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COMMENTARY

Deepening the conversation between business history and evolutionary economics

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Walking into one of the great university libraries of this world can easily elicit two very different emotions. The first one is amazement and joy of being able to access the ideas that the great minds of the world have put into words. The second one is sadness, since it is physically impossible to read all the books and journal articles that could possibly be useful for one's research question. The Columbia University Library, for example, which I used for my graduate school research, has 12 million books and 160,000 current journal and serials.¹

Even if we lived for 100 years and read on average one book a day, we would only get through 36,500 books, a minuscule fraction of the library's collection. The fact that we may now be able to read books and articles online and acquire information on the Internet without having to physically enter the library does not change this equation in a meaningful way. We can never hope to read all information that might be relevant to our research. All we can aim for is to become more skilled in deciding where to read more and where to read less so we make the most effective use of our time before sending a new book or article to print and continuing our research.

A modest interpretation of the aim for this special issue of *Business History* is to nudge business historians to allocate some precious reading time to sections of the library where books and articles on evolutionary economics are stored, and to nudge evolutionary economists to allocate some precious reading time to sections where business history writings can be found – be it in the physical or the electronic library. A more ambitious interpretation of the special issue's aim is to provide an introduction to the questions, concepts, and methods of the two fields so that reading, interpreting, and making use of the respective literatures becomes easier and more frequent in the two communities.

I have been given the opportunity to comment on *Constructing an 'Industry': The Case of Industrial Gases, 1886–2006* and *The Evolution of the Pharmaceutical Industry* written by two teams, one affiliated with the literature on business history (Stokes and Banken) and one affiliated with the literature on evolutionary economics (Malerba and Orsenigo). Even though I have tried to integrate business history and evolutionary economics into some of my writings, I should acknowledge at the outset that I have spent much longer hours in the section of the library devoted to evolutionary economics than the one devoted to business history.² I have also read much more technological and economic history than business history narrowly defined. As a result, I may not be able to do justice

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to the literature on business history in the same way as I can do justice to the literature on evolutionary economics, particularly those writings focused on the development of firms, industries, and their supporting institutions. My aim here is to help deepen the conversations between business historians and evolutionary economists, a project that Dan Raff has already pursued for a number of years.³ Reflecting on the two articles, it seems that the most productive conversation between business historians and evolutionary economics probably centers on the questions of how firm capabilities are developed in different historical and industrial contexts, allowing some firms to exist for a long time while many others fail, often very quickly. To explain my reasoning behind this conclusion I will proceed as follows: After a few preliminary remarks on the two articles, I will offer a summary of their key arguments and how each article is trying to advance the conversation between business historians and evolutionary economists. Stokes and Banken, in my view, raise important questions that deserve some close attention if we want to deepen the conversations between business historians and evolutionary economists and prevent possible misunderstandings. I will end by articulating some key questions about the development of firm capabilities, using the context of Stokes and Banken's interesting study of firms operating in what today is called the industrial gases industry.

To see the similarities and differences in the approaches of business historians and evolutionary economists easily, it would have been ideal if both author teams had written about the same industry during the same time period, and with access to the same primary and secondary literature. It is important to emphasise that this is not the case, making it difficult for the reader to easily see the similarities and differences in the two approaches. Although the time period covered is roughly similar (1880s to the first decade of the twenty-first century) and although the pharmaceutical and industrial gases industry are related because in the nineteenth century they could have both been regarded as a branch of the chemical industry where science mattered, there are profound differences between the two industries, some from the very beginning and some that emerged later. For this reason, we need to remember that the differences in what the two teams of authors are saying may be driven in part by the differences of the two industries. Understanding why industries develop in different ways is itself an important task about which I will say more later.⁴ From the source and reference lists for the two articles, it is also clear that some differences in the topics and styles of the articles are clearly driven by the fact that a much larger literature exists on the pharmaceutical industry than on industrial gases. Stokes and Banken can be seen as being engaged in a project of filling many gaps in the written history of this industry whereas Malerba and Orsenigo, building on an already extensive historiography of the pharmaceutical industry, are offering a historically informed account of the industry through the lens of evolutionary economics. Malerba and Orsenigo could not have written the same kind of article for the industrial gases because not enough has been written about the business and economic history of this product class and how it developed.⁵

The two articles pursue quite distinct objectives in their quest to further the conversation between business historians and evolutionary economists. Malerba and Orsenigo's main aim is to give business historians a summary of the key assumptions and concepts of evolutionary theory and then demonstrate that evolutionary theory can explain key features of the historical development of the pharmaceutical industry. Malerba and Orsenigo conclude their article with a call to business historians, inviting them to take advantage of the explanatory power of evolutionary theory to help interpret the history of other industries.

Stokes and Banken (2015) seek to advance the conversation by highlighting challenges that business historians can face when they want to apply concepts from social science approaches such as industrial organisation economics and evolutionary economics.

They stress that without more agreement on ‘a common – and commonly and clearly understood – unit (or units) of analysis, there will be natural limits to fruitful dialogues’. Stokes and Banken advocate that more attention should be paid to making explicit firm–industry interactions that draw a clear analytical distinction between the concept of a firm and the concept of an industry. I see them offering three interpretations why existing social science approaches may not have fully appreciated the need for a clear analytical separation between firms and industries. Let me summarise these three interpretations as follows:

1. The way evolutionary economists and other history-friendly social scientists such as Michael Porter (*Competitive Advantage of Nations*), and even some business historians, use the concept of an industry is very static, doing injustice to the actual historical process through which industries come about.
2. Evolutionary economists and scholars such as Michael Porter writing from the industrial organisation tradition in economics make it seem that the relationship between a firm and an industry in which the firm operates is straightforward one-to-one mapping, with each firm only belonging to one industry. In reality, many firms are multiproduct firms that operate in several industries. Hence, to understand the behavior and the competitiveness of particular firms over time, one needs to examine several industries and sectors. The concepts of an industry and a firm are constructs that need to be kept analytically distinct. It would be impossible to write an insightful history of such multi-business firms as Linde without examining how it operated in many different industries.
3. Evolutionary economists seem to have misunderstood what business historians do. We ‘business historians [. . .] privilege the firm or enterprise in their research’ while for you ‘historically oriented evolutionary economists, the industry is the primary focus of analysis’.

I want to address these issues one by one in some detail because I think doing so will help advance the conversation between business historians and evolutionary economists.

1. Do evolutionary economists in general take a very static picture of an industry? I can see why business historians reading the work, for example, of Klepper et al. as well as by Homburg and myself, might get this impression.⁶ To count the number of producers in an industry over time, one has to assign a starting point for the data. This creates a sharp boundary when the industry is seen to begin. Subsequently, these demographic studies then trace on an annual basis firms, their products, their output, etc. and from this one may get the impression that the concept of an industry is homogenous or static. But this impression, in my view, is largely wrong. Evolutionary economists are very aware that the concepts of an industry and its membership are constructed in historical time.

Building on the Stokes and Banken discussion, I think it is useful to review the different ways in which an industry gets defined. The first way proceeds in terms of product markets and here the crucial question is how buyers perceive the products or services of two firms. Two firms are seen to be in the same industry by buyers when their products are seen as close substitutes. This is precisely the test that anti-trust authorities in the US use to ascertain whether a merger between two companies should be blocked because of the potential of anti-competitive consequences of the merger.⁷ Stokes and Banken correctly note that if one company builds single-family houses using timber frames, a second company that builds concrete high-rise apartment blocks would not be seen as a substitute and hence not belong in the same product market. On the other hand, a Finnish builder of wood single-family homes selling these homes in Germany would be classified as belonging to the same product market as German builders of concrete single-

family homes. The way anti-trust authorities determine that two products belong to the same market is by examining the cross-price elasticity of the two products. The two types of single-family houses would be deemed to be in the same market in Germany because significant price changes in one product would have impact on the demand for the other product. When this is not the case, two products are seen in distinct markets.

Product markets are also examined in terms of their geographic dimensions. Industrial organisation economists have become very disciplined in counting firms as competitors only when they can be seen as competing in the same geographic location. In my study of the synthetic dye industry in the nineteenth century, German producers could ship products from one plant to all locations in the world, hence one could treat the entire globe as one market. Stokes and Banken are entirely justified in arguing that in terms of geographic product markets, firms making the same industrial gas in different locations were not competing with one another. Incidentally, the US Federal Trade Commission uses industrial gases to illustrate how it determines whether two plants are close enough so they can be seen as competitors. 'For example, when examining the market for industrial gases, the FTC found that the cost of transporting liquid oxygen and liquid nitrogen limited customers to sources within 150 to 200 miles of their business.'⁸ In this case, two liquid oxygen plants within 100 miles would be seen as belonging to the same product market, while two plants 300 miles apart would not. Contemporary empirical work in industrial organisation economics (in which most evolutionary economists have been trained) and corporate strategy pays close attention to the actual pattern of competition. Typically two firms will only be judged to be in the same product market when they are truly competing for the same customer. I do not want to imply that measures used in empirical work are always perfect. But evolutionary economists would be very comfortable with Stokes and Banken's assessment that during the early decades many firms making industrial gases did not compete directly in the same product markets.

A second way that industries get defined is in terms of the similarity of production technologies that they use. Two firms producing liquid oxygen may see themselves as belonging to the same industry or trade because they can learn a great deal from each other to improve their operations. Although the two firms may not be competing with each for the same customers, they may attend the same trade shows to learn how to improve their production technology. They may even share their advances with each other. In the nineteenth century UK paper industry, firms shared knowledge about how to design effective machinery.⁹ Similarly, Allen has shown that the development of iron technology in the middle of the nineteenth century was a form of collective invention in which many producers and inventors shared information and showed each other their respective plant designs in the process.¹⁰ It strikes me as entirely legitimate to talk about an industry or trade even if firms are not directly competing for the same customers as long as one makes it clear that this is how one is using the term. In this second process of defining an industry, the construction of the industry occurs because of self-definitions of a set of actors who see themselves as belonging to one industry rather than a second one. The self-definitions can clearly change in historical time. It would be interesting to learn more about whether the early producers of industrial gases had similar self-conceptions or whether an industry in this sense only emerged in the 1920s. To phrase it more specifically: did producers of industrial oxygen not see themselves as sharing an identity?

A third way industries get defined is through various actions on the part of governments that go much beyond the anti-trust enforcement procedures I mentioned earlier. There are many more ways that governments classify firms beyond the North American Industrial Classification System (NAICS). The scheme is often problematic for

determining who competes with whom, as noted by Stokes and Banken. Doing a bit of Internet research on regulations pertaining to industrial gases, I found this revealing statement on the website of Linde USA.

A number of agencies have regulations impacting the transportation of industrial gases, including the DOT [Department of Transportation]. Truck maintenance, driver's hours of service, recordable incidents and many other issues are subject to DOT regulations. Also by DOT regulation, gas cylinders must be requalified at prescribed intervals. Cylinders failing the requalification process must be removed from service. Linde adheres to these and all other regulations. Proper material labeling, truck placards and shipping papers are very important steps in the safe transportation of hazardous materials. And some industrial gases fall into several of these categories. Linde complies with all Hazardous Material Regulations set by the various regulatory agencies, including OSHA [Occupational Safety and Health Administration] and EPA [Environmental Protection Agency].¹¹

Even if two firms are not competing directly for the same customer and even if the two firms do not see themselves as belonging to a particular industry at a point in time, this quote illuminates that different government agencies may define them as falling into the same industry. One of the rationales why firms form an industry or trade organisation is precisely to influence government regulations toward particular firms. The actions and coercive power of governments may, as time passes, change the self-conceptions of firms. Even though the industry makes a great variety of products that have changed over time, one can speak of a pharmaceutical industry because governments define certain firms to be pharmaceutical firms and then regulate them in a similar way. A company that is selling vitamins is not treated as a pharmaceutical firm today. Evolutionary economists recognise that definitions of an industry change, for example, because governments pass new regulations and modify or eliminate old ones. Malerba and Orsenigo (2015) do not devote any space in their article to characterising the details of how the pharmaceutical industry came to be seen as a distinct industry beyond noting that 'the pharmaceutical industry was born in the late nineteenth century as a segment of the nascent chemical sector'. But it seems to me that Malerba and Orsenigo take into account that what they call the pharmaceutical industry is an entity that has changed dramatically over the past 120 years, including the regulations on firms making pharmaceuticals.¹² If they believed that the industry was static and if – for purposes of exposition – they needed to break up the long history of the industry into shorter segments, they would have divided the history of the industry into four 30-year periods. Instead, they organise their discussion in terms of what they determine to be distinct areas of unequal clock time duration: what they call the formative stages (from late 1800 to World War II), the so-called Golden Age (1940s to the mid-1970s), the biotechnology revolution (1970s to 2000 approximately), and what they label the 'Winter of Discontent' (the first decade of the new century). It seems to me that business historians and evolutionary economists have a very similar view of the dynamic nature of industries. A selective reading of the empirical work by those scholars who collect demographic data on industries over long periods of time may give business historians an inaccurate picture of how evolutionary economists see industries. Consistent with the views expressed in Stokes and Banken's article, evolutionary economists believe that industries are defined and redefined in historical time through at least three aforementioned distinct processes (product market competition, self-definition, and government actions). For some products the idea that a group of firms form a distinctive industry arrives more quickly, for others it happens more slowly. Perhaps one reason why the idea of the pharmaceutical industry as a distinct subsector of the chemical industry may have arrived more quickly than industrial cases is because pharmaceutical firms such as Schering, founded in 1851 to focus on pharmaceuticals, found more easily a significant

market for their products compared to Brins Oxygen Company (later renamed British Oxygen Company, or BOC) founded in 1886.¹³ And in some cases formerly distinct industries (e.g. computers and mobile phones) may become regarded as the same industry (e.g. smartphones). Evolutionary economists would have no objection to the assessment that industrial gases did not have strong product market competition among the main firms around the world early in their history and that the industry in terms of strong product market competition among the main players only arrived much later. There is not enough detail in Stokes and Banken's article for me to make a firm judgement whether the industry did or did not exist for many decades in the terms of the self-definition of firms or in terms of definitions imposed on firms (or their divisions) by governments.

2. Do evolutionary economists believe that the relationship between a firm and an industry in which the firm operates can be represented by straightforward one-to-one mapping, with each firm only belonging to one industry? I do not think so. Let me emphasise here that evolutionary economists do not presume that all firms in the industry have to have the same strategy. This is true for mainstream neo-classical economics but not for evolutionary economics. As Malerba and Orsenigo (2015) note, 'The departure point [for evolutionary economists] is that, given the properties of agents' behaviour and the nature of firms just discussed, heterogeneity in the traits and performances of firms is expected to be the norm rather than the exception'. I understand why Stokes and Banken may have received such an impression. To make the data collection tractable, the aforementioned demographic studies by Homburg and myself and Klepper and colleagues focus on one product market – e.g. synthetic dyes, automobiles, tyre producers, TV producers, and radio producers – as the unit of analysis. It is important to point out that multiproduct firms often appear in these studies because focal firms have been active in another industry and the researchers want to track how important knowledge in another industry was to become successful in the next industry. Klepper, for example, examines explicitly how having been active earlier as a radio producer influenced the likelihood of succeeding as a TV producer. In the study of the synthetic dye industry, Ernst Homburg and I collected data not only on the previous activities of dye producers but also the products synthetic dye producers manufactured, including chemical raw materials, organic intermediates, pharmaceutical and photo chemicals, etc., and we could show the large firms became more vertically integrated over time.¹⁴ At the same time, some organic intermediates that initially needed to be made by firms themselves because no market for them existed were later on bought from the market after sufficient numbers of players had emerged to allow for the creation of specialised producers.¹⁵ No evolutionary economist would make the argument that if one wanted to write the history of Linde, for example, which is clearly a multi-sector firm, one would only examine the industrial gas industry. One would track the major product divisions one by one and examine the competitive dynamics in each of the sectors and ascertain to what extent market structure in each of the sectors can help explain the performance of the divisions. But the tools of industrial organisation economics would still be highly relevant in understanding the performance of the business units and understanding the behavior of a particular business unit and its parent.¹⁶ It appears that the reason why the Linde division *Güldner Motoren-Gesellschaft mbH* initially produced forklifts in the 1950s was that the demand for its agricultural tractors went down and profits in that sector became scarce.¹⁷ One would also move the firm as whole and ask to what extent the firm could leverage its capabilities from one sector to the next and examine the level of relatedness of the technologies among the divisions.

But instead of doing an analysis of the entire Linde company, one could also do a narrow investigation, let's say of the industrial oxygen industry in three major industrial

cities like Berlin, London, and New York, with a demographic study of how many firms participated in the industry in these three cities since the late nineteenth century, counting the number of entries and exits every year, to examine whether companies focusing only on oxygen rather than other products would be more likely or less likely to succeed, etc. One would treat the three cities as independent markets and make comparison of the patterns of industry evolution in them. These types of studies have been done by some evolutionary economists, but they are not the only ones. Stokes and Banken's article is persuasive that doing such an analysis for all the products now called industrial gases for the past 130 years which took the entire world as one market rather than studying local ones would not be a productive exercise. I do not think that any evolutionary economist would disagree with this statement. Evolutionary economists are also very comfortable with the idea that a firm and an industry are separate constructs.

3. Do evolutionary economists fail to appreciate that '*business historians [...] privilege the firm or enterprise in their research*' while for '*historically oriented evolutionary economists, the industry is the primary focus of analysis*'? If one only reads the article by Malerba and Orsenigo, one could arrive at this conclusion. Although once in their article Malerba and Orsenigo name key pioneering firms in the pharmaceutical industry, the unit of analysis is clearly the industry, and the authors make no attempt to deal with individual firms as an important unit of analysis in their own right. When they discuss firms, they treat them as classes such as 'big pharmaceutical firms' or 'dedicated biotechnology firms'. Nothing in their article suggests that we could learn something by studying the history of individual firms. As a general statement, it is true that for evolutionary economists the industry matters more than the firm, because for evolutionary economists the key question is whether the economy is able to add new sectors and innovate in old sectors, increasing the diversity and quality of products and reducing their cost wherever possible. It does not matter from this point of view whether firm A or B delivers the products and services. If firm B is more efficient and pushes firm A out of existence, an evolutionary economist would welcome this outcome because it is seen as a necessary component in the process that leads to an increase in GDP per capita.

The article by Malerba and Orsenigo in my view does not articulate sufficiently that evolutionary economists are deeply interested in learning how firms are able to develop capabilities to make complex modern products, such as automobiles, aircraft, computers, etc. The only way to gain an understanding of how this occurs is to do detailed studies on how individual firms have developed their capabilities. If one wants to gain a deep understanding why, during what Malerba and Orsenigo call the 'Age of Biotechnology,' big pharmaceutical firms such as Hoffman-La Roche and Novartis found it difficult to learn how to do R&D using biotechnology methods and instead found it necessary to buy leading biotech firms such as Genentech and Chiron to acquire this capability, it is necessary to study the history of individual firms. It is not by accident that Richard Nelson early in his career did a study of the role of ATT's Bell Laboratories in the invention of the transistor.¹⁸ Many evolutionary economists appreciate that business historians typically have the firm rather than the industry in the foreground of their analyses, and they have been interested in the work of business historians precisely because it sheds light on the behavior of individual firms. Evolutionary economists in general have strongly encouraged studies of individual firms developing their capabilities over time.¹⁹ Notable examples are Fujimoto's study of Toyota, Szulanski's study of BankOne, Szulanski and Jensen's study of Mail Boxes Etc, and Tell's study of eight large electrical power transmission equipment manufacturers.²⁰ My detailed study of six synthetic dye firms, a winner and a loser in Britain, Germany, and the US respectively, in the context of a larger

study on the dynamics of the entire industry, resulted from my extensive interaction with Richard Nelson.²¹ Evolutionary economists have also drawn on the writings of Chandler as well as on insights provided by Usselman's study of IBM and its competitors in the early computer industry, McDonald's study of the development of Intel's manufacturing capabilities, and Burgelman's study of strategy making at Intel, to name a few.²²

In my mind, it is in the detailed study of capability formation in individual firms over time, where the concerns of business historians who want to tell the history of individual firms and the concerns of evolutionary economists overlap, that more extensive interactions would be most productive.²³ Reading the article by Stokes and Banken, a number of questions immediately came to mind that I hope they will be able to address when they synthesise their research project on industrial gases from 1886–2006 in a longer book. Stokes and Banken report that today there are four industrial gas companies – Air Liquide (headquartered in France), Linde (headquartered in Germany), Praxair and Air Products (both headquartered in the US) – that dominate the world market, with Linde and Air Liquide in positions 1 and 2, each possessing about 20% of the world market for industrial gases. Stokes and Banken (2015) note that:

All four offer a full range of gases and work closely with customers to develop new applications. All four of them not only produce, sell, and distribute gases, but also produce and sell air separation units and other related equipment, and they all do so internationally. They are, for the most part, focused entirely on these two related areas, one involving chemical processing, advanced logistics capabilities, and technical services, and the other involving specialised engineering and construction.

Did these four firms develop capabilities that were better than other firms? Or did they have a bundle of capabilities that, as markets became more international, proved to be particularly advantageous? Later on in the article, Stokes and Banken (2015) state that in the late 1960s, '[a]ll of these companies were now active in co-developing applications for industrial gases with their customers, a pattern very different from that which characterised the decades during which cutting and welding dominated sales and outlook'. Did the co-development capability have to be grown in-house or was it possible for a leading firm to acquire another firm that already had the capability? Given that Air Products was a relative late comer, founded only in 1940 while the other three leaders had started by 1907, how precisely did the firm build its position in the industry? Why did Linde buy BOC and AGA rather than BOC or AGA buying Linde? Did superior firm capabilities have anything to do with it? Would Linde have been able to become a top four company if it had not developed deep capabilities in the engineering of plant equipment for many processing industries (chemicals, oil gas), allowing it to become a turn-key provider of plants? These are all questions that I believe both business historians and evolutionary economists would find very stimulating to continue the conversation.

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Notes

1. <http://library.columbia.edu/about.html> accessed on March 28, 2014.

2. [Murmann](#), *Knowledge and Competitive Advantage*.
3. [Raff](#), “Superstores and the Evolution” and “How to Do Things with Time.”
4. [Mowery and Nelson](#), *Sources of Industrial Leadership*. [Murmann](#), “Marrying History.”
5. One reason why I focused on the synthetic dye industry in my 2003 book is precisely because so much had been written about individual firms, the industry, the technology and its underlying science. ([Murmann](#), *Knowledge and Competitive Advantage*).
6. [Klepper](#), “Industry Life Cycles.” and “Firm Survival”; [Buenstorf and Klepper](#), “Heritage and Agglomeration”; [Murmann and Homburg](#), “Comparing Evolutionary Dynamics”; [Murmann](#), *Knowledge and Competitive Advantage*.
7. For details on how US antitrust authorities determine whether two products belong into the same product market, see <http://www.ftc.gov/tips-advice/competition-guidance/guide-antitrust-laws/mergers/markets> and <http://www.ftc.gov/tips-advice/competition-guidance/guide-antitrust-laws/mergers/competitive-effects> [accessed 27 March 2014].
8. [Federal Trade Commission](#), “Guide to Antitrust Laws » Mergers » Markets.”
9. [Magee](#), *Productivity and Performance*.
10. [Allen](#), “Collective Invention.”
11. http://www.lindeus.com/en/sheq/safety_health_info/gas_transportation/index.html [accessed 30 March 2014].
12. See [US Food and Drug Administration](#), “About FDA » What We Do » History.”
13. [Kobrak](#), *National Cultures*.
14. [Murmann and Homburg](#), “Comparing Evolutionary Dynamics.” Details of what data we collected are to be found in Appendix 1 of [Murmann](#), *Knowledge and Competitive Advantage*.
15. The idea that initially firms have to make some of their own inputs because a market for these products does not exist was highlighted by [Stigler](#). See Chapter 12, “The Division of Labor is Limited by the Extend of the Market” in [Stigler](#), *The Organization of Industry*.
16. [Scherer and Ross](#), *Industrial Market Structure*. For a wonderful illustration on how to use concepts from industrial organisation economics to understand the historical development of industries, see [Scherer](#)’s underappreciated textbook explaining industrial organisation with detailed historical industry case studies that include grain farming, crude oil, petroleum refining and marketing, steel, semiconductors, computers, automobiles, pharmaceuticals, and beer: [Scherer](#), *Industry Structure*.
17. [The Linde Group](#), “The Complete History.”
18. [Nelson](#), “The Link Between.”
19. [Dosi, Nelson, and Winter](#), *The Nature and Dynamics*.
20. [Fujimoto](#), *The Evolution*; [Szulanski](#), “Appropriability and the Challenge; [Szulanski and Jensen](#), “Growing Through Copying”; [Tell](#), “Organizational Capabilities.”
21. [Murmann](#), *Knowledge and Competitive Advantage*. Chapter 3. Three times Two Case Studies of Individual Firms.
22. [Chandler](#), *Scale and Scope*; [Usselman](#), “IBM and its Imitators; [McDonald](#), “The Evolution”; [Burgelman](#), “Intraorganizational Ecology.”
23. For an overview statement of the research agenda on dynamic firm capabilities see introduction chapter to [Dosi et al.](#) *The Nature and Dynamics*; also see [Winter](#), “Understanding Dynamic Capabilities.”

Notes on contributor

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