKinney and Zhao, 2017). Song et al. (2016) found that over two-thirds of the increase in earnings inequality from 1981-2013 can be accounted for by the rising variance of earnings between firms and only one-third within firms. One of the co-authors of that study noted in a separate article (Bloom, 2017) that interfirm inequality has become greater and more persistent as firms increasingly sort themselves into a small number of knowledge-intensive companies and a larger pool of relatively labor-intensive firms. Moreover, evidence suggests that interfirm differences in profitability are becoming more persistent (Furman and Orszag, 2015).

Understanding how some enterprises build capabilities, grow, and create competitive advantage, leading to higher profits (and higher wages) above a perfectly competitive level, is an essential element for understanding capitalism and the modern economy. Indeed, as John Sutton of the London School of Economics states in his recent book *Competing in Capabilities*: “The proximate cause [of differences in

the wealth of nations] lies, for the most part, in the capabilities of firms” (Sutton, 2012: 8).

However, despite the salience of capabilities to business performance and to economic performance more generally, economists, until quite recently, have not developed the concept. About all that economists since Alfred Marshall have to offer with respect to the sources of firm-level competitive advantage are theories of monopoly and imperfect competition. Unfortunately, theories of monopoly, oligopoly, and other forms of imperfect competition in economics are rather barren when it comes to explaining how innovative firms like Amazon and Apple outcompete other innovative firms like Nokia and Motorola, why Singapore Airlines and Emirates Airways have come to be major carriers that can provide superior service while generating attractive profits, and why Fonterra needs “to be far more agile” and struggles to add significant value for its dairy farmer owners (Fox, 2015). Perhaps the reason is that there is no theory of capabilities in economics.

Surely one of the most important questions in both economic theory and economic reality is how individual firms build and manage capabilities to create and capture value so as to avoid the zero-profit trap of competitive equilibrium. Sadly though, this is not where modern theory has gone. The assumption of homogeneity (or near homogeneity) of firms has suffocated this inquiry. Part of the collateral damage is that the field of economics is bereft of appreciative frameworks that can provide useful advice to firms making resource allocation decisions or to policy makers endeavoring to understand firms and shape better outcomes for society.

Nevertheless, the Royal Swedish Academy of Sciences has selected several Laureates in Economics in recognition of work on efficiency-based theories of the firm. Efficiency-based economic models outline arrangements that, in practice, are relatively easy to imitate and that therefore cannot support durable

firm-specific performance advantages even though they might aid productivity. Thus, notwithstanding Nobel prizes to Coase, Williamson, and Hart for their important work on how firms organize their activities, many fundamental questions about firms have been left unanswered, such as how they create value and protect that value so as to grow and have durable competitive advantage domestically and globally. The building and maintenance of competitive advantage, to the extent it is derived from innovation rather than from some type of market restriction, is arguably more seminal than an inquiry into (static) efficiency because it focuses on how firms develop, learn, and, in some cases, become “great” and benefit their stakeholders, rather than merely select boundaries or governance structures so as to become efficient enough to just stay alive. The apparatus of production, transaction costs, and agency theory simply does not address the critical questions that managers, as resource allocators (and stewards to multiple stakeholders), struggle with every day. Despite important advances, mainstream microeconomics tells us next to nothing about the dynamic allocation of resources, the maintenance of difficult-to-imitate positive differentiation, and the sources of firm-level growth in employment and profits. To heterodox economists like Dosi, Nelson, Winter, and myself, this is an embarrassing lacuna in economic theory; but it does not seem to perturb the mainstream.

As noted, the monopoly “problem”—with its focus on welfare loss—is one of a few places in economic theory where single-firm issues have been addressed; but the answers so far are of limited value. While scale, scope, network effects, lock-in, and product differentiation

² Teece and Coleman (1998) discuss three sources of economic rents: Ricardian (scarcity) rents accrue to the firm for its control over scarce and valuable inputs; Schumpeterian (entrepreneurial) rents accrue to a firm for its ability to exploit unique knowledge assets in the period before rivals are able to imitate its products or services; and

are all part of the modern toolkit that economists reach into for explanations of market power, these factors do not go nearly far enough when it comes to understanding how individual firms establish and maintain competitive advantage. Indeed, the profession has been slow to explain why even these structural factors can prove inadequate, and how even a small degree of “monopoly” power can be contested by disruptive innovators. Market and organizational evolution are also expressly neglected.

As noted, some progress has been made. However, in textbook theory, there is little effort to look at particular firms, or group of firms, their histories, and organizational and technological issues in a systematic, time-sensitive manner. The continued silence of mainstream economists on these matters contributes to policy makers having jaundiced and naïve views of the role of managers and of the business enterprise in the economy and in society. Students complain bitterly, while faculties push back.

In short, despite the efforts of Michael Porter and others, standard monopoly theory is too blunt an instrument to support a meaningful explanation of the differential financial performance of firms in dynamically changing markets laced with deep uncertainty.² A more granular view of how wealth is created and captured by firms is needed. A new view must have, at its core, a theory of capabilities. Such a theory must explain what they are, how they are built, how they are employed, and how value is captured.

The neglect of (single) firm-level issues by the mainstream micro-theorists has left the door wide open for strategic management scholars to address

Monopoly (Porterian) rents can arise from “exclusionary conduct lacking efficiency justifications, from predatory conduct, or from governmentally conferred privileges (e.g., licenses)” (Teece and Coleman, 1998: 822). Only monopoly rents should be of concern to antitrust regulators.

important economic issues such as how successful firms create difficult-to-imitate capabilities and other points of technological and organizational difference that enable them to innovate and to allocate resources better over time. Such an explanation has failed to emerge out of standard economic models. Not even modern Coase-Williamson and Hart-Moore theories of the firm are up to the task, perhaps because they assume that markets are more complete than they are. While Williamson is explicit that complete contingent claims markets don't exist, he and others, including Coase, go on to assume that many prices exist when, in reality, they often do not (Boudreaux and Holcombe, 1989). Markets are more often incomplete (Arrow, 1962, 2012), property rights are often in dispute, innovation regularly throws the economic system into disequilibrium, and Knightian uncertainty is ubiquitous.

As Nelson (1981) explains, the very essence of capitalism—in fact, the very advantage of a private enterprise economy over a planned one—is that, with private enterprise, firms innovate, compete, sometimes disrupt each other, and sometimes cooperate. This observation would suggest that the ability of a capitalistic system to innovate, more than the twin theorems of welfare economics, ought to be the lynchpin of our understanding of the advantages of market economies. Yet this is not the case. Moreover, the field of industrial organization, which claims to analyze competition issues, has not fully faced up to the implications of working within a market structure-performance paradigm that says almost nothing about the nature of firms' capabilities or about how innovative firms and markets evolve.

In this paper, I endeavor to address these lacunae by developing a framework or meta-theory of firm capabilities and in particular, a theory of how firms innovate and change so as to maintain evolutionary fitness. An understanding of capabilities can help economists begin to fill in important gaps. The basic argument is that firms differentiate themselves

through learning, entrepreneurship, innovation, and astute decision making; in short, firms are differentiated by their capabilities, especially their capabilities to decide, to innovate, and to change.

The paper starts with an analysis of the shortcomings of the dominant microeconomic theory of the firm, noting the admonitions of Coase, Romer, Leontief and others to be loyal to the phenomena at hand and not merely accept theoretical elegance and the acclaim of colleagues as indicators of good science. I then introduce the capabilities view of the firm. Concepts similar to what I call "ordinary capabilities" are beginning to gain recognition among economists. The dynamic capabilities framework, which encompasses the firm's ability to act in an entrepreneurial fashion, has also gained some attention, but has yet to be fully integrated into economic theory. The paper then compares the capabilities framework with mainstream economic models in a number of areas, including markets and the boundaries of the firm. Special attention is given to the contrasting way managers are treated in the economics and capabilities frameworks. Next, a few areas are identified where a capabilities framework could be used to better inform policy, including antitrust, corporate governance, and economic development. A final section summarizes and concludes.

2. Fundamental Lacunae in the Theory of the Firm

The theory of the firm has received considerable attention since Ronald Coase's famous 1937 article "The Nature of the Firm." Economists have certainly begun to grapple with questions such as (1) why firms exist in a market economy; (ii) what determines the boundaries of the firm; (iii) how firms should be organized to align incentives for managers and owners and (iv) how they should be structured financially to

maximize profits and minimize managerial malfeasance. Economists such as Coase and Williamson have helped massively on the first question. Williamson and Klein, Crawford, and Alchian have contributed on the second, as have I. A panoply of economists including Jensen and Meckling and Alchian and Demsetz have put effort into the third, while Jensen and others have contributed significantly to the fourth. However, as Harold Demsetz noted: “Neoclassical theory’s objective is to understand price-guided, not management-guided, resource allocation” (Demsetz, 1997: 426). This focus is a major limitation as it deflects attention from critical resource allocation decisions.

In particular, economists have been silent for too long on critical managerial issues such as: (i) how firms innovate (beyond just spending money on R&D); (ii) why firms have capabilities that transcend the sum of individual skills of their employees and contractors; (iii) how individual firms evolve so as to build and sustain competitive advantage over rivals. As already noted, the third issue is arguably more fundamental than either (i) or (ii), and also many of the other questions to which the profession has already given its attention.

The third question has implications for the stakeholders of the firm (employees, shareholders, customers, suppliers) and is talked about every day in the business press. It has, to an inadequate extent, been addressed in the study of monopoly and imperfect competition. Economists usually appeal to some kind of structural cause such as entry barriers or scale and scope economies to explain why some firms get ahead. More recently, first-mover advantage, network effects, multi-sided platforms, and switching costs have been added to the list.³ These analyses

³ Nicholas Bloom’s (2017) explanation for interfirm heterogeneity as the result of knowledge-intensive firms outsourcing lower-value work, aggressively adopting IT, and benefiting from some unspecified winner-take-most mechanism is a recent example.

almost always ignore the how and why that brought about the analyzed circumstances; yet this is what matters for competition policy, industrial policy, innovation policy, and the regulation of corporate governance. Judge Learned Hand came close to the how and the why in his influential 1945 opinion in *United States vs Alcoa* when he noted that a “producer may be the survivor out of active competitors, merely by virtue of his superior skill, foresight and industry” (148 F.2d 416 (2d Cir. 1945) at 571). A line in Hand’s opinion⁴ gave rise to the notion of a “thrust-upon monopoly,” which was used by the U.S. Federal Trade Commission in the 50s and 60s as justification for not pursuing antitrust cases against companies merely because of market dominance. Ironically, Justice Hand’s thinking appears, at least in some small ways, to be ahead of economists. His opinions were an invitation to explain the foundations of superior managerial skill, foresight, and industry. Behavioral economists have in recent years provided significant insights into decision making; but any effort to establish links between these and the performance of individual firms has been handicapped by the absence of a comprehensive firm-level framework such as a theory of firm-level capabilities.

Clues as to the underlying reasons for the lack of progress can be found in Paul Romer’s (forthcoming) observation that too many economists have shown loyalty to their friends and, by implication, their own (sunk) investment in a body of inadequate theory that should have been abandoned decades ago. Romer has critiqued rational expectations macroeconomics, pointing out how the theory has failed to explain much of anything; but his most fundamental critique is that the field displays greater loyalty to its members than to

⁴ “[I]t may not have achieved monopoly; monopoly may have been thrust upon it.” (148 F.2d 416 (2d Cir. 1945) at 429).

the scientific principles that must drive honest inquiry. His concern is that macroeconomics is suffering from “a general failure mode of a scientific field that relies on mathematical theory”, which includes “disregard for and disinterest in ideas, opinions, and work of experts who are not part of the group” (Romer, forthcoming: 7).⁵ His criticism of the pursuit of (false) rigor over relevance is just as relevant to micro- as to macroeconomics.

Critiques of economic formalism are not new. More than three decades ago, Nobel laureate Wassily Leontief worried publicly about this tendency: “Year after year economic theorists continue to produce scores of mathematical models and to explore in great detail their formal properties ... without being able to advance, in any perceptible way a systematic understanding of the structure and the operations of a real economic system.” (Leontief, 1982: 107). Nobel laureate Ronald Coase, shortly before he died, contributed a column to the Harvard Business Review (Coase and Wang, 2012). According to Coase: “Economics as currently presented in textbooks and taught in the classroom does not have much to do with business management”, which has “severely damaged both the business community and the academic discipline ... It is time to reengage the severely impoverished field of economics with the economy.” His plea, however, remains largely ignored by the mainstream, even as they are quietly endorsed by economists working in the fields of strategic

⁵ Romer suggests that this failure mode occurs “when a few talented researchers come to be respected for genuine contributions on the cutting edge of mathematical modeling. Admiration evolves into deference to these leaders. Deference leads to effort along the specific lines that the leaders recommend. Because guidance from authority can coordinate the efforts of other researchers, conformity to the facts is no longer needed as a coordinating device. As a result, if facts disconfirm the officially sanctioned theoretical vision, they are subordinated. Eventually, evidence stops being relevant. Progress in the field is judged by the purity of

management and evolutionary economics. The point is not that formal (dynamic) modeling isn’t useful; it is. Rather, it is that the tools and models need to be embedded in and connected to narratives of what happens inside firms, industries, and ecosystems.

I don’t want to suggest that it is only the penchant for formalization that has distracted our profession from real issues about business firms and their management, even though I suspect it is the largest cause. Sidney Winter and I (Teece and Winter, 1984) sketched out deficiencies and deflections, and the appendix to this article provides an updated bill of particulars. There are at least two underlying culprits:

1. Reductionism and Homogeneity: Economists see the industry supply curve as nothing other than the sum of individual firm supply curves.⁶ This construct is convenient, especially when coupled with an assumption of firm-level homogeneity, which enables industry supply functions to be specified. However, it ignores interaction effects between firms, treats them as operating on (and not above or below) an identifiable supply curve, and assumes they are producing the right product(s) given market demands. No one who reads even a modicum of business news could possibly believe this is generally the case. The problem here is

its mathematical theories, as determined by the authorities” (Romer, forthcoming: 7-8).

⁶ While Alfred Marshall (1920) pioneered the concept of the representative firm as the building block for the industry supply curve, it is also the case that he used this as shorthand and that firms are, in fact, very diverse. In *Industry and Trade* (Marshall, 1919), he was clear that firms operate in a dynamic environment and that firms themselves change. Mathematical analysis was relegated to footnotes and appendices.

that economists took as their starting point the mathematical appendix to Alfred Marshall's (1920) *Principles of Economics* where he constructed the supply curve, rather than the body of the book and the rest of his work, which clearly recognized firm-level heterogeneity and the importance of management. In adopting this path, economists read out of the theory of the firm not only an affirmative role of the manager but also any role for entrepreneurship (Baumol, 1968, 2010).

2. Neglect of Innovation and Deep

Uncertainty: Economists have preferred to focus on risk and ignore Knightian and Rosenbergian (technological) uncertainty, despite the obvious ubiquity of deep uncertainty due to technological change, political factors, and unforeseen economic interactions. With risk, rational decision makers can operate by applying the rules of probability. With deep uncertainty (the open set of unknown unknowns about which no forecast can be made), rational decision makers freeze, and at least one economist had to appeal to the "animal spirits" of investors and managers to drive his macroeconomic model (Keynes, 1936). Economic theory needs to somehow develop a theoretical structure that allows entrepreneurs and managers to invest, operate, gain insight, learn, and act in the presence of the deep uncertainty that is part of everyday business life.

Once economists begin to accept the necessity of addressing these lacunae, the theory of the firm—and microeconomics more generally—will become far more relevant and credible to other social scientists, management scholars, and students. It is this very project to which I've devoted much attention in my own work because it is not enough to simply criticize. One must also build an alternative theoretical structure

that affords keener insights and better explanatory power. Because the theoretical framework outlined in this paper is the effort of a single scholar—assisted by graduate students, post-doctoral fellows, and, on occasion, colleagues—this effort is only a start, and is very modest relative to the scale of the problem at hand.

There is, in my view, too much talent dissipated on developing formal agency models of the firm that ignore its most fundamental and defining elements: its (unique) organizational and managerial capabilities, and especially its ability to innovate and to change. Demsetz insightfully noted that economic theory has shown a "neglect of information problems that do not involve agency relationships. These are associated with planning in a world in which the world is highly uncertain, and they involve problems of product choice, investment and marketing policies, and scope of operations" (Demsetz, 1997: 428). Unfortunately, his critique of the excessive focus on agency issues did not extend to suggesting a remedy for the problem. It is my hope that a greater percentage of talent and time in the economics field will start "doing the right things" rather than simply doing things "right," i.e., creating elegant but largely irrelevant mathematical models of firms and their interactions. Game theory, when applied to markets, proves everything and nothing at the same time because models developed for one setting are unlikely to prove robust when applied elsewhere (Sutton, 1990).

Clearly, behavioral economics has, in recent years, pointed out issues relevant to management: irrationality is possible, rules of thumb are ubiquitous, and hubris and decision traps are common. These insights, while important, still leave unexplained key elements of managerially guided resource allocation such as strategy, business models, and the organizational capabilities that impact the ability to transform the business.

In the rest of this article, I summarize some of my recent work on what I'm calling a capability-based theory of the firm. I will also reference the work of fellow travelers like Giovanni Dosi, Connie Helfat, Richard Nelson, Gary Pisano, and Sidney Winter. Others, including Jay Barney, Michael Jacobides, Peter Klein, Richard Langlois, Sohvi Leih, Franco Malerba, Margie Peteraf, and Paul Schoemaker, have joined the parade of management scholars taking the ideas of economists, challenging them where necessary, and applying them to management and policy questions.

3. The Capabilities View of the Firm: An Introduction

While the progress of science, according to Kuhn (1963), involves periods in which a mainstream paradigm dominates, the subsequent discovery of "anomalies" leads to the emergence of a new paradigm that, over time, displaces the old. Such anomalies exist in economics for very long periods without the mainstream budging much at all. In the spirit of Romer's suggestion that "a research program ought to involve risk" (Romer, forthcoming: 7), I take here some risk and outline a radical approach to the theory of the firm that puts capabilities, and not the production function or production sets, center stage. This exercise is animated by my own conviction and by John Sutton's (and Alfred Chandler's) observations that one cannot adequately explain the wealth of either firms or nations without a theory of capabilities. I begin by pointing out the rather wooden nature of the approach to the firm in contemporary industrial organization and in economics more generally. Resource allocation in economics is price-guided or government-guided; the role of firms and their

management in guiding resource allocation is largely ignored.

The field of industrial organization observed almost a century ago that different industries had different levels of (accounting) profits. This led to the structure-conduct-performance (S-C-P) paradigm that saw concentrated market structure as the foundation for tacit or explicit collusion, and profits (Mason, 1949, and Bain, 1959). Although severely (and, in my view, correctly) challenged by Phillips (1971), Demsetz (1973), and others who saw causation as going from (financial) performance to market structure, the structuralist view has not lost much sway,⁷ still animating today's antitrust/competition policy and even giving rise to Porter's influential Five Forces framework of competitive strategy (Porter, 1980). The Five Forces model possibly helps explain why the pharmaceutical industry is historically more profitable than airlines, and why airlines with strong hubs are, on average, more profitable than restaurants (although this may be changing). Nonetheless, it leaves many questions unanswered. Fundamentally, though, the S-C-P paradigm and Porter's Five Forces variant are not widely applicable because any supracompetitive profits are due to a small number of firms and industry-level structural factors.

It is true that Porter's Five Forces framework filled a vacuum in business schools and in management consulting, providing a laundry list of factors to analyze so as to identify attractive industries. It did not help the analyst figure out, however, the characteristics of "good" firms. Moreover, it has evolved little since its introduction and has serious shortcomings, having imported many of the weaknesses of the structuralist paradigm from economics upon which it was built. In particular, Five Forces doesn't account for capabilities or for innovation. Moreover, it fails to recognize that a

⁷ Modern approaches to disruption, e.g., Abernathy and Clark (1985), Jorde and Teece (1991), Christensen (1997), all share this view—implicitly if not explicitly.

concentrated, market structure is often the consequence (rather than the cause) of superior profitability. Furthermore, it assumes that “industry” is a meaningful category, and the underlying theory lacks firm-level explanatory power. To take one example, entry barriers are treated as an industry-level construct and are therefore useless for explaining intra-industry performance differences.

In due course, the clear existence of intra-industry performance differences (Rumelt, 1991) was sufficiently embarrassing that an alternative perspective known as the Resource-Based View emerged to explain firm-level differences. It gained a large following (Teece, 1982; Wernerfelt; 1984; Barney, 1991; Amit and Schoemaker, 1993), at least in the field of strategic management. In this paradigm, intra-industry differences are explained by firm-level ownership of difficult-to-imitate resources, especially intangible assets. These can serve as “isolating mechanisms” (Rumelt, 1987).⁸ The approach built on Penrose (1959) and found early applications (in the management literature) in research on diversification. Buttressing the resources approach, meanwhile, was important work on operations management. This revealed measurable differences in performance and technical capabilities (Abernathy et al., 1983; Hayes and Clark, 1986; Clark and Fujimoto, 1990) consistent with Liebenstein’s (1966) notion of x-inefficiency. Both of these newer approaches were silent, however, on important questions such as what technical criteria really mattered and what resources allowed some firms to remain competitive across numerous turns of the technology cycle. This created the need for evolutionary economic theory and something like a dynamic capabilities framework.

The capabilities view of the firm to be outlined below looks beyond “factors of production” and production

⁸ An intermediate step was the identification of “strategic groups” consisting of firms within an industry that have adopted similar strategies and business models and that are

functions to recognize the importance of the choices managers make to render resources more productive and to meet customer demand. It also recognizes that technology and know-how do not fall like manna from heaven but rather result from search, R&D, and investment. Moreover, the capturing of value by innovators and imitators is a function of the strength of competition, the appropriability regime, and the nature of the industrial knowledge the firm can build or acquire over time. In this way, the capabilities view endeavors to help explain interfirm heterogeneity, enterprise evolution, and organizational longevity.

I. 3.1 Resources versus capabilities

Resources are the tangible and intangible assets, broadly defined, that the firm can develop and effectively control. Resources, which include the skills of the firm’s employees, its equipment, and the collective skills of the organization, generate streams of services that the firm can deploy. As theorized by Penrose (1959) a firm at any point in time is likely to have underemployed resources, including management skills. A firm with excess resources may find it more profitable to monetize those services via product diversification into new avenues of growth rather than through a market transaction that leases access to the surplus services to an independent party—assuming such a transaction would even be feasible (Teece, 1980a, 1982). These decisions are consistent with the capabilities approach to the boundaries of the firm, which will be discussed below.

The manner in which a firm’s resources are coordinated and managed is at least as important to competitive success and survival as the identity of the resources themselves. Capabilities such as asset

separated from other groups by mobility barriers (Hunt, 1972; Porter, 1980).

orchestration and market creation (or co-creation) are vital to profitable resource management (Pitelis and Teece, 2010). Capabilities arise in part from learning, from combining resources, and from exploiting complementary assets. Many capabilities become embedded in routines, and some reside with the top management team. Organizational capabilities can usefully be thought of as falling into one of two interconnected (but analytically separable) categories: ordinary capabilities and dynamic capabilities. Ordinary capabilities are to a large extent operational whereas dynamic capabilities are generally strategic in nature.

Capabilities are not appropriately summarized by a production function because they are untethered from particular products. For example, a capability to make machines powered by small, compact internal combustion engines can manifest itself in the manufacturing of motorcycles, outboard (boat) motors, or tractors and lawn mowers. Other capabilities, such as the ability to offer outstanding customer service, may not be tied to a particular product area at all.

A higher-level category of capability was posited by Teece, Pisano, and Shuen in a 1990 working paper (revised and published in 1997). In this stream of research in strategic management, “dynamic capabilities” (Teece *et al.*, 1990) are integral to selecting, developing, and coordinating ordinary capabilities. The dynamic capabilities framework, which will be amplified below, has also been advanced by Nelson (1991), Chandler (1992), and Winter (2003), among others. The dynamic capabilities framework has become one of the leading perspectives on the firm in the field of strategic management (Di Stefano *et al.*, 2010). It seeks to explain firm survival (or failure) and long-run growth and firm survival (or failure) by detailing how firms can create, extend, integrate, modify, and deploy their resources while simultaneously managing competitive threats and effectuating necessary transformations (Teece, 2010a). Although it is not yet fully elaborated as a theory of the

firm, the dynamic capabilities framework brings Williamsonian transaction costs, Penrosean resources, Knightian uncertainty, and Schumpeterian (knowledge) combinations together in a way that can potentially explain not only why firms exist, but also their scope and potential for growth and sustained profitability in highly competitive markets.

II. 3.2 Ordinary and dynamic capabilities

This section provides further specification of the two types of capabilities.

a) Ordinary capabilities

Ordinary capabilities, which encompass operations, administration, and governance of the firm’s activities, allow the firm to produce and sell a defined (and static) set of products and services. Ordinary capabilities are embedded in some combination of (1) skilled personnel, including, under certain circumstances, independent contractors; (2) facilities and equipment; (3) processes and routines, including any supporting technical manuals; and (4) the administrative coordination needed to get the job done.

A firm’s ordinary capabilities support technical efficiency (and hence productivity) in performing a fixed group of productive activities, regardless of how well- or ill-suited the outputs are to the firm’s competitive needs (Teece, 2007: 1321). Quality control methodologies, performance measurement and payroll execution are examples of ordinary capabilities.

Ordinary capabilities can be measured against the requirements of specific tasks, such as labor productivity, inventory turns, and time to completion, and can thus be benchmarked internally or externally to industry best practices. Best operational practices are those that support speed, quality, and efficiency.

Best practices alone, however, are generally insufficient to ensure a firm success and survival, except in weak competitive environments (which are still ubiquitous in less-developed countries). One reason is that there is no benefit at being very good at delivering the “wrong” products after market demand shifts. Furthermore, much of the knowledge behind ordinary capabilities can be secured through consultants or through a modest investment in training (Bloom *et al.*, 2013). As a consequence, good and even “best” practices diffuse more or less quickly at least amongst those firms in environments exposed to strong global competition. Such firms are likely to be aware of benchmarking data, can acquire and absorb competitive off-the-shelf technologies, and can implement best practice training.

For example, the multidivisional (M-form) organizational structure diffused across large-scale corporations in the middle of the 20th century. In the petroleum industry, the majority of leading firms adopted an M-form structure over a period of about 15 years (Armour & Teece, 1978; Teece, 1980b). Once this organizational best practice became commonplace, the higher profits that had accrued to its early adopters in the U.S. petroleum industry dissipated.

Even though the diffusion of best practices clearly isn't rapid or complete, being a top performer in productivity is unlikely to lead to supernormal profits because it only takes a few firms at the frontier to drive prices down to competitive levels, thereby dissipating any economic rents. Put differently, even if best practices aren't universally adopted, their adoption is unlikely to support returns above competitive levels.

In globally competitive firms facing strong competition in advanced economies, where profits have the greatest potential to be sizable, a relatively high level of ordinary capabilities exists, and best practices are

close to universal. Bob Lutz (2011), the former vice chairman at General Motors, illustrates this point for today's automotive industry⁹:

The operations portion of the automobile business has been thoroughly optimized over many decades, doesn't vary much from one automobile company to another, and can be managed with a focus on repetitive process. It... requires little in the way of creativity, vision or imagination. Almost all car companies do this very well, and there is little or no competitive advantage to be gained by “trying even harder” in procurement, manufacturing or wholesale.

Just because operations are not at present a differentiator in the industry does not mean that they are not important at an aggregate level. There are significant differences in productivity among firms (Dosi, 2007), and productivity gaps widened in the 2000s (OECD, 2015). This translates into a great deal of unrealized value for society. Doing ordinary things well can support the jobs associated with surviving in “me too” commodity competition. However, it cannot lead to levels of exceptional profitability that drive investment, employment growth, wage growth, and the economic expansion associated with business leadership. This is in part because, as mentioned above, the presence of well-developed (best-practice) ordinary capabilities in a firm says nothing about whether its current production mix is the right path for the present or the future. In fact, strong ordinary capabilities can lead a firm into complacency; a trap is sprung when market conditions change because a single-minded pursuit of efficiency and productivity can drive out the capacity to effectuate change towards the new suite of products and processes the market

⁹ The advent of driverless and electric cars is turning the basic design paradigm of a car on its head, and certain new

ordinary capabilities (e.g., building batteries) are beginning to matter.

requires.¹⁰ Indeed, O'Reilly and Tushman (2013) point to how the pursuit of efficiency can stand in the way of innovation.

The fundamental problem is that efficiency/productivity, which is so much emphasized in (static) economic theory, ignores innovation and the transformation of markets and organizations. Inertia is often inadvertently imposed on organizations by efforts to optimize processes and achieve best practice. Not surprisingly, empirical research on the effects of process management practices fails to yield conclusive evidence of benefits. Powell (1995) and Samson and Terziovski (1999) did not find evidence that the employment of process (optimization) technologies aided enterprise performance. Indeed, some evidence (e.g., Garvin, 1991) suggests the contrary. The payoff to better process management is doubtful, except in an industry's periods of technological stability. As Benner and Tushman (2003) noted: "Activities focused on measurable efficiency and variance reduction drive out variance-increasing activities and, thus, affect an organization's ability to innovate and adapt outside of existing trajectories ... Core capabilities may become core rigidities" (Benner and Tushman, 2003: 242).

As a practical matter, the perceived need to maintain best practice and high productivity can distract top management from focusing on innovation so as to develop the right products. Doing things right (technical efficiency) is not the same as doing the right things. Doing the right things supports evolutionary fitness. Moreover, as John Chambers, former CEO of Cisco Systems, has observed, companies must be willing and ready to "change from doing 'the right thing too long' to 'the next big thing'" (Chambers, 2017). This

¹⁰ Henry Ford learned this the hard way. The Ford Motor Company used vertical integration to optimize the production process for the Model T. This worked well until the market shifted. Bringing a follow-on product, the Model

ongoing evolutionary fitness is the goal of dynamic capabilities.

b) Dynamic capabilities

As noted, dynamic capabilities are about doing the right things, at the right time, based on new product (and process) development, unique managerial orchestration processes, a change-oriented organizational culture, and a prescient assessment of the business environment and technological opportunities. Strong dynamic capabilities are possessed by the few, not the many.

Strong dynamic capabilities help enable an enterprise to profitably build and renew resources, reconfiguring them as needed to innovate and respond to (or bring about) changes in the market and in the business environment more generally (Pisano and Teece, 2007; Teece *et al.*, 1997). They allow the enterprise and its top management to develop conjectures about the evolution of consumer preferences, business problems, and technology; validate and fine-tune them; and then act on them by realigning assets and activities. Successfully building strong dynamic capabilities allows firms to challenge competitors that prioritize efficiency over innovation, that ignore (or are ignorant of) changing customer needs, or that fail to empower internal entrepreneurs and change agents.

For applied purposes, dynamic capabilities can usefully be broken down into three primary clusters: (1) identification, development, codevelopment, and assessment of technological opportunities in relationship to customer needs (*sensing*); (2) mobilization of resources to address needs and opportunities, and to capture value from doing so (*seizing*); and (3) continued renewal (*transforming*). Engagement in continuous or semi-continuous sensing,

A, to market was a long and arduous process that allowed General Motors to get ahead of Ford, a leadership position, GM held for decades.

seizing, and transforming is essential if the firm is to sustain itself as customers, competitors, and technologies change (Teece, 2007).

Dynamic capabilities reside, in part, with individual managers and especially the top management team who are required to take an entrepreneurial role in detecting and exploiting opportunities. At certain critical junctures, the ability of a CEO and the top management team to recognize a key development or trend, then delineate a response and lead the firm in its path forward, might be the most prominent feature of the firm's dynamic capabilities. But the organization's values, culture, and collective ability to quickly implement a new business model or other changes are also integral to the strength or weakness of the firm's dynamic capabilities (Teece, 2010b).

The dynamic capabilities approach helps explain why intangible assets, including a firm's collective knowledge and capabilities, have become the most valuable class of assets in a wide range of industries (Hulten and Hao, 2008). The reason is that knowledge, capabilities, and other intangibles are not only scarce; they are often difficult to imitate.

Bob Lutz (2011) of General Motors (echoing Abernathy, 1978) put this aspect of dynamic capabilities rather succinctly for the auto industry:

Where the real work of making a car company successful suddenly turns complex, and where the winners are separated from the losers, is in the long-cycle product development process, where short-term day-to-day metrics and the tabulation of results are meaningless.

In other words, ordinary capabilities do not determine whether the current production schedule will be the right (or even a profitable) path to follow in the future. Strong ordinary capabilities are valuable only during a given market window; they are insufficient to undergird sustainable competitive advantage as the business environment changes. What's needed is some

kind of dynamic optimization, rather than the static optimization that is normally practiced. Lou Gerstner, IBM's former (turnaround) CEO put it this way:

In anything other than a protected industry, longevity is the capacity to change ... Remember that the enduring companies we see are not really companies that have lasted for 100 years. They've changed ... and they aren't the same companies as they were. If they hadn't changed, they wouldn't have survived. If you could take a snapshot of the values and processes of most companies 50 years ago—and did the same with a surviving company in 2014—you would say it's a different company other than, perhaps, its name and maybe its purpose and maybe its industry. The leadership that really counts is the leadership that keeps a company changing in an incremental, continuous fashion. It's constantly focusing on the outside, on what's going on in the marketplace, what's changing there, noticing what competitors are doing. (Davis and Dickson, 2014: 125).

Dynamic capabilities have to be "built" through a process of investment in discovery, knowledge generation, and learning. As Apple CEO Tim Cook said in February 2013 with reference to the company's ability to integrate hardware, software, and services: "Apple has the ability to innovate in all three of these spheres and create magic. ... This isn't something you can just write a check for. This is something you build over decades" (AFP, 2013).

Table 1 summarizes important distinctions between ordinary and dynamic capabilities, and Table 2 aligns strategy and dynamic capability concepts.

< TABLE 1 ABOUT HERE >

< TABLE 2 ABOUT HERE >

III. 3.3 Capability development

a) Calibrating capability “distance”

Lest dynamic capability theory be impugned itself for being insufficiently dynamic, the issue of how capabilities are built needs consideration, too. Here it is useful to distinguish between the demand side (i.e., what consumers want) and the supply side (i.e., how firms build capabilities if what the market wants and what the firm’s technology and organization allow are not synchronized).

In the dynamic capabilities framework, sensing may lead to the diagnosis of a market and competitive situation that requires transforming and the building of capabilities inside the firm that don’t currently exist. How can this be brought about? In essence, what is required is learning how to do new things, possibly utilizing quite different business models. In this regard, the question of “distance” from current practices is highlighted. In our framework, capability distance for an incumbent firm can be calculated on three dimensions (Figure 1):

1. Technical distance: A technological challenge can be incremental (inside an existing technology paradigm) or radical (outside the paradigm). If the former, *kaizen* (continuous small improvements to existing technology) will often get the job done with the existing resource base. If the challenge is radical, then R&D and/or open innovation (i.e., technology outsourcing) will be required. The challenge is particularly severe in competitive terms if it is radical for the focal firm but incremental for a rival. Hence, “radical” is to some extent a relative concept.
2. Market distance: The target market can be near or far. Market distance increases as the firm reaches for new pools of

customers, perhaps in a new geography with cultural and/or regulatory barriers.

3. Business model distance: Distance also has a business model dimension. Does the new technology require a radically different revenue mechanism? Will the existing cost structure remain profitable? Does the firm’s current mix of outsourcing and in-house activities need to change?

When the capability goal lies closer to the origin (point O in Figure 1), it is relatively easier to achieve. The further out on each axis, the harder. Multiplier effects for changes involving more than one dimension make the challenge greater still.

< FIGURE 1 ABOUT HERE >

b) Closing (ordinary and dynamic) capability “gaps”

Closing capabilities gaps between what companies have and what they need is something we know a little more about. Capability gaps are of at least three kinds.

- Closing technology gaps: The contemporary literature is rich with respect to how technology gaps get closed. The discussion has progressed from standard technology transfer issues (licensing, technology assistance agreements, etc.) to using the SECI process (Nonaka, 1991) and to using “open innovation” (Chesbrough, 2003), while not forgetting traditional internal development through corporate R&D. The criticality of R&D and new product development to this effort will vary with the magnitude of the gap that must be closed. New talent will likely need to be hired if the gap is considerable whether the technology is to be developed in-house or absorbed from an external source.

- Closing market gaps: Addressing new market segments requires a deep understanding of customer “needs”, which has cultural and economic dimensions. The most valuable knowledge about customers comes from interacting with them in multiple market segments. Data analysis is a useful supplement to experiential knowledge.
- Closing business model gaps: The emergence of new technology and market needs can sometimes require adjusting the way business is done. For instance, the Internet is allowing (and requiring) online sales. Brick-and-mortar stores have to improve their traditional approaches, adopt the new, or run both in parallel. Even mature sectors such as oil and gas are not immune from technology and other shocks, as the industry experiences policy uncertainty around environmental concerns, the emergence of new technologies such as hydraulic fracturing, and new assertiveness among state-run oil and gas companies (Shuen et al., 2014).

There is a literature to help understand each of the above gaps in isolation, but little to help understand how to manage all three at once. When all three must be changed, the firm must undergo a radical transformation. Inasmuch as business organization has systemic dimensions, it is important to recognize that our understanding of social and organizational systems is often limited. Such an admission implies that the business risk associated with closing capability gaps is likely non-linear with the number of gaps to be closed.

There are at least two classes of phenomena embedded in understanding how to close capability gaps: (1) learning and (2) transformation. Both require leadership. Organizations won't learn unless they are encouraged—and given the means—to do so. Nor will they transform unless the leaders of the organization are in the vanguard. This is well known, but a

systematic effort to incorporate such notions into capability theory is just beginning (Teece, 2016).

Whether ordinary or dynamic, there are certain systemic challenges in closing capability gaps. The first challenge is to actually understand the location and magnitude of capabilities deficiencies. Often it is only after an organization tries to do something (and fails) that the gap is apparent. The early phase of a project looks okay because there are typically few outcomes metrics to evaluate; later on, problems begin to crop up, the senior team gets more and more involved, and the goal slips further away. Ad hoc “solutions” are attempted and failed. Finally, there is general recognition of a capability gap.

There may or may not be a resource gap. Resources are not capabilities. There may be budgets and people assigned to a project; but, if the people are not chosen correctly, performance failure is more likely. Many projects and programs fail because of an organization's inability to develop and integrate the capabilities needed to design, develop, and deliver. Strong (ordinary) capabilities (and not just resources) are needed to get things done.

What is critical are abilities to (1) recognize what capabilities are needed and (2) develop them quickly, efficiently and effectively. These capabilities themselves are key parts of dynamic capabilities (Feiler and Teece, 2014).

Dynamically capable firms are agile. Too often, though, agility is defined as the ability to do commonplace things faster and cheaper. If that's what one means by agility, it is more akin to ordinary (rather than dynamic) capabilities. When agility refers to a reduction in the time required to reach best practices, it is simply an incantation for Six Sigma, Value Engineering, or other efficiency initiatives. Those may be necessary for the organization to become more efficient; but they are only secondarily related to conferring evolutionary fitness, i.e., being more

effective, more able to get new things done, and more focused on the right things.

Strategic agility is more about effectiveness than efficiency. The top management team must identify opportunities and recognize gaps in the resources and capabilities that the organization needs to address opportunities and threats. The organization must be able to learn, absorb and improve the necessary processes. While existing businesses need best practices, new, materially significant initiatives generally require new capabilities. A focus on the maintenance of financial performance over the creation of new capabilities actually impairs the ability to deliver better results in the longer run. At a minimum, mastering a capability requires creating the capacity for a repeat performance.

While there are well-documented practices for many, if not most, ordinary capabilities, there are few documented processes for bringing new capabilities online. An organization has few or no internal reference points for how to do what it has never done before. There may be individuals with some of the requisite knowledge, but management may not know who they are. Moreover, the organization may not know what “excellence” in the target capability looks like.

Establishing new capabilities requires leadership and teamwork. As management expert David Johnston describes it:

I tell teams as we are getting organized and pulling in needed capabilities that we are aiming for "crackle". It is hard to describe the phenomenon, except to say that we start to work multiple steps ahead, making decisions now that don't simply service the next milestone, but the real endpoint ... There is little debate over how to go about something, and little debate over what is good enough—this is a real contrast to lower-capability teams where nearly everything becomes matter for discussion and debate

... We reverse the ratio of talking-to-doing from 80-20 to 20-80. Things happen. (Johnston, 2017)

Johnston goes on to note that excellence in building capabilities often combines internal and external sources of knowledge. In his words, it requires:

having ready access to great help and acting on it. It also means that if we don't know exactly where to get help, we know someone who does. We don't reinvent wheels, we don't beat our heads against walls, we don't pretend our way through; we discard hubris and ego, and we recognize that greatness comes from finding the solution, not from trying hard or talking smoothly. (ibid.)

The search for capability gaps begins by examining the match between a proposed business model and the firm's existing capabilities. An analysis of existing capabilities needs an objective point of view that is detailed and realistic. Organizational instincts tend to compel the exaggeration of current capabilities.

The capabilities to be assessed are technical, market, and business model-related. They are undergirded by business processes that support making, storing, selling, shipping, delivering, and the handling of transactions, returns, and complaints. Some companies go into a new line of business and are slow to come to grips with many of these business processes until required. Late in the game, they discover a number of business processes that really should have been considered in the product requirements and design. There is then quite a scramble to decide what to do and how to do it. Market entry is delayed and costs soar. A drive for insight on such matters is part of dynamic capabilities.

Some (ordinary) capabilities have multiple options by which they may be acquired. Senior leaders

seeking to build ordinary capabilities, can exercise the following three options alone or in combination:¹¹

1. **Make:** choose to develop the new capability in the existing organization by selecting and developing people, teams, their methods, tools, processes, training them and otherwise exposing them to new ways of doing things;
2. **Buy:** acquire the new capability by purchasing an existing organization or by hiring key individuals with the knowhow required to implement one;
3. **Rent:** add the new capability through more or less temporary contracts and consultants.

The “make” option takes time, effort and skill. A robust capability building process requires the conscious attention of management. To position the organization for excellence in a new capability using the existing internal team can be particularly challenging because in-house learning processes are difficult to accelerate. Success also requires accountability, which is aided by the use of objective measures against agreed-upon goals.

The “buy” option can be problematic as a first step, though it is often the one taken—maybe even most often taken. Buying often involves hiring; but whom to hire? The “buy” option to add or enhance capabilities should probably be lower ranked unless or until it is understood with reasonable precision what is needed, including what constitutes excellence in the target capability.

The “rent” option can be a powerful accelerator for capability development. It involves using consultants to jump-start the establishment of a

capability at a high (best practice) level in order to produce good results fairly quickly. A barrier to the success of renting can be resistance from the existing organization. The option requires a conscious direction from senior leaders to endorse the direction being given by the outside firm as part of a strategic vision and set expectations for the behavior change.

Getting capabilities into place across all needed functions and geographies is a challenge. One critical requirement is alignment. In common practice, “alignment” is often used to mean acquiescence on a particular issue. It rarely means what it needs to mean, namely mutual understanding, agreement, and action in support of strategic goals. Acquiescence is shallow and easily abrogated. Strategic alignment is deep, committed and accountable.

Many capabilities (and dynamic capabilities in particular) cannot be bought; they must be built. In the case of organizational coherence, for example, the ability to know how processes and functions need to fit together is largely a matter of idiosyncratic experience. Another inappropriate candidate for outsourcing in most cases is R&D and other technological innovation, particularly where the firm needs to “pace” the technology so that it develops in line with other parts of a system (Chesbrough and Teece, 1996). Managers must learn to synchronize the efforts of marketing, R&D, operations, quality assurance, etc., to understand their perspectives, and to effectively draw them into a coordinated whole in ways specific to a particular company at a particular stage in its trajectory. Being able to understand who the stakeholders are, to elicit their needs, to develop interactive business processes, to create internal documentation and communication systems are more examples of capabilities that are difficult and probably inappropriate to outsource. In fact, these integrative capabilities are often invisible to

¹¹ Chesbrough and Teece (1996) outline some of the relevant elements (see below).

organizations, with management being only vaguely aware of the learning that needs to take place. An integrative capability may emerge in the course of a project, but it may not persist without conscious recognition and nurturing. If consciously developed, such a capability can generalize and become a dynamic capability.

Building capabilities is hard; the silver lining is that, once built, they are then difficult for others to imitate. Put differently, the absence of a market for capabilities means that benefits can flow from entrepreneurial and managerial activity that builds and hones value-creating capabilities. Once such capabilities exist, the astute implementation of value capture strategies can fuel growth in profits.

IV. 3.4 Dynamic capabilities and strategy

Strategy, when developed successfully, involves doing the right things—deploying the firm’s scarce assets in calculating ways and aligning its processes to outmaneuver competitors by taking advantage of their mistakes, leveraging in-house strengths, and overcoming any constraints imposed by the firm’s legacy. It is thus a critical adjunct of dynamic capabilities.

Put differently, the managerial orchestration that is core to enhancing processes and exploiting positions must be guided and informed by strategy—and vice-versa. Strategy needs to be consistent and coherent. Although the firm is constrained to some extent by what it has done in the past, it can still shape the path ahead. Dynamic capabilities guide decisions such as which products to make or which customers to target. Strategy helps to determine the timing of market entry and how to keep competitors at bay.

A strategy can be defined as “a coherent set of analyses, concepts, policies, arguments, and actions

that respond to a high-stakes challenge” (Rumelt, 2011: 6). According to Rumelt (2011), a good strategy has (1) prescient diagnoses that identify obstacles, (2) a guiding policy specifies an approach to overcoming them, and (3) coherent action consists of feasible coordinated activities that implement the policy. A good strategy will often not appear fully formed, but instead emerge over a period of trial and error (provided the business environment is sufficiently forgiving to allow experimentation). While the actions dictated by the strategy may be visible to rivals and freely imitable, rivals may not perceive it in their interest to do so until it is too late because the underlying diagnosis and policy can be kept secret.

While they are analytically distinct concepts, strategy and dynamic capabilities are, in practice, closely related. For instance, sensing is important to dynamic capabilities but also contains a strong element of diagnosis, which is important to strategy; seizing needs to be connected to both a guiding policy and coherent action; and transforming that is value protecting and enhancing requires a guiding policy and coherent action.

Dynamic capabilities and business strategies codetermine performance (Figure 2). Strong dynamic capabilities still require a sound strategy. Firms with weaker capabilities will require different strategies from firms with stronger capabilities. And the effectiveness of dynamic capabilities will be compromised by poor strategy.

< FIGURE 2 ABOUT HERE >

4. Capabilities: Antecedents in Economic Theory

The concept of capabilities outlined above is not completely alien to economics. Organizational capabilities have appeared periodically in the economic

literature, connected most often with notions of productivity.¹² Their lineage can be traced at least to Marshall (1920: 322) who recognized that managerial capabilities matter. Despite his use of the representative firm assumption, he saw firms as being different from one another. He also recognized the need for an evolutionary/capability approach to economics, noting

We shall need ever more to think of economic forces as resembling those which make a young man grow in strength, till he reaches his prime; after which he gradually becomes stiff and inactive, till at last he sinks to make room for other and more vigorous life.

As explained below, Marshall's reference to "strength" is aligned with capabilities, evolutionary economics, and notions of firm heterogeneity. Joan Robinson (1977: 1324) noted that Marshall "described industry as a forest in which each individual tree grows only to a certain height."

A first step toward explaining this interfirm variation was made by Penrose (1959), who described the relation between a firm's resources and its production of final products. Richardson (1972: 888) further developed the idea, positioning capabilities, which he defined as the firm's "knowledge, experience and skills," as the driver of, and constraint on, the activities of the firm. Demsetz (1976: 373) pointed to the "inherent capabilities of producers" as a possible socially benign explanation for large market shares. The term has continued to be used in this context (e.g., Bresnahan, 1992). More recently, Matsusaka (2001) developed a dynamic model of corporate diversification in which acquisition and divestment are driven by efforts to match a firm's activities to its capabilities. Capabilities were defined as "the

combined marketing, distribution, and development skills of top and middle management" (Matsusaka, 2001: 428). The capabilities model shows how diversified firms can trade at a discount even when diversification is value-maximizing, which contradicts the results of agency models of diversification.

John Sutton (2002) has equated "capabilities" more narrowly with the ability to enhance product quality and reduce cost. However, in the terminology laid out earlier, such capabilities are only the "ordinary" capabilities relevant to an enterprise remaining competitive in established markets, not the dynamic capabilities that can potentially help the corporate tree to grow beyond its "certain height". Nevertheless, in writing less formally on the capabilities required for economic development, Sutton has highlighted the ability (what can be classified as a dynamic capability) of managers to select promising markets (Sutton, 2012).

Although he did not use the language of capabilities, Garicano (2000) introduced a model of a firm in which workers are involved either in production or in solving problems. This model captures essential features of the process by which firms harness resources to develop new capabilities. This model of a knowledge-based firm was later embedded by Garicano and Rossi-Hansberg (2012) in a general equilibrium model in which innovations displace old products and lead to the founding of new firms that learn and build internal hierarchies. Another model that captures elements of the dynamic capabilities framework without directly referring to it was presented by Dessein and Santos (2006). In their model, firms move to one of two equilibria: a strong division of labor resulting in organizational rigidity or an internal system of flexible coordination that permits better adaptation to local

¹² An economic concept similar to capabilities is "organization capital." The phrase was introduced by Prescott and Visscher (1980) as a proxy for proprietary information that a firm gathers about its employees and

their tasks. It has since been made more general, encompassing a firm's "operating capabilities ... investment capabilities and innovation capabilities" (Lev and Radhakrishnan, 2005: 75).

changes in circumstance. Work such as this shows a promising avenue for the incorporation of organizational capabilities and related concepts into formal models.

For the most part, however, the concept of capabilities in modern economics has migrated from the rich and dynamic enterprise growth focus of Marshall and Penrose to a narrower conception more consistent with a static, production-function model of the firm. This is disappointing and has deeply impaired the ability of economic theory to inform many contemporary issues. Something better is needed.

5. A new (capability) theory of the firm centered around managing under deep uncertainty, innovation, and building/deploying non-priced assets

The dynamic capabilities framework sketched above incorporates an entrepreneurial theory of the firm that starts from a more primitive initial state than the one assumed in most economic models. In the Coase-Williamson framework, for example, many markets, technologies, and prices exist already (Boudreaux and Holcombe, 1989). In reality, entrepreneurs must first cut through uncertainty and create each market before there are preferences and prices that can lead to market activity, an observation that dates back to at least the work of Frank Knight (1921).

V. 5.1 Deep uncertainty

Deep uncertainty is ubiquitous in today's complex interdependent business world. Major unexpected shocks, dubbed "Black Swan events" by financial

¹³ U.S. Department of Defense News Briefing, February 12, 2002. The phrase "unknown unknowns" was already in frequent use at NASA and perhaps appeared first in a 1982

theorist Nicholas Taleb (2007), occur "outside the model." Yet, as Taleb argued, such events often drive changes in the fortunes of countries and companies.

While large-scale shocks are rare, smaller shocks are fairly frequent. Small, frequent, and unanticipated shocks are particularly common in the technological arena. All industries are competing in a world where capabilities have spread to more geographic regions than ever before and interconnectedness can propagate shockwaves from once-obscure corners of the globe to major markets in the turn of a news cycle. As venture capitalist William Janeway (2012: 105) noted, "the Innovation Economy ... is saturated in unquantifiable uncertainty."

Nearly a century ago, Frank Knight recognized that:

With uncertainty present, doing things, the actual execution of activity, becomes in a real sense a secondary part of life; the primary problem or function is deciding what to do and how to do it. (Knight, 1921: 268)

Practically all of the traditional approaches to the firm implicitly assume relatively predictable environments. These approaches may recognize risk, but they ignore deep uncertainty. In effect, they assume that uncertainty can be managed in the same way as risk. Accordingly, they are of little help to managers figuring out how to compete in environments characterized by technological ferment, financial volatility, and other sources of disruption.

Deep uncertainty is the type of operating environment then-U.S. Secretary of Defense Donald Rumsfeld characterized by the term "unknown unknowns."¹³ A known unknown is when one is missing vital knowledge that could nonetheless be known, given enough time and resources. For example, in the Battle

New Yorker article by John Newhouse citing the example of metal fatigue causing the crash of the British de Havilland Comet airliner in the 1950s.

of Midway, both sides knew the enemy fleet existed, but they did not know where. In contrast, an unknown unknown is when we haven't even thought of the possible event.

Uncertain events do not always result in negative outcomes. A large, unexpected event might also be positive, such as when a consumer-generated online video "goes viral" and creates massive demand for a toy. However, as any small company unable to take advantage of a sudden temporary surge in demand knows, positive shocks require agile management and flexible organizations. With uncertainty present, the primary problem for managers and investors is figuring out what to do. Efficient execution (how to do it most cost effectively) is decidedly secondary. That is why the dynamic capabilities framework puts the management priority around figuring out how to do the right things; how to do things right is of secondary importance.

For managers in the innovation economy, the goal should be to navigate unexpected events with a minimum of disruption—and preferably without resorting to crisis management. Crisis management is all-consuming and deflects management from engaging with concomitant opportunities. What is required for sustained profitability is that the business enterprise be built to respond to the unexpected by establishing and maintaining flexible systems, which are hallmarks of strong dynamic capabilities.

There is limited short-term financial protection available to guard against such uncertainty, or to embrace unexpected opportunity. Holding cash is a good hedge against unpleasant surprises; it is a form of self-insurance against uninsurable (negative) uncertainties that a business (or individual) might face. It's also good to have if new opportunities suddenly emerge.

Managing under deep uncertainty calls for art as well as science. Reason and analysis are in the toolkit, but imagination is also required. In effect, navigating the

unknown involves imagining a future and endeavoring to build it.

There is limited short-term financial protection available to guard against uncertainty, or to embrace unexpected opportunity. Holding cash is a good hedge against unpleasant surprises; it is a form of self-insurance against uninsurable (negative) uncertainties that a business (or individual) might face. It's also good to have if new opportunities suddenly emerge. However, managing uncertainty requires a different kind of resource that is deeply entrepreneurial in nature and enables the firm to develop and deploy non-priced assets.

VI. 5.2 The centrality of non-priced assets

Mainstream price theory holds that with (perfect) competition it is impossible to purchase something for less than it's worth or for less than the long-term costs of producing it. However, and without appealing to monopoly theory, it is often possible to acquire something for less than it's worth to the buyer if the acquiring firm has superior information or owns related specific complementary assets for which there is no established market.

In fact, most strategic assets have no market price in isolation because the value of an asset is context-dependent. Such assets generally yield their full value to the owner only when they are combined with other complementary or cospecialized assets. If markets for isolated strategic assets exist at all, they are generally thin.

It is well understood that the price system's normal asset allocation role is unlikely to occur properly when asset values depend on idiosyncratic combinations. An economic implication of this is that input or factor markets are not fully efficient, and the factor markets

will not serve their coordinating function. The entrepreneurial manager, not the Walrasian arbitrageur, achieves the micro-level coordination on which the economy depends. And the market inefficiency opens the way, if the entrepreneur has correctly sensed and seized the business environment, for supernormal profits—not from arbitrage but from innovation and/or superior acumen.

a) Coordination, integration, and innovation

As noted earlier, technological and innovational complementarities impose coordination, market design, and control challenges. Alignment of activities within firms is required. Alignment among firms is also necessary where certain types of complementarities exist.¹⁴ These external alignments were raised decades ago at the most general level by Boulding (1956), then specifically by Malmgren (1961) and Richardson (1972). Thereafter, they were echoed by Williamson (1975), remarked upon by Teece (1984, 1990), explored empirically to a limited degree by Armour and Teece (1980) and Helfat and Teece (1987), emphasized in a vertical relation to general-purpose technologies by Bresnahan and Trajtenberg (1995) and Helpman (1998), but never fully explored or developed by economists or management scholars. The economics literature tends to assume that, in the main, upstream and downstream investment expectations will converge, which seems unlikely given the proprietary

¹⁴ Technological complementarities are largely absent from economic analysis. In fact, they completely vitiate the concept of a production function, which assumes that a fixed list of inputs is used to practice a technology known to all firms. In reality, production functions, even in the absence of a major innovation, are often firm-specific and quite proprietary. Schumpeter (1934) observed nearly a century ago that the very essence of innovation is typically “new combinations.” However, his theory brought no granularity to the analysis. Nor did he consider the appropriability issues around new combinations because his main focus was on the ability of new products and processes to displace

(and hence secret) nature of much of the required innovation activity.¹⁵

In the economically significant realm of enabling and general-purpose technologies, these alignment problems are particularly severe. Bresnahan and Helpman are amongst the few pointing out potential contractual and market failure issues that may lead to under-investment. With reference to the class of widely applicable technologies, Jones (2012: 660) noted that the main problem for capturing value by exploiting the application of an innovation in many downstream sectors is “the fact that you cannot identify the recombinant possibilities ex ante means that you cannot easily solve the bargaining problem in practice—you cannot integrate your way around it. So innovation faces a serious market failure in the sense that socially profitable innovation does not occur.” In short, there is no market mechanism, perhaps not even vertical (and horizontal) integration, that can ensure socially optimal innovation and adoption of general-purpose and enabling technologies that permit further “add in” innovation by downstream implementers.

From a managerial perspective, there is a similar lacuna regarding “alignment.” Some of these concerns are addressed under the heading of business model issues (Teece, 2010b), leaving it to entrepreneurs to design creative organizational arrangements to help solve the coordination and associated appropriability

existing ones. This spoke to substitution, not complementarities.

¹⁵ Vertical integration can partially mitigate coordination problems. Armour and Teece (1980) established that R&D levels in the petroleum industry were sensitive to the extent of vertical integration in a direction suggesting that integration can ease the coordination issues when new technology is developed and deployed. Helfat and Teece (1987) showed that vertical integration reduced risk, which can include the uncertainty that accompanies commercialization of new technology.

challenges. When the coordination/integration challenges are external, private ordering (contractual) solutions are possible in some—but not all—cases.

Intangibles are a particularly important class of strategic assets for which markets are underdeveloped (Teece, 1981, 2015). This is only in part because of the limited nature of the property rights assigned to them. Context-dependency is particularly acute for certain knowledge assets such as technological capabilities that cannot be meaningfully secured without acquiring a company or business unit, then finding a way to retain key personnel. Even if prices did reflect all information, the thin-market phenomenon referenced here would still result in wide bands for “competitive” prices when firms are heterogeneous and products are differentiated. This is the setup implicitly adopted in the strategic management literature (Denrell *et al.* 2003; Rumelt *et al.*, 1991; Teece and Winter, 1984). Modern auction theory (e.g., Klemperer, 2002) likewise recognizes that assets will not achieve their full value in an auction if there is only one buyer.

Economic theory has yet to address these pervasive market imperfections in a meaningful way, particularly as regards their implications for the theory of the firm, the role of the manager, and the challenges associated with innovation. Hints about these matters can be found in Richardson (1972) and in the literature on entrepreneurship (e.g., Kirzner, 1997) and that on general-purpose technological innovation (Bresnahan and Trajtenberg, 1995; Helpman, 1998; and Jones, 2012). What is missing is an effort to tie these disparate threads into a theory of the firm that includes a distinctive role for managers. The dynamic capabilities framework can move the theory of the firm in that direction.

¹⁶ To the extent the emphasis in dynamic capabilities is on contracts (explicit or implicit), it is less concerned with avoiding opportunism and more concerned with embracing

b) The centrality of managerial asset orchestration

Because the vital coordination and alignment of assets/resources is difficult to achieve through the price system, special value can accrue from owning and utilizing the capability of achieving good internal and external alignment. This is more easily accomplished by managers than by markets. Achieving such alignment through internalization goes beyond what Barnard (1938) has suggested as the functions of the executive. His was a limited view of managers, with their task whittled down to one of “cooperative adaptation” (Williamson, 1993). Building and assembling assets inside the firm (as opposed to accessing them through a skein of contracts) is not done primarily to guard against opportunism and recontracting hazards, although in some cases that may be important. Rather, it is done to achieve economies of scope and appropriability benefits, which goes far beyond the conventional economic logic of minimizing Williamsonian transaction costs. This alignment process has incentive and organizational culture dimensions, too. It is meaningful that the basic unit of analysis for dynamic capabilities is not the transaction (as in transactions cost economics) but the entire firm.¹⁶

In capabilities-based theories of the firm, the concept of cospecialization between or among assets is particularly important (Teece, 1986). Assets that are cospecialized need to be employed in conjunction with each other, usually inside the firm (Teece, 1980a).

Merely putting two business units or departments under common ownership and common governance need not bring about “integration” in the sense of achieving full alignment and cooperation. Williamson identifies communication distortions, internal procurement hazards, internal expansion proclivities,

opportunity. However, there is also considerable emphasis on production, learning, and innovation.

and program persistence because “shifting the incremental transaction from the market to the firm generally results in greater budget-based supports, whence vertical integration gives rise to persistence tendencies” (Williamson, 1975: 122). His concluding comment is that:

although market failure constitutes a presumptive basis for internalizing transactions, the “defects” associated with market exchange may need to exceed a nontrivial threshold before internal organization offers a clear cost advantage. (ibid.: 130)

One way or the other, “integration” (whether within a firm or amongst firms) is necessary for long-term survival. Successful functional integration can be tremendously hard, especially in contrast with disaggregation, which is often simple to accomplish. Growth will always involve more work on integration (which may be one reason why many managers prefer low growth). The entrepreneurial task of implementing value-enhancing “new combinations” inherently requires some measure of functional integration. It is not just a cost-based calculus. The same is true for new business models and the introduction of new capabilities. The challenge of functional integration is less in smaller companies. The CEO/founder can use personal influence to help bring it about. As organizations become larger, the CEO must work through others to communicate goals, motivate employees, and propagate the organizational culture that underpins good alignment. As entrepreneur Peter Thiel has noted, this is hard to do; but he credits his fellow PayPal co-founder, Elon Musk, with these capabilities. With reference to Musk’s Tesla and SpaceX ventures, Thiel has said that “what was really impressive was integrating all these pieces together,” and that this “is actually done surprisingly little today and ... when people can pull it off, is very valuable” (Thiel, 2014).

In the dynamic capabilities framework, rather than the single-minded pursuit of cost minimization, the

distinctive role of the (entrepreneurial) manager is this “orchestration” of cospecialized assets and of business activity to achieve value-creating and value-capturing alignment. Performed astutely and proactively, such orchestration can: (1) keep cospecialized assets (and people) in value-creating alignment, (2) identify new cospecialized assets to be developed through the investment process, and (3) divest or run down cospecialized assets that no longer yield special value. These goals cannot be readily achieved through contracting mechanisms in part because of dynamic transaction costs (the costs of negotiating, etc.) but also because there may not be a competent entity to build or “supply” the assets that are needed. In short, capabilities must often be built, they cannot be bought, and there is limited utility in labeling this conundrum as a transactions cost problem.

Rather than stressing opportunism (although opportunism surely exists and must be guarded against), the emphasis in dynamic capabilities is on building specialized assets (that cannot be bought) and on change processes (to keep the enterprise aligned with its business environment). These processes include, research and development, remodeling the business architecture, asset selection, and asset orchestration. In dynamic capabilities, “small numbers” bargaining is at the core, as in Williamson (1975). However, the emphasis in dynamic capabilities is not just on protecting value from recontracting hazards; it’s also on creating the assets that, in transaction cost economics, become the object of rent appropriation efforts.

VII. 5.3 Toward a (capability-based) theory of heterogeneous firms

a) Introduction

Intraindustry heterogeneity has roots in both demand- and supply-side factors. Differences among firms often reflect the fact that firms target different customer segments with different needs. Thus, in autos, Volkswagen competes for different customers than Rolls-Royce, and this requires different production technologies and different marketing and sales methods. For any number of reasons, firms may opt for different technological and organizational approaches, use different business models, and choose different strategies—even when the firms are pursuing the same or similar market segments. Such (strategic) decisions by managers establish different pathways, leading to interfirm heterogeneity.

Deep uncertainty also impacts decision making. Technological uncertainty renders decisions relating to innovation complex, and different firms make different decisions because of how each management team reads the situation differently (Rosenberg, 1982; Teece, Peteraf, Leih, 2016).

As firms innovate, recombine assets, and compete, they create economic dynamism and disequilibrium.¹⁷ As opposed to many other types of investments, innovation requires robust “animal spirits” because the

¹⁷ The capabilities framework, while antithetical to traditional production-function views of the firm, is not to be placed in strong opposition to all mainstream economic theories of the firm. The framework incorporates, but is not animated, by transaction cost or contractual concerns. While it is not blind to agency costs, these are seen as of secondary importance because the dynamic capabilities framework is

best path is often unclear, outcomes are uncertain, and payoffs hard to calibrate.

The dynamic capabilities framework thus recognizes the distinctive role of managers in asset orchestration and recombination. In endeavoring to build a theory of the firm without fully acknowledging the economic importance of internally managed coordination, Williamson, Jensen, and others have deflected attention away from the important role the business enterprise, led by entrepreneurs and managers, plays in allocating resources to expand the existing set of economic possibilities. Coordination is also crucial for the initial identification of these opportunities. Because the market for information/knowledge about new opportunities (Arora et al., 2001, Gans and Stern, 2010; Teece, 1981) isn't well developed, entrepreneurs and managers must build organizational capabilities inside businesses firms to assist in knowledge creation and knowledge capture. They often do so in distinct ways, generating heterogeneity (Nelson, 1991).

b) Sensing, seizing, and transforming

The sensing, seizing, and transforming capabilities of managers and their organizations bring learning and leadership onto the stage. Most importantly for a complete theory of the firm, they are the critical factors that distinguish between what can be done inside the firm as opposed to what is possible under a system of pure contracts.

‘Sensing’ is an inherently entrepreneurial set of capabilities that involves exploring technological opportunities, probing markets and listening to customers, along with scanning the other elements of

focused more on opportunity than on opportunism. Managerial discretion, harnessed astutely, is seen more as a desirable complement to firm innovation and growth rather than as a significant risk factor that ought to drive organizational design and financial structure. It enables asset orchestration, which solves fundamental market failure problems.

the business ecosystem. It requires management to build and test hypotheses about market and technological evolution, including the recognition of latent demand. The world wasn't clamoring for a coffee house on every corner, but Starbucks, under the guidance of Howard Schultz, recognized and then successfully developed and exploited the potential new market. As this example implies, sensing requires managerial insight and vision—or an analytical process embedded in the enterprise that can serve as a proxy for it. Sensing benefits from the application of data analytics to real-time market data to spot trends, anomalies and patterns. The ability to sense different ways of doing things is the precursor to choosing among them.

Once opportunities are sensed, choices must be made, and investment follows. The structure and assets of the organization help shape the choices made. 'Seizing' includes implementing the choice of business model to satisfy customers, shape markets and market outcomes, and capture value. Large cash balances provide the financial flexibility that aids dynamic capabilities. Ready access to external capital and top talent helps. Employee motivation and cultural alignment is vital. Good incentive design is a necessary but not sufficient condition for superior performance in this area. Strong relationships must also be forged externally with suppliers, complementors and customers, with the boundaries of the firm drawn to avoid (or at least limit) the loss of profits to the owner of an external 'bottleneck' asset (Teece, 1986). Cooperation is often part of the ecosystem occupied by firms with strong dynamic capabilities.

Sensing and seizing are similar to exploration and exploitation, two activities discussed in the organizational behavior literature as potentially incompatible inside a single organization (March, 1991). Exploration (e.g., research on a potentially

disruptive technology) has a longer time horizon and greater uncertainty than exploitation (e.g., selling mature products). The two types of activities require different management styles; one solution is an "ambidextrous organization" where two separate subunits with different cultures are linked by shared company-wide values and senior managers with a broad view (O'Reilly and Tushman, 2004, 2016). But the tensions between subunits must still be astutely managed so that the integrated structure reaps the full learning benefits.

The 'Transforming' capabilities that realign the enterprise's resources are needed most obviously when radical new opportunities are to be addressed. But they are also needed periodically to soften the rigidities that develop over time from asset accumulation, standard operating procedures and insider misappropriation of rent streams. A firm's assets must also be kept in strategic alignment vis-à-vis its ecosystem. Complementarities need to be constantly managed and reconfigured as necessary to achieve evolutionary fitness, limiting loss of value in the event that demand shifts in a way that favors external complements.

c) The economics of organizational agility: normative elements¹⁸

The dynamic capabilities framework indicates a set of principles that entrepreneurial managers should and usually do understand. In particular, managers must recognize that the pursuit of agility requires sensing, seizing, and transforming and often puts ordinary and dynamic capabilities in conflict. Observers note that "the cruel joke is that in attempting to preserve their source of advantage, organizations can overcommit to institutionalization, making them more inert and vulnerable to environmental shifts" (Worley, Williams, and Lawler, 2014). It is of great

¹⁸ This section is based on Teece, Peteraf, and Leih (2016).

importance to understand when companies (inadvertently or deliberately) overcommit to wooden structures, and where maintaining and enhancing agility ought to be a managerial priority.

Achieving organizational agility often involves sacrificing technical efficiencies. If not for this tradeoff, organizational agility would not be so hard to achieve, and ordinary and dynamic capabilities would always be additive. Because of these costs and tradeoffs, it is generally best to shield the organization through insurance/hedging when the challenge is merely to manage risk. This is because insurance/hedging and the installation of risk management procedures and protocols are less disruptive of operations, and can reduce the amount of adjustments and adaptation the organization needs to make to remain competitive.

The tradeoff between agility and efficiency is only sometimes recognized in the field of economics (e.g., Stigler, 1939). It has likewise received insufficient attention in the field of strategic management and is almost never mentioned in organizational theory, with the notable exception of the work on organizational ambidexterity, mentioned earlier, by Michael Tushman and colleagues O'Reilly and Benner (e.g., Tushman and O'Reilly, 1996; Benner and Tushman, 2003). Ambidexterity is a dynamic capability (O'Reilly and Tushman, 2008).

Outside the ambidexterity literature, which captures some, but not all, aspects of agility, only very limited attempts have been made to offer prescriptive advice to managers regarding how to negotiate the agility-efficiency tradeoff. Even when observers define agility as "a higher-order dynamic capability that is built over time" (Doz and Kosonen, 2008), they do not usually consider tradeoffs. The

following are some relevant principles that are derived from and/or are consistent with the dynamic capabilities framework:

- 1) Risk can and should be managed differently from uncertainty.
- 2) The first task in managing those business enterprises competing in environments exposed to perturbation and disruption is to determine whether the source of change is primarily risk or primarily uncertainty.
- 3) Uncertainty in the business environment manifests itself in unpredictable turbulence, disruption, and hypercompetition.
- 4) More flexible plants and equipment can enable the firm to deal with frequent changes in the rate of production.
- 5) Not all business environments face strong dynamic competition generating deep uncertainty at all times.
- 6) Relative calm allows for forms of "business as usual," even though the organization must remain vigilant and be ready for rapid change when needed.
- 7) The net benefits (i.e., benefits minus costs) of organizational agility increase with the degree of uncertainty in the organization's competitive environment.¹⁹
- 8) To better manage deep uncertainty, business firms need to quickly generate and "test" a (novel) hypothesis about what is going on in the business environment.
- 9) Strong dynamic capabilities can yield organizational agility while minimizing the cost of achieving a particular level of organizational agility, thereby allowing management to achieve a more favorable

¹⁹ The concept of high-velocity markets is similar (Bourgeois and Eisenhardt, 1988). These ideas are also captured in one

of the concepts of next-generation competition (Teece, 2012).

tradeoff between agility and efficiency.
10) Transformation is hard for established enterprises but relatively easy for startups.

The above principles are derived from (or are at least consistent with) dynamic capabilities thinking. We believe that implementation of these principles can best be done under the sensing, seizing, and transforming rubrics. Analysis under each cluster of microfoundations can benefit from consideration of these (derived) principles. Put differently, sensing, seizing, and transforming are three clusters of dynamic capabilities that must be built to achieve evolutionary fitness. When coupled with strategy, each helps achieve judicious levels of agility.

d. Agility and strategy

No matter how astutely entrepreneurial management copes with risk and uncertainty, how effectively it diagnoses what's happening in the marketplace, or how well it manages the flexibility/efficiency tradeoff, all is for naught if these activities are not aligned with a good strategy. Strong dynamic capabilities allow a company to “roll with the punches” and tap into new opportunities. However, underlying agility has opportunity costs and should only be built for worthwhile purposes. These issues implicate strategy.

The effectiveness of even strong dynamic capabilities can be compromised by poor strategy and poor strategic leadership. As noted elsewhere, the greater the uncertainty and dynamism in the business environment and the greater the need for organizational agility, the more critical good strategy, entrepreneurial management, and strong dynamic capabilities become for the firm's growth and financial performance (Teece, 2014).

Analogies outside of business make this apparent. In boxing, the prizefighter must stay agile and “keep up on his toes,” ready to dodge the next blow from an adversary, or better still, to strategically place one. Agility and strategy work in tandem. In some cases, agility will be sacrificed to aid strategy, as in the case of commitments to production capacity.

The fact that reducing agility is sometimes desirable speaks to the importance of building strategy into agility frameworks, which the dynamic capabilities framework requires. Agility does not always create or preserve value. For example, a decision implies (or signals) commitment when significant irreversibilities occur (i.e., there is no low-cost way of going back). Clearly, strategic choices and organizational designs need to be managed together, and more agility, even putting cost to one side, is not always better.

In the context of warfare, agility is a valuable force characteristic. Hence the justification for the significant investments made in the United States in Special Forces and rapid deployment forces.²⁰ Such forces typically consist of elite military units that are usually better trained and have priority with respect to new equipment.

An excellent example of the interdependence of agility (a capability) and strategy is the Battle of Trafalgar (off Cape Trafalgar, Spain) in 1805. This was a naval engagement fought by the British Royal Navy against the combined French and Spanish fleets during the Napoleonic Wars. Historians never fail to give credit to the British Admiral Lord Nelson's strategy: engaging the enemy fleet by dividing his smaller force into two columns directed perpendicular to the larger enemy fleet—a complete break from prevailing tactical orthodoxy (which was to engage parallel, in a single line). Less

forces.

²⁰ The 82nd Airborne and 75th Ranger regiment are the best examples of rapid deployment

frequently mentioned is that in pursuing this strategy, Admiral Nelson hoped to isolate the enemy's flagship (leading to a lack of coordination) and create chaos on the water. In the ensuing chaos, there would necessarily be ship-to-ship actions, in which Admiral Nelson's more agile ships and crews would have a better chance. Lord Nelson knew that the better seaman-ship and faster reloading speeds of the Royal Navy gunners would play a key role. The strategy would favor his ships' and his crew's capabilities over their Spanish and French adversaries. In short, Admiral Nelson's strategy leveraged the more agile capability of his naval force. Despite a smaller number of ships, he was able to pull off a decisive victory.

Lord Nelson's victory at Trafalgar was not through strategy alone, which is often assumed, but by marrying capabilities (and in particular agility) and strategy. Put differently, the value (and the need for) agility cannot be calibrated properly absent considerations of strategy. That is the place to which the dynamic capabilities framework leads the analyst (and the managers). When available, flexibility/ agility can be costly and will not yield commensurate benefits unless married to a good strategy.

e. Epilogue on agility

Organizational agility is a much-touted attribute and usually considered virtuous. However, there are associated costs, and the existing strategic management literature does not explain when agility is desirable, the nature of its foundations, and how, if at all, it relates to strategy. By viewing agility within the dynamic capabilities framework, we advance the notion that agility should be sought only in harmony with the requirements of the business environment and with the firm's strategy. Fortunately, agility is usually unnecessary in business environments exposed merely to risk. On the other hand, it is essential when confronting the

deep uncertainty and associated threats and opportunities characteristic of today's innovation economy.

The type of agility that (entrepreneurial) managers choose to build into their organizations and maintain should depend on their strategy and positioning in the market and the desire to prepare for both downside and upside. That said, if firms have strong dynamic capabilities, they will be better at sensing emerging developments; moreover, they will achieve agility with less sacrifice of efficiency, along with making better use of whatever agility they possess. This is because they will, by definition, be better at sensing, seizing, and transforming.

However, one should not conflate agility and dynamic capabilities. The latter has far more elements and, when practiced well, provides the enterprise greater robustness. While firms with strong dynamic capabilities are likely (if facing deep uncertainty) to be agile, firms may perform well in stable or even predictably volatile (i.e., risky) environments without having made costly investments in agility. The dynamic capabilities framework helps one understand the costs and payoffs to agility, when to build agility in and when not to, and when to sacrifice it.

The dynamic capabilities framework can help guide managers with respect to when and how to manage under deep uncertainty. As we have discussed, the framework is informed by systems theory and assembles the elements needed to decide when to invest in agility and when to rely on the standard tools of risk management. Traditional strategy frameworks are not only silent on such matters, but also deflect management from focusing on them. Dynamic capabilities propounds that, in regimes of deep uncertainty such as those which characterize sectors of the economy experiencing rapid change, management must prime the organization for

VIII. 5.4 The foundations of firm-level heterogeneity

sensing, seizing, and transforming, and marry the right strategy to the firm's capacity to be agile.

Congruence between strategy and capabilities is particularly important. When the business environment is saturated with deep uncertainty, dynamic capabilities ought to be the CEO's leitmotif, as it delineates pathways that allow escape from the agility/efficiency tradeoff. Abductive reasoning and imaginative hypothesis building need to kick into gear quickly when there is deep uncertainty about the future. Second, when needed, agility can be achieved by multiple organizational modalities.

Finally, while not developed directly, we note that agility may sometimes be a fool's errand; enterprise death may in fact be the best solution if squandering resources to transform would leave stakeholders worse off. Because dynamic capabilities require strategy to be coupled to agility, only when everything is congruent can value be created and captured and durable competitive advantage realized.

The dynamic capabilities framework highlights interrelationships that need to be understood if managers are to build and maintain competitive advantage. It helps set priorities and enables coherence and congruence between strategy, structure, and the business environment.²¹

A top management team determines the path and character of an organization. At any given date, the top management team of a particular enterprise is unique to it alone. While the organization and its capabilities provide managers with the raw material required to perpetuate the enterprise, it is incumbent on top management to make the key decisions as to whether the enterprise is currently making the right products and addressing the right market segment and whether its future plans are appropriately matched to consumer needs and technological and competitive opportunities. Top management must develop conjectures, validate them, and realign assets and competences for new requirements, as well as shaping the internal culture in which the generation and sharing of knowledge are to take place. The combined dynamic capabilities of the managers and the organization enable the enterprise to profitably orchestrate its resources, competences, and other assets.

With the dynamic capabilities framework, I would like to believe that we are indeed a few steps closer to a truly fundamental understanding of the origins of firm-level heterogeneity and the sources of enterprise-level value creation, capture, and durable growth. No other framework is as ambitious in its reach. Understanding the origins of long-term cash flow generation is the deepest unanswered question in microeconomic and financial theory. It is the question that directly and indirectly animates management theory and

content, and all we can say about practically everything is almost nothing" (Boulding, 1956: 197). One must nevertheless always remain mindful of Aristotle's claim that knowledge is derived from the understanding of the whole and not that of the single parts.

²¹ In this regard, the framework endeavors to revitalize the application of general systems theory in management. One needs, as Boulding reminds us, to "not seek ... to establish a single, self-contained 'general theory of practically everything' ... Such a theory would be almost without content, for we always pay for generality by sacrificing

investment choices and motivates the quest for understanding the ways that enterprises are far from being interchangeable black boxes.

As noted earlier, heterogeneity is also impacted by market demand and the needs of the particular customer segments that a business enterprise chooses to target. The business processes at the heart of capabilities can be unique and firm-specific. These unique processes are sometimes called “signature processes” (Gratton & Ghoshal, 2005).²² They result from past activities, irreversible investments, and embedded values that shape a distinct organizational heritage. Their basis in past managerial decisions tends to make them difficult for competitors to imitate. Sooner or later, though, if they are good, they will be copied. The Toyota System of Production, which was eventually matched by U.S. automotive firms, is one such example. However, the replicability of any complex process is sometimes confounded by what Lippman and Rumelt (1982) call “uncertain imitability.” This, along with a high tacit component to the underlying knowledge, may keep a signature process effectively proprietary for quite some time, providing at least a temporary source of interfirm heterogeneity.²³

6. Implications of Capability Theory for Resource Allocation: x-inefficiency and d-ineffectiveness

To many economists, the central problem in economic theory and in the field of economics more generally is the achievement of efficient resource allocation. Many textbooks still frame the problem in static terms such

²² To be clear, signature processes are just one element of ordinary and dynamic capabilities.

²³ Over longer periods of time, signature processes may become somewhat imitable by others. As Gratton and Ghoshal point out, such a transformation occurred,

as: “the study of the allocation of scarce means to satisfy competing ends.”²⁴ It is sometimes formulated as an issue of “what, how, and for whom.” Economists often assume that, if firms maximize profits, they will, absent externalities, drive economy-wide efficiency through Adam Smith’s invisible hand. Alfred Chandler (1977) reminds us that the visible hand of the manager also supported the price system, although he didn’t explain it in a manner consistent with economic theory. That is what has been attempted above with the concepts of thin markets and (managerial) asset orchestration. The more fundamental economic problem, perhaps, is about how to create and sustain business enterprises that can innovate and change, thereby augmenting what the economy can do with its available resources. This is a dynamic problem.

After Alfred Marshall and the Austrian School, Leibenstein (1966), as noted above, was one of the few economists to explicitly recognize that many firms may not, in fact, achieve technological efficiency, and that the production function may therefore be different for different firms in the same industry, even when there is competition. He proposed the concept of x-inefficiency, which occurs when a firm operates above its cost curve. X-inefficiency made room for the possibility that managers (as opposed to entrepreneurs) might matter in economic theory after all. However, Leibenstein’s x-inefficiency theory, despite being cited occasionally, has not really been embraced by economists. It has arrived at an enigmatic dead end in the economics literature.

A very recent, welcome exception is Bloom et al. (2013), who interestingly declared (consistent with Marshall) that “management matters” (p.40) based on a controlled study in which 14 Indian textile plants

eventually, in the automotive industry with Toyota’s lean manufacturing model, known as the Toyota System of Production.

²⁴ This definition can be found in Becker (1976) and is similar to treatments by Robbins (1932) and many others.

were taught a set of 38 well-known (in developed countries) management practices, resulting in a 17% increase in productivity in the first year. The apparent reason for the firms' initial (avoidable) inefficiency was that the Indian managers had either not known about the superior practices or had been skeptical of what they had heard. This confirms basic Austrian School notions about imperfect information (and inaction) being ubiquitous in the economic system.

Bloom et al. focus on quite ordinary organizational capabilities, which are amenable to transfer and testing in an experimental setting. In the dynamic capabilities framework, that is merely the tip of the iceberg in terms of the ways that management matters.

While not couched in the language of x-inefficiency, the dynamic capabilities framework implicitly accepts elements of that 50-year-old concept. Leibenstein and others attributed x-inefficiency to the lack of adequate competition, but just as important is poor management, limited information, and weak ordinary capabilities. Stronger competitors alone may not solve these problems.

The dynamic capabilities framework suggests a theory of the firm that not only recognizes firms with x-inefficiency (i.e., firms with weak ordinary capabilities, as evidenced by costs above the technically efficient level). It also recognizes firms that suffer from what might be called "d-ineffectiveness" (i.e., weak dynamic capabilities). In fact, I posit that most firms are d-ineffective, because, at any point in time, many are likely to produce a portfolio of products not ideally suited to customer needs. Moreover, efforts to eliminate x-inefficiency can cause d-ineffectiveness

through the efficiency-innovation tradeoff mentioned earlier.

Strategic management scholars have long recognized the problem of sub-optimal management practices that economic theory for the most part assumes away. As noted, a key tenet of the field of strategic management is that not all firms will follow best practice, let alone generate and adapt new practices which outclass all others. If a firm is d-effective, it may not need to follow best practice to remain competitive.

In the dynamic capabilities framework, only d-effective firms are destined to last. Developments in trade and technology have placed a premium on the ability of companies to become entrepreneurial and agile at home and abroad, requiring in turn that management sense emerging opportunities and threats and organize to allow and promote flexibility, learning, and, of course, innovation. Ordinary capabilities are less salient and can often be outsourced to expert suppliers that achieve economies of scale by serving multiple customers. Internal operational efficiency is not enough for survival and growth in today's global economy. Indeed, a focus on efficiency will likely dampen innovation, unless firms are ambidextrous (O'Reilly and Tushman, 2004).

Capability theory is thus the portmanteau that allows (strategic) management theory to inform both a deeper understanding of durable firm-level competitiveness and the proper functioning of the economic system. It provides economic substance to Chandler's concept of the visible hand while helping to highlight invisible hand "failures" associated with incomplete markets.²⁵ This in turn will lead to better understanding by policy makers of how the firms actually operate, not as mere bundles of capital, labor, and technology, but rather as complex organizations

²⁵ After briefly adopting transaction costs as one of his theoretical frameworks, Chandler switched to capabilities (Chandler, 1992).

that thrive and wither based in some measure on the (visible hand) activities of management.

7. Public Policy Implications

Differences between paradigms of firm behavior can have important public policy ramifications. Policy makers must strive to carry multiple models of organizational behavior in mind as they make judgments about possible emerging avenues of intervention.

Although there is some truth to the agency theory view that managers steal or waste shareholder dollars in various ways, it completely fails to provide any understanding of how firms first create the value that wayward managers (and boards) then supposedly dissipate or steal. While it has been shown that contracting issues and fear of opportunistic recontracting by parties outside the firm help shape the boundaries of the firm, transaction cost economics ignores differences in production costs and the value of integrating diverse pools of technology and know-how. While the neoclassical view of the firm as a production function can illuminate certain issues surrounding the supply and demand for inputs, it assumes that markets exist rather than that they must first be created.

Bad theory produces bad policy; and bad, poorly informed public policies can weaken an economy. Without adding the capabilities approach to the policy maker's toolkit, government's may impede innovative changes in the economy that offer major growth opportunities. In this section, I consider three areas where a capabilities approach can lead to non-standard policy prescriptions.

IX. 7.1 Corporate governance and oversight

Regulatory and legal frameworks that rely on economic analysis, particularly agency theory, have steered corporate governance away from a focus on the future health of the organization toward more short-term concerns. As Garicano (2000: 874) notes, "with a few recent exceptions, most previous economics literature has equated the study of organizations with the study of incentive problems." Accordingly, policy frameworks have over-emphasized at least two potentially major sets of "problems" for corporate longevity and growth. One is the issues arising between management and the board of directors. The other set of issues is between management and shareholders. The "solutions" that have been adopted constrain the scope of management to fully leverage the capabilities of the firm, risking long-run growth in employment and output.

a) Agency theory

The mainstream (agency) theory of the firm takes a contrary approach to that of the capabilities framework. In most large, publicly traded corporations, ownership belongs to a more or less fragmented group of shareholders, while day-to-day control is exercised by professional managers who may or may not own a significant number of shares in the firm. This raises the possibility that managers could choose to operate the firm in ways that benefit themselves rather than the shareholders.

Concerns about the potential for misallocation of resources by non-owner managers dates back to at least the work of Berle and Means (1932). In the 1960s, a flurry of books by economists, such as Williamson (1964), Marris (1964), and Baumol (1967), expanded on the Berle and Means thesis that incentive misalignment between managers and shareholders was inimical to economic performance.

In the finance literature, Jensen and Meckling (1976) offered an influential solution based on the financial structure of the firm, i.e., the balance between the firm's use of equity (stock) and debt (bonds). They argued that misalignments in the objectives and information sets of the principal (owners) and the agent (managers) impose agency costs such as contracting and monitoring expenses. Their solution relied on a trade-off between the agency costs of equity financing (which weakens the incentives for managers by reducing their ownership) and the agency costs of debt (which strengthens incentives for managers but can lead them to pursue overly risky strategies). Total agency costs are minimized when the marginal agency cost of additional debt equals the marginal agency cost of additional equity. The logic behind all such agency models is that management discretion must be limited and shareholder value maximized.

In the dynamic capabilities approach, the risk of self-interested behavior by managers is not ignored, but it is of secondary concern relative to the future prospects of the firm. Appropriate incentive systems and board oversight are recognized as desirable. However, the most important job of organizational design is to empower creative contributions from managers and to coordinate and align "expert talent" (Teece, 2011).²⁶ Long-term shareholder interests are served by strong dynamic capabilities. The task of the board in competitive markets is to help managers keep dynamic considerations prioritized over technical efficiency, as the pursuit of the latter cannot lead to (and can undermine) long-run competitive advantage in tight selection environments.

Both the agency and capability perspectives have their role to play. Owners (i.e., shareholders and their

representatives on the board) must find ways to prevent managerial excess and fraud while harnessing the skill of managers to build capabilities and guide the firm in hypercompetitive global markets.

b) Board oversight

One place where policymakers have run afoul of the imperatives of enterprise capabilities is in the design of corporate governance mechanisms, specifically the composition of the board of directors. In the Capabilities perspective, what matters most is the board's role in verifying that top management is pursuing a coherent strategic vision and developing strong dynamic capabilities. In addition to the standard financial monitoring function, the board should also be responsible for responding to evidence of strategic malfeasance by management, i.e., cases where top management is making poor decisions with respect to the firm's long-term investments. Positioning for the future, not optimizing for the present, ought to be the focus of attention.

Recent regulatory changes, such as the U.S. Sarbanes Oxley Act of 2002, have created greater financial transparency and require extremely tight financial controls and rigorous—some might say pedantic—application of accounting rules. However, this type of rigor and oversight, while consistent with the problems as defined by agency theory, provides little protection against strategic blunders by management. Indeed, by focusing so much board attention elsewhere, Sarbanes Oxley is likely to amplify the likelihood of such blunders. The new technical requirements of good governance now prioritized in U.S. law may be of only second- or third-order importance relative to the larger issues that truly good governance requires, namely,

their long-term strategic initiatives are less likely to invest in R&D (and more likely to acquire other firms) even after controlling for industry-specific R&D intensity.

²⁶ Top management holds the key to unlocking the firm's innovation capabilities. Hitt *et al.* (1996) showed that companies in which managers are rewarded primarily on periodic financial measures rather than on an evaluation of

relentless focus on capability development, innovation, and transformation.

Complicating the picture is that what constitutes “good governance” may, in fact, be context-dependent. For example, in some circumstances, the separation of the CEO and chairman roles may be counter-productive to the rapid transformation required to meet a competitive threat, or to develop and commercialize a new technology that is meeting resistance from certain parts of the company. Bifurcated responsibilities and decision rights might well complicate leadership issues and slow organizational transformation.

Many boards may today have insufficient strength to help management properly evaluate strategic alternatives. Board members typically lack staff to conduct their own analyses, which leaves them reliant on themselves and on management for their understanding of complex issues.

In the contemporary governance environment in the United States and Europe (and, to a lesser extent, Asia), greater weight has been put on the need for board members who are independent of management, but not on members who understand the industry environment in which the company must compete.

c) Shareholder value

In large part due to the currency of agency theory, a “shareholder-centered ideology” has come to dominate the legal, economic, and business fields of most major economies—and especially in the United States and the United Kingdom (Hansmann and Kraakman, 2001: 439; Deakin, 2004). As a consequence, there is a trend toward convergence of legal practices, board structure, securities regulation,

and accounting methodologies that govern major events such as takeovers despite national variations such as the United Kingdom’s legal requirement for boards to consider “employee interests” (Conard, 1991) and other manifestations of “stakeholder value” approaches (Kay 1998). The problem, from a dynamic capabilities perspective, is that shareholder turnover is high, so a single-minded focus on maximizing shareholder value too often leads to a short-run focus by both management and boards.

Corporations governed according to the tenets of agency theory may be (at least theoretically) more or less immune from self-aggrandizement by managers. But the constraints imposed by existing regulations and developments in corporate law have almost certainly restricted the ability of management to invest in existing and new businesses to ensure the development of capabilities and innovation to drive the long-term health of the company and the economy.²⁷

Shareholder primacy began to emerge as a guiding principle of corporate governance in the 1980s. It was manifested in multiple ways, including hostile takeovers and an increase in the role of stock options in executive compensation (Haberstroh, 2002: 93). One fairly recent manifestation from the perspective of the long-run growth of the enterprise is the drive to increase dividends and buybacks, both of which raise the value to existing, but not necessarily future, shareholders. In the 1980s, the largest corporations began allocating a large share of their income to dividends and stock repurchases (Lazonick, 2014). In many years, the combined total of dividends and repurchases by the largest companies exceeded 75%—and sometimes exceeded 100%—of their net income,

term value of their shares. These activists are often not investors but rather traders, despite the fact that they cloak themselves in the mantle of shareholders. They often have little if any interest in the long-term health of the company.

²⁷ In theory, agency models are compatible with the long-term, socially efficient maximization of enterprise value. In practice, the logic of these models has been distorted to reward short-term stock market activists who cajole management to squeeze large payouts that raise the short-

leaving relatively little money for investing in the company's future (Lazonick, 2014).

Another outgrowth of the shareholder primacy view is the role of activist investors in breaking up companies to release short-term value while potentially reducing long-term potential. Between 2003 and 2013, the amount under management by activist hedge funds grew from less than \$12 billion to \$65.5 billion (Das and Terlep, 2013). The phenomenon is even impacting the relatively closed market for corporate control in Japan (Hamao *et al.*, 2011).

Company performance in the wake of shareholder activism is difficult to evaluate because a large share of target companies merge or delist and others divest activities, leaving a reduced asset base on which to judge performance. Studies of hedge fund activism generally find an increase in earnings (EBITDA/assets) among the remaining companies in the year or two following the intervention (e.g. Brav *et al.*, 2008). A study of more than 300 activist campaigns by all types of blockholders that occurred between 2003 and 2005 at U.S. listed firms found that, while the campaigns were profitable for the investors, earnings (EBITDA over assets) generally declined relative to those of a matched control sample of firms in the year following the blockholder's initial investment (Klein and Zur, 2011). The study found that hedge funds generally pursued strategies of paring cash balances by raising dividends or increasing leverage, while other types of "entrepreneurial activists" pursued strategies of reducing investment in R&D and/or new capital.²⁸ More than 13% of the sample firms were merged or acquired within a year of the intervention (Klein and Zur, 2011: 219).

²⁸ A study that looked only at hedge fund campaigns, but covering a far longer period (1994-2007) found that return on assets generally improved in the following five years (Bebchuk *et al.*, 2015). The paper does not make direct

Shareholder activism risks replacing the knowledgeable judgment of the firm's managers and board with the less-informed analysis of investors with an interest in making a quick profit. A study of hedge fund activism in the early 2000s found that the funds held the shares of target companies for about 20 months, which is long-run for tax purposes but not in terms of the life of a company (Brav *et al.*, 2008: 1732). It seems highly likely that activists are leaving a trail of lost opportunities from investments skipped for lack of capital or executives distracted by a focus on returning cash to shareholders. Reforms that would be likely to improve the ability of management to focus on developing organizational capabilities (which requires a stakeholder approach) rather than paying off or pandering to activist shareholders include reducing (short-term) stock-based pay, limiting the ability of firms to execute open-market buybacks, and restoring limits on the ability of shareholders to shape boards.

X. 7.2 Development policy

The dynamic capabilities framework could also be used to inform policy with respect to economic development. Consider, for example, the successes of the Asian "tiger" economies and the lackluster outcomes in many other countries. Whereas traditional economic development theorists stress resource accumulation (propelled by high rates of investment), the dynamic capabilities framework stresses the importance of enterprise-level entrepreneurship, innovation, learning, and good strategy.

This resonates with emerging theories of development (Lall and Teubal, 1998). Nelson and Pack (1999) distinguished between accumulation and assimilation

comparisons with other studies or look at whether the recent period is different from the earlier years of the sample.

theories of development. The assimilation approach aligns with dynamic capabilities theories of the development and growth of the business enterprise. The accumulation approach is more akin to the resource-based view of the firm (Barney, 1991). When Nelson and Pack (1999: 434) noted that “if ... one marshals [inputs] but does not innovate and learn, development does not follow,” they implicitly endorsed the importance of capabilities for national economic development.

Firms are the "engines" of economic development. Furthermore, as noted in the introduction, there is emerging evidence from developed economies that better-managed firms support higher wages. Economic development policy makers must therefore understand the developmental processes inside firms. It is up to government to provide the fundamental economic and political conditions favorable to enterprise and national growth including a functional electrical and transportation infrastructure, macroeconomic stability, non-predatory taxation, incentives for saving, internal and external peace, and relatively high levels of literacy.

A consensus, summarized in a World Bank (1993) study of the high-growth economies of East Asia, emerged on the ideal institutional bases for economic growth: (1) a mechanism for broad distribution of the benefits of growth; (2) a powerful, meritocratic bureaucracy insulated from factionalized political and business influences; and (3) channels for sharing information between the bureaucracy and the private sector. Although subsequent events and later reassessments (summarized in Yusuf, 2001) have called into question several aspects of the “East Asian Miracle” and underlying policies, it is clear that public policy can play a more positive or negative role in a country’s economic development.

The scarcity of firm-specific idiosyncratic assets and the complexity of integration and coordination processes constrains the growth of firms. The supporting

infrastructure in the economy at large also matters, because this is likely to affect the local supply of appropriately educated and trained managerial and technological human resources. The growth of firm capabilities is closely coupled to the availability in factor markets of trained personnel.

It is worth noting from the economic history of the United States that it was only with the emergence of the railroad, the telegraph, and the professional managers required to run them that large, innovative, industry-dominating companies such as Standard Oil and General Motors emerged. Chandler (1977) labeled the dynamism he chronicled in his study of the long-run development of the industrial business enterprise as a period of “managerial capitalism” (Mason, 1958). The entrepreneurial functions in the dynamic capabilities framework are not confined to start-ups and to individual actors. They are associated with a new hybrid: entrepreneurial managerial capitalism.

Public policy can help to encourage the improvement of the local pool of management talent. For example, programs that support education in advanced countries, periods of overseas employment, and eventual return to work at local firms can, over time, raise the quality level of the talent pool. In countries that already have a number of foreign subsidiaries, establishing programs with those who are willing to provide management training to local employees is another potential avenue to increase the stock of human capital.

Even with competent management, the positions of firms in industrializing economies may not initially be competitive in the global supply system. Nevertheless, as discussed in the dynamic capabilities framework these firms can catch up by being better at processes and by carefully choosing the markets in which to compete. Thus many firms in Asia have found a promising path by acting initially as complementors to firms in advanced countries. This could be a simple supply relationship, but multinational enterprises

(MNEs) have an incentive to invest resources in spurring the improvement of capabilities at local suppliers in low-wage countries in order to reduce the MNE's own costs while maintaining quality. Most notably, local firms became strategic complementors to MNEs in manufacturing (East Asia) and in software and services (India). These relationships bring higher employment and export earnings to the developing country, but they may not involve much value added because of the limited power of the local firms in global supply chains, where the MNE, as owner of the valuable bottleneck assets, is able to extract the major share of value (Dedrick *et al.*, 2010).

Many local firms in global value chains never develop the capabilities to compete on their own. In a few cases, however, local companies such as Acer in Taiwan and Samsung in Korea successfully graduated from supplier to competitor. This required establishing managerial processes to facilitate the absorption and integration of technical and industrial knowledge from partner firms and other sources while developing capabilities to acquire and apply market knowledge, to build distribution and service networks, and to create a valuable brand image. Strong dynamic capabilities are required to compete in global industries.

In other cases, suppliers in global value chains can use their capabilities to expand horizontally to pursue local market opportunities (Humphrey and Schmitz, 2002). Developing countries have a relatively large share of inefficient, poorly managed firms (Bloom *et al.*, 2012). Once a particular firm develops excellence in manufacturing in one industry, it can often apply its operational know-how to other, import-substituting industries where global competition is less strong (Amsden and Hikino, 1994). For this reason, conglomerates remain much more common in developing than in advanced economies. Large business groups can be a source of national advantage provided that local institutions are strong enough to

prevent the corruption that often comes with concentrated wealth.

A capabilities perspective can also be helpful in developing regional clusters. A cluster is a geographic concentration of firms, suppliers, and associated institutions in a particular industry (see Pitelis *et al.*, 2006, for an overview). Such groupings can realize agglomeration economies from phenomena such as specialization, labor pooling, and shared services.

Policy interventions can assist the development of existing clusters or the emergence of new ones. A capability inventory, for example, can reveal gaps in local activities, such as legal services or IT management, that are raising costs or hampering development. Promoting ties with a local university or other educational and training institutions in the area can improve innovation or enhance the supply of skilled labor. Reducing administrative burdens associated with starting new companies and investing in new facilities is also vital.

8. Conclusion

Economists recognize that the fundamental economic problems are about “what, how, and for whom.” Textbook economics sees resource allocation decisions as guided only by the price system, but managerial decisions based on more than just relative prices play a key role, too. Faced with pervasive deep uncertainty, different management teams see the world differently, pursue different strategies, allocate resources accordingly, and build distinct organizational capabilities inside firms. Some will do better than others (Lovallo *et al.*, 2017). If they make missteps, they can sometimes catch up—particularly if it's about doing things right (the “how”), since there will generally be a way to achieve best-practice efficiency. However, it is not as easy for a business to solve the “what” problem—a matter for dynamic capabilities—

as the “how”, where ordinary capabilities are sufficient.

The capabilities approach is only starting to receive attention from scholars in the field of economics, despite the availability of a large and growing theoretical and empirical literature in the field of strategic management. To the extent economists have examined the concept in recent years, the emphasis has been on the ordinary capabilities relevant to maintaining and improving productivity. Dynamic considerations are largely absent from this discourse. Mainstream economics has yet to fully embrace the reality of heterogeneous, entrepreneurial firms creating markets, developing unique and differentiating knowledge, pursuing unique strategies, and transforming internal structure and business models to manage disruptive competition.

Core to the capabilities approach is the recognition of the business enterprise as an organization with capabilities and strategies. Capabilities lie behind distinct, firm-specific production activities. Innovation capabilities create new products, new processes, and new production functions. Entrepreneurs and managers play critical roles in developing and sustaining capabilities. Ordinary capabilities are about best practices, can often be bought or “rented”, and diffuse relatively quickly. Dynamic capabilities are harder to develop. They must be built as they cannot be bought. While strong dynamic capabilities enable the effective selection and deployment of ordinary capabilities, the strengthening of ordinary capabilities, such as a drive for efficiency, can actually undermine dynamic capabilities by reducing organizational agility, unless skillfully managed.

The dynamic capabilities framework carves out a unique place in economic theory for the entrepreneurial manager, who has hitherto had no productive role. Managers identify needed capabilities and help build or buy those that are missing, then integrate and orchestrate them. They also choose

strategies and make decisions—often under deep uncertainty. Maintaining evolutionary fitness requires their presence in the theory because the price system alone, even when forward markets are reasonably complete, cannot account for it.

Because of the dominance of mainstream economics in public policy analysis, the absence of a capabilities perspective has led to policy myopia. The capabilities perspective maintains that economic growth has more to do with technological and business innovation than with eliminating additional inefficiencies, as important as that is for boosting short-term profits. National economic growth can be hamstrung if short-term earnings-per-share metrics are center stage. What’s critical for growth is for firms to invest in longer-term, value-enhancing projects. If corporate boards are forced to worry about audit trails and are distracted from strategizing, or if CEOs who invest for the long run are challenged by shareholder activists with short time horizons, then the majority of shareholders and other stakeholders will suffer, even if short-term traders gain.

Likewise, if less developed countries focus on investment for technical efficiency without consideration of market needs and the building of (dynamic) managerial competences, success will be limited. There are endless implications of a capabilities approach, including the promise of a new genre of microeconomic analysis that incorporates a more complete model of the factors that underlie firm heterogeneity, the innovative performance of firms, and productivity growth in the economy more generally.

Appendix: Deficiencies of the Established Models of the Firm

This appendix compares the capabilities view of the firm with the leading models of the firm that are

currently prominent in economics. The three considered here are the neoclassical model of the firm, transactions cost economics, and agency theoretic approaches.

Neoclassical economics views the firm as a profit maximizing machine. Some have called it a black box. Mainstream economists have been reluctant to look too deeply inside. In their heavily stylized models, the main role of management is to choose inputs so as to minimize costs while producing the level of output that equates marginal revenue with marginal cost. Markets are generally assumed to exist, although demand may be uncertain. Market power can exist and is almost always seen as deleterious, even if it has resulted from innovation and/or superior foresight.

Transaction cost economics (TCE), closely associated with the work of Ronald Coase and Oliver Williamson (1975, 1985), implicitly assumes that production costs are the same no matter the governance arrangements. There is little effort to link the two, or to bring in innovation. Coase (1937) went so far as to ignore the revenue side entirely, modeling internalization of transactions up to the point where the marginal cost of internalizing an activity is equal to the marginal cost of using the market instead. TCE focuses instead on the relative costs of integrating transactions inside the firm and contracting for them in a market. Internalization imposes costs because of bureaucratic overhead, while market contracts carry costs related to asset specificity, which raises the possibility of opportunistic recontracting.

TCE is a variant of the neoclassical view in that management's goal is to minimize the sum of production and governance (transaction) costs. If the organizational locus of a firm's transactions can be arranged in the order of the cost difference between internalization and contracting, then transactions should be internalized up to the point where the bureaucratic deadweight of internalizing the marginal transaction is just equal with the cost of conducting it

via the market. This logic has been accepted without serious critique from within the discipline for almost a century, despite the fact that it flies in the face of conventional economic analysis because, as noted, Coasian boundary choices are made strictly in terms of costs without considering revenues or benefits. It is unlikely, for example, that the dynamic effect of organizing knowledge-intensive activities within the firm and across a market interface yield the same benefits.

The agency theory view, which also assumes that agents will act opportunistically if allowed to do so, looks at conflicts of interest within and around the firm. Relevant principal-agent pairs include shareholders and managers, debtholders and shareholders, and managers and employees. One of the main applications of agency theory is to capital structure. In particular, Jensen and Meckling (1976) argued that the ownership structure of the corporation (insider shareholders, external shareholders, and bondholders) should be optimized by considering the related agency costs, which include monitoring, bonding, and the loss that is assumed to result from the separation of ownership and management control. The key assumption throughout this genre of models is that managers will misuse corporate cash by undertaking negative-value projects, failing to downsize, or spending on wasteful R&D unless the cash is siphoned off to service corporate debt.

Another class of agency models pushes the problem down a level, with overspending arising from the excessive requests of division heads who are better informed than executives about the value of their projects and will choose those that yield the highest personal (as opposed to organizational) benefit (Rumelt, 1987; Aghion and Tirole, 1997). Thus, divisional managers are modeled as likely to provide inadequate or misleading information, which leads to inefficient investment (e.g. Stein, 2002; Inderst and Klein, 2007; Friebel and Raith, 2010).

These models of firm behavior have myriad shortcomings in terms of explaining how innovation and growth, the roots of wealth creation, take place. The dynamic capabilities framework makes a start at addressing the gaps.

XI. A.1 Markets too often assumed to be complete, and externalities too often ignored

At least two of the three economic models discussed above tend to assume that markets are relatively complete, even if they don't necessarily function well.²⁹ These assumptions reduce the economic problem to one of contract, when in fact it may be a more severe problem of market existence or market expansion.

The problem stems in part from what was referred to earlier as the hyper-rational equilibrium assumption (Teece and Winter, 1984). In a "perfect" world of markets (spot, term, future, etc.), the firm has full information about competitors, about complementors in investment decisions, and about what consumers really want. But, in reality, much of this information is proprietary, tacit, or diffuse, and thus inaccessible. The decision to invest depends on capabilities for sensing and calibrating opportunities, developing strategies to exploit the most promising, and foreseeing how potential competitors and complementors will

²⁹ The capabilities approach makes no such assumption. Indeed, markets may have to be created, as in the case of new products and services that tap into latent demand (e.g. the iPad and App Store) and which require after-sales support and product training. This requires that top management have the capabilities to identify unmet demand, conceive ways to meet it profitably, and commit resources to do so with no certainty of a competitive return. For new product categories, building user awareness and

respond. These are not capabilities required in a neoclassical world of perfect competition. Of course, game theory models of information asymmetry exist, but they are not robust, and a far cry from the complex reality that the capabilities approach endeavors to address.

One area where this is especially problematic is that of complementary investment, a problem flagged by Malmgren (1961) and Richardson (1972), remarked upon by Teece (1984), explored more recently in the vertical context by Bresnahan and Trajtenberg (1995), and commented on by Jones (2012).

XII. A.2. Existence of firms assumed, entrepreneurs sidelined, and managers implicitly vilified

The neoclassical model usually assumes that markets simply exist and lead to spontaneous production. Agency theory also takes the existence of firms as given. In the Coase-Williamson formulation, firms arise from market failure. It contrasts the costs for market-based arrangements with the control afforded by a hierarchical firm. But it is far from being a full explanation of why firms are more than the sum of

knowledge is critical. This is what Singer did globally to allow market development of the sewing machine. Gillette has likewise promoted the aesthetic benefits of removing men's beards and of a clean shave in order to broaden the market for its safety razors. The need for such creation and expansion activities is assumed away in transaction-based approaches, where there is almost always a party (or customer) to transact with and a known, existing demand to satisfy.

their parts.³⁰ And the assumption that firms exist allows the role of entrepreneurs in building firms to be ignored.

Managers are also slighted, even though differences in management (past and present)—and in management decisions—lie at the root of most interfirm heterogeneity.³¹ In microeconomic theory, managers have been virtually denied a positive role in economic performance, despite clear evidence of their importance (Adner and Helfat, 2003). It is amazing that the theory of the firm would go for so long with scant attention to the role of management. In the theories discussed above, managers are almost always treated (if at all) as boundedly (if not hyper-) rational automatons with deep proclivities to steal from shareholders.

In neoclassical theory, the roles of entrepreneurs and managers are often stripped out by the assumption of full information and the existence of a complete set of markets, even for contingent claims.³² Agency theory recognizes managers only in so far as they will misuse

³⁰ The capabilities approach recognizes firms as repositories of the productive knowledge that drives the economy. In a knowledge-based theory of the firm, transactions (internal or contracted) do not just entail costs; they also determine “how the parties’ starting knowledge endowments are blended and used... [and] how learning or developments occurring during the course of the work are taken into account” (Conner and Prahalad, 1996: 484). Because knowledge is more likely to be freely shared and exploited within firms than between them, the conduct of activities within a firm often has advantages over the market that a transaction cost theory ignores (Teece, 1980a, 1982). In some cases, knowledge considerations will be more prominent than the risks associated with opportunism, and in other cases, the opposite will hold true. Even if transaction costs were zero, learning and orchestration functions would still need to be carried out. The firm is a vehicle designed to do so.

or misappropriate corporate cash if given half a chance. This raises the question of where the wealth inside firms comes from in the first place, something that agency theory does not—and cannot—address.³³

Economists have a long history of failing to consider how much organization is necessary before there are goods and services to exchange in markets. Adam Smith, in his famous pin-making example (Smith, 1776, I.1.3), did not explain how the pin got invented and how the integration and coordination of non-traded pin sections (e.g. the wire, the head) took place inside the workshop in order to realize the fruits of specialization. Yet management functions had to be performed in Smith’s pin factory because specialization will not produce its benefits without a coordinating agent.

Somewhat surprisingly, economists have not done much about this lacuna in the last two hundred years even as the work carried out by managers has become exponentially more complex.³⁴ There is occasional reference to “superior foresight” by management (e.g.

³¹ For a more complete statement about how management functions are obscured in economic theory, see Teece and Winter (1984).

³² “We may define the manager to be the individual who oversees the ongoing efficiency of continuing processes... The entrepreneur (whether or not he in fact also doubles as a manager) has a different function. It is his job to locate new ideas and to put them into effect.... He is the individual who exercises what in the business literature is called ‘leadership.’ And it is he who is virtually absent from the received theory of the firm.” (Baumol, 1968: 64–65)

³³ In the dynamic capabilities framework, managers are expected to fulfill entrepreneurial as well as operational roles. While the Austrian School finds room for the entrepreneur, it doesn’t have much room for the manager. In capability economics, there is a complementary place for the entrepreneur and the manager. Hence, capability theory takes Austrian economics to the next logical step.

³⁴ One noteworthy exception is Walker (1887), who placed differences in managerial ability firmly at the center of his

Gilbert and Newbery, 1982: 525), but little explanation of what that might entail.

The manager is scarcely present even in John Roberts' (2004) "modern firm." And even when managers *are* present in economic theory, the focus of modern economics and finance is on the distribution, and less so the creation, of the value (Jensen, 2000). This is despite the fact that the efficacy of the market economy flows less from the twin theorems of welfare economics and more from managerial organizational capability, enterprise management responsiveness, entrepreneurship, and innovation (Nelson, 1981).

Management is not just about specialization and the division of labor. It's also about the more entrepreneurial tasks of ideation, co-creation, and coordination (asset orchestration). The integration of ideas and tasks to create or co-create innovative products and services is at the heart of how firms compete. This is not a recent development, but it is not yet adequately reflected in mainstream economic theory.

However, an empirical economics literature on the effects of managers and management practices on firm-level outcomes is finally emerging. Bertrand and Schoar (2003) carefully analyzed a host of firm-level variables for a sample of about 500 C-level executives who had moved from one major U.S. company to another between 1969 and 1999. They found significant managerial fixed effects in return on assets. The operating variables most associated with the identity of an executive were acquisition and diversification decisions, dividend policy, interest coverage (a measure of debt service relative to earnings), and cost-cutting. Most importantly, the results confirm casual observation—and investor belief—that certain individual executives bring unique

explanation for the profit differential between companies. Unfortunately, his insights seem to have found no purchase in the subsequent literature.

and potentially valuable characteristics to the firms they manage.

Bloom and Van Reenen (2007) looked at the economic impact of management practices such as process documentation and performance tracking in hundreds of medium-size firms and showed that they were correlated with productivity but found a wide dispersion of adoption among the sample firms. Bloom *et al.* (2013) followed this up with a controlled study in which 14 Indian textile plants were taught a set of 38 well-known (in developed countries) management practices, resulting in a 17% increase in productivity in the first year. The apparent reason for the firms' initial (avoidable) inefficiency was that the Indian managers had either not known about the superior practices or had been skeptical of what they had heard. This confirms basic Austrian School notions about imperfect information (and inaction) being ubiquitous in the economic system.

Not only these studies but also logic and simple observation show that good managers play a vital role in value creation for shareholders and other constituencies, such as employees. Yet agency theory has so blotted out appreciation of these critical management functions that the positive roles of management are effectively forgotten in modern treatments of corporate governance and public policy.

XIII. A.3 Managerial (non-price) resource allocation substantially ignored

Some economists would have us believe that market exchange activity is the linchpin, if not the sole basis, of efficient resource allocation and wealth creation in the economy. Economists (e.g. Hayek, 1945) wax eloquent about how well the market does this kind of allocation, and appropriately so.³⁵ The firm is also significant because it is one place where markets are particularly incomplete. Inside the firm, the price system may not hold sway.

However, when innovation and change are part of the economy, more than the price system is needed to allocate scarce resources among unlimited wants. Managers and management are needed, too, in part because key asset markets are too thin—or nonexistent. The (neoclassical) economic model of market exchange takes for granted that somehow, somewhere, new goods and services are being designed, developed, and produced by some method that will be technically efficient, conditional on factor costs.

The price system has little relevance to the internal allocation of resources within firms. As explained in Teece (1980a, 1982, 1986) and in Helfat *et al.* (2007, Chapter 2), managers, entrepreneurs, and innovators cannot just leave it up to a hypothetical market to line up specific assets, develop new ones, and integrate them into a well-functioning innovation, production, and marketing system because markets for high-

³⁵ Hayek and other Austrian School economists such as von Mises and Kirzner also maintain that people do not allocate means to ends; rather, they consistently seek to discover

specificity (idiosyncratic) assets generally don't exist, and if they do exist they are invariably "thin." To overcome this problem, managers become the instruments that help achieve the shrewd, and often highly complex, allocation of company resources. They gather information, make assessments, and give directives so that non-priced assets are developed and deployed in value-enhancing ways. This is the orchestration function that the dynamic capabilities framework assigns to managers.

As both a theoretical and practical matter, how firms allocate resources so that they are in their first best use is a fundamental question. How firms build, augment, and modify their resource base and productive capabilities over time is also of critical importance. These are important resource allocation functions that (neoclassical) economic theory ignores.

Given its history of successes in the face of uncertainty, managed coordination within firms certainly seems just as remarkable an allocation process as that which Hayek (1945) observed in the workings of the price system. Thus, markets and intra-firm resource allocation are not only substitutes, as Coase (1937) implicitly claimed; they are also complements. Williamson (1999: 1106) seems to have agreed, noting that "the relation between competence and governance [is] both rival and complementary—more the latter than the former".

XIV. A.4 Intraindustry heterogeneity ignored

A consequence of firms' departure from coordination via the price system is that they differ from each other in numerous ways, including efficiency and

and create new ends and means. In this regard, Austrian economics is compatible with dynamic capabilities; neoclassical economics is far less so.

innovativeness (Nelson, 1991). Mainstream economics, including the three models of the firm considered in this paper, sheds little light on the sources of intraindustry heterogeneity.

There have been periodic attempts to embed firm heterogeneity in models of economic activity. Iwai (1984), for example, included firms with different production costs in a Schumpeterian model of industry dynamics. More recently, Melitz (2003) introduced a contract-based, heterogeneous firms model of international trade. The heterogeneity was introduced by drawing each firm's productivity from a probability distribution. Firms still optimize, subject to the level of their productivity, and compete in existing markets with known characteristics. Firms may enter or exit a market, but these events (particularly entry) are generally unexplained, apart from rule that, at least in the short-run, production is not worthwhile if price is less than average variable cost.³⁶

There is ample empirical evidence that profit-maximizing firms will not necessarily achieve technical efficiency (Syverson, 2011). As noted, Leibenstein (1966) introduced the concept of x-inefficiency, which occurs when a firm operates above its cost curve. Economists of the Austrian School recognized that firms may not even achieve technological efficiency. Leibenstein's x-inefficiency theory made clear that a full understanding of the economy needed to look more closely at why firms differ. Although the challenge wasn't taken up at the time, recent research has started to fill in the blank.

³⁶ In the dynamic capabilities framework, by contrast, interfirm heterogeneity is a natural outcome, not an assumption. Because many capabilities are idiosyncratic and built on a unique organizational history and unique business model designs, they are not easily imitated by other firms that have different histories and corporate cultures. Dynamic capabilities are particularly distinctive because they are embedded to some extent in the personalities and level

The studies of management practices by Bloom and Van Reenen (2007) and Bloom *et al.* (2013) confirmed that many firms fail to optimize their operations for any of a number of reasons. They showed that competition matters, but so does management with respect to developing and using quite ordinary capabilities.

XV. A.5 Firm boundaries set by incomplete frameworks

Another aspect of interfirm heterogeneity is that firms choose different business models and different boundaries. In a given industry, some may choose strong vertical integration while others choose to contract out most of the necessary activities. The differences can arise for any number of reasons, including distinct firm histories, disparities in coordination capabilities, and different appropriability strategies.

Of the economic models under consideration, transaction cost economics is the one most associated with delineating the boundaries of the firm. As described above, transactions are to be allocated between the firm and the market so as to equate the marginal costs of each modality.

The problem with this is, as hinted earlier, that marginal benefits are ignored. In any credible economic model, firm boundaries need to be selected

of integration of the top management team (Linden and Teece, 2014). Moreover, the imitation of capabilities is often confounded by what "uncertain imitability" (Lippman and Rumelt, 1982) because even the people involved may not fully understand the complementarities underlying a specific capability. Hence, capabilities, especially dynamic capabilities, are hard to imitate, allowing interfirm heterogeneity to persist (Jacobides and Winter, 2012).

based not just on the basis of transaction costs but also on the need to capture value (Teece, 1986, 2006). In the dynamic capabilities framework, firm boundary choices are defined not just by a set of make-or-buy decisions. They also represent a business model choice. Business models take into account appropriability as well as cost issues. Control over bottleneck assets is a key driver (Teece 2006, 2010b). For example, a firm with a certain type of unpatentable know-how may not be able to license it to potential users without revealing so much that the user can employ the know-how without taking a license (Arrow, 1962). This and other types of “market failures” can drive firms to use business models that employ the technology internally rather than licensing it to others. This in turn requires that they develop or acquire the necessary capabilities.

Furthermore, transaction cost analysis overlooks product-specific technological concerns because some complementary activities have more need to be integrated than others. For example, (vertical) integration is more likely to be preferred when unstructured (non-modular) technical dialogue is needed between two stages of production (Monteverde, 1995).

Another weakness of the transaction-focused theory of firm boundaries is its (implicit) assumption that firms are (or ought to be) designed with (static) efficiency in mind. In the dynamic capabilities framework, boundary choices need not be efficient in a transaction-cost sense because firms differ in their unique histories, in the quality of their management, in their internal organizational structure and flexibility, and in their readiness to pursue opportunities.

In other words, firms need to change continually to maintain evolutionary fitness for competition in the market. Yet organizational change is also largely missing from the economic theory of the firm.³⁷ While

³⁷ Williamson (1985) identifies what he calls the “fundamental transformation,” but a close reading shows

there is a recognition among organizational economists that change can be difficult due to the presence of complementarities or employee mindsets (Brynjolfsson and Milgrom, 2013), there is virtually no exploration of the processes that lead to the need for regular transformations of internal structures and scope of activities.

XVI. A.6 The theory of complements is confused

Complements are pervasive throughout the economic system, and particularly in technology development and business transformation. It is common for two or more technologies to produce much more when practiced together. The first steam trains emerged when high-pressure steam engines were yoked to coal cars running on coal-mining hand cart rails. The laser and the computer together enabled CDs and DVDs and also optical fiber-based telecommunications. Nevertheless, these complementarities are not captured adequately by most mainstream economic models.

Absent complementary technologies, many products simply won't get developed and launched. This was the case, for example, in the U.S. electrical supply industry at the end of the 19th century. The industry had a killer app—lighting—but was mired in a “war of the currents” between alternating and direct current, each of which had certain deficiencies. It was only with the development of rotary converters that one system (alternating current) was able to develop a dominant position and spur rapid deployment (David, 1992).

At the heart of economic notions of complementarity is the idea, due to Edgeworth (1897), that the marginal value of a variable increases with another variable.

that it is not about organizational transformation, but rather transformation in a contracting party's competitive position.

Despite this simple basis, there is much complexity to the concept of complementarity, which prompted Nobel Laureate Paul Samuelson to say in 1974 that:

The time is ripe for a fresh, modern look at the concept of complementarity ... the last word has not yet been said on this ancient preoccupation of literary and mathematical economists. The simplest things are often the most complicated to understand fully. (Samuelson, 1974: 1255)

The literature on complements remains underdeveloped and rather confused.³⁸ Economists tend to think of complementarity in terms of its effect on factor prices or on value from use (Carlaw and Lipsey, 2002). Innovation studies (e.g., Rosenberg and Frischtak, 1983) look instead at technological relatedness and the impact of new combinations of existing technologies. Economics needs a structure that can encompass and differentiate among these and other variants of complementarity.

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³⁸ For a very modest effort to sort this out in the context of innovation, see Teece (forthcoming).

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Table 1: Some Differences Between Ordinary and Dynamic Capabilities

	Ordinary (“necessary”) capabilities	Dynamic capabilities
Purpose	Technical efficiency in business functions	Achieving congruence with customer needs and technological opportunities
Mode of attainability	Buy or build (learning)	Build (learning)
Tripartite schema	Operate, administrate, and govern	Sense, seize, and transform
Key routines	Best practices	Signature (beyond best practice) processes
Managerial emphasis	Static optimization	Entrepreneurial asset orchestration and leadership
Priority	Doing things right	Doing the right things
Imitability	Relatively imitable	Relatively inimitable
Result	Technical fitness (efficiency)	Evolutionary fitness (continuous innovation)

Source: based on Teece (2014), Table 1

Table 2: The Interrelation of Dynamic Capabilities and Strategy

Strategy kernel	Diagnosis	Guiding policy	Coherent action
Related dynamic capabilities schema	Sensing	Seizing/transformation	Seizing/transformation
Nature of managerial orchestration	Entrepreneurial	Administrative	Leadership

Source: Teece (2014).

Figure 1: The Dimensions of Distance for Transformation

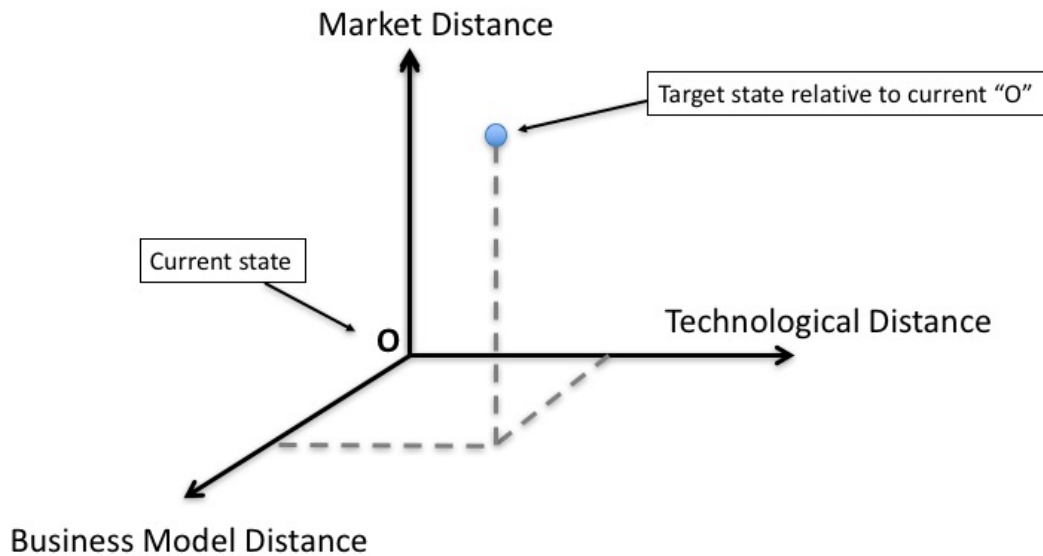
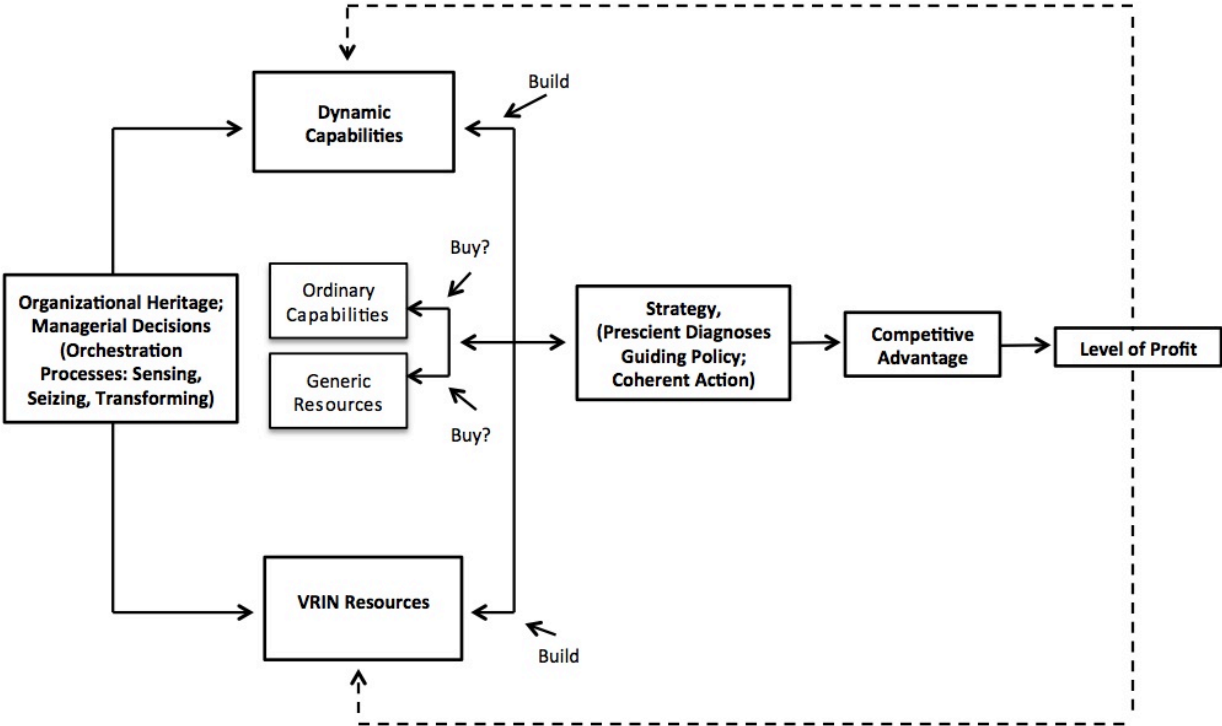


Figure 2: The Logical Structure of the Dynamic Capabilities Framework



Source: Teece (2014).