
1. Perpetually on the eve of destruction? Understanding exits in capitalist societies at multiple levels of analysis

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INTRODUCTION

Entrepreneurial exit completes the full cycle of the entrepreneurial process, because every entrepreneurial entry carries the potential of becoming an entrepreneurial exit. Indeed, the great majority of entries make fairly rapid exits from the business population, often leaving little trace of their existence (Yang and Aldrich 2012). Simply put, we cannot have one without the other. Researchers often lose sight of this truism because of their focus on large, public traded companies, which have lower exit rates than mundane entrepreneurial startups. When we step back to reflect on the larger context for entrepreneurship, however, we recognize how much we have yet to understand about the causes and consequences of exits.

The Alluring Promise of Capitalism: Perpetual Novelty

Capitalist systems encourage the pursuit of opportunities by individuals free to appropriate the rewards of their own efforts. In principle, creative new ideas that lead to innovative products and services can enrich entrepreneurs and make the total system better off. Schumpeter (1942: Chapter VII, 84) saw innovation as the core engine of capitalist growth: capitalism is a 'process of industrial mutation . . . That incessantly revolutionizes the economic structure *from within*, incessantly destroying the old, incessantly creating a new one'. For growth to occur, a number of assumptions must be met, and many theories of economic development have elaborated on them. In principle, the list is quite long, but the key assumptions can be enumerated (Stinchcombe 1965). First, social, political and economic institutions must be supportive of creative and innovative efforts. Second, individuals must be able to mobilize resources to fund their efforts. Third, existing organizations must not be allowed to crush new ventures before they establish themselves.

Over time, in any given capitalist system, these assumptions will be

imperfectly met, as the record of the last century demonstrates (Schumpeter 1939; North 2005). Periodic crises erupt, punctuated by intermittent periods of stability, and we have already had a demonstration of this effect in the twenty-first century, with the recession of 2008. The record shows the rise and fall of industries over successive eras, with discontinuous and uneven rather than linear change. In periods of relative calm, exits may be observed primarily at the firm level, but entire industries also emerge and disappear with some regularity (Tushman and Murmann 1998; Aldrich and Ruef 2006). Viewed over a longer duration, we observe fundamental institutional structures of economies undergoing disruptive changes, with large-scale changes in the mix of organizational populations.

UNITS AND LEVELS OF ANALYSIS

Research and theorizing on entrepreneurial exits focuses mainly on two units of analysis: individuals and firms. When individuals are taken as the unit of analysis, researchers treat entrepreneurial events as spells in the working career of individuals, typically focusing on founders but sometimes also including owners of businesses who may not necessarily have founded the business. DeTienne (2010: 204) offered a typical definition at the individual level of analysis, defining 'entrepreneurial exit as the process by which the founders of privately held firms leave the firm they help to create; thereby removing themselves, in varying degree, from the primary ownership and decision-making structure of the firm'. In contrast, when firms are taken as the unit of analysis, investigators focus on organizations rather than on individuals and examine the fate of the organizations, rather than that of founders and owners (Wennberg et al. 2010). This perspective emphasizes that firms have an independent existence from their founders and current owners.

When firms are treated as the unit of analysis, exits can be conceptualized as occurring at multiple levels, nested within a hierarchy of increasing scope: exits of founders and founding teams, new ventures, new populations, and then finally the aggregation of populations at the level of the total economy (Aldrich and Ruef 2006). Thus analyses might examine individual firms, multiple firms within populations, multiple populations within an ecosystem or community of populations, and finally communities of populations at the societal level. Conceptualizing firm exits in terms of multiple levels of analysis directs our attention to entry and exit processes, wherein we think of phases in the life course of whatever unit of analysis we are examining: emergence, growth and decline, or survival and exit.

Why 'Exit' Cannot Be Equated with 'Failure'

Entrepreneurship scholars at the conference that led to this book were careful to distinguish between 'exits', at whatever level, and 'failures'. When individuals are taken as the unit of analysis, investigators have noted the diverse pathways open to founders, with many of them culminating in founders exiting firms. Early on, researchers cautioned us not to interpret exits as failures, beginning with Ronstadt's (1986) observation that almost half of the entrepreneurs in his sample of convenience sold their business to someone else, with most of the rest simply liquidating the business, and only a handful experiencing bankruptcy. His observation is critical because it reminds us that businesses often live on, despite the exits of their founders. Subsequently, more systematic studies have given us a clearer picture of the many possible reasons for exits and their consequences: leaving for a better job and more money, retiring, withdrawing for health reasons, assuming greater family responsibilities, and experiencing personal, as opposed to business, bankruptcy (Taylor 1999; Bates 2005; DeTienne and Cardon 2012).

Founders represent an incredibly heterogeneous group, with some very well prepared with appropriate skills and resources, whereas others find themselves over their heads (Lazear 2005; Bublitz and Noseleit 2014; Lechmann and Schnabel 2014). Bates (2005: 344) noted that 'young firms often shut down for reasons other than failure', and that 'a successful closure may represent the owner's decision to redeploy the knowledge gained in the entrepreneurial venture in some other context, perhaps in another small business' (2005: 347). Founders may have learned enough in their new businesses to move on to a better job, and to the extent that true entrepreneurial learning has occurred, they can use the lessons learned to perform at a higher level in their next startup. Thus, although founders may abandon their startups, the resources they devoted to those efforts may still bear fruit.

At the level of the firm, to classify exits and their consequences, we ignore individual founders and concentrate on organizations and their fate. Consider the possibilities: acquisition by another firm; merger with another firm; sale to another group of owners (my own studies of small businesses have found that often a quarter or more of the business owners in representative samples were not the founders of the business they own); a transformation in business goals such that it is reborn as another kind of business; and a business bankruptcy involving financial loss to creditors (Harhoff, Stahl and Woywode 1998; Headd 2003; Wennberg et al. 2010). Many of these exit routes can be thought of as carrying potentially positive consequences, such as the elimination of bad ideas. During the life of

a firm that eventually exits as an independent entity, it may have served as an incubator of innovation; its exit may facilitate the diffusion of innovations to other firms via departing employees (Hoetker and Agarwal 2007). New firms introduce diversity into populations and make visible creative experiments in business models, regardless of their outcomes.

Exits therefore should never be equated with failures, as I believe the chapters in this book make clear. My focus in this opening chapter is on exit as an historically embedded process, wherein conditions of entry – at multiple levels – set in motion a process that leads to exits of various types. For each level of analysis, I will consider a few methodological and conceptual issues. To begin my exploration of the multi-level nature of exits, in the next section I take up the question of exits at the societal level, focusing on the emergence of new industries.

SOCIETAL-LEVEL EXITS

Transformations in capitalist economies show long-wave cycles of emergence and destruction, as Nikolai Kondratiev pointed out early in the twentieth century (Barnett 1998). For analytic purposes, we can think of two dimensions to these long waves: first, technological change facilitating the emergence of new industries; and second, the social, economic and political institutional infrastructures that support new industries. These two dimensions are interdependent because collective action by firms and individuals shapes the institutional infrastructure that emerges and, in turn, institutional structures enable and constrain collective action.

Perez (2002) posited a sequence in which technological revolutions lead to financial bubbles, which eventually collapse, followed by a golden age, followed by political unrest. She argued that these waves are driven by causal mechanisms inherent in capitalism. In particular, she argued that three features of the capitalist system cause the cycles. First, technological change occurs in clusters of radical innovations, creating successive and discrete revolutions that transform production systems and structures. Second, the functional separation between financial and production capital creates two interrelated but divergent systems, each pursuing profits in its own distinctive way. Third, substantial inertia exists in the socio-economic framework of a society, such that the techno-economic paradigm is more variable than the production system it undergirds, generating intense competitive pressures on economic producers. We do not have to completely accept the causal argument she offers in order to appreciate the descriptive picture she paints of the cycles over the last few centuries.

Table 1.1 Society-level emergence and exit of industries in five phases

Period/era/epoch	New technology and populations (examples)	New institutional infrastructures (examples)
Late 18th and early 19th century: Industrial Revolution	Mechanized production, for example, cotton	Canals, waterways, turnpikes
Early to mid-19th century: steam and railways	Steam engine, iron and coal mines, railways	Postal and telegraph service, seaports
Late 19th century: steel, heavy engineering, electricity	Steel, chemicals, civil engineering, electrical equipment	Electrical distribution networks, worldwide shipping, railways, telephone
Early 20th century: oil, automobile and mass production	Autos, engines, petrochemicals, home appliances	Networks of roads, ports, airports, worldwide communications
Late 20th century: digital information and telecommunications	Microelectronics, computers, software	Worldwide digital communications, high-speed physical transportation links

Source: Based on information in Perez (2002).

Perez posited five cycles of boom and bust over the past two centuries, occurring every 50 years or so, as shown in Table 1.1. As I describe them, I will point out the exit implications of each. Note that each simultaneously builds on but also transforms industries from the previous era, leading to distinctive groups of winners and losers. Perez does not argue that this is an orderly and linear process, as transformations are often disruptively radical in their speed and impact. The 50-year phases are a useful ordering device rather than a theory of timing and rhythm, and thus nothing should be read into that duration.

In the first phase depicted in Table 1.1, in 1771, Arkwright’s textile mill opened in the Derbyshire region of England, building on some innovations pioneered by Wedgwood in the production of pottery in Staffordshire, a decade or so earlier in an adjacent county. Arkwright added mechanization to Wedgwood’s bureaucratic innovations, spelling the end to many traditionally organized handicraft industries and wiping out many small producers (Langton 1984). Mechanization and factory production spurred the rapid growth of the textile and machinery industries, but their operation on a large scale was made possible only because of government-financed infrastructures (Nuvolari 2004).

Canals, improved waterways and turnpikes made widespread distribution possible. The technological innovations crystallized in the UK were quickly copied in other nations, and the Industrial Revolution spread to North America and Western Europe, further facilitated by technological innovations in the second wave depicted in Table 1.1.

Substantial improvements in steam engines in the early nineteenth century created a new era of steam and railways, with the construction of rail lines spurring growth and iron and coal mining industries. New factories built railway cars and engines, and mass-produced textiles. New means of long-distance communication, such as the universal postal and telegraph service, were added to the infrastructural changes generated by the earlier era. Long-distance transportation of manufactured goods in the industrializing nations facilitated growth of very large firms, further undermining locally produced handicraft goods and sending unemployed craftsmen in search of work in larger firms (Chandler 1977). The political and legal structure of the era tolerated the growth of many monopolies in the mid- to late nineteenth century, often driven by large firms' aggressive and predatory tactics. New seaports opened up the possibilities for global exchange networks, particularly between Europe and North America.

During the late nineteenth century, the third phase depicted in Table 1.1, technological innovations in a wide range of basic industries – iron and steel, chemistry, civil engineering, electrical equipment, paper products – enabled the USA and Germany to overtake the UK as industrial powers. Machines replaced hand tools, electricity replaced waterpower, petrol- and steam-powered engines replaced horses, and the new industrial era transformed many aspects of the global economy. Exits of entire industries were widespread, such as in those based on horse-drawn methods of transportation (Schmookler 1962). The power of the institutional templates developed in the industrialized nations of Western Europe and North America was vividly demonstrated when the Japanese government, forced to open its borders to Western commerce, copied wholesale the police, military, postal and other institutional structures of the West (Westney 1987).

In the early twentieth century, in the fourth phase depicted in Table 1.1, mass production in manufacturing spread to many industries serving consumers, such as automobiles and home appliances. Technological improvements in machine tools, internal combustion engines and electrical engineering transformed what was available to households, leading families to give up autonomous production and turn to products supplied by businesses. Millions of families moved off farms and rural areas and into cities and, coupled with huge waves of immigration from Europe, substantially enlarging the urban workforce (Lieberson 1980). As in

earlier phases, massive changes in institutional infrastructures, especially with regard to transportation and communication technologies, caused major disruptions among established industries.

In the fifth phase depicted in Table 1.1, in the late twentieth century and continuing into the twenty-first, the digital information and telecommunications era emerged. Cheap microelectronics wiped out firms and industries that did not make the transition from electrical to electronic components, and infrastructural improvements that made global transportation faster and cheaper destroyed many industries, such as the domestic television and home appliance industries in North America. Changes in the world digital telecommunications infrastructure, via cable, fiber optics, radio and satellite, transformed competitive conditions for many industries. For example, such developments nearly eliminated organizations that formerly acted as intermediaries in industries such as travel and insurance. Local travel and insurance agencies were replaced by Internet-based sales and distribution aimed directly at consumers (Hunt and Aldrich 1998).

Whether we are now in a sixth phase in the early twenty-first century remains to be seen. Some would argue that we have entered the age of genomics and bio-informatics, digital fabrication, distributed manufacturing and other disruptive innovations that will again change the mix of industries across nations (Kurzweil 2005; Davis 2013). For the purposes of this chapter, I simply wish to point out that the exits produced by these technological and institutional changes transcend the ability of any particular founder, firm or trade association to take adaptive action.

Research Issues at the Societal Level

Viewing exits at the societal level, where our focus is on the emergence and exits of entire populations across an economy, raises several conceptual and methodological issues. First, with respect to temporality, analysts need to recognize differences across eras and epochs by acknowledging the possibilities of historical specificity versus historical generality in presenting their empirical findings (Sewell 2005). I suggest bracketing all analyses of exits with a qualifying statement such as, 'In this particular era, technological sophistication was not a prerequisite for organizational survival, whereas in a subsequent era, it was'. By explicitly noting the temporal era to which a generalization applied, analysts could go a long way toward eliminating the prevailing historical amnesia in entrepreneurship, which treats all eras as more or less the same (Hodgson 2001). Remembering that time is an arrow, not a loop, would draw our attention to transitions between eras, as well as the way in which

some institutional and technological innovations are transformative, rather than incremental, in their effects (Anderson and Tushman 1990). Moreover, by explicitly acknowledging differences between eras, we bring exit and destruction to the forefront, making clear that they are inherent in a capitalist system in which a drive to perpetual novelty puts all existing organizations and industries at risk (Davis, Haltiwanger and Schuh 2007).

Second, bringing historical analysis into our investigations raises a major methodological issue concerning how we frame the analysis and acquire the analytic tools required to conduct research at this level (Bucheli and Wadhvani 2014; Lippmann and Aldrich 2014). At the most general level, narrative/interpretive historians, at least implicitly, have theories of temporality and events at their disposal to explain the past, while many management and organization studies scholars focus on more abstract notions of process and structure that they believe transcend time and space (Aldrich 2009). In an attempt to distance themselves from the humanities and to emulate the physical sciences, many organization theorists ignore time, place and the importance of events in favor of the ‘all eras are alike’ approach. By contrast, many historically minded scholars prefer the ‘everything is different’ approach. I suspect that periodizing our analyses by placing our work within a specific historical era, spelling out beginning and ending dates, will go a long way toward narrowing the gap between the various theory groups.

INDUSTRY AND POPULATION LEVEL

Just as societal eras constitute the context for the analysis of population- and industry-level exits, industry- and population-level dynamics constitute the context for firm-level exits. Thus we need to understand the actual history or life course of organizational populations and industries (Aldrich and Ruef 2006). In this chapter, I use the terms organizational ‘population’ and ‘industry’ interchangeably. Industrial economists typically associate ‘industry’ with patterns of consumption, whereas organizational ecologists associate ‘population’ with sets of potential competitors in a production system. In practice, ecologists often use the same data source as economists and just change the label. Nevertheless, the term ‘population’ seems preferable for a number of reasons. Many voluntary and public sector organizations do not fit easily under the label of an ‘industry’ and neither do pre-industrial organizational forms. By contrast, we readily identify colleges, grocery stores and craft guilds as comprising ‘populations’ of organizations. Thus I use the term ‘population’ most of

the time, but also use the term 'industry' in some cases, for example in referring to the 'auto industry'.

Organizational communities consist of diverse populations that occupy different niches and use a mix of general and population-specific routines and competencies. In the short run, we observe a fairly stable set of populations, depending on the rate at which new organizations replace disbanding ones. However, this placid image is deceiving. Populations appear and disappear with some regularity. Given a long-enough period of observation, almost all populations show an inverted-U-shaped growth pattern, with numbers of organizations rising and falling as a population ages. Thus, just as we observe epochs in which sets of populations that depend on the same technologies and institutional structures rise and fall, we also observe variability in entries and exits across specific populations.

Identifying Organizational Populations

Because population emergence is a process, observers often have difficulty in identifying discrete points of origin. For instance, the concept of a health maintenance organization (HMO) in the USA can be traced back as far as the Marine Hospital Service, which began providing prepaid medical care in 1798 (Freeborn and Pope 1994). Nevertheless, the term 'health maintenance organization' was coined only in 1970 and definitive regulatory endorsement did not occur until 1973, with the passage of the HMO Act (Scott et al. 2000). Precise efforts to time the origin of populations depend largely on how scholars conceptualize organizational forms. Some perspectives emphasize processes occurring within organizational boundaries, whereas others stress processes that occur beyond the organizational level.

External perspectives on form emergence consider processes beyond individual organizations, such as regulatory initiatives, technological breakthroughs or patents, social movements, and the development of labels for organizational forms in public media sources (Ruef 2000). The particular marker utilized may depend on the technical and institutional pressures facing an emerging population (Meyer and Scott 1992). For organizational communities subject to strong institutional and technical pressures, such as health care, utilities and banks, regulatory markers often prove important in marking the emergence and disappearance of new populations. When only technical pressures predominate – as in many areas of large-scale manufacturing – innovations or patents may serve as the most useful timing markers (Van de Ven et al. 1999). Conversely, populations subject to strong institutional and weak technical pressures, such as schools and churches, can be tracked through the rise of social

movements that advocate one form or another. For forms that are subject to neither strong technical nor institutional pressures, the initial identification and naming of new organizational forms in public media sources may be the most suitable marker of population emergence.

Survival of New Populations

Available resources determine an environment's carrying capacity and set a limit on 'population density': the number of organizations competing for the same resources in a limited space. An environment's carrying capacity – the number of organizations it can support – for a newly forming population cannot be known in advance. Instead, carrying capacity is revealed only as organizations of the new form carve out their niche in the face of competition from established forms, institutional constraints and other forces affecting the terms on which resources are available. In practice, this means that we know the level of carrying capacity only after it has been reached and a new population's numbers have stabilized or shrunk.

One common perspective on new populations visualizes them by thinking about their resource 'niche', defined as a distinct combination of resources and other constraints that are sufficient to support a population. A new population must carve out a space for itself, within the community of populations, either by creating a new niche or by invading an already-occupied niche. The balance a new population achieves between competition and cooperation *vis-à-vis* other groups of organizations ultimately determines its boundaries. Members learn and respond to constraints and opportunities as they strive to construct a population's boundaries. Their struggle involves a collective effort, although not necessarily a collaborative one. Indeed, in the early days, founders might battle each other to set a direction for the new population. Accordingly, not all collective actions benefiting a population are driven by explicitly strategic activities. Nonetheless, when achieved, legitimacy and population-level knowledge become resources supporting all organizations in the population, regardless of their individual characteristics (Rao 1994).

Thus substantial variability exists across organizational populations regarding how much time elapses from the first startups to subsequent population stability and eventual decline, as Klepper and Graddy (1990) demonstrated. Their study of industry growth found that some industries went from origin to stability – defined as the year when the number of firms reached a peak and remained more or less the same for a few years – in only two years, whereas others took over 50. The average was 29 years and the standard deviation was 15, illustrating an enormous variation in the time required for industries to establish themselves. Table 1.2 presents

Table 1.2 Population growth and decline in 23 US industries in three stages

Product name	Period observed	Stage I: Growth (years)	Stage II: Shakeout (years)	Stage III: Stability (years)
Baseboard radiant heating	1846–1981	25	10	N/A
Computers	1935–1981	46	N/A	N/A
DDT	1943–1981	9	22	7
Electric blankets	1911–1981	51	13	6
Engines, jet-propelled	1943–1981	21	8	9
Fluorescent lamps	1938–1981	2	1	40
Gauges, beta ray	1955–1981	18	8	N/A
Lasers	1960–1981	21	N/A	N/A
Missiles, guided	1950–1981	12	19	N/A
Nylon	1939–1973	34	N/A	N/A
Penicillin	1943–1981	7	23	8
Photocopying machines	1940–1981	25	11	5
Pumps, heat	1953–1981	28	N/A	N/A
Radio transmitters	1922–1981	40	13	6
Readers, microfilm	1929–1981	49	3	N/A
Saccharin	1906–1972	12	9	45
Streptomycin	1943–1981	8	19	9
Tanks, cryogenic	1959–1981	8	1	13
Telemeters	1928–1979	34	17	N/A
Tents, oxygen	1926–1981	32	23	N/A
Transistors	1948–1981	33	N/A	N/A
Tubes, cathode ray	1922–1981	37	7	15
Windshield wipers	1914–1981	11	9	47
Average (across products attaining the next stage)		24.1	12	17.5

Key: N/A = Industry has not reached that stage yet (by end of observation period, 1981).

Source: Based on information reported in Klepper and Graddy (1990).

descriptive statistics for 23 selected industries from their analysis and illustrates just how large the range is between slowly versus rapidly growing populations.

Klepper and Graddy (1990) divided each product history into a maximum of three stages: stage I comprises the years in which the number of firms grows; stage II is characterized by a decline or shakeout in the number of firms; stage III comprises the period after the shakeout when the number of firms stabilizes. Note that, because the observation period

ended in 1981, many of the series are right-truncated and thus some industries had not yet reached a subsequent stage by the time the observation period ended. The authors reported that, during the shakeout period, the number of producers decreased by slightly more than half, on average, from the peak number reached in stage II. As shown in Table 1.2, some industries apparently faced almost no competition or threats and thus grew to the shakeout stage quite rapidly. What conditions in new populations generate such variation?

As a population grows, the pattern of low founding rates and high exit rates in its early years is followed by a gradual increase in founding rates and a decrease in disbanding rates. Entrepreneurship researchers tend to emphasize lack of access to resources and robust competition as key explanations for exits, often overlooking two important social factors: (1) lack of effective organizational knowledge; and (2) lack of external legitimacy for the new activity. In the early days of a new population, nascent entrepreneurs will have a few guidelines as to what works and what does not, and thus they will make many mistakes. Many will exit the population. To the extent that effective templates are discovered and a dominant design agreed on, exit rates will begin to decrease. However, conflict between entrepreneurs with different designs and practices may keep exits high and even lead to the demise of budding populations. Similarly, lack of cognitive and socio-political legitimacy hampers some but not all emerging populations. To the extent that potential users and regulatory authorities are confused by a new population's characteristics, exit rates will be high, possibly cutting short the life of the population. However, effective collective action by pioneers in an emerging population may overcome these legitimacy issues and thus bring down the exit rate.

Population decline produced by an excess of exits over entries is often quite dramatic, depending on the industry and the duration observed. In Table 1.2, I show four populations that declined between 81 and 98 percent in the USA, after having attained their peak size in the first third of the twentieth century. Operating railways declined 95 percent (Dobbin 1995), New York state-chartered credit unions declined 81 percent (Barron 1995), auto producers declined 97 percent (Carroll and Hannan 1995), and breweries declined by 94 percent (Swaminathan and Carroll 1995). In several cases, population size subsequently rebounded slightly, but never came close to reaching its former peak size. Historical accounts have described other populations that have simply vanished or dwindled into insignificance, such as the group of industries associated with horse-drawn vehicles in the mid- to late nineteenth and early twentieth centuries: horseshoes, horseshoe caulk, buggy whips, buggies, harnesses and various other types of hardware (Schmookler 1962). Some firms in this group

Table 1.3 Examples of major declines in US organizational populations

Population	Peak population size	Declined to size	Percent drop from peak
US operating railways	~1320 in 1910	~20 in 1980	98
State-chartered credit unions in New York	~108 in 1930	~20 in 1990	81
US auto producers	~340 in 1916	~10 in 1945	97
US beer brewers	~710 in 1935	~43 in 1980	94

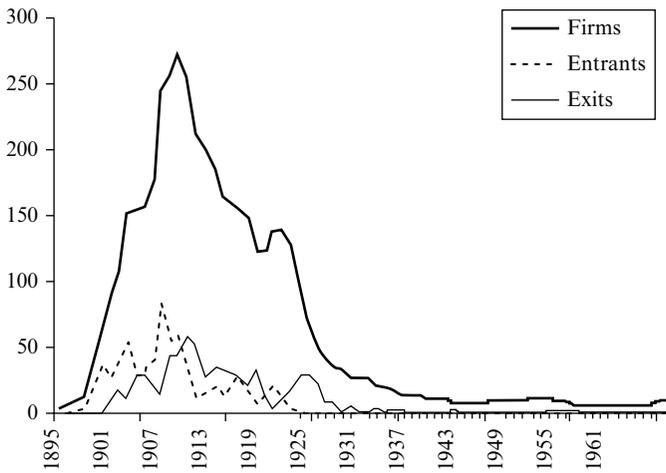
Source: Various; see text.

successfully made the transition to supplying products for the emerging automobile industry, such as carriage manufacturers who began supplying auto chassis, but most did not survive.

Other Examples of Population Variability

To illustrate population growth and decline over time, I present three examples. Two of these are chosen from research on the American auto and tire industries, and the other is from a cross-national study of the international auto industry. I begin with the American automobile industry, as analyzed by Klepper (2002). He noted that over 500 firms entered the auto industry in its first two decades, with firms that diversified into the industry from other industries doing better than *de novo* entrants, in general. However, the most successful were *de novo* firms started by founders who had previously worked for the most successful firms in the auto industry. Klepper argued that the automobile industry faced unique organizational challenges and that working in successful firms was excellent preparation for entrepreneurs who subsequently founded their own firms in the industry, thus lowering their exit rates.

Figure 1.1 shows the annual number of entries, exits and number of firms for the US automobile industry from 1895 until 1966. At its high point, in 1907, 82 firms entered the industry. This number remained high for the next three years and then began to fall. After 1922, only another 15 firms had entered through the end of the observation period. At the industry's peak, in 1909, there were 272 firms. After the first few years, the exit rate exceeded 10 percent and, after 1909, the exit rate was greater than the entry rate, leading to a decrease in the number of firms. As exits continued and entries decreased, the number of firms fell sharply at first, and then gradually through the decade of the 1930s until, by 1941, only nine were left, with the top three producers accounting for over 80 percent of the automobiles



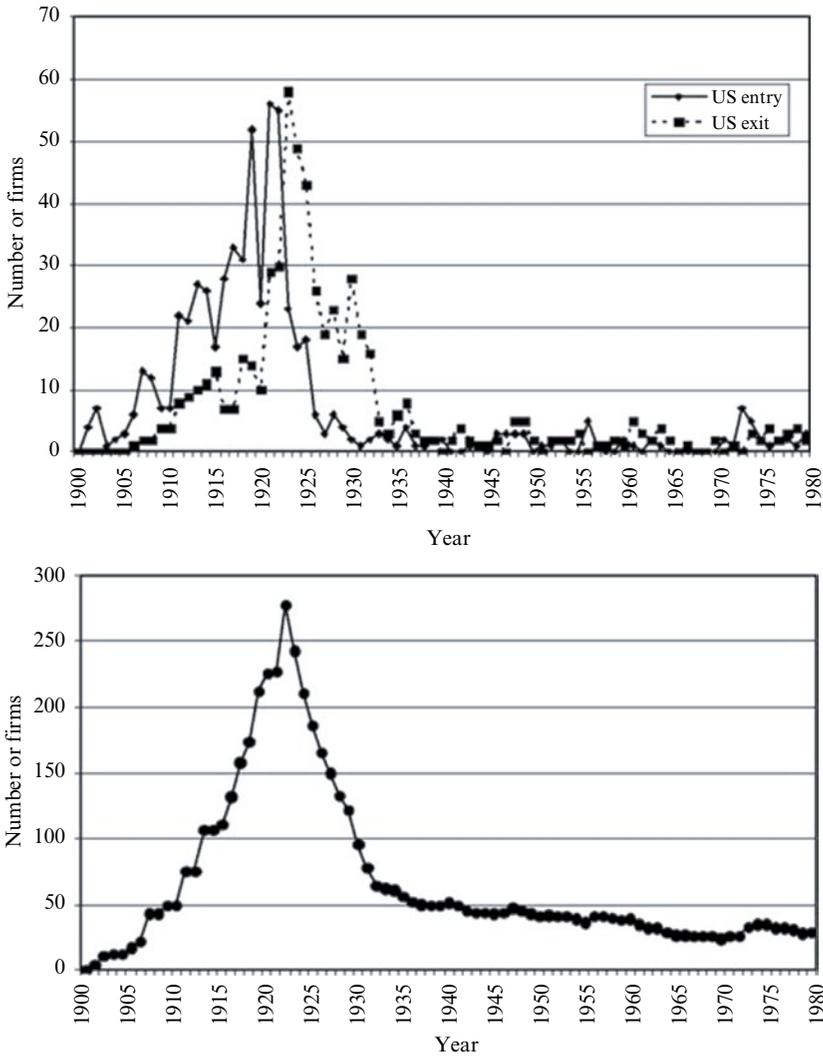
Source: Klepper (2002: 652).

Figure 1.1 Annual number of entries, exits and number of firms for the US automobile industry, 1895–1966

produced. In the 1980s, as East Asian and European auto manufacturers began siting their plants in the USA to avoid import restrictions, the number of North American auto manufacturers rose again.

In a subsequent paper on the US tire industry between 1900 and 1980, an industry tightly connected to the population of automobile producers, Buenstorf and Klepper (2009) analyzed entry and exit rates. Although their primary purpose was to challenge classical agglomeration economies' explanations for the concentration of the tire industry around Akron, Ohio, their data strongly support the model of population growth and decline that I discussed with regard to the automobile industry. Figure 1.2 shows the number of entries and exits in the top panel and the pattern of aggregate population growth produced by those entries and exits in the bottom panel. Just as with the automobile industry, entries outstripped exits over the first 20 years or so of the population, reaching a peak of 278 in 1922, after which continued exits sharply reduced population size. However, it never became as concentrated as the US automobile industry, as in 1940 there were still 51 firms and, in 1970, 24 firms.

Population growth in the industry was strongly driven by the success of tire producers located in and around Akron, the largest city in Summit County, Ohio. Whereas the conventional agglomeration economies argument stresses advantages produced by co-location with producers and



Source: Buenstorf and Klepper (2009: 708).

Figure 1.2 Evolution of the US tire industry, 1900–1980: entries, exits and number of firms

suppliers, a growing and talented labor pool, and first-mover advantages, the ‘heritage theory’ advanced by Buenstorf and Klepper (2009) emphasized the entrepreneurial advantages gained by founders who worked in successful companies and then took that knowledge with them when founding their new firms. They enjoyed a much lower likelihood of exit than founders without such an advantageous legacy. Thus the beautifully symmetric population growth and decline distribution, shown in the lower panel of Figure 1.2, conceals quite a bit of heterogeneity at the level of individual firms’ entries and exits.

Patterns of population growth and decline in the auto industry were rather different in other nations. Hannan and his colleagues (1995) collected data on entries and exits in the automobile industry from 1886 to 1981 in five European countries to test Hannan’s (1986) theory of the effects of population density on competition and legitimacy. For my purposes, this project is important because it points to the possibility of institutional-level effects on population exits that cut across national boundaries. Their results show that changes in the size of the automobile industry within a country had strong competitive effects on within-nation entry rates, whereas the growth of the trans-European auto industry had strong positive effects. Note that these results are historically specific: the rise of the European Union and the creation of its common institutional infrastructure have undoubtedly substantially reduced, if not eliminated, the effects found for earlier eras.

I mention the growth of the auto industries in five European nations from 1885 to 1985 to make two points. First, compared to the US automobile industry’s growth, shown in Figure 1.1, there was not one early peak followed by a shakeout in long-term decline in numbers, but rather several decades of population stability. Second, although growth patterns were somewhat parallel, it appears that the French and British national contexts were much more favorable toward rapid and sustained growth in the auto industry than in the other three countries. Unlike the USA, the automobile producer populations in three of the European nations actually grew in the decades after World War II, again because of national economic development policies.

Research Issues at the Population and Industry Level

Viewing exits at the population level, where our focus is on the patterns of growth within specific populations across an economy, raises several conceptual and methodological issues. First, rates of entry and exit differ substantially across populations, affecting the rate at which populations grow and decline over time. Findings depicted in Table 1.2 and Figures 1.1, 1.2

and 1.3 show extreme variations in the duration of key phases of population growth and decline. Researchers must be careful not to generalize about exits without specifying the historical and population contexts for their findings, because the significance of exits and their interpretation can vary greatly, depending upon when they occur. Exits at the beginning of a population's emergence can have quite different implications than those occurring as it approaches extinction. For example, the descriptive results presented in this section imply that new ventures entering the automobile industry in the first decade of the twentieth century, in every capitalist nation, faced radically different exit prospects than those attempting to enter in the 1920s. Thus two pieces of information are particularly important: precisely which population is being studied and which historical era is being covered.

Second, the methodological demands implied by these considerations are daunting. Samples of convenience collected in the contemporary era might constitute a starting point for pilot projects, but we need to go substantially beyond that standard. Obtaining rich historical information on entries and exits is easiest when researchers focus on single populations, but understanding the extent to which their findings are generalizable requires information from multiple populations. Many entrepreneurship researchers still rely on projects capturing a cross-sectional or time-limited slice of a population's history, whereas I have argued that projects may well require decades of data points to place patterns of entrepreneurial exit in their proper context. The examples of population growth and decline I have discussed took decades for their full expression, and examining exits in only a narrow slice of population history could lead to seriously misleading results. Expanding the time horizon of data collection and incorporating multiple populations require team-based rather than solo research projects, drawing on the expertise of historians, geographers and other social scientists with an appreciation for the historical embeddedness of entrepreneurial exits.

ORGANIZATION LEVEL

Organizations are founded within a particular era and in a competitive context with similar organizations, if a population already exists, as I have described in previous sections. At the organization level, two dimensions to the exit question are of particular interest. First, how strong is the liability of newness? Second, how sensitive are rates of organizational exits to period effects? I take up each question below, with examples, beginning with the liability of newness.

Planting the Seeds for Exits during Founding

Accumulated evidence shows that the likelihood of entrepreneurial exit is highest in the weeks and months following startup. Thus we must focus on founding processes if we are to understand exits. Evidence also suggests that, although the exit rate drops substantially after the first few years, organizations are still at risk of exiting over their entire life course.

Organizational emergence as a process

Since the 1960s, organization theorists have explored the dynamic relationship between organizations and environments, especially those taking an evolutionary approach (Campbell 1969). Theorists emphasized the contingent nature of organizational characteristics, positing that their features depended on environmental conditions. Explanations focused on organizations adapting to their context, implicitly assuming that most organizations would somehow muddle through, although perhaps at the cost of reduced performance. However, by the 1970s, research had shown that adaptation was problematic for many organizations (Aldrich 1979). Theorists began offering models in which organizations struggled and failed to overcome selection forces.

For a time, organizational ecologists dominated the thinking on this issue, as they posited that selection pressures were so severe that few, if any, organizations were capable of adapting to them (Hannan and Carroll 1995). However, other scholars objected to this gloomy prediction and offered models in which many organizations were able to adapt to their environments. For example, organizational learning theory posits that some entrepreneurs are capable of learning from previous experience and the feedback gained from their initial organizing efforts (Argote and Miron-Spektor 2011; Toft-Kehler, Wennberg and Kim Forthcoming). Several contemporary theoretical approaches take a similarly optimistic view, such as effectuation theory (Sarasvathy 2001), opportunity recognition theory (Alvarez, Barney and Anderson 2013), and strategic capability theory (Bingham and Eisenhardt 2011).

Basic demographic facts about foundings

For decades, entrepreneurship researchers focused on individual founders and their characteristics, conveying the strong impression that entrepreneurship was a solo endeavor. Although Gartner (1988) and others strongly argued against this misapprehension, not until the 1990s did methodological advances permit investigators to unequivocally document that teams played a very important role (Reynolds and Miller 1992). About one-third of all new ventures are team-based, especially

in knowledge-based industries such as biotechnology and computer software, and team-based startups tend to be larger and have lower exit rates (Ruef 2010). Most startups begin with no outside funding and no employees, and most are initially based in households rather than standalone premises. Most founders attempt to start businesses in industries where they have had no previous managerial or ownership experience, and quite often they have not even worked in the industry. In these conditions, it is not surprising that so many of them make a rapid exit.

Compounding the problem of poor preparation, a myriad of institutional forces in modern capitalist societies create, sustain and diffuse extremely positive conceptions of ‘entrepreneur’ and ‘entrepreneurship’ (Aldrich and Yang 2012). Many opportunities exist for people to encounter such views and to have them reinforced by repeated exposures on television, movies, websites and other social media. When these institutional forces enhance the cultural appeal of entrepreneurship, becoming an aspiring entrepreneur may require little more than a modest commitment to using the entrepreneurial resources provided by favorable institutional environments. Committed to ‘being’ an entrepreneur rather than taking the hard road of preparation through arduous work experience, many nascent entrepreneurs put themselves in ready-made exit positions. Thus such institutional forces may raise the rate of both firm foundings and exits.

The liability of newness

Previous findings on new ventures’ survival probabilities have been highly divergent. In part, this stems from the failure of many studies to adequately assess the reasons for non-survival, and they often implicitly equate non-survival with exit. As I indicated in the introduction, we need to distinguish between the exit of a firm’s founders and the exit of a business from a population. Exit via selling to or being acquired by another firm carries a different substantive meaning than exit via business bankruptcy. Often the data in survival studies do not permit such fine-grained distinctions.

‘Survival probability’ is defined as the probability that a subject (a new venture) survives longer than time t . Several studies have reported a survival probability of 0.2 in the fifth year; that is, they estimated that 80 percent of the new ventures they sampled died within five years (Dickinson 1981; Nystrom and Starbuck 1981). Relatively higher fifth-year survival probabilities, between 0.4 and 0.55, were found in several other studies, such as Audretsch (1991) and Levie et al. (2011). Some studies found even higher survival probabilities after a firm has been in operation for five

years (Romanelli 1989; Brüderl, Preisendörfer and Ziegler 1992; Wiklund, Baker and Shepherd 2010).

Results regarding the hazard rate of exit are even more diverse than for survival probabilities. The hazard rate of exit is the ‘instantaneous’ age-specific exit rate. It indicates the approximate probability that a new venture exits in the next time unit, conditional on its probability of surviving to time t . Using a life-table estimator, Brüderl et al. (1992) found the hazard rate for new ventures in Germany was about 0.0075 per month initially, then increased to 0.0175 in the tenth month, and decreased monotonically afterwards. Some scholars have reported age-specific death rates from parametric models. Singh et al. (1986) predicted the death rate of voluntary social service organizations using a Gompertz model. The hazard rate they found was 0.052 in the initial year, 0.037 in the fifth year and 0.027 in the tenth year. Freeman et al. (1983) found an asymptotic death rate of about 0.012 for National Labor Union organizations, 0.065 for semiconductor manufacturing firms, and 0.024 for newspaper publishing organizations. In a comparative study, Carroll (1983) found monotonically decreasing patterns of death rates for three populations. However, there was huge variation in the size of age-specific death rates across the different data sets.

Previous studies have thus reported a wide range of estimates for both survival probabilities and hazard rates of exit. The fifth-year survival probabilities reported in previous studies vary from 0.2 to 0.7, and hazard rate estimates differ by orders of magnitude across studies, with some two or three times larger than others. Some of these diverse results might be due to substantive heterogeneity among new ventures in different periods, industries, geographies, countries and other social contexts (Aldrich 2009; Wiklund, Baker and Shepherd 2010), in keeping with arguments made in previous sections. Some theorists have posited a liability of adolescence (Fichman and Levinthal 1991), rather than a liability of newness, but studies of this conjecture have been plagued by methodological difficulties (Yang and Aldrich 2012). Undoubtedly, in some conditions, the organizational exit rate is fairly low initially and does not increase until initial capital, enthusiasm, or both, have been exhausted. However, as a general pattern across industries, the liability of newness is quite robust. I turn now to a specific example of research on the liability of newness.

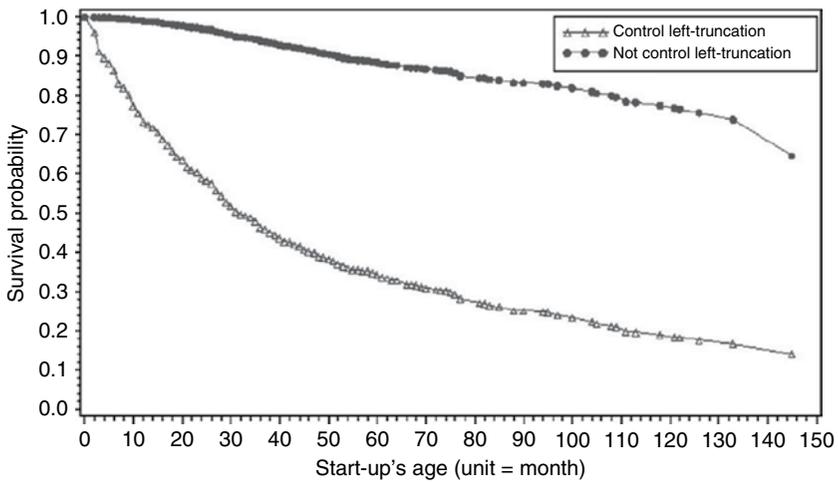
The liability of newness in the PSED

The Panel Study of Entrepreneurial Dynamics (PSED) identified emerging organizations by locating nascent entrepreneurs involved in creating new ventures. Using an elaborate screening interview, it identified nascent entrepreneurs based on their entrepreneurial activities and was intended

to follow them from a very early time until the point when new ventures were either terminated or disbanded. As such, the data set provides an excellent opportunity to illustrate the consequences of the liability of newness for entrepreneurial exit. Respondents were qualified as nascent entrepreneurs if they met four criteria: general criterion of entrepreneurial status; behavioral criterion; ownership criterion; and profit criterion (Reynolds and Curtin 2009). They had to have taken actions in the past 12 months to start the business and they also had to have an equity stake in the business.

An issue that arises in studying entrepreneurial exits over time is that it is impossible to begin following every new venture on the day that it initially emerges. Instead, investigators try to construct a representative random sample at a particular moment and then follow them subsequently over time, to determine their fate. That initial sample thus includes some startups that may have begun in the immediately preceding weeks and others that might have been under way for a year or more. This method of selection means that all of the startups had already been exposed to the risk of exit for a certain period (depending on when there were initiated) before they came under observation. If the analytic method for analyzing exits does not take such left truncation into account, seriously biased estimates can result, as Yang and Aldrich (2012) explained in presenting methods for dealing with the problem and generating unbiased estimates for survival rates. I will not discuss them in this chapter but instead refer readers to Yang and Aldrich (2012).

Figure 1.3 reports the Kaplan–Meier estimate of survival function. It shows the proportion of startups that survived to a given point and is a good technique for taking into account the problem of right-censoring. (Right-censoring can occur when investigators can no longer discern the fate of a particular case, perhaps because the respondent has moved.) It contrasts the survival function estimated without controlling for left truncation versus the survival function estimated while controlling for left truncation, and shows that the difference is considerable. Two points stand out. First, the bottom line controls for left truncation and is much steeper in its decrease over time than the top line, which does not control for left truncation. Second, exit rates are much higher in the first few years than they are subsequently, especially before an emerging venture's fortieth month. About 30 percent of the startups have been abandoned by the end of the first year, and about 50 percent within the first two and a half years. Many of the papers at our conference examined factors that contributed to the liability of newness, including social capital, retirement intentions, family ownership, gender and dissatisfaction with a business's financial performance.



Source: Yang and Aldrich (2012). Data from the Panel Study of Entrepreneurial Dynamics II (2005–2009).

Figure 1.3 *Liability of newness estimate for PSEDI sample: Kaplan–Meier estimate of survival function*

Organizational Exit Dynamics over Time

Throughout my discussion, I have emphasized the importance of taking historical era into account when examining exits. As technological innovation and institutional changes affect the distribution of resources and the terms on which they are available, I have already shown that groups of industries rise and fall. Within an era, populations also emerge, grow and decline on a regular basis. At the level of individual organizations, variability in exit rates over time is smaller but nonetheless significant. In this section, I will first look at births and deaths of establishments in a recent year in the USA and then look back over a longer period of time.

In 2011 in the USA, the economy began to grow again, after a downturn of several years sparked by the recession of 2008. One indicator of the turnaround can be seen in the rising number of business births and the stable number of deaths, as measured by the Business Employment Dynamics Database maintained by the Department of Labor's Bureau of Labor Statistics (BLS 2013a). The BLS collects data on new businesses by using unemployment insurance tax accounts, which must be filed by a business when it has employees working enough hours to qualify for

Table 1.4 Volatility in the US employer business population (establishments), 2011

Year: 2011	Births	Deaths	Number of employees generated by births	Number of unemployed caused by deaths
First quarter	189 000	184 000	695 000	610 000
Second quarter	192 000	190 000	748 000	677 000
Third quarter	198 000	187 000	790 000	674 000
Fourth quarter	202 000	191 000	802 000	750 000

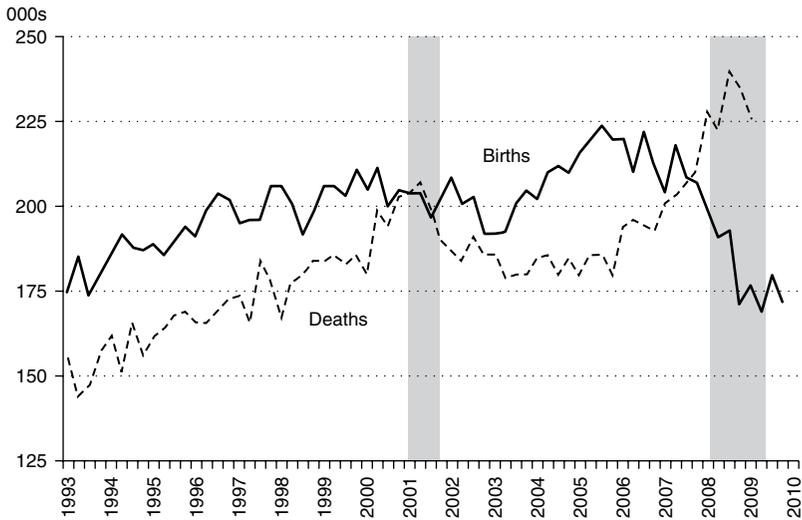
Source: US Bureau of Labor Statistics (2013b).

unemployment insurance. The same database also allows the BLS to measure business deaths.

As shown in Table 1.4, business births in 2011 gradually increased in each quarter, whereas business deaths fluctuated. Consequently, the business population expanded because, in each quarter, there were fewer deaths than births. In terms of societal impact, the last column of Table 1.4 shows that exits of employer firms left hundreds of thousands of workers unemployed, at least temporarily. However, because there were more business births and deaths in each quarter, the jobs added through births more than made up for those lost through deaths. Moreover, a more important factor affecting job growth, in terms of magnitude, is expansions and contractions of existing businesses, each of which involves millions of jobs gained and lost each year. The net effect of those two events in 2011 was overall growth in the number of people employed.

The data in Figure 1.4 put the events shown in Table 1.4 into historical perspective, displaying the quarterly pattern of establishment births and deaths from 1993 through 2010, the latest year for which complete data are available. In the early to mid-1990s, the excess of births over deaths meant that the business population and its associated labor force were growing. The economic and political events of 2000–2001 brought the upward trend in births to a halt, but after a few years the trend turned upward again. The recession of 2008, however, sent the numbers plunging, and it only turned up again in 2011. Conversely, business deaths, which had been climbing more or less in concert with business births – as we would expect – fell through the early part of the first decade of the twentieth century, but then shot up rapidly, as the recession of 2008 dragged on for a few years.

At the organizational level, two points stand out regarding exits. First,



Source: US Bureau of Labor Statistics (2013a).

Figure 1.4 Births and deaths of US employer establishments, 1993–2010

people beginning a new venture face a very high likelihood of exit in their first 15 to 30 months, and after they are organized, the likelihood of exit drops but never vanishes. Analyses at the organizational level, such as those reported at our conference, can explain variations across startups in their likelihood of survival, but this is against a generic backdrop of precarious conditions for *all* new organizations. Somewhat surprisingly, the survival chances of a newly registered employer establishment in the BLS database did not change much over the years between 1994 and 2010 (BLS 2013b). The liability of newness for startups was essentially the same over that era. Second, the aggregate number of exits in a capitalist economy is highly sensitive to trends in the number of business births, as well as fluctuations in socio-economic conditions.

Research Issues at the Organizational Level

Viewing exits at the organizational level, where our focus is on the life course of individual organizations, raises several conceptual and methodological issues. First, some entrepreneurship scholars previously treated entrepreneurial orientation and ability as a fixed characteristic that some people have and others do not. This view leaves little room for entrepreneurial learning. However, I believe this view is outdated, and new theories

of entrepreneurship posit that entrepreneurial learning plays a major role in new venture foundings and growth (Argote and Miron-Spektor 2011). The new view treats learning as potentially occurring when entrepreneurs adapt in response to feedback from their actions, and thus learning can be seen as the process by which entrepreneurs discover effective routines and add them to their startup's stock of other effective routines (Deakins and Freel 1998). To what extent can entrepreneurial exits be explained by inadequate learning? Perhaps the problem is not that entrepreneurs cannot learn, but rather that they cannot learn quickly enough to adapt to rapidly changing environments (Toft-Kehler, Wennberg and Kim Forthcoming). Framed this way, the study of exits must explicitly include a time dimension and account for the process by which entrepreneurs learn and adapt to their environments (Wiklund, Baker and Shepherd 2010).

Second, the study of entrepreneurial exits must pay attention to the possible imprinting effects of contexts (Stinchcombe 1965). Early choices made by founders, in conjunction with strong external selection pressures, can leave a lasting imprint on the structures and practices of new ventures. The early months are the time in a firm's life when its basic business platform develops and becomes the potential bedrock on which subsequent practices are built. Later adaptation will be possible only if a solid foundation has been laid at the beginning. Many researchers have studied the impact of initial founding conditions on organizations' later development, finding imprinting effects with regard to employment systems, managerial turnover, organizational culture and financial performance. Examining exits at the organization level gives investigators clues for understanding changes in population composition, possibly indicating promising paths that were initially available but then subsequently closed.

Startups are imprinted by their environments' technology and institutional infrastructures, and also by when they emerge in the life cycle of populations. For example, organizations that survive a baptism by fire, after being formed under highly competitive conditions, may enjoy a longer life than those created in more affluent times (Swaminathan 1996).

Third, organizational ecologists initially dominated the study of organizational exits because the statistical models they employed required big data sets and sophisticated statistical models. As the pace of technological and institutional change accelerates, made more complex by increasing globalization, our need for big data sets covering long time spans has only increased. In this context, it is easy to lose sight of the need for closely observed and finely detailed ethnographic studies of what entrepreneurs actually do, particularly when confronted with conditions hinting at their impending doom (Stewart 2003; Watson 2011). Fortunately, ethnographic methods have been greatly enhanced by new research technologies,

such as the use of smart phones to record observations in the field and data management programs making full use of richly documented field observations (Mueller, Volery and von Siemens 2012).

CONCLUSIONS

I began this chapter by noting that exits can be conceptualized as occurring at multiple levels, nested within a hierarchy of increasing scope: founders and founding teams, new ventures, new populations, and then finally the aggregation of populations at the level of the total economy (Aldrich and Ruef 2006). If we begin at the top of the hierarchy, we can think of the more inclusive levels of analysis structuring the constraints within which units at the lower levels – populations, organizations and founders – must operate. In the short run, population conditions at the time of founding may simply be taken for granted by founders, as something to which their firms must adapt. Similarly, industry champions attempting to create a trade association may initially focus on creating an agreed definition of their population's boundaries and recruiting enough members to give themselves a powerful voice *vis-à-vis* regulators and legislators. Thus, from a top-down perspective, higher-order conditions can be seen as relatively fixed constraints and exits result, in part, from organizations' incompatibility with conditions in their contexts.

If we start at the bottom of the hierarchy, however, successively higher levels represent emergent properties, reflecting, to some extent, actions taken by individuals and organizations at lower levels. From this agentic or constructionist perspective, nascent entrepreneurs who create organizations that survive selection pressures at their level become part of a community of entrepreneurs building a population. To the extent that their collective and collaborative actions are effective, their population grows. Whether a population will reach a stable state and persist depends not only on their actions but also on the actions of other populations in their environment. The larger institutional structure, as well, affects the viability of populations and, from an emergence perspective, that structure can be altered by the action of constituent populations. A comprehensive framework thus takes account of both emergent opportunities and institutional constraints affecting exits.

Entrepreneurs may create organizations in already established populations, or they may be pioneers in an emerging population. Over the past few decades, researchers have shown increasing interest in ventures creating entirely new populations, especially in the knowledge-based sectors of the economy, such as computer software, microelectronics and biotechnology

(Aldrich and Fiol 1994). At the level of the entire economy, entrepreneurship researchers interested in public policy, especially with respect to economic growth and job creation, have focused on the relative mix of old and new populations. With globalization, some economies have seen the destruction of entire populations of firms, such as textile and furniture producers in the American South, whereas others have seen the burgeoning of new industries, such as contract manufacturing in Southeast Asia.

An historically informed and multilevel view of exits also puts them into a framework for understanding their role in capitalist economies. What some might see as a wasteful diversion of productive resources represented by thousands of failed organizing efforts could be seen by others as crucial to the survival of capitalist economic systems. Variability lies at the heart of evolution and innovation. To the extent that powerful selection forces inhibit the ability of nascent entrepreneurs to construct context-appropriate responses to problems, entrepreneurship will mostly be characterized by inertia, not innovation. Surviving startups will mainly rely on the knowledge and routines derived from their predecessors. By contrast, to the extent that selection processes are less harsh or entrepreneurs better prepared, nascent entrepreneurs might be able to craft innovative solutions that lower their chances of exit. As I emphasized in explaining the societal level of analysis, technological and institutional innovations can disrupt established selection processes, ushering in a new era of possibilities.

From an evolutionary viewpoint, heterogeneity at the organizational level constitutes the raw materials on which evolutionary selection processes operate. We need research methods that capture those processes, early in the life course of new ventures. With regard to founding conditions, the heterogeneity of organizational forms and routines is probably greatest at the moment when new ventures are initiated. Founders undertaking radically innovative activities usually put themselves at substantial risk, and the consequences of such risk-taking activities for entrepreneurial exits will be overlooked if investigators do not begin studying them in the weeks and months immediately following startup. Patterns of organizational exits in the early months can give clues to the strength of selection forces in the environment, before isomorphic pressures have eliminated the most innovative startups. From an evolutionary perspective, chances for the expression of commercially valuable creativity depend on what founders do to keep their emerging organizations alive until they can build a stable platform and find a place in the market.

Researchers studying exits must be cognizant of actions at multiple levels of analysis. I have argued that a comprehensive approach to understanding exits requires teams of researchers with multiple disciplinary

backgrounds. At the societal level of analysis, political scientists and historians have much to offer with regard to understanding the technological and institutional constraints of different eras. In sociology, neo-institutional theory emphasizes the cultural and symbolic aspects of institutional structures that shape the life chances of organizations and populations. Anthropology and communication studies scholars help us understand the ways in which entrepreneurs and others interpret and act on what they find in their environments. Organization studies, inherently a multidisciplinary field, sheds light on the managerial and human resource issues that make survival problematic for entrepreneurs, as does psychology. At all levels, economics points us to the efficiency implications of intra- and inter-organizational arrangements, such as governance structures, affecting the likelihood of exit. As the chapters in this volume demonstrate, studying exits presents exciting opportunities for scholars from many disciplines, as long as they are prepared to adopt a process-oriented perspective that takes account of the multiple levels at which relevant events occur.

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