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The Origin and Evolution of New Businesses Part 3 and Conclusion

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PART 3: SOCIETAL IMPLICATIONS

The next two chapters explore some broad societal implications of this study. Chapter 13 discusses the contribution of new businesses to innovation and long term economic growth. Chapter 14 examines the conditions that foster the formation and growth of new businesses.

The current interest in the societal contribution of new and transitional businesses has its roots in Schumpeter's challenge to conventional economic theory. Schumpeter argued that new technologies and "combinations" that disrupted the prevailing equilibrium, rather than say, the steady accumulation of capital stock, led to the long term growth and development of capitalist economies. Economist Robert Solow's 1956 and 1957 papers seemed to bear out Schumpeter's claim. They reported, according to the economist Stiglitz, the "shocking" empirical finding that "most of the growth of the economy over the past century had been due to technological progress."[1] According to Solow, an increase in the use of capital accounted for only 12.5 percent of the doubling of gross output per man hour from 1909 to 1949; the remaining 87.5% was due to "technical change."[2]

Solow's results "have held up held up remarkably well to more than three decades of extensive and thorough investigation."[3] To some scholars, the so-called Solow "productivity residual" points to the critical role played by entrepreneurs. According to Baumol, any technical change or innovation "will require entrepreneurial initiative in its introduction." By "ignoring the entrepreneur we are prevented from accounting fully for a very substantial portion of our historic growth."[4] Although for reasons discussed in the introduction, most formal models of growth do not contain an explicit entrepreneurial variable, many scholars of technological change such as Stanford economist Nathan Rosenberg, popular writers, such as George Gilder, and policy makers share Baumol's viewpoint.

I hesitate to add to the discourse. I have little expertise in the field of technological innovation and just a faint acquaintance with growth theory and models. I did not undertake my research with the intention of drawing inferences about the "macro" effects of what entrepreneurs do or how public policies influence their efforts. I fear the fallacy of composition. "What is good for the *Inc.* 500 is good for good for economic growth" is as overdrawn a proposition as the claim made in 1953 by Charles Wilson, the General Motors chairman, that what was good for General Motors was good for America. I therefore offer the ideas that follow in the chapters that follow as provisional speculations.

The reason for saying anything at all is twofold. First, my data did suggest propositions that conflict with widespread beliefs, for instance, about the novelty of activities involved in the typical startup and the role that the availability of risk capital plays in the supply of entrepreneurs. Also, I want to demonstrate the contribution a broad, case-based approach can make A judicious aggregation of many worm's eye views, I hope to show, can provide a valuable complementary perspective to traditional econometric and quantitative studies of innovation.

CHAPTER 13: REEXAMINING SCHUMPETER

This chapter examines three claims made by Schumpeter about the relationship between innovation ("new combinations") and economic growth. Section 1 discusses Schumpeter's claim about the role of large companies in undertaking new combinations; Section 2, his emphasis on radical or discontinuous innovation; and, Section 3 the degree to which new combinations lead to the rapid displacement ("creative destruction") of existing structures.

The breadth and influence of Schumpeter's ideas makes them a convenient frame for discussing the contribution of new businesses to innovation and, by extension, to long term growth. Schumpeter's writing spans a considerable range in content and form. The thousands of pages he wrote over more than four decades contained sharp, unequivocal claims as well as tangles of contradictions: Elster describes Schumpeter as an 'elusive' writer who could contradict himself in the course of a single paragraph.[5] The sharp claims have proved long-lived; according to Rosenberg, "his influence has been so great" that "his model has become the accepted one for all innovative activity."[6] This chapter reexamines some elements of what Rosenberg calls the "Schumpeterian system" It takes for granted Schumpeter's central thesis – that innovation drives long term growth – but raises questions about his characterization of the process.

The discussion will make frequent references to the microcomputer revolution that has taken place in the last two decades. This reflects a long-standing personal interest in the field, its prominence and economic significance and the large number of companies that I encountered in my research. As mentioned I avoided focusing on businesses in particular sectors of the economy (such as "high technology") because I wanted to identify patterns common to the broad category of promising businesses. But, as discussed in Chapter 2, the turbulence generated by the microcomputer revolution has lead to a clustering of startups in the field. Although microcomputer related products and services account for less than 5% of the G.D.P of the United States*, they have consistently been responsible for over a quarter of *Inc.* 500 companies.

1. THE ROLE OF ESTABLISHED COMPANIES

Schumpeter placed the individual entrepreneur at the center of the innovative process in his early work, but later claimed that the large corporation would inevitably usurp the entrepreneur's role. His 1911 book, The *Theory of Capitalist Development* credited capitalist innovation to entrepreneurs with the 'dream and will to found a private kingdom' and the 'will to conquer.' The 1934 work, *Capitalism, Socialism and Democracy* placed kingdoms ahead of conquerors. In creating the giant enterprise, Schumpeter now declared, entrepreneurs had eliminated their own function. The "perfectly

* As mentioned in Chapter 2, according to a U.S. Department of Commerce report, a broadly defined "Information Technology" sector comprising all computing and communications, represented only 4.9 percent of G.D.P. in 1985 and 6.4% in 1993.

bureaucratized giant industrial unit" could automatically discover and undertake the 'objective possibilities' for innovation. It had "come to be the most powerful engine of progress."

The section below discusses the prior research on Schumpeter's hypothesis and my alternative view that startups and established companies perform complementary functions.

Prior Research

Most researchers do not directly compare the contributions of new and established firms. Rather they study whether large firms innovate more than small firms. According to a review by Acs and Audretsch, the economic literature posits several advantages that large companies enjoy. They can support projects with high fixed costs and can diversify their risks by undertaking several initiatives. They can more easily find economic applications for the unexpected outcomes of innovative activity. Their marketing and distribution capabilities provide greater returns to the development of innovative products and large volume production amplifies the profit gains from cost reducing innovations.[7]

On the other side, smaller enterprises can make "impressive contributions to innovation" according to Scherer, because "they are less bureaucratic, without layers of "abominable no-men" who block daring ventures in a more highly structured organization." They can also more easily sustain "a fever pitch of excitement" because "the links between challenges, staff and potential rewards are tight."[8] Arrow reaches a similar conclusion relying on the information processing capabilities of small organizations. He suggests that small firms have an advantage in pursuing novel projects because they can efficiently share information between the individuals who are working on the innovation. Large companies cannot accurately evaluate such projects because of the distortion of information transmission within the organization; they do however have a superior capacity to communicate with external capital markets and can therefore fund larger scale innovations.[9]

Empirical studies of the relationship between firm size and innovation have produced ambiguous results. The studies typically rely on two types of indirect measures: R&D expenditure, which represents a proxy for the 'input' of innovative activity and patent filings, a proxy for innovative 'output'. Studies of R&D spending, according to Scherer "tilt on the side of supporting the Schumpeterian hypothesis that size is conducive to vigorous conduct of R&D" whereas the evidence on patents "leans weakly against the Schumpeterian conjecture that [large companies] are especially fecund sources of patented inventions."[10] The results can have "two rather different interpretations: that the largest firms in an industry generate fewer patentable inventions per dollar of R&D than their smaller counterparts, or that they choose to patent fewer inventions."[11]

Winter has proposed that exogenous conditions (such as the importance of human capital in an industry) create "entrepreneurial regimes" conducive to innovation by small firms or "routinized regimes" which favor the innovative efforts of large companies.[12] The empirical work of Acs and Audretsch supports the idea of the two regimes and suggests they are the "product of the market structure environment." They find routinized regimes in industries that are "capital intensive, concentrated, highly

unionized, and produce differentiated goods" and entrepreneurial regimes in "highly innovative industries, where the use of skilled labor is relatively important and where large firms comprise a large share of the market."[13]

Complementary Roles

The data and analysis in Parts 1 and 2 lead to an alternative perspective on the large versus small company debate. As discussed below, my research suggests that corporations like IBM and promising startups like the *Inc.* 500 companies make different contributions to innovation and economic growth. They play complementary rather than overlapping roles.

Established companies. As we have seen, companies like IBM enjoy several advantages in undertaking large initiatives. The most obvious one derives from their capacity to mobilize significant capital from investors. This intermediation function we may note is of especial importance in an era when rising incomes and retirement and pension plans have made the middle class an important source of investment funds.

Besides capital, large initiatives usually also require significant irreversible commitments by many customers, employees and other resource providers. An established corporation's base of tangible and intangible assets provides advantages in securing such commitments. Cash flows from existing businesses and access to capital markets allow the established corporation to offer credible contractual safeguards to the resource providers. Prior reputations help engender the confidence that the corporation will not behave opportunistically in matters that cannot be contracted for and honor promises that are necessarily vague – for example, to not "punish" employees for failed initiatives or provide the "good" after-sales service.

Established corporations also have an advantage in solving the coordination problems involved in launching large initiatives. Major projects, which seek to exploit economies of scale and scope, involve securing the joint effort of many personnel and solving conflicts among the providers of specialized resources. Established companies with well-developed coordination mechanisms have obvious advantages in doing so.

The microcomputer revolution illustrates the important contribution of established corporations. According to Steffens, the 'entry of large established companies from the computer, office products and consumer electronics industries (like, IBM, Xerox, DEC, NEC and Sanyo) between late 1981 to the end of 1982 'legitimized' personal computers. IBM utilized its "enormous market power and committed significant resources."[14] The company established "a highly automated, high volume assembly plant which provided significant economies of scale." It encouraged third party software houses to develop higher performance applications. It "made use of bulk discounting to switch the purchasing channel from individual users to corporate buyers." IBM, which then accounted for sixty-one percent of worldwide general purpose mainframe computer market, "effectively legitimized the personal computer in the minds of data processing managers in large organizations." It broke down a "major psychological marketing

barrier, namely the attitude that had existed within many DP [data processing] departments that personal computers were an unfortunate nuisance and certainly not part of the corporate management information system." IBMs penetration of the corporate market was so successful that the company could not satisfy demand for approximately eighteen months. This created an opportunity for many startups to develop IBM compatible machines or "clones."[15] IBM's entry also led to "increasing professionalism in the industry" and forced competitors to invest in marketing activities, especially in advertising, distribution and service support."[16]

Substantial investments by Intel, and after the late 1980s, by Microsoft, have sustained on-going improvements in performance and reductions in costs. Intel spent more than $4 billion to develop the Pentium family of microprocessors. Development costs for the Merced (P7) chip are expected to exceed $8 billion.[17] According to co-founder Gordon Moore, the company has routinely invested 10 to 15 percent on revenues on R&D: "A plot of Intel's financial performance" writes Moore, "would show revenues dipping here and there, earnings fluctuating wildly, and R&D expenses following a smooth exponential growth curve."[18] Intel has also invested heavily in making and marketing its microprocessors. One new semiconductor fabrication facility costs well in excess of $1 billion to build, and in 1997, the company spent $3.5 billion in the Sales, General and Administration (SG&A) category. Microsoft has spent similar amounts in recent years in developing and marketing software. In 1997 the company spent $2.5 billion on R&D (slightly under 20% of the $13 billion it booked in revenues) and $3.5 billion in SG&A. According to one analyst, manufacturers of PCs have essentially relied on Intel's and Microsoft's efforts, spending just 2 to 3% of their annual revenues on R&D.[19]

New businesses. We can think of the distinctive, complementary role of new businesses in the following way: they mitigate the constraints that result from the rules that large corporations must observe. As we saw in Part 1, the institution of extensive checks and balances (or "internal control systems") allows large corporations to separate the bearing of the risks of innovative activities from the identification, evaluation and implementation of such activities. These systems provide access to capital markets but limit the firm's capacity to pursue small, uncertain initiatives. By filling this opportunity space, bootstrapped entrepreneurs help incubate technologies whose promise is initially unknown. Many new "disruptive" technologies, according to Christensen, cannot initially compete in mainstream markets and can only be sustained in out-of-the way niches. In 1975, for instance, the personal computer was a poor substitute for mini- and main frame computers and was of interest mainly to hobbyists. Corporate decision-makers (or any other objective analysts for that matter) cannot predict which offbeat products and technologies will enter the mainstream; individual entrepreneurs who have the capacity and incentive to pursue uncertain, niche projects help select and develop the 'fittest' ones. Between 1975 and 1980, for instance, tinkerers and enthusiasts conducting low-cost, and not particularly scientific, experiments with personal computers, refined the technology and developed commercial applications that broadened its appeal. The cumulative efforts of a diffused band of individual entrepreneurs reduced the uncertainty

about the size of the potential market and paved the way for IBM to enter the business. A similar pattern, we may note, later emerged with Internet technologies.

The willingness to pursue niche opportunities helps propagate innovations after they have become recognized. New businesses provide complementary goods and services whose revenue potential is too small to interest established companies. In the 1980s for instance, startups provided services such as installation and maintenance and products such "add-on" hardware and software and educational books and videos that both took advantage of and helped advance IBM's efforts to make the PC a mainstream product. Startups also help attack the disequilibria that follow the introduction of new technologies, as manifested by the 90% gross margins on the retailing of printer cables. Established companies do not usually pursue these small, transient profit opportunities.

Opportunistic entrepreneurs relieve the inflexibility that arises because of the adherence of established companies tend to adhere to long-term strategies. In Part 2 we saw that companies build valuable know-how and reputations by steadfast adherence to rules about the markets they will serve and the services they will provide. These rules can preclude established companies from establishing optimal contracts and lead to a misallocation of resources. For example IBM offered standard levels of service and support for its PCs; for some sophisticated customers the standard was too much and for some technical novices it was too little. Similarly, when PCs were in short supply, IBM's policy of treating dealers 'equitably' led to a geographic distribution of machines that did not reflect differences in demand. IBM would not ship more product to regions where customers placed a high value on PCs and were prepared to pay a premium to obtain them. New businesses that took advantage of such misallocations helped mitigate their consequences. Some sold PCs at a low cost to customers who did not need much hand holding and service; others (the so called "Value-added-resellers") charged premium prices to customers who did. Upstart businesses also operated 'gray' markets, buying surplus machines from authorized IBM dealers and selling them in territories where PCs were in short supply. Thus IBM could maintain its reputation for treating authorized dealers equitably while entrepreneurs helped place its computers in their highest valued use.

Entrepreneurs similarly help mitigate the costs of standardized employment policies that large corporations adopt. Corporations try to recruit individuals who will fit their culture and norms in order to promote cooperation and teamwork. Such policies however, limit their ability to employ the best individual for a given task, especially in the early stages of a technology, when many of capable individuals lack the backgrounds and temperaments that suit the organizational climate of a large corporation. Corporations can reduce this problem by contracting out tasks to startups that can 'make do' with difficult staff and where there isn't much teamwork or organizational climate for quirky individualists to disrupt. IBM can secure the use non-conformist programmers without compromising its culture by turning to startups who can best utilize their talents.

Startups can also help established corporations, whose employment policies are optimized for long-term relationships, fill their transient needs for labor.[20] Companies like IBM have historically adopted policies such as a commitment to promote from within and to provide job and income security in order to encourage employees to internalize organizational objectives and acquire 'firm specific' skills that have limited value to other employers. The effectiveness of such policies depends on the constancy of their application. Unlike the firm promises in written contracts, these policies often have an ambiguous 'best efforts' quality: for instance, corporations 'favor' internal promotions but do not rule out hiring outsiders; unless the circumstances are clear cut deviations impair credibility. Moreover, in order to promote solidarity and teamwork, the policies have to be uniformly applied: corporations cannot easily offer job security just to employees from whom they wish to elicit high 'specific' investment in human capital.

The difficulty of discriminating between employees poses an acute problem in the development of new technologies and markets. In the early stages of a product or industry, firms have needs for labor that disappear later. For instance, marketing personal computers initially required considerable hand holding and missionary selling; as consumers gained experience and comfort with the product, their need for such service declined. Established companies that employ staff for these transient services who they later dismiss, risk tarnishing their reputations as good employers. They can instead rely on startups, whose staff do not expect much job security and often lack many employment alternatives, to satisfy these needs.

Subcontracting to get around the rigidities of employment policies can entail some costs. 'Outsiders' who invest in firm specific assets may require higher current compensation in lieu of the employment security and promotion opportunities that employees receive. They may also not internalize their customers' goals to the same degree as loyal employees. Contrary to received theory however, there seems little evidence that sub-contractors are less responsive or more difficult to control. Several theorists, going back to Simon, assert that employees submit to hierarchical authority more readily than do sub-contractors. This control hypothesis seems inconsistent with everyday experience. To take an extreme example, Detroit autoworkers have been known to attack foremen with tire irons. 'Outside' management consultants and investment bankers, I can report from first-hand knowledge, will usually work longer hours to satisfy client executives than in-house staff. College professors who formulate models of employment relationships exercise greater control over graduate students than over the support staff employed by the university. My interviews with *Inc.* founders suggest that they feel the same pressure to serve their large company customers as many graduate students do their advisors; they are more willing to submit to capricious demands than 'nine-to-five' employees, not less.

The complementary nature of the roles of new and established businesses does change when ambitious entrepreneurs try to build long-lived businesses. As Microsoft stops serving IBM and begins competing with it, the roles of the two companies begin to overlap and some of the debate inspired by Schumpeter's hypothesis about innovation in large companies becomes germane. The 'transitional'

Microsoft has greater access to resources that it does at the start-up stage but not to the same degree as an established IBM. Conversely, its emerging decision making routines and strategies give Bill Gates more room to act boldly than IBM's CEO enjoys. An analysis of these trade-offs, however, is beyond the scope of this book.

2. DISCONTINUOUS INNOVATION

According to Schumpeter, the economically significant innovations that disturbed the "circular flow" were 'large' and 'spontaneous' rather than 'small' and 'adaptive'. They so displaced the "equilibrium point" that "the new one [could] not be reached from the old one by infinitesimal steps. Add successively as many mail coaches as you please, you will never get a railway thereby."[21]

Schumpeter also distinguished such innovations ("carrying out of new combinations of the means of production") from their antecedent inventions. "The making of the invention and the carrying out of the corresponding innovation," he wrote, "are, economically and sociologically, two entirely different things."[22] Inventions are "economically irrelevant" as long as they are not carried out into practice.[23] He also contrasted innovation from its subsequent diffusion through imitation and adaptation. Undertaking a new combination represents an unusual event and takes charismatic economic leadership. But "as soon as the various kinds of social resistance to something that is fundamentally new and untried have been overcome, it is much easier not only to do the same thing again but also to do *similar* things in different directions, so that a first success will always produce a cluster."[24]

Some scholars, notably Nathan Rosenberg, have questioned these claims about the importance and distinctiveness of radical innovation; the section below summarizes and then extends these critiques.

Rosenberg's Critique

In his 1976 book, *Perspectives on Technology*, Rosenberg suggests that Schumpeter's sharp distinctions have created "artificial conceptual disjunctions between innovative activity and other activities with which it is not only linked, but which in fact constitute major parts of the historical process of innovation itself." This leads us to "focus disproportionately upon discontinuities and neglect continuities in the innovative process" and to overlook its crucial later stages.[25]

The inventive activity which precedes a new combination in Schumpeter's model, observes Rosenberg, is "carried on offstage and out of sight. Inventions come onto the Schumpetarian stage already fully grown"[26] and ready for commercial exploitation. In fact, we cannot easily distinguish between invention and innovation: "Whereas for some inventions no serious technical obstacles to their implementation may exist once the basic idea has been established, for other inventions such obstacles are formidable and can be overcome only after much further time consuming search and experimentation."[27]

Rosenberg questions the association of inventions with the "initial basic conceptualization of a product or process," under the assumption that "as soon as the basic conceptual or intellectual breakthroughs have been made, all the "real" problems are solved." Writes Rosenberg: "To date the

invention of the fluorescent lamp in 1859, the gyro-compass in 1852, the cotton picker in 1889, the zipper in 1891, radar in 1922, the jet engine in 1929, or xerography in 1937 is to select years in which significant steps were indeed made. But in none of these years was the product concerned even remotely near a state of technical feasibility."[28] Solving the problems that remain after the initial conceptualization takes "protracted inventive activity." Techniques for producing a new material (such as polyethylene) under laboratory conditions may be known, but it may take years to develop ways to produce it commercially. Or, an invention may be technically feasible, but its economic superiority over existing techniques may require many improvements in its "performance characteristics, often in inconspicuous and unspectacular ways." Early diesel engines for instance were too heavy for economic operation, and early jet engines had unacceptably low performance characteristics until the development of materials that could withstand high pressures and temperatures.[29] In such cases, innovators cannot, per the Schumpeter model, merely select inventions which are "already suitable for commercial introduction" and carry out the introduction of a new production function with them.[30]

Rosenberg similarly questions the distinct and secondary role Schumpeter accords to the propagation of new combinations. Schumpeter posits a "sharp disjunction" between "the high level of leadership and creativity involved in the first introduction of a new technique as compared to the mere imitative activity of subsequent adopters." In fact, Rosenberg argues, the diffusion of an innovation requires much more than simple imitation. A "stream of improvements in performance characteristics," "progressive modification and adaptation" to suit the requirements of sub-markets, and the introduction of complementary inputs, "decisively affect the economic usefulness of an original innovation."[31] These ongoing activities are:

> …central to the pace of the diffusion process. It is economically absurd to consider the innovation of the automobile as having been accomplished when there were a few buffs riding around the countryside terrifying horses. Innovation is, economically speaking, not a single well-defined act, but a series of acts closely linked to the innovation process. An innovation acquires economic significance only through an extensive process of redesign, modification, and a thousand small improvements which suit it for a mass market, for production by drastically new mass production techniques, and by the eventual availability of a whole range of complementary activities, ranging, in the case of the automobile, from a network of service stations to an extensive system of paved roads. These later provisions, even if they involve little scientific novelty, or genuinely new forms of knowledge, constitute uses and applications of knowledge from which flow the productivity improvements of innovative activity.[32]

Although Rosenberg defers to Schumpeter's analysis for "major innovations" involving "significant shifts to an entirely new production function" he does not provide examples of such one shot breakthroughs. I wonder whether many exist. As we saw in Chapter 8, even ventures like Federal Express that start with a revolutionary concept seem to require refinement over several years before their product or service attains commercial viability. More commonly, noteworthy developments of new

products or processes result from a large number of steps undertaken by many individuals and companies over several decades.

Extensions to the Critique.

The evolution of microcomputers after 1975 conforms closely to the model of continuous innovation discussed in Rosenberg's 1976 book. My current laptop (a sadly out-of-date 1996 model) which provides more processing power and functionality than did the computer center of my undergraduate engineering college seems to have little in common with its pioneering forebear, the Altair. Altair aficionados derived less practical use from their machines than did the turn-of-the century automobile buffs. Lacking basic input or output devices (such as keyboards and printers) Altairs could not even scare horses. Numerous innovations turned this oddity into a ubiquitous artifact. Some of these innovations – the mouse, graphical user interfaces, and electronic spreadsheets – represented conceptual breakthroughs. Others (such as word-processing software) were borrowed from mainframes and minicomputers. Continuous improvements and refinements in performance and features have been a hallmark of the industry -- Excel 7.0 has come a long way from the first spreadsheet, Visicalc. Complementary innovations have played a crucial role in such improvements: Excel 7.0 could not have been implemented on earlier generations of hardware. The introduction of new microprocessors, storage devices, application and operating system software, communications technologies (such as local area networks and the internet), innovations in manufacturing and distribution (such as the "build to order" process) and the opening of new market segments (such as home computing) have reinforced each other and sustained a virtuous cycle of ever improving price-performance.

The case studies discussed in Parts 1 and 2 suggest that on-going rather than one shot innovation extends beyond high technology into fields such as publishing and retailing. Jan Wenner, who started *Rolling Stone*, we saw, built on the experiences of several predecessor rock and roll magazines. Sam Walton opened his first Wal-Mart (in Rogers, Arkansas) after making dozens of trips to study discount retailers that were emerging in other parts of the country, including Ann and Hope (considered the creator of the concept) in Rhode Island and Fed-Mart in California. And, as we have seen, Walton, never stopped innovating, continuing to borrow and integrate new ideas into Wal-Mart practically until the day he died.

This research also suggests extensions to Rosenberg's ideas. First, the uncertainty-investment tradeoff discussed in Part 1 provides another reason for a gradual rather than one shot development of new combinations. Pioneering individuals who have the psychological willingness to confront the early uncertainties and do not have to answer to outside investors or bosses cannot muster the resources for a great leap forward. Corporations who have the resources to make large commitments tend to wait until the pioneers have resolved some of the uncertainties because of their due-diligence requirements.

A second extension relates to the coordination of sequential adaptations. We should expect a more opportunistic pattern in the early stages when individual entrepreneurs add to each other's innovations in the manner of guests at a party who create a story by adding sentences to the collective

narrative. This leads to a stochastic evolution of technologies, as seems to have occurred in the early years of the microcomputer industry. After some basic technological trajectories have been established, the entry or emergence of firms with the will and resources to pursue a long-term strategy changes leads to a more directed or purposive sequence of innovations. The strategic players' search for and select innovations that conform, not just to an innate predetermined technological path, but also to their goal of market dominance. For instance, Intel continued to develop CISC based microprocessors in order to leverage its installed base when RISC based microprocessors may have represented a superior technological choice. Strategic players also influence the initiatives of more opportunistic participants. For example, from about the early 1980s, Intel's strategies in microprocessors and Microsoft's strategies in operating systems helped determine the product choices of numerous ventures that provided complementary goods and services.

If large, well-established firms totally dominate a market (as now seems the case in automobiles, commercial aircraft, and photo-film industries) and shut out opportunistic startups, we would expect their strategies to more or less dictate the evolution of new products and processes and limit chance variations from a purposively determined trajectory. We may further expect that the innovative efforts of already dominant players will reflect the expected effects on their existing base of business. They will, for instance, be more concerned with the "backward compatibility" of their new products and (as I will discuss in Section 3) will attempt to avoid cannibalizing their existing revenues. Innovation will therefore follow a more predictable path.

Third, we can extend Rosenberg's propositions to the evolution of large firms. Companies like IBM represent a "new combination" or innovative production function that transforms capital, labor and other inputs into products and services in a unique way. And, like most innovative products and processes, such companies evolve gradually. As we saw in Part 2, the 'radical' transformation of a fledgling C-T-R into the mature IBM takes place over many decades and involves bold moves as well as many incremental modifications and adaptive changes. Here, too, we find that complementary innovations play an important role: the effectiveness of an initiative undertaken by say the manufacturing function often turns on parallel changes undertaken by the others. Apparently, many significant economic developments require multi-faceted, multi-period change.

3. CREATIVE DESTRUCTION

According to Schumpeter "a perennial gale of creative destruction" is an "essential fact about capitalism. It is what capitalism consists in and what every capitalist concern has got to live with."[33] Destruction is the price of innovation: the automobile must displace the buggy makers and mass merchandisers must put the country store out of business. The innovator combines the roles of Shiva the Destroyer and Brahma the creator, of the mobs of the French revolution who overthrew the *ancient regime* and Napoleon who founded an empire on its remains.

Although Schumpeter's vivid metaphor has become commonplace, the underlying proposition has not received much scrutiny. According to Jensen's 1993 article on "The Modern Industrial Revolution" research on issues of exit and retrenchment have been sparse after the 1942 publication of Schumpeter's creative destruction idea.[34] The indirect evidence, I argue below, suggests that new combinations usually displace existing structures gradually rather than through a sudden cataclysmic gale. And, a variety of other factors overshadow the importance of new combinations in engendering business terminations and job losses.

Pace of Displacement

The gradual evolution of new technologies discussed in Section 2 limits the rate at which they displace existing products and processes. The automobile did not displace the stagecoach and horse buggy overnight. Karl Benz and Gottlieb Daimler built a gasoline-powered vehicle in Germany in 1885. Armand Peugeot built a workable automobile in France soon thereafter. Automobile manufacture began in the United States in 1893 when the Duryea brothers of Springfield Massachusetts built a carriage powered by a one-cylinder motor. Six years later, in 1899, many individuals and about thirty American companies had built a grand total of some 2,500 vehicles.[35] Ten years later, reports the U.S. Bureau of the Census, total car registrations reached 32,900 vehicles, with 11,200 passenger vehicles sold in 1903.[36] The "unification" phase of the automobile industry in the United States, which according to historians McCraw and Tedlow led to the development of a mass market, did not begin until the introduction of Ford's Model T. This was in 1908, fifteen years after the Duryea brothers and nineteen years after the Daimler-Benz vehicles.

Moreover, unlike urban redevelopment projects that must first level decrepit structures, most innovations start out on virgin ground. Cost and unreliability often preclude new technologies from serving existing mainstream needs. The early automobiles were too unreliable a substitute for stage-coaches to deliver mail and too expensive to satisfy mainstream transportation needs; like the early PCs, they appealed instead to the enthusiasms of a few individuals for trendy products.* Customers' switching costs and prior investments make them unwilling to adopt new technologies for current needs. For instance, after the 1980s personal computers became cheap and reliable enough to migrate from the fringe hobbyists market into commercial use. But even as PCs sprouted in offices everywhere, they did not displace many traditional main-frame applications, because of the great cost that turning over the installed base entailed, not to mention the reluctance of many MIS personnel to obsolete their personal human capital. Spreadsheets, the "killer application" that created a commercial market for personal computers allowed users, many of whom had not previously used computers extensively, to perform analyses and simulations which they would not have otherwise performed.

* Schumpeter himself noted that innovations create the needs they satisfy rather than fill preexisting needs. In *Business Cycles* ((1939)p.73) he cited the example of automobiles.

The "growth imperative" faced by large, well-established companies often helps channel innovations towards serving new needs and markets rather than attacking existing ones. The desire to expand revenues, profits, personnel, market power and so on represents the main impetus in large corporations for undertaking new investments and initiatives; they generally back technologies that cannibalize existing businesses with reluctance, when it becomes clear that if they don't competitors will. Robert Cringely, who has written a popular history of the industry, suggests that IBM executives backed its PC initiative in 1980 because they thought personal computers would not reduce the demand for IBM's other products. "Every sales dollar brought in to buy a microcomputer," writes Cringely, "would be a dollar that would not otherwise have come to IBM."[37] The substantial assets and resources of large corporations and their dominance of some markets suggests that their bias against displacement* likely has a significant effect on the evolution of technologies.

The role of PCs in expanding the pie rather than destroying existing technologies, apparently represents a common feature of the so-called 'digital revolution.' New communications services – E-mail, newsgroups, and "chat" – have provided a critical mass of users for the Internet and on-line services such as AOL. These services do not seem to have significantly eroded the demand for traditional phone and mail communication. Nor is it obvious what products or services are threatened by the dissemination of information on web-sites and Intranets or the upsurge in web-surfing. To be sure, some new technologies have attacked existing products from the outset. Sun and other microcomputer based engineering workstation manufacturers targeted their products against mini-computers. The new on-line services such as Travelocity, Amazon, and E-trade compete against traditional travel agencies, bookstores and stockbrokers. It seems implausible to me, however, that the growing importance of information technology in the economy derives, to any significant degree, from displacement effects. According to a 1998 U.S Department of Commerce report, the share of the information technology (IT) sector (computing and communications) grew from 4.2% of the gross domestic product of the United States in 1977 to 6.1% in 1990 to 8.2% in 1998.[38] This is probably not because computers have displaced traditional goods and services. Rather, IT has accounted for a disproportionate share of growth: according to the Department of Commerce IT industries have been responsible for more than one quarter of real economic growth[39] that is, about three times their share of the economy.

Of course, new combinations can undermine older businesses without competing for their customers, by drawing away capital, labor and other inputs. Fast growing companies offer investors and talented individuals opportunities for capital gains and excitement that firms in slower growing fields cannot. The stock market provides a striking indicator of the appeal of IT companies. The Department of Commerce report on IT notes that the collective market capitalization of five large companies – Microsoft,

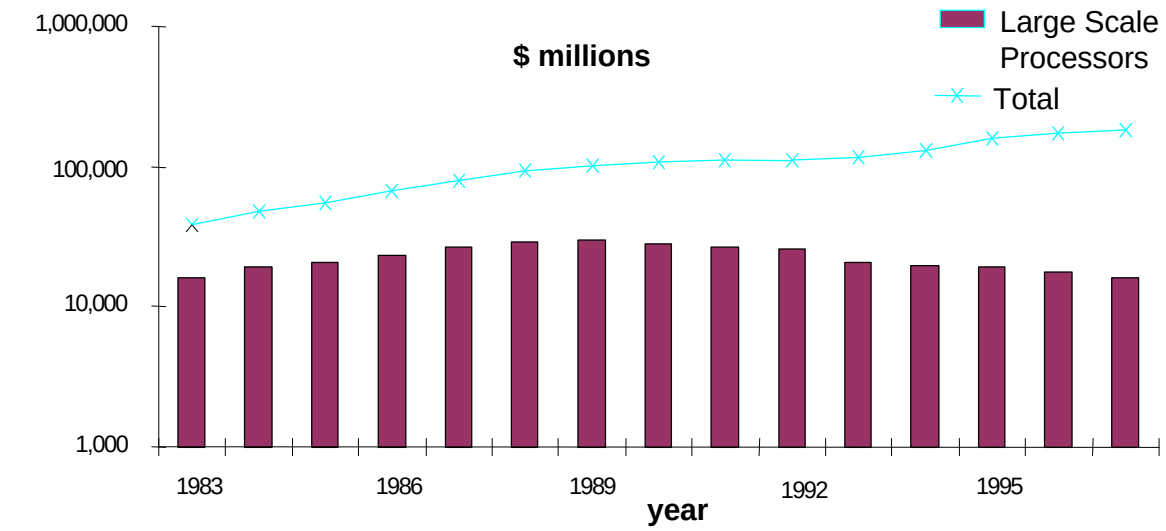
* The so-called "planned obsolescence" we seen in durable goods is consistent with this principle. Detroit's annual model introductions and new versions of software represent attempts to stimulate new purchases of long-lived or indestructible goods.

Intel, Compaq, Dell and Cisco, grew to over $588 billion in 1997 from under $12 billion in 1987.* IT industries also offered workers higher compensation. The Department of Commerce estimates that the 7.4 million people employed in the sector earned about $46,000 a year compared to an average of $28,000 in the private sector.[40] Such differentials do sap the vitality of slow growing companies and industries, but the process is insidious and gradual.

Similarly, in the long run, technologies that initially serve 'new' needs and can take over traditional markets. Automobiles and trucks did replace buggies and stagecoaches and packet-switched Internet telephony may someday make the existing circuit based telecommunications obsolete*. But the displacement often takes place at a much slower rate than the hype about the obsolescence suggests. In 1938, the New York Times observed that the typewriter was "driving out writing with one's own hand," yet Petroski reports the sale of 14 billion pencils in 1990.[41] The introduction of word processors in the 1970s in turn led to predictions of the imminent demise of typewriters. As I discovered in the course of a consulting study for a typewriter manufacturer, in spite of a fourteen-fold growth in the shipment of word processing units between 1977 and 1981, the demand for typewriters in the United States had remained steady at around a million units a year.

COMPUTER PROCESSOR REVENUES

Figure 13.1



Note: Includes embedded peripherals only; excludes all external peripherals and software
Total processors include large, mid-range, workstations, servers and PCs.
Source: McKinsey database; McKinsey analysis

Newer computer architectures have taken away share from mainframes, but, over 30 years after the introduction of minicomputers and more than 20 years after the introduction of microcomputers, the

* As of this writing the stock market has placed nearly twice as great a valuation on the stock of the virtual bookseller Amazon than on the Barnes and Noble, the leading chain of conventional bookstores. Barnes and Noble which has recorded "solid" profits for the last three years has nineteen times the revenues as Amazon, which has never booked a profit. Mayer (1998)

mainframe remains an important category. Total worldwide revenues of large-scale computer processors (or mainframes) amounted to $16 billion in 1997 compared to $16.2 billion in 1982 (see **Figure 13.1**). Their share of the total computer market dropped considerably in that period, from about 42% in 1982 to about 9% in 1997 as total demand grew from $38 billion to $183 billion. Although its share of total revenues has declined considerably, IBM's mainframe business continues to be large and profitable. In 1997, mainframes and their associated storage devices generated $5.7 billion for the company. Networks of smaller processors may eventually make mainframes extinct but their destruction will not be the consequence of a cataclysmic "gale of creative destruction."

Salience

The magnitude of the 'destruction' wrought by new combinations is sometimes as exaggerated as the rate. As we will see next, only some businesses (such as stagecoach builders and typewriter manufacturers) succumb to new combinations. Other factors such as incompetence, over-confidence and the growth imperative likely play a more significant role in the failure and contraction of businesses.

Small businesses apparently turn over at a rapid rate – a roughly similar number (around three-quarters of a million) of businesses are started and terminated in the United States every year. Most of these entries and exits have little to do with creative destruction. As we saw in Part 1, most new businesses are started in fields such as lawn care, beauty salons and construction, all of which require little technology, specialized skill, or capital. Kirchoff and Philips, estimate for instance that there are five times as many "low innovation" startups as "high innovation" startups.[42] The termination of such businesses cannot be attributed to their displacement by a new combination. Indeed, except to their proprietors, exits have little significance. For instance, according to Dun and Bradstreet's estimates, nearly 90% of terminations do not involve losses to creditors: apparently, suppliers and banks do not regard these businesses as creditworthy.

Some high growth companies, particularly in high technology industries, do get leapfrogged by competition from the next generation of innovation. As mentioned, Henderson has studied this phenomena in the photolithography equipment business and Christensen in disk drives. The high flying manufacturers of dedicated word processors of the 1970s such as Wang, CPT and NBI, lost out in the 1980s to PC-based software that could provide the same functionality at a much lower cost. But a superseding innovation represents only one of the factors that can lead to the termination of promising businesses. Many promising startups, we saw in Part 1, exploit opportunities that are inherently transitory. Unless their proprietors can find a more sustainable follow-on source of profit, they have to wind up the enterprise. As discussed in Part 2, the inability to manage growth can also jeopardize a business. The entrepreneur may run out of cash because of inadequate financial controls, dissipate effort

* We should note however that the rapid growth of cellular phones has not had this effect.

by failing to formulate a coherent strategy, or engender organizational turmoil through ill-defined reporting relationships.

New combinations represent even less a threat to the survival of mature, well established corporations. As discussed in Part 2 the diversified assets of companies like IBM protect them from adverse innovations such as the displacement of punchcard based data processing by mainframe computers. Innovations usually cause mortal harm only in conjunction with protracted obstinacy and denial. I can think of few examples from the last two decades where a large corporation has failed to survive because of an innovation from which it could not defend itself. Moreover, the destructive force of new combinations represents but one, arguably minor, cause of the demise of large corporations. Many fail because of 'internal' management lapses. My former employer, E.F. Hutton, was forced to merge into its competitor Shearson Lehman, because poor internal controls led first to a check kiting scandal and then, in the stock market crash of 1987, de facto insolvency. International Harvester is no longer with us because in 1980, management took a strike to get out of a contract with the United Automobile workers. According to Flint, the strike "lasted six months and wrecked the company."[43] And, companies can fail because of the financial policies they adopt. "The high leverage incurred in the eighties," Jensen writes, "contributed to an increase in the bankruptcy rate of large firms in the early 1990s."[44]

Creative destruction also seems to have played a modest role in the recent "downsizing" of large corporations. According to Jensen, the "Third Industrial Revolution" that started after 1973 generated significant "excess capacity and thus the requirement for exit."[45] As one manifestation of this phenomenon, Jensen notes that *Fortune* 100 firms eliminated 1.5 million jobs or 14 percent of their workforce in the decade from 1979 to 1989.[46] Technological changes helped generate some of the excess capacity eliminated. For example, radial tires lasting three to five times longer than the older bias ply tires created excess capacity in the tire industry. Improvements in the design of objects such as bridges and cars reduced the intensity of consumption of metals. Mini-mills increased the productivity of steel making.

Technology represents but one of the factors behind the sharp reductions in capacity in mature industries such as oil, chemicals, steel, aluminum and automobiles. We find little evidence in these sectors of cataclysmic or unforeseeable changes. Radial tires displaced the older technology gradually. The consumption of metals and energy grew more slowly but did not actually decline because economic growth outweighed the increased efficiency in their use. And, we cannot easily relate technological innovation to the widespread cutbacks in what Jensen calls "white collar corporate bureaucracies."[47] Some large companies, report Bartlett and Ghoshal,[48] nearly halved the number of layers of their middle management.*

* We do not have good aggregate estimates of the white collar positions eliminated in the 'downsizings' and 'restructurings' of large corporations; announcements by companies like AT&T, IBM and Exxon in

The pressure to grow faced by the managers of large companies in the United States and overseas were at least as important a factor as technological changes in generating excess capacity. These pressures led to investments in new capacity, in the face of slow or declining demand. They also fostered the growth of managerial positions: between 1970 and 1980, report Caves and Kreps, executive, administrative and managerial occupations in the median industry grew 20.6% faster than real output.[49] The profitability of their core franchises helped mask the excess physical and managerial capacity carried by large corporations. Jensen's analysis suggests that many factors forced companies to reduce this capacity after 1973. These factors included the oil shock, which lead to a ten-fold increase in prices between 1973 and 1979; changes in tax policies; deregulation of transportation, telecommunications and financial services in the United States; the globalization of world trade; and, the movement of formerly communist and socialist economies to more market-oriented capitalist economies. Technology of course contributed, but per the previous discussion, many of its dramatic advances had as much to do with creating new markets as with generating excess capacity in existing ones.

4. SUMMARY AND CONCLUSIONS

The case Schumpeter made for the importance of new combinations has stood the test of time. His contributions seem exceptionally valuable when set against the great body of microeconomics that assumes known, stable production functions. Schumpeter's speculations about the process and mechanism of innovation conflicts however with the observed evidence in important ways: Routinized innovation by large corporations represents an important but not dominant mode for undertaking new combinations. Major innovations usually evolve through many steps rather than through a single discontinuity. And, they do not rapidly blow away existing structures – new combinations typically satisfy new needs and only gradually displace existing products and processes.

Rosenberg suggests that the Schumpeterian framework does not adequately incorporate the technical difficulties and the learning by doing that major innovations entail. Schumpeter's failure to address issues of capital availability and organizational structures may also have contributed to the limitations of his assertions. Schumpeter argued that the providers of capital, rather than entrepreneurs, bore the financial risks of undertaking new combinations. Schumpeter did not however did adequately analyze the conditions under which the providers of capital would do so.

These conditions have important implications. Established companies like IBM enjoy access to capital on a large scale because they have an objective process for evaluating initiatives, and this process tends to screen out great leaps into the unknown. Individual entrepreneurs can undertake uncertain initiatives because they aren't bound by rigorous vetting procedures, but they cannot raise the capital to do so on a large scale. This trade-off between the uncertainty and investment requirements of new initiatives

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the 1980s suggest they were significant. Nohria (1996) p. 24 reports that about 75% of the layoffs by Fortune 100 firms between 1978 and 1992 involved white collar employees

suggests that individual entrepreneurs and large companies play complementary roles and helps explain why new combinations evolve in a gradual rather than discontinuous way.

Financial and organizational constraints also help direct innovative effort away from displacing existing products and processes. Individual entrepreneurs lack the resources to directly attack the existing order. And large companies who do have the resources are reluctant to pursue innovations that would reduce their current revenues and profits.

CHAPTER 14: FACILITATING CONDITIONS

This chapter analyzes the conditions that influence the formation and growth of promising businesses. The first four sections examines the following factors that influence the level new business formations: social attitudes, technology, the prevailing corporate ethos, and tax and regulatory policies. Section 5 deals with the determinants of the growth of promising businesses. Section 6 discusses the implications for public policy.

The proposition we just reviewed, that startups and established corporations complement each others' roles does not imply a fixed relationship between new business and corporate activity. Indeed we find noteworthy shifts in their relative proportions. From the turn of the century till about the early 1970s, large corporations in the United States steadily increased their share of output and employment. The trend was subsequently arrested and possibly reversed. David Birch's 1979 report, which claimed that small firms created 82 percent of new jobs, sparked controversy regarding his definitions and methodology. But, whatever the precise numbers, the tens of millions of new jobs created in the United States in the last two decades, in the face of shrinking of the workforces of *Fortune* 500 companies, clearly point to an increasing proportion of employment in the 'entrepreneurial' sector. The data also seem persuasive in attributing much of the net growth in employment to the formation and growth of promising startups (or what Birch calls 'gazelles') rather than to the more numerous marginal businesses.

Although new businesses and entrepreneurs are in vogue, the factors behind their renaissance do not seem to be well researched. David McClelland's 1961 book *The Achieving Society* may well represent the last major effort to systematically investigate the factors that promote self-employment; furthermore, McClelland did not distinguish between marginal and high growth businesses. Today, policy makers and analysts often rely on the vivid but special case of VC-backed startups. Consider, for instance, Acs and Audretch's (1990) explanation for why the small business share of manufacturing employment has grown substantially in the United States when we find decline or stagnation in the main European economies. According to Acs and Audretch, "the main sources of these differences in the employment growth can be traced to misguided government policies in Europe supporting large firms, as well as a much larger venture capital market in the United States, and from the willingness of scientists and experienced managers to leave secure jobs and share the entrepreneurial risks in new enterprises."[50]

In fact, promising startups do not usually require venture capital or risk-taking by seasoned scientists and managers. As we have seen, most promising startups do not require much capital. Their founders have some, but usually not deep, experience in their chosen line of business, and they do not leave high paid employment to start their ventures. This chapter explores the 'exogenous' or 'environmental' factors that affect the formation and subsequent expansion of such bootstrapped ventures which could help explain their recent resurgence.*

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* The discussion of the determinants of the share of new initiatives undertaken by individual entrepreneurs, does not address the more significant issue of what determines the aggregate level of

1. SOCIAL ATTITUDES

A few 'born' entrepreneurs feel compelled to start businesses under any conditions. The section below discusses how social attitudes affect – and are affected by – the efforts of the more typical individuals, that is, those who can choose between starting promising businesses and pursuing other careers.

Status and Recognition

The degree to which society rewards and recognizes entrepreneurs can influence the willingness of individuals to start promising businesses in several ways. In societies that hold entrepreneurs in low esteem, new businesses are started mainly by deviants and "outsiders." Conversely, societies that accord entrepreneurs high status, attract mainstream individuals to such careers by the actual provision of prestige and by influencing the nature of the psychic rewards they seek. As is well known, peer groups affect the preferences of many individuals. We often value certain activities and goals when we see other valuing them,

The attitudes of peer groups may also affect their members' willingness to confront the uncertainties of starting promising businesses. As mentioned in Chapter 5, experimental research suggests social factors influence ambiguity aversion. The fear of the unknown likely represents a less of an impediment to starting a business if 'others like us' (rather than of a few unusual deviants) seem willing to take the plunge.

Public and media interest in startups can indirectly increase potential entrepreneurs' estimates of the probability of significant success. Media coverage of noteworthy successes considerably exceeds their representativeness in the universe of startups. This celebration of big winners stands in contrast to the normal focus of the media on regrettable occurrences such as massacres, political scandals, natural disasters and the mistakes of large company executives. This reflects the asymmetric magnitude of gains and losses involved in starting new businesses: the failure of a promising startup (as opposed to the stumbles of an IBM, or the folding of a glamorous VC-backed company like GO) is not sufficiently consequential to be newsworthy. Even when covered, the stories lack pizzazz. The resulting spotlight on the more interesting and memorable winners leads people (per the "availability" bias) to overestimate the likelihood of a major success.

Trust

The opportunity for entrepreneurs to realize attractive returns without much downside often turns on the willingness of customers and other resource providers to bear the risks. As we will see next, that

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entrepreneurial activity; it also has nothing to say about 'marginal' businesses which likely have very significant socio-economic consequences.

willingness requires an optimistic trust, bordering on naivete, which is distinct from the quasi-contractual trust that facilitates ongoing exchanges in settled markets.*

Social scientists suggested that trust – which we may broadly define as the willingness to take a gamble on others – represents a prerequisite for economic development. "Virtually every commercial transaction" Arrow writes, "has within itself an element of trust, certainly any transaction conducted over a period of time. It can be plausibly argued that much of the economic backwardness in the world can be explained by the lack of mutual confidence."[51] Francis Fukuyama's 1995 book contrasts prosperous "high trust" societies of Germany and Japan with the relatively less well to "low trust" societies of Italy and China.[52] A compilation of papers by scholars from several fields, edited by Diego Gambetta (*Trust: Making and breaking cooperative relationships*) offers a similar view.

This literature suggests that mutual trust facilitates economic exchange by reducing the costs of negotiating formal contracts and monitoring the performance of agreed on duties. It permits transactions that information asymmetries might otherwise preclude: A market for second-hand cars, for example, will not clear at efficient prices if dealers are known to pass off lemons as good buys.[53] And it helps overcome "prisoner's dilemma" type problems that impede cooperation. The literature also suggests that, under certain conditions, rational self-interest can sustain trust. The fear of ostracism and what Axelrod calls tit-for-tat retaliation discourages breaches of trust when parties engage in repeated transactions. Axelrod cites the example of diamond markets that are "famous for the way their members exchange millions of dollars worth of goods with only a verbal pledge and a handshake. The key factor is that the participants know they will be dealing with each other again and again. Therefore, any attempt to exploit the situation will simply not pay."[54]

Rational self-interest cannot, however, easily explain the trust that facilitates the formation of new businesses. Unlike diamond merchants, the often young and inexperienced founders of promising businesses, do not risk an established reputation: if anything, the heads-I-win-tails-I-don't-lose nature of their ventures should encourage entrepreneurs to take their chances with puffery and misrepresentation. As the attached insert, "The Selling of an Ad-Salesman" suggests, an entrepreneur with his back to the wall can resort to elaborate deceptions.

The Selling of an Ad-Salesman

Philippe Kahn, in an interview with Inc. magazine, describes with apparent relish how his company, Borland International, got its start by deceiving an ad salesman for *BYTE* magazine.

Inc.: The story goes that Borland was launched by a single ad, without which we wouldn't be sitting here talking about the company. How much of that is apocryphal?

Kahn: It's true: one full-page ad in the November 1983 issue of *BYTE* magazine got the company running. If it had failed, I would have had nowhere else to go.

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* The discussion relies on interviews that Howard Stevenson and I conducted with about 20 entrepreneurs on the topic of trust and our analysis reported in Bhide and Stevenson (1990)

Inc.: If you were so broke, how did you pay for the ad?

Kahn: Let's put it that we convinced the salesman to give us terms. We wanted to appear only in *BYTE*—not any of the other microcomputer magazines—because *BYTE* is for programmers, and that's who we wanted to reach. But we couldn't afford it. We figured the only way was somehow to convince them to extend us credit terms.

Inc.: And they did?

Kahn: Well, they didn't offer. What we did was, before the ad salesman came in—we existed in two small rooms, but I had hired extra people so we would look like a very busy, venture-backed company–we prepared a chart with what we pretended was our media plan for the computer magazines. On the chart we had BYTE crossed out. When the salesman arrived, we made sure the phones were ringing and the extras were scurrying around. Here was this chart he thought he wasn't supposed to see, so I pushed it out of the way. He said, "Hold on, can we get you in BYTE?" I said, "We don't really want to be in your book, it's not the right audience for us." "You've got to try," he pleaded. I said, "Frankly, our media plan is done, and we can't afford it." So he offered good terms, if only we'd let him run it just once. We expected we'd sell maybe $20,000 worth of software and at least pay for the ad. We sold $150,000 worth. Looking back now, it's a funny story; then it was a big risk.

Source: "Management by Necessity," *Inc.*, March 1989, p. 33.

Moreover the effectiveness of reputational incentives and tit-for-tat strategies turns on the clear identification of bad faith, which is often difficult to establish in an uncertain new enterprise. The failure to pay for diamonds received, the palming off of a lemon as a good car, or defection in a "prisoner's dilemma" game, can be sharply identified after they occurred. An entrepreneur's dishonesty or bad faith is less clear cut. When others take a chance on a startup, they simultaneously rely on the founder's integrity, native ability and on favorable external circumstances. So if things go wrong, they (and third parties) often cannot tell whether the entrepreneur acted in bad faith, lacked competence, or was unlucky.

We saw in Chapter 4 that in lieu of 'objectively' credible promises, entrepreneurs use a variety of strategies to exploit others' cognitive biases, reflexive behavior, and sympathy for an underdog. The success of such strategies depends on mores and attitudes that are distinct from those that sustain on-going transactions between known parties. In a social climate conducive to startups, customers and resource providers do not ask many questions about entrepreneurs' backgrounds. They assume that others are usually honest. As one businessman we interviewed put it: "I tend to take people at face value until proven otherwise, and more often than not, that works. It doesn't work with a blackguard and a scoundrel, but how many total blackguards and scoundrels are there?" They disregard past incidents, such as T.J. Watson Sr.'s conviction for price fixing (later overturned on a technicality) and the repeated business failures of R.H. Macy and H.J. Heinz.[55] They attribute deceptions, such as Kahn's charade for the ad-salesmen to the force of circumstance, and may even enter into transactions with individuals they believe are dishonest. As one real estate developer told us: "People are really whores. They will do business with someone they can't trust if it suits their convenience…I've done transactions with people knowing they were horrible. But the deal was so good, I just accepted it."

Members of a startup-friendly society are somewhat myopic. The focus on immediate benefits and disregard the long term risks. And if things go wrong or their trust is violated, they shrug they shoulders and move on. "You can't get obsessed with getting even. It will take away from everything else" one businessman told us. Another called retaliation "a double loss. First you lose your money; now you're losing time…[If you bite me] I won't have anything to do with you, but I'm not going to bite back. I'm not going to litigate just for the pleasure of getting even with you."

Such attitudes obviously create opportunities for fraud: a favorable climate for legitimate new businesses also facilitates the sales of titles to swampland and the operation of boiler room stock operations. Conversely, norms of the diamond market and of societies optimized for frictionless exchange may not be the most hospitable ones for startups. The mistrust of strangers, long memories and belief in an-eye-for-an-eye, limits broken promises, but it also makes it hard to young, undercapitalized entrepreneurs to start new businesses. In suspicious or retributive societies, we would expect, established entities who can bond their commitments with their name and capital, would undertake a high proportion of new initiatives.

This is not to suggest that absolute tolerance for broken commitments produces an agreeable climate for startups. An 'anything goes' system would collapse into a Hobbesian state of disorder hostile to any kind of commerce. There has to be some risk of sanction for failure to keep ones commitments or some way to distinguish between out-and-out cheats from desperate entrepreneurs like Kahn who use deception in order to build a legitimate business. My argument is simply that closed unforgiving systems to ensure probity and frictionless exchange make it difficult to start a business. 'Entrepreneurial' systems rely on weaker forces of social disapproval (rather than ostracism) and on a morality that encourages most people to behave honestly most of the time. There is a tradeoff between frictionless exchange and new ventures, although a state of anarchy is good for neither.

Feedback Effects

The social factors, which influence the level of startup activity in a certain period, are themselves affected by the startup activity of previous periods. Up to a point, the skewed distribution of attention and returns generated by startups leads to positive feedback: because the gains of successful entrepreneurs exceed the losses of the unsuccessful ones, the glamour and excitement of the activity increases, which in turn encourages more individuals to try their hand. The process snowballs as the winner's circle expands to include 'mainstream' individuals (rather than 'deviants') which provides support for the belief that "anyone can do it." Casual observation suggests that we have reached this stage in the United States today as many college students and corporate employees who would previously have sought to rise through managerial ranks dream of starting their own businesses.

The expansion has limits however. Innate ambiguity aversion represents one limiting factor. Snowballing social acceptance will draw in increasingly ambiguity averse individuals, but only up to a point. Starting a business requires a more conscious choice than does finding a job: there are no campus

recruiters or corporate headhunters who sign people up to start a business. And some individuals will be too ambiguity averse to make the leap to self-employment, no matter how fashionable it becomes. They may talk about it and think about it, but at the end of the day they will follow the path of least resistance into working for someone else.

The availability of profitable opportunities represents a second constraint. Most promising startups, we have seen, exploit situations that already exist rather than undertake their own innovations. But the supply of such opportunities is limited. The introduction of IBM PCs creates opportunities for a large but finite number of startups selling complementary goods and service. If the number of entrepreneurs overwhelms available opportunities, we would expect failure rates to escalate to proportions that undermine the glamour of starting a business and the "availability biases" that distort estimates of the chances of success.

Third, as their numbers escalate, the social attitudes and norms that help the founders of new businesses to get others to bear the risks declines. The psychic value customers derive from giving the 'struggling entrepreneur' a break depends in part on the scarcity of such individuals. If they became as ubiquitous, as say tele-marketers of long distance phone services, the founders of new businesses wouldn't enjoy the same goodwill. Increased startup activity can increase suspiciousness and intolerance as the number of entrepreneurs who fail to live up to their commitments grows; a climate of optimism and tolerance requires that bad faith or incompetence remains within limits. Similarly, the ploys entrepreneurs use to gain credibility and orders become less effective as their use becomes more common. In other words, promising businesses provide a valuable free option to their founders only to the degree that factors such as ambiguity aversion or ignorance of sales skills limit the number of individuals who try to take advantage of them.

2. TECHNOLOGY

In the previous chapter we discussed how startups contribute to technological change. We now turn to the reciprocal role of new technology in stimulating startups. Although there is some literature on how technology affects economies of scale and the size distribution of firms, I will argue that these results cannot be simply extended to startup activity, which is driven by somewhat different factors.

According to Acs and Audretsch, the "implementation of new flexible technologies" represents "the most decisive factor contributing to the [recent] emergence of small firms." For most of the 20th century, they write, "industrial technology favored mass production, or the application of special purpose machines to produce standardized products." This technology was "inherently" inflexible and favored large firms over small firms. New technologies such as programmable robots and numerically controlled machines allow for "flexible," short production run manufacturing at costs comparable to those of producing standardized goods on a large scale. Changing consumer tastes have supported the shift to flexible techniques: "The proliferation of consumer tastes, away from standardized mass-produced goods

and towards stylized and personalized products," write Acs and Audretsch, has mitigated "the inherent cost disadvantage of small scale production."[56]

Empirical research supports the argument that changes in manufacturing technology have affected the size distribution of firms. In their 1988 paper Acs, Audretsch and Carlsson concluded that "there was substantial evidence that at least certain flexible technologies have promoted the viability of small firms." Subsequently they studied plant level data from the Bureau of the census and found that mean plant size "tended to decrease the most in those engineering industries where there has been the greatest application of programmable robots and numerically controlled machines," that is, flexible manufacturing techniques.[57] But the historical evidence suggests that technologies that increase the viability of small firms and decrease plant sizes do not always lead to a proliferation of new businesses. Between1947 and 1958, according to a study of 125 industries, the share of sales of the eight largest plants declined in 67 cases and increased in only 48. A contemporary economist, John M. Blair attributed the declining share of large plants to "fundamental changes in the direction of technological advance away from centralizing innovations and toward decentralizing techniques" such as "the replacement of central motive power units by individual electric motors."[58] We do not find a great upsurge in the number of startups in the 1947-1958 period, however.

Flexible manufacturing techniques do not appear to have played much of a role in the *Inc.* startups I studied. I encountered just one company involved in the manufacture of robots. I did not encounter a single user of such equipment or of numerically controlled machine tools. The reported fragmentation of customer tastes also did not seem to have affected the startups in my sample, nearly 90% of whom provided sold to other businesses rather than to end users. Capital constraints preclude most individuals from using flexible manufacturing techniques to start their businesses. A bare bones machine tool shop requires several hundred thousand dollars of equipment and a state of the art facility can run into the millions. VCs who can make investments on this scale did fund startups making robotics equipment, but I do not know of any that have backed companies using such equipment. So the techniques to customize products such as automobiles which may produce significant changes in the operations of the incumbents have likely not had much effect on startup activity.

For a technological change to catalyze startups (rather than reduce industry concentration ratios of the average size of plants) it must mitigate the constraints faced by the typical entrepreneur. One example is the case of the so-called 'digital' or 'information technology' revolution that has helped promising startups overcome capital constraints and secure customers.

Sharp declines in computing and communication costs have brought the fixed and recurring outlays required to start a business within the reach of a large number of capital constrained individuals. As of this writing an aspiring entrepreneur can purchase the equipment required for a fully featured office – a computer, fax machine, printer and copier – for a few thousand dollars and rent voice mail and internet access for less than fifty dollars a month. In addition, software programs for word processing,

bookkeeping, and tax-preparation that cost a few hundred dollars allow entrepreneurs to substitute their personal labor for services that would otherwise cost tens of thousand of dollars a year. These developments have affected the economics of established companies as well, but their value for the bootstrapped entrepreneurs is difficult to overestimate. Whereas leasing a telex machine involved a serious financial and emotional commitment, buying a fax machine and establishing an e-mail account is commonplace.

The new technologies have ameliorated the credibility problems entrepreneurs face by blurring the differences in the 'appearance' of well-established companies and shoestring startups. Word processing packages (with spell-checkers) and laser printers let any business to generate professional looking business correspondence. Desktop publishing and color copiers allow startups to produce slick sales brochures and newsletters at low cost. Advances in communications have also eroded the perceptional advantages of established companies. A cartoon in *The New Yorker* of a canine with its paws on a computer keyboard has the caption 'On the Internet, nobody knows you are a dog.' Whereas in the past, the phone manner of receptionists and secretaries gave callers an indication of the solidity of the enterprise, today it is difficult for callers to tell whether they are leaving voice mail message on a multi-million dollar PBX system or a ten-dollar a month service offered by the phone company.

The digital revolution has created opportunities that resource constrained entrepreneurs can exploit. As mentioned in Chapter 2, many new ventures have taken advantage of opportunities to provide ancillary goods and services whose revenues were too small to attract large companies and did not require much up-front investment. And, in contrast to many flexible manufacturing techniques, the advances in information technologies have created opportunities to provide goods and services without displacing existing technologies and firms. The capital and credibility barriers faced by startups have been correspondingly lower.

We may further speculate that the digital revolution has helped startups by the beliefs about new technologies that it has engendered. In the previous section, I suggested that favorable social attitudes had caused startups to snowball; a similar (and very likely overlapping) relationship may be observed between expectations of advances in digital technology and the accelerating realization of such advances. Gordon Moore's famous "law"—which he proposed in an *Electronics* magazine article in 1965—that the number of transistors that can be built on a chip doubles every eighteen months, provides a classic and important illustration of the role expectations have played in the digital revolution. Moore's claim, which we cannot properly call a natural or economic law, has become an influential self-fulfilling prophesy. Semi-conductor companies, who believe in Moore's law, invest the resources needed to make it come true. Downstream customers, (such as PC manufacturers) and providers of complementary goods to their customers (such as applications software companies) design products in anticipation of the eighteen months cycle. So when the new chips arrive they find a ready market, which in turn validates beliefs in Moore's Law and encourages even more investment in building and using new chips.

Snowballing technological change seems to have engendered a powerful belief among large suppliers and users about the need to make rapid preemptive investments without their traditional analytical scrutiny. For instance, telephone and cable companies are rapidly providing "high bandwidth" connections to households in the belief that the proliferation of the internet will provide first mover advantages. Similarly, Fortune 500 corporations are investing in web-sites and e-commerce in anticipation of Internet ubiquity, without waiting to see what standards emerge or demanding much economic justification for their outlays. This attitude, we may note, contrasts with the corporate response to the advent of personal computers. Enthusiastic individuals first brought personal computers into the corporate world without official sanction, sometimes 'diverting' departmental budgetary allocations from other uses. Corporations did not embrace personal computers until they were reassured by the entry of IBM and applications such as spreadsheets and word processing had demonstrated their value.

The current almost unquestioning faith in new technology helps creates niche opportunities for startups to provide complementary products and services. For instance, the growth of the web has created a demand for HTML tools and training. And, as customers are in a great rush to embrace the new technologies, they are more willing to give startups a chance. For instance the urgency many corporate customers feel to establish their web-sites and intranets, has led them to turn to untried entrepreneurs instead of waiting for say a division of IBM or Anderson Consulting to offer such services or hiring in-house staff.

3. CORPORATE BELIEFS

Besides inducing episodic deviations from normal procedures, corporate beliefs also affect the initiatives they routinely undertake. An 'optimistic' climate increases the proportion of new initiatives undertaken by corporations whereas pessimistic assumptions and beliefs increase the role of promising startups.

Although corporate controls systems strive for objectivity, subjective judgments play an important role in the evaluation of new initiatives. Old-fashioned yardsticks such as payback periods and return on investment clearly involved an arbitrary choice of acceptable thresholds. Subjective choices play a more hidden role in approaches that are based on modern finance theory, such as discounted cash flow analyses. Calculating an appropriate discount rate for a project requires estimating its systematic risk (or "beta"), its optimal capital structure, the risk free rate, and the market price for risk (or the "market risk premium"). These estimates involve subjective choices of methods and data which have a substantial impact on the overall result. (See insert 'The Uncertainty of Discounted Cash Flows').

The Uncertainty of Discounted Cash Flows

In *A Cautionary Tale about discounted cash flow analysis*, William Sahlman[59] reminds us of the many assumptions we have to make in order to implement Net Present Value Theory. For instance to calculate the right discount rate we have to estimate the *expected* systematic risks or "beta" of the project. But we can only calculate

historic "betas" which we know to be unstable. The same problem arises with estimating the market price for risk. In calculating the risk free rate of a long lived project there is some dispute about whether to take into account the shape of the yield curve. In other words, estimating the parameters of a discounted cash flow model is rife with measurement error and unresolved theoretical issues. And the consequences of the errors and uncertainties are far from trivial: In a simulated project in the food industry that has a mean cost of capital of 15%, Sahlman demonstrates, there is a 50% chance that the true discount rate could be less than 12.6% or greater than 17.4%. Uncertainly about discount rates generates a corresponding uncertainty about present values. In Sahlman's project which has a mean estimated present value of $137 million, uncertainties about the discount rate give us a 50% chance that the true present value could be less than $73 million or greater than $192 million. This assumes perfect knowledge of cash flows; adding "mild" uncertainty, leads to a 50% chance that the true present value could be less than $28 million or greater than $226 million (versus the mean estimate of $137 million)

This subjectivity makes decision-makers susceptible to the practices and assumptions of their peers in other companies and their providers of funds. The collective assumptions of managers and financial analysts, for instance, will influence estimates of crucial variables such as the market risk premium (or in the old days, the required Return on Investment) used by individual corporations. These assumptions, in turn, depend on the degree of optimism prevailing in the managerial and financial community. More optimism, we would expect, generates estimates that increase the aggregate level of initiatives pursued.

The prevailing corporate beliefs also affect the willingness and capacity of large corporations to search for new initiatives. As discussed in Part 2, new initiatives increase the heterogeneity of a firm's assets and activities and exacerbate coordination problems; optimism about these problems leads to broader searches for new initiatives. Similarly, optimistic expectations about finding new sources of profit encourage corporations to maintain more managerial capacity than they require for their existing operations.

The attitudes of the top managers of large industrial corporations and stock markets in the United States appear to have undergone marked change in the last couple of decades: Beliefs in the virtues of focus and maximizing free cash flow has replaced optimism about growth opportunities. This has, we will see next, contributed to the retrenchment of large companies and the growth of new businesses.

Corporate executives in the United States once had great confidence in their ability to find and exploit profitable opportunities and to coordinate heterogeneous assets. According to Chandler, corporations in the United States initially grew through vertical integration and geographic expansion in their core businesses, then entered related industries and, in the 1960s, embarked on unrelated diversification. The stock markets did not resist and arguably endorsed this expansion. Investors in the 1960s reacted positively to unrelated acquisitions and valued conglomerates more highly than mutual funds.[60] Consultants and academics reflected and reinforced the prevailing ethos of expansion. The

Boston Consulting Group (BCG) advocated strategies based on the "learning curve" of aggressively increasing market share in order to enjoy the cost advantages that accrue to the competitor with the highest cumulative output. Consulting firms also provided analytical frameworks (such as BCG's growth share matrix) to help manage unrelated businesses. The economist Oliver Williamson highlighted the advantages of internal capital markets in allocating resources and so helped provide an intellectual justification for diversification.

A different ethos emerged in the 1980s. Focus took precedence over growth. Studies about whether the diversification of previous decades was reversed significantly reach conflicting conclusions, but the trend was certainly broken: For instance according to Chandler there was only one divestiture for every 11 mergers in 1965[61]. Between 1978 and 1992, according to Nohria, the divestitures of Fortune 100 firms exceeded their acquisitions by 36%.[62] Stock markets imposed "conglomerate discounts" on companies with unrelated businesses. Academics (this writer included) drew attention to the limitations of internal capital markets.

Skepticism about diversification and the belief that they had saturated their core markets encouraged executives to shrink. Surplus resources lost their perceived value as growth options. The new climate seemed to throw the Penrose and Rubin growth models into reverse gear. Recall that in those models unused managerial and other resources stimulate a search for new profit opportunities. Now companies sought ways to most profitably shed the excess resources.

Business consultants promoted the retrenchment ethos. "Reengineering" studies, which helped corporations make do with fewer employees, became a multi-million dollar business. Stern Stewart's Economic Value Analysis and BCG's Cash Flow Return on Investment measured profits generated by businesses after taking into account the cost of the capital they employed. Such measures, which encouraged managers to shrink the capital they used in their businesses, implicitly assumed that shedding assets did not destroy valuable growth options (or employee morale). Stockholders who reacted positively to the downsizing of old line corporations apparently endorsed this assumption.

The new beliefs, which have directly limited the initiatives undertaken by large companies, have also indirectly encouraged the formation of promising businesses. Reengineering projects have created "outsourcing" opportunities for startups. Many employees who have been laid off have started their own businesses. According to the outplacement firm Challenger, Gray, & Christmas, about 20% of laid-off managers started or bought their own businesses and consulting firms in 1990.[63] And, as faith about the security of employment has been shaken; the perceived difference in the uncertainty of starting a business and working for a large company have narrowed.

4. TAX AND REGULATORY POLICIES

The effects of tax and regulatory policies must always be examined on a case-by-case basis. The section below suggests a few heuristics about how different policies affect the mix of corporate initiatives and promising startups.

Tax Policies

Investment tax credits. Accelerated depreciation and similar efforts to lower the cost of capital expenditures favor initiatives undertaken by established corporations who have relatively easy access to debt and equity financing. They do little for individual entrepreneurs who rely on their sweat equity to start labor intensive businesses. Similarly, tax credits for R&D favor large corporations that have the wherewithal to support such activity and can "segregate" it for tax purposes from their ongoing business. Promising businesses rarely use these credits because they start out by imitating or modestly refining others' ideas and their subsequent development activities are closely intertwined with their ongoing business.

Double-taxation of dividends. Dividends get taxed twice – through taxes on corporate profits and then through taxes on the incomes of individuals who receive dividends. This encourages corporations to reinvest profits in 'internal' initiatives instead of paying them out to stockholders. Double taxation, we may also note has a more limited impact in the small owner-managed firms, where the principals can pay themselves high salaries and bonuses instead of dividends.

Capital gains rates. Lower rates on capital gains (than on ordinary corporate incomes) also creates an incentive for corporations to undertake new incentives. It encourages corporations to transform current income into increased equity value through deductible expenditures (on items such as R&D and advertising) and to develop new products and markets. Low capital gains rates have less impact on the economics of most startups. The founders of most bootstrapped ventures (as opposed to VC-backed companies), as we saw in previous chapters, do not expect to realize a substantial capital gain through an IPO or sale of their company.

Taxes on personal incomes. The effect of personal taxes on the formation of new businesses depends on the opportunities the system provides for avoidance or evasion. Low personal taxes should stimulate new business starts by helping individuals accumulate the savings they need to start a business. Also, as mentioned, the ongoing returns of an owner-managed business are especially sensitive to the level of personal taxes. But, high rates on personal incomes may also encourage individuals to start their own businesses if it is easier to evade or avoid taxes as the owner of a business than as an employee.

Regulatory Policies

The effects of regulations on the mix of entrepreneurial activities will depend on a number of factors.

Fixed compliance costs. Regulations, such as those designed to promote product safety, which impose high up-front compliance costs, preclude entry by capital constrained entrepreneurs. For instance, we almost never find bootstrapped startups offering new pharmaceuticals or medical devices. Only the established drug companies and some VC backed startups can afford the tens of millions of dollars it takes

to secure FDA approvals. By contrast, the unregulated health food and supplements markets have been a hot bed of startup activity.

Small company exemptions. Some regulations especially regarding the terms and conditions of employment often exempt small companies from their purview. In other cases (such as immigration or minimum wage rules) regulators cannot effectively enforce the provisions of the law in small firms. These de jure or de facto relief from compliance costs have led large companies to rely on entrepreneurs to provide services ranging from custodial work (which is often dirty and low paid) to contract programming (which involves securing work permits for overseas staff).

Long-tailed liabilities. Some activities, such as asbestos removal, involve risks of large, long term liabilities. Here too, established companies will turn to startups who "have nothing to lose" in the hopes of protecting their assets and cash flows from future lawsuits and penalties.

Unexpected consequences. Major changes in the rules (such as airline or telecom deregulation) often lead to disruptions and unforeseen opportunities that nimble startups can exploit more easily than large well-established companies.

5. FACILITATORS OF GROWTH

In Part 2 we examined the proposition that only exceptional entrepreneurs can transform promising startups into long-lived corporations. The total number of startups should therefore help determine the number of such transformations; the greater the number of individuals who start new businesses, the greater the likelihood that some of them will have the necessary drive and capacity. Many entrants do not however ensure a proportionately large number of big winners. The evidence suggests that the United States and European economies have comparable numbers of small businesses and startups. The perception of a gap between the United States and Europe likely derives from the fewer founders of promising businesses in Europe who try to subsequently build a Microsoft or Dell Computer. As we will see next, the factors that promote the formation of new businesses do not necessarily coincide with the factors that facilitate their subsequent growth.

Social Attitudes

In his book, *The Wheels of Commerce*, the economic historian, Fernand Braudel, distinguishes between a market economy and the system of capitalism. Simple "bourgeois principles" can sustain the former, whereas the latter requires the capacity and drive to accumulate significant capital. We can similarly say that whereas bourgeois principles and a generally favorable view of commerce may suffice to encourage individuals to start new businesses, the social climate that encourage entrepreneurs to build a large company has distinctive features. Society must approve of, or at least grudgingly respect, the drive to accumulate substantial wealth and power and value winning over being a 'good sport.' It must tolerate 'winner take all' type games and the rough tactics that some entrepreneurs employ in their drive for dominance. Social attitudes that frown on individuals rising too far above the rest or think more highly of

gifted amateurs than of methodical winners, discourage the average entrepreneur from trying to build a substantial enterprise.*

Corporate beliefs

We see considerable overlap here – the nature of corporate beliefs has a similar effect on the growth of fledgling firms as it does on startups. Corporate pessimism helps ambitious entrepreneurs grow their businesses by freeing up capital and managerial personnel. If large corporations retrench, financial markets can recycle some of their surplus cash to smaller growth companies.† The downsizing of managerial staff likewise helps growing companies, by increasing the supply of employees who have the know-how of large company systems and procedures that the often inexperienced founders of promising companies lack.

Corporate attitudes towards diversification affect the competitive resistance that growing companies encounter. New businesses, we have seen, usually start in markets where they compete against other small companies. If their success attracts large companies, the stiffer competition can limit their growth. The office-products discounter, Staples, could more easily expand from a regional to a national scale as long as large established retailers (such as the mass-merchandisers, Wal-Mart and K Mart) did not enter its category. In general therefore, transitional companies are more likely to attain their growth goals when executives of large companies lack confidence in their capacity to enter new businesses and the prevailing ethos is a cautious one of focus and consolidation.

Tax and Regulatory Policies

Policies that promote the formation of new businesses can sometimes discourage their subsequent growth. As mentioned, the opportunities for tax evasion afforded by the ownership of a business can encourage individuals to start their own ventures. And the lower costs of complying with workplace safety, discrimination, overtime and other such rules enjoyed by small businesses, can lead large companies to outsource some functions to entrepreneurs. Such conditions however discourage firm growth. I have encountered many business owners in Europe and Asia who do not want to expand for fear of attracting the attentions of the tax authorities and government regulators. They have chosen to enjoy

* A former student, Mauro Pretolani, speculates that the attitudes of the different socio-economic classes also play an important role. According to Pretolani, Italy has a stronger entrepreneurial tradition than many other European countries. But its entrepreneurs have been drawn mainly from the ranks of manual or blue collar workers who have been satisfied with building small businesses. Individuals from upper middle class backgrounds who might have aspired to build larger companies have been attracted to professions such as medicine and the law.

† In the last decade for instance, stock repurchases have exceeded stock issuance, and according to a report by Needham Asset Management, large companies (that is, those with a market capitalization of over $1 billion) have done most of the repurchasing. The net supply of the stocks of smaller companies has increased during this period.

what Galbraith called the "quiet life" or to satisfy their ambition through owning several small firms.* Conversely, regulations that discourage small scale entry can act as spur for growth. For instance, the high fixed costs of complying with product safety regulations encourages businesses to expand their output in order to decrease the costs per unit.

Government policies, such as anti-trust laws, can also directly limit an entrepreneur's drive to dominate a market. According to some historians, the United States has spawned more large companies than other countries partly because of a more tolerant attitude towards firm expansion. In the formative years of the country, leaders like Jefferson directed their fear of concentrated power towards government – the issue of corporate power was moot. When the Second Industrial Revolution started around 1880, a "tiny" government, according to McCraw left a "vacuum of power" which allowed American companies to attain "gigantic" size.[64] Subsequently, "trust-busting" politicians did attempt to curb the power of large corporations, but as McCraw points out, their anti-trust legislation was "not synonymous with anti-bigness law. The "most conspicuous targets" of antitrust were giant companies, but "the majority of prosecutions" had been against groups of small firms engaging in collusive behavior.[65]

In pre-communist, imperial China, by contrast, an omnipotent state actively suppressed the emergence large businesses that could threaten its hegemony. The state played a ubiquitous role, writes Braudel, handling "public works, irrigation, roads [and] canals." In order to provide measures against famines, the state took responsibility for agricultural production making advance payments to peasants and filling the public granaries as emergency stores. A "lynx-eyed administration" controlled and confined the activities of businessmen -- for instance, the local mandarin authorized the entry and departures of all vessels in the ports. "Under such conditions, neither the merchants, the usurers, the money changers, nor the manufacturers … had much in the way of power. The government had the right to punish or tax anyone it saw fit to, in the name of the common good which condemned excessive wealth … as both immoral and unjust."

China did have "a solidly-established market economy" with "chains of local markets," a "swarming population of small artisans and itinerant merchants," and, "busy shopping streets and urban centers." The government encouraged simple trade to facilitate agricultural production. But the accumulation of capital "could only be achieved by the state and within the state apparatus." Long before the arrival of communist rule, a state that "uncompromisingly controlled everything and expressed unmistakable hostility to any individual making himself 'abnormally' rich" could not countenance any private large-scale enterprise.[66]

* One businessman provided a Kafkaesque story of having different firms operating the same plant in succeeding months of the year, so that each could enjoy small firm status. (I did not however, verify this claim)

Capital and Labor Markets

The conventions and structures of financial markets have a more significant impact on the growth of fledgling businesses than they do on startups. The workings of financial markets makes little difference to the founders of most promising businesses who face nearly insurmountable barriers to raising outside capital and can make do with meager funds. Some businesses, like Microsoft, enjoy such high profit margins, that they can finance their subsequent growth entirely through retained earnings. For many other businesses the availability of additional capital represents an important determinant of growth. Wal-Mart for instance relied heavily on lines of credit, limited partnerships, subordinated loans from insurance companies, and the public equity markets to finance its growth. The financial markets can therefore affect the entrepreneurs' capacity and willingness to grow such businesses.

In markets that encourage the growth of companies like Wal-Mart, capital is mobile, rather than locked into existing corporations. Imaginative financial intermediaries compete to offer a broad range of financial instruments. Their optimistic outlook makes them willing to weigh potential earnings more heavily than past performance and to extend credit against expected cash flows; in unfavorable markets, pessimistic capital providers invest in blue chip companies and demand hard collateral for any loans they make to fledgling businesses.

The terms of capital availability also matter. Market conventions (and legal rules) about the separation of personal and business liability affect the willingness of entrepreneurs to seek expansion capital. If capital providers hold entrepreneurs liable for the debts of their business (through personal guarantees, for instance) or make it difficult for them to start new business after a failed venture, we would expect to see fewer entrepreneurs trying to expand. Conversely, an environment in which entrepreneurs can raise hundreds of millions of dollars in unsecured debt after declaring bankruptcy (as in the case of Donald Trump) or reneging on contractual obligations (as in the case of Oscar Wyatt, the founder of Coastal Corporation) encourages them to turn small businesses into large ones.[67]

The market for experienced personnel similarly affects firm growth more than it does startups. Whereas improvised startups make do with inexperienced employees who have limited job prospects, their subsequent evolution often requires entrepreneurs to recruit seasoned employees from established companies. The willingness of such personnel to join transitional businesses depends in part on the costs they incur when they leave their jobs and the risks they face if things don't work out. For instance, the portability of pension benefits and the acceptance of 'job hopping' help transitional companies attract experienced employees. Conversely, if established companies usually tie pensions to employment until retirement age and fill 'good' jobs mainly from within, they will discourage experienced employees from taking a chance on a transitional enterprise.

6. IMPLICATIONS FOR PUBLIC POLICY

The preceding sections raise many questions about the effectiveness and wisdom of extending public help to individual entrepreneurs. Government policies, I argue next, cannot promote the formation and evolution of new businesses to a significant degree. Nor does favoring individual entrepreneurs over the initiatives of established companies seem any more sensible than the reverse tilt in favor of large companies.

We have examined an extensive (and arguably incomplete) set of factors that affect the willingness and capacity of individuals to start their own businesses. It is difficult to imagine how governments can affect these factors to create a more 'favorable' environment for entrepreneurs. Public policies cannot easily make startups fashionable or turn successful entrepreneurs into popular icons. Government awards and recognition tend to follow rather than determine what's 'in': the postal service issues Elvis stamps long after he has attained cult status. We have limited knowledge of, let alone the capacity to manage, how societies attain the optimal level of honesty (and gullibility) that facilitates startups, or how corporate the climate turns from optimistic expansionism to retrenchment. Similarly, whereas governments can underwrite scientific research, we cannot predict what kind of projects will generate technologies that help startups.

Even the factor directly most directly connected to the activities of government – taxes and regulations – does not provide an effective instrument for helping entrepreneurs. Although individuals may start businesses to evade or avoid taxes or because small businesses can more easily circumvent workplace regulation, this does not seem like a reasonable consideration in the design of the tax and regulatory system. Similarly, although the Food and Drug Administration has a significant impact on entrepreneurial activity in the United States, this need not be of primary concern in the debate over its role. If public health concerns justify strict oversight of new drug development or the labeling of health foods, it is not obvious that the rules should be weakened for the benefit of undercapitalized entrepreneurs.

Policies to ameliorate the so-called capital shortage faced by entrepreneurs seem particularly questionable. Most entrepreneurs, we have seen, use their personal savings or the modest funds raised from relatives and friends to start their businesses because they don't have much verifiable human capital and intellectual property. Their success depends on their energy and adaptability. It is just as hard for a public agency as it is for professional investors to identify individuals who have the requisite innate capacity to make a go of such ventures. And, providing capital to all comers will lead to large scale misallocation of resources – even without the inducement of easy funding nearly a million individuals try to start new businesses each year – and opportunities for fraud.

Moreover, much of the distinguishing contribution of promising startups derives from their capital constraints. Meager funding forces entrepreneurs to conduct low cost experiments that help resolve market and technological uncertainties and prepare the ground for subsequent large scale

investment. It also makes entrepreneurs seek out underutilized resources such as inexperienced or fringe members of the labor force and provide them with on the job training.

Capital availability does represent an issue for the exceptional startups (such as in bio-technology) that require significant up-front investment to develop new technologies and for firms trying to expand their scale and scope. Policy choices such as the taxation of capital gains, investment tax credits and the regulation of financial markets and intermediaries can make a difference in such situations. But, at least in the United States, there seems little evidence that capital intensive startups and transitional firms face a shortage of funds. Arguably VC firms and the IPO markets have shown an excessive eagerness, bordering on what the United States Federal Reserve Chairman Alan Greenspan might term as 'irrational exuberance', to provide capital to them. Expectations about the revolutionary potential of the Internet for instance may have engendered significant overinvestment and drawn in individuals who lack the innate capacity to start a business. The easy availability of large scale funding can also lead inexperienced entrepreneurs to grow their businesses at a faster rate than their managerial capacities can develop. We may wonder for instance whether individuals like Bill Hewlett, David Packard or Bill Gates would have been able to build long-lived firms if they had to cope with multi-billion dollar stock market valuations within years of launching their businesses.

The personal computer industry provides a useful contrast. Bootstrapped entrepreneurs carried out the early experiments with very little capital in the 1970s. Capital became available on a large scale in the 1980s mainly to entrepreneurs and firms with demonstrable track records and technologies. Companies like Microsoft, Lotus and Dell issued public stock after they had established sizeable ongoing revenues, profits and an organizational infrastructure. And, by the standards of Internet IPOs, valuations were modest.

Richard Florida argues that venture capitalists fund too many startups by "pulling inventions out of existing companies." Florida writes that in Silicon Valley, "every new idea seems to lead to the formation of a new start-up – a wasteful and inefficient process…[E]xisting firms suffer from raids and defections of key scientists, technologists, and management personnel. Promising projects are abandoned and companies find it hard to follow on breakthroughs they have made…Too much venture capital, while it may lead to more start-ups, may in fact be detrimental to the national economy."[68]

We cannot easily verify Florida's impressions, but they do raise a basic question about whether public policies should even try to favor new or transitional businesses over established corporations. Many kinds of individuals and organizations carry out 'entrepreneurial' activities. Their initiatives often complement each other, and in some cases overlap. This chapter discussed some broad factors which affect the proportion of the activities of the different players, but did not make any claims about the optimal mix. Individual entrepreneurs (many bootstrapped and some VC backed) have made great economic contributions but so have large corporations. While individuals likely have an advantage in undertaking small uncertain initiatives, established companies are better equipped to put large amounts of

capital to work. In this era of corporate retrenchment, we should not lose sight of the long term record of publicly held corporations in the United States. Some large companies have realized poor returns: for instance according to Jensen, General Motors spent $67.2 billion on its R& D and investment program between 1980 and 1990 only to produce a firm with a total value at the end of the period of $$26.2 billion.[69] For just $21.5 billion, GM could have bought all of the equity of Toyota and Honda in 1985. Fama and French's estimates of the returns earned by all non-financial publicly held corporations in the United States for 1950-96 tell a different story. According to Fama and French earned a return on 12.11% p.a. compared to their cost of capital of 10.72% over the 46-year period. These numbers are especially impressive given the trillions of dollars these companies invested.

There seems little reason therefore for governments to try to manage the ebbs and flows in the fortunes of the different actors. The idea of large 'national champions' that so captured the fancy of European policy makers in the 1960s has, appropriately, fallen out of favor. This need not however lead governments to undertake the even more difficult task of directing capital and other resources to the vast and diffused population of actual and would be entrepreneurs. An interest in the overall climate for economic enterprise seems more worthwhile than a focus on any particular manifestations of entrepreneurship.

7. SUMMARY AND CONCLUSIONS

Several factors help determine the relative proportions of promising startups and the initiatives of large corporations. These include social attitudes towards entrepreneurs, the nature of technological developments, the outlook and beliefs of executives in large corporations, and, the tax and regulatory regimes. (See Table 14.1 for a list of some of the factors that have contributed to the increased importance of promising startups in recent years). The same factors do not however, facilitate the transformation of startups into large corporations – the growth of firms depends on a different set of conditions. (See Table 14.2). Public policies cannot easily influence the climate for the formation and growth of promising businesses. Nor does there appear to be a compelling case for the state to even try to influence the relative proportions of the entrepreneurial initiatives undertaken by individuals, transitional firms and large corporations.

CONDITIONS FAVORING PROMISING STARTUPS

Table 14.1:

Social Attitudes	• Entrepreneurs accorded prestige and recognition • 'Optimistic' trust
Technology	• Products and services that facilitate bootstrapping • Expectations of rapid and unpredictable change
Beliefs of Corporate Executives	• Pessimism about profitable growth and diversification opportunities
Tax and Regulatory Policies	• Tax advantages from business ownership • Low fixed costs of regulatory compliance • Regulatory burdens decrease with firm size • Disruptions due to radical changes in regulation

CONDITIONS FAVORING FIRM GROWTH

Table 14.2

Social Attitudes	• Emphasis on Winning • Tolerance for 'winner take all'
Beliefs of Corporate Executives	• Pessimism about profitable growth and diversification opportunities
Tax and Regulatory Policies	• Tax and regulatory burdens do not increase with firm size • Fixed compliance costs increase minimum efficient scale • Regulatory burdens decrease with firm size • Tolerance for market power (e.g. weak anti-trust rules)
Capital and Labor Markets	• High mobility for capital and labor • Limited personal liability (e.g. 'liberal bankruptcy regime)

CHAPTER 15. TAKING STOCK

When we embarked on this journey, I stated that our purpose was to outline the principal features of an important but not well-explored territory. This final chapter recapitulates some of the highlights of what we have observed and provides suggestions for future travels. My claims are tentative – exploratory inquiries do not lead to firm conclusions. But, for the sake of clarity, I have omitted the 'perhaps' and 'mays' that ought to qualify the propositions below.

1. RECAPITULATION

Promising Startups

Only a small proportion of new businesses – between 5 to 10% of the total – make much of a contribution to economic growth or job creation or have the potential to provide significant returns to their owners. The great majority comprises 'marginal' micro-enterprises providing routine services in mature fields such as lawn care and beauty salons. Their high rate of appearance and disappearance has limited economic significance.

Capital constraints. Most promising businesses start out with meager funds – only a very select subset of high potential startups can raise funds from professional intermediaries such as venture capitalists. Most founders of promising businesses cannot raise much outside capital because they don't have much verifiable human capital or proprietary technologies – they tend to have limited experience and often start their businesses by copying or slightly modifying someone else's idea.

Uncertain niches. Promising startups have low 'most likely' profit potential; but, because of the nature of the opportunities they pursue, they have at least a chance of earning significant returns: promising startups cluster in market niches characterized by high uncertainty generated by technological, regulatory or other such exogenous changes or by the amorphous nature of the customer wants. High uncertainty and low capital and opportunity costs create a 'heads-I-win-tails-I-don't-lose-much' proposition for entrepreneurs. In contrast, the low uncertainty of marginal businesses means that their principals don't have even an outside chance of a sizeable payoff.

Opportunistic adaptation. The founders of promising ventures find their business ideas in the course of their previous employment or by chance, rather than through a systematic search. They devote little effort to prior market research or planning. They don't have the money, the opportunities are often fleeting and with high uncertainty, and extensive research and planning doesn't have much value. Instead, entrepreneurs rely on opportunistic adaptation to unexpected problems and opportunities.

Securing resources. In order to add value to their free option, entrepreneurs have to get customers and other 'resource providers' to take a chance on their businesses. The lack of a track record and capital makes resource providers reluctant to do business with a startup. Entrepreneurs overcome this

reluctance by providing special benefits, exploiting others' cognitive biases and reflexive tendencies, and by locating resource providers with unusual needs or willingness to bear the risks of a new enterprise.

Traits and skills. Unforeseen events play a significant role in promising startups because of the high uncertainty and lack of planning. Success isn't just a matter of luck, however. Starting a business with a 'free option' attached requires an unusual tolerance for ambiguity. Adapting to unforeseen circumstances requires the ability to act decisively, to be both open-minded and confident, and to have a talent for reading messy or hidden data. Moreover, attracting customers and other resources requires exceptional control over one's ego, tactical ingenuity, perceptiveness and sales skills. Some other qualities that have been traditionally associated with entrepreneurs, such as low risk or loss aversion, foresight, and charisma do not play an important role in starting promising businesses.

Specialization of initiatives

Large, established corporations like IBM and P&G tend to pursue different kinds of opportunities than do promising startups. They have the capacity and incentive to pursue larger projects; because large corporations have track records and checks and balances for evaluating investments, they can raise capital from diffused sources (not just a few relatives and friends). Also, they tend to concentrate their efforts on a few initiatives that they expect will generates profits large enough to cover their high fixed evaluation and monitoring costs. Corporations avoid uncertainty: requirements for due-diligence discourages them from undertaking initiatives whose risks cannot be objectively verified or diversified away. Due process and multi-level decision making also make it difficult to make the quick course changes required in an uncertain environment. The corporate comparative advantage thus lies in projects that require substantial up-front capital and the execution of well-laid out plans. The billion dollar development of the next generation of microprocessors represents a concrete example of the natural and preferred initiatives of established semiconductor companies like Intel.

Venture capital backed startups and 'transitional' firms pursue initiatives of medium uncertainty and size. The verifiable human capital of the founders of VC-backed startups and the track records of transitional firms give them more credibility with investors than most new businesses have but not quite as much as 'blue chip' corporations. Similarly, the due-diligence processes of VCs (or other providers of expansion capital) and the emerging internal control systems of young firms fall between the 'act first and adapt afterwards' approach of promising ventures and the extensive checks and balances of mature corporations. The 'intermediate' reputations and control mechanisms lead to an incentive and capacity to specialize in projects of in-between investment and uncertainty, such as Mitch Kapor's launch of a better spreadsheet (Lotus 1-2-3) and Wal-Mart's construction of its first in-house distribution center.

These specific archetypes suggest the general hypothesis of an inverse relationship between the investment requirements and uncertainty of new initiatives. Different types of economic agents specialize in different regions of this tradeoff depending on their track records and processes for decision making. Inexperienced 'nothing to lose' entrepreneurs represent one bookend, large and mature corporations the

other, and a variety of experienced individuals and young firms occupy the space in between. On rare occasions, we see 'revolutionary' initiatives like Federal Express which involve high uncertainty and large initial investment, but these are exceptions to the general rule.

Firm Evolution

Turning a promising startup into a large, long-lived corporation entails a radical transformation, not a simple 'scaling up.' The fledgling firm's profits usually derive from arbitrage type activity in an unsettled market, quasi wage compensation for the proprietors' labor or, in a relatively small number of cases, a differentiated product. A large and long lived corporation's profits in contrast, derive from many tangible and intangible assets such as its manufacturing plants, patents, customer relationships, and know how. Large corporations have dense, deeply embedded coordination mechanisms to coordinate its heterogeneous assets and activities, whereas in the relatively simple fledgling enterprise, the entrepreneur performs the integrative and coordination functions. And large corporations can sustain on-going growth by virtue of the size of the markets they serve, the productive capacity of their assets, and their coordination mechanisms. The specialized nature of the fledgling firm's markets, the limited capacity of its main asset – the entrepreneur – and the lack of coordinating mechanisms all place significant constraints on its growth.

The transformation from fledgling to mature firm requires protracted, purposive investment. Firms acquire a system of coordinated assets gradually, because capital constraints limit the size of individual investments and because it takes time to build customer relationships, know-how and other such intangible assets. The process isn't predestined, like the normal development of an infant into an adult; entrepreneurs must consciously abandon the pursuit of short term cash flow in favor of long term investment. And although the sequence and pattern of investments isn't predetermined, it isn't random or opportunistic either. Building long lived firms involves the coordination of investment and efforts across functions and time. Specifically, entrepreneurs have to adopt and articulate audacious goals, formulate a set of general rules (or strategy) for realizing these goals and translate these rules into specific actions and decisions (that is, implement the strategy).

The effective pursuit of a strategic rather than opportunistic approach requires entrepreneurs to have qualities and skills that are not important in starting improvised businesses. The pursuit of audacious goals requires a high level of ambition and tolerance for risk. Formulating a strategy requires imagination, a capacity for creative synthesis and a capacity for abstraction. And, the effective implementation of a strategy requires constancy, the capacity to inspire and intimidate and the ability to learn new skills.

Many individuals who start businesses don't have these traits; nor can they easily transfer or delegate the responsibility for critical firm building tasks to others. Few new ventures attain significant longevity and size because only a very small number of individuals have the willingness and capacity to both start **and** build a business.

Implications for Economic Change

Investment-uncertainty tradeoffs (and the incremental nature of scientific discovery) limits the occurrence of large scale discontinuities in technology (or the "production function"). Individual entrepreneurs who might have the disposition to confront the uncertainty don't have the capital to undertake large-scale innovations, whereas large companies that have the resources cannot tolerate the uncertainty. Major technical changes therefore occur gradually, through the complementary efforts of many entrepreneurs and firms. Improvised startups help resolve the early stage uncertainties of new technologies by conducting cheap experiments as well as the subsequent diffusion of these technologies by providing complementary goods and services. Established and transitional firms and some VC backed startups who have access to more resources, undertake R&D which requires significant up-front expenditure, and invest in high volume production and help create a mass market.

The interests and the capabilities of the different players also directs their efforts towards technologies that create new markets rather than ones that displace existing products and firms. The founders of promising startups have a propensity to serve new markets and customer needs because they lack the resources to compete against incumbents in existing markets. The fear of cannibalizing their existing revenues and profits creates a similar bias in large resource rich firms. And when new technologies and "combinations" do provide substitutes for existing products and services, they usually threaten small firms with narrow capabilities. Schumpeter's "gale of creative destruction" sweeps away the country store and narrowly focused mini-computer manufacturer rather than the Fortune 100 company with a broad businesses and assets.

The goals and qualities of the entrepreneurs who start businesses in the formative stages of a market influence its long run structure. Markets do not naturally converge to a certain number of competitors because of preordained economies of scale and scope. Whereas exogenous innovations often provide the spark (as for instance the microprocessor did for personal computers), the choices and investments of the participants in the market help determine the minimum efficient scale, the importance of brand names, customer switching costs, and other such long-run structural features. Entrepreneurs with the unusual drive and capacity needed to build large and dominant firms help create concentrated market structures with high barriers to entry. With less ambitious or capable entrepreneurs, we are more likely to find fragmented markets and not as well entrenched firms.

2. OPEN QUESTIONS

The territory explored in this book holds great potential for advancing our understanding of important economic phenomena. The propositions summarized above merit, I believe, refinement and challenge. For instance, although my analysis of firm evolution conforms to the histories of actual firms more closely than do theories of predestined or random development, it is but a rough and incomplete, sketch. I believe more regularities in firm evolution await discovery if only because entrepreneurs often

look for successful models they can imitate. The data and analysis contained in this book also point to new questions and the need for hypotheses and theories about the topics listed below.

Opportunity evaluation. Standard discounted cash flow techniques assume a well-diversified decision-maker with free access to capital. While these assumptions may approximate the situation facing corporate decision-makers, they are not relevant for the founders of promising businesses who face severe capital constraints and can pursue only one project at a time. For these individuals, the up-front cash required, payback periods, gross margins, and other such characteristics represent critical determinants of the attractiveness of a project. But, we do not have a normative or descriptive theory for the systematic incorporation of such factors into an entrepreneur's decisions about whether to proceed with a project.

Decision making under uncertainty. Modern theory assumes away the problem of uncertainty by asserting that decision makers can (or ought to) form a subjective estimate of the probabilities of the consequences of their choices. The experimental evidence on ambiguity aversion that we reviewed in Chapter 5 suggests that in many situations this is an unrealistic assumption, but our knowledge of alternative procedures for coping with uncertainty (such as 'opportunistic adaptation') is limited.

Contracting. Uncertainty and capital constraints also play an important role in a startup's ability to contract with customers and other resource providers. Uncertainty creates considerable incompleteness by making it difficult for the parties to anticipate contingencies and leads to fuzzy promises about 'best efforts,' 'fairness,' and other such ambiguous constructs. Capital constraints make it difficult for others to recover their investment if the entrepreneur defaults on agreed-on terms (such as providing on-going maintenance to customers.) Standard contracting theory, which implicitly assumes 'known' probabilities and contingencies, ignores such problems. For instance, under what Goldberg calls "the paradigmatic contract of neo-classical economics"[70] the parties clearly determine the duties they will discharge and there is a sharp line between breach and performance. The recent economic literature contains a growing acknowledgement of the importance of incomplete contracts. For instance Zingales suggests that "corporate governance" exists to mitigate the contracting problems faced by the stakeholders of firms because they cannot anticipate all the events that will affect the division of the returns their specific investments will generate.[71] These ideas will perhaps also eventually help us analyze the contracting problems faced by the founders of new businesses.

Firm evolution. Instead of forcing the data into a one-size-fit-all model, we could make more progress towards developing a general theory by identifying and explaining differences in the evolution of long-lived firms. This corresponds incidentally to Kurt Fischer's approach to studying human development. Fischer argues that standard developmental theory overemphasizes universal consistencies and neglects the variations that represent a pervasive feature of human development. Fischer suggests that studying the sources of the variations (which traditional theory dismisses as random) reveals patterns of organization within the variations. For instance, understanding why some babies crawl on their hands

and knees and others or why some crawl for weeks rather than months can help us explain the general consistency of crawling over walking.[72]

Industry structure. The proposition that unusually talented and ambitious entrepreneurs help shape the structural factors of an industry raises questions about the role that established companies play in this regard. Do the checks and balances of their internal control systems limit their capacity to lead changes in an industry? Or, does their access to resources make them more potent agents of change? To what extent, and under what circumstances do they serve as a brake on the efforts of entrepreneurially led firms to dominate an industry? How do variations in their decision making processes matter?

3. NEW RESEARCH APPROACHES

The study of such questions involves a focus on change: on the evolution of new production possibilities, consumer wants, firms and market structures rather than on the allocation of existing resources by existing firms under current market structures and on transient rather than steady state phenomena. And, understanding the processes of change in turn will require changing the norms and approaches of economic analysis which now bias scholarly research towards static phenomena. Readers will have undoubtedly noticed, and may have been troubled by the deviations from accepted research practices in this book; in the remaining paragraphs, I will make explicit some of these deviations and discuss why they are necessary.

Starting with the most innocuous: We need to elevate the status of heuristics and rules of thumb. The current norms of scholarly inquiry value generalizing theories and look down on "laundry lists" of heuristics. This leads researchers to neglect problems mentioned above such as decision making and contracting under uncertainty and the evaluation of opportunities under severe capital constraints where general theories have been difficult to formulate. Scholars of extraordinary genius may one day find closed form analytical solutions to these problems. Until such time we should recognize the utility of more ad-hoc or contingent rules. Research into such rules have led to great advances in applied fields such as engineering and medicine. I see little reason why, pending alternatives, they cannot play a valuable role in advancing our understanding of economic phenomena (such as how capital constrained entrepreneurs contract for resources or evaluate opportunities.)

Similarly, we need to acknowledge the importance of qualitative case studies of businesses and entrepreneurs. Clearly there are risks: to paraphrase the poet Blake, case researchers do sometimes "see a World in a Grain of Sand." I also worry that the perspectives and memories of case protagonists can color the data they provide. On the other side, objective large sample data also has its limitations. We should keep in mind Schumpeter's criticism of research based on aggregate economic data: "It keeps analysis on the surface of things and prevents it from penetrating into the industrial processes below, which are what really matters. It invites a mechanistic and formalistic treatment of a few isolated contour lines and attributes to aggregates a life of their own and a causal significance that they do not posses."[73] Moreover we can take steps to ameliorate the problems of overreaching by studying a large number of cases, written

up and interpreted by many individuals. In this book for instance, I have relied on my own interviews and case studies, hundreds of papers written by my students and on a large number of biographies and memoirs of entrepreneurs. I have also tried to limit the idiosyncrasies of my interpretations by comparing them to my students' analyses of the same data.*

Advances through studying specific cases require a concurrent broadening of economic theory. We cannot 'just observe': we need hypotheses to filter and organize the pertinent facts. But many current economic theories about entrepreneurs and firms draw attention to an overly narrow class of data. The limitations of the modern 'theory of the firm' provides an important example of the usefulness of a broader perspective. In order to distinguish between hierarchical firms and markets populated with autonomous decision makers, the current theory emphasizes constructs such as authority and control. With some exceptions, such as the Alchian and Demestz's 1972 paper, the literature has little to say about the problem of organizing joint effort. The theory focuses more on bilateral prisoner's dilemma games between 'principals' and 'agents' rather than on multilateral cooperation. Formal analyses of group effort or team work (such as Holmstrom's 1982 paper) have produced interesting insights about the incentives for individuals to "free-ride." This literature however focuses on highly stylized settings, and has little to say about richer forms of interaction between team members.

As a result, the overlap between the concerns of firm theorists and the efforts of entrepreneurs like Hewlett and Packard, Sam Walton, and Marvin Bower to build long-lived firms seems small. Standard theory of the firm textbooks have little in common with David Packard's memoir *The H-P Way* or Sam Walton's *Made in America.* The language of conflict inherent in the usual framing of principal-agent problems draws attention away from the efforts of entrepreneurs to get members of the firm to cooperate and to 'internalize' the firm's goals. The theory of the firm has little room for H-P's company picnics (which take up two pages in the *H-P Way*), Sam Walton's hula dances, hiring practices that trade-off talent for personality 'fit' with the group or for unilateral gift giving to firm members to create reciprocal obligations and loyalty. It does not take into account the heterogeneity and malleability of the goals and wants of individuals; it tacitly assumes that employees have fixed preferences that group norms cannot materially affect.

All theory of course abstracts from the reality and for many problems, 'oversimplification' may be inconsequential. The known 'incompleteness' of Newtonian physics for instance did not stop NASA scientists from using it to land a man on the moon. The choices and reasoning of entrepreneurs suggest however that the variables that the theory of the firm glosses over have important economic implications for an organization's capacity to undertake new initiatives. Employees will be more willing for instance to specialize their human capital for a new project if they subscribe to the firm's goals and believe that

* For instance, I required students in my course to read the compilation *Tales of Successful Entrepreneurs,* which contains relatively raw data, and – fairly early in the term – write up an analysis of the issues we have covered in this book.

mangers will not exploit the limited transferability of their knowledge and skills. We may further note that the popular and scholarly management literature has long moved beyond its initial militaristic or 'Theory X' focus on authority. Modern management practice accords as much importance to 'Theory Y' principles for building teamwork and loyalty as it does to the design of systems and to monitor and control employee behavior. It also recognizes that a focus on controls over individual behavior may impair group solidarity and effort.

The theory of the firm could relatively easily incorporate some ideas (such as investments in building employee trust) from the management literature. Incorporating other assumptions (such as the malleability of employee preferences) could impair analytical tractability. But, in terms of explaining real world economic phenomena, excluding modern management practices is as problematic as neglecting the circulatory and nervous systems in a model of human anatomy and recognizing only the skeletal system. Studies of the evolution of firms and markets ought to pay as much attention to Edgar Schein's ideas of corporate culture as Alfred Chandler's histories did to the transaction costs models of Oliver Williamson.

Understanding the processes of change requires attention to exceptional phenomena. Economic analysis ought to pay as much attention to deviant phenomena as do historians, evolutionary biologists, psychologists and sociologists. An exclusive focus on what happens 'on average' leads us to attribute the creation of new profit streams and firms to chance, to the otherwise undistinguished player who got lucky. To say something systematic about such out of the ordinary events, we have to use our knowledge of central tendencies to examine the distinctive features of the outliers. We may further note that the vast number of economic agents and events provides a sizable sample of special cases – the evolution of an IBM or Microsoft is an unusual but not as extraordinary an event as a revolution or war.

We need a special effort, I believe, to examine the psychology of 'exceptional' entrepreneurs. Schumpeter put this psychology at the center of his economic theories, but most modern economists shy away from treating variations in the traits of individuals as explanatory variables. The following claim by the economist Franklin Fisher exemplifies the prevailing ethos:

> As a teacher of mine (probably Carl Kaysen) once remarked some thirty years ago, it may very well be the case that one cannot understand the history of the American rubber tire industry without knowing that Harvey Firestone was an aggressive guy who believed in cutting prices. Maybe so. But then, as someone else (probably Mordecai Kurz or Kenneth Arrow) remarked to me a few years ago, the job of theory is to discover what characteristics of the rubber tire industry made such aggressive behavior a likely successful strategy. Absolutely right. That question would be answered if we had a generalizing theory of oligopoly.[74]

For reasons discussed in Chapter 12, I consider the search for innate characteristics of the rubber industry that made it conducive to aggressive strategies as implausible* and contrived. An analogy would

* As a thought experiment, I once tried to relate the vertical structure of metal extraction industries to the position of the metal in the periodic table thus: The oxides of metals like sodium and potassium that occupy a low position in the periodic table can be found in large quantities but required considerable

be a historical determinist's attempt to explain the evolution of Germany and Italy without taking into account the roles and personalities of Bismark and Garibaldi. The neglect of individual entrepreneurs seems to derive mainly from convention. As Sutton puts it: "In seeking to explain why things went this way rather than that, we rapidly outrun those systematic and measurable influences that are the domain of the contemporary economist, and we are drawn ineluctably into the historian's realm of accident and personality."[75] And, the implication I draw from Sutton's statement, is that in order to explain significant variations in important economic phenomena, we must venture out of the domain of contemporary economists and examine the issue of personality.

We can and should do so in a systematic way however. To merely say that exceptional entrepreneurs drive economic change does not provide more insight than the claim that changes arise by chance. We have to disaggregate what entrepreneurs do under different conditions and relate specific tasks to specific traits. Fortunately, work in 'behavioral economics' and related fields has given us a much deeper knowledge of the psychology of cognition and decision making than Schumpeter had at his disposal. So it is more feasible to map tasks into traits. But here too we have to focus more on variations in traits and personalities rather than on the central tendencies. Much of the work in behavioral economics focuses on the cognitive biases of the typical individual, whereas my analysis suggests that *differences* in ambiguity aversion, self-control, susceptibility to framing and so on play a crucial role in the formation and evolution of businesses.

Lastly, and possibly most importantly, we need to develop appropriate standards for scholarly inquiry. The rhetoric of economic analysis (if not always the reality) seems to crave the norms of the natural experimental sciences, which we cannot easily apply to the transient and out of the ordinary processes of change. Here it would help to adapt models for research from fields such as history, literature, anthropology or even some of the more speculative 'speculative' sub-fields of physics. Scholars who analyze the works of Shakespeare or try to explain the origins of the Second World War have managed to establish high standards for research and discourse in spite of measurement problems and the lack of matched samples. Incorporating their standards for consistency of reasoning, the integrity of data, building on prior work and so on will provide much needed respectability and draw the best and the brightest to work on exciting, real world issues of economic change.

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energy to break the metal oxygen bond. The value added is therefore concentrated in the downstream extraction of the metal rather than upstream mining and discovery. As one progresses along the periodic table (through aluminum, copper, silver and gold) the oxide become more scarce but the metal-oxygen bond easier to break. Correspondingly, the economic action progressively shifts from the extraction to mining and discovery. This is the **only** example I can think of which ties the structure of an industry to a truly innate characteristic.

Endnotes

[1] Stiglitz (1990) p.53
[2] Solow (1957) p. 320
[3] Stiglitz (1990) p.53
[4] Baumol (1993) p. 4
[5] Elster (1993) p. 118-119, 247
[6] Rosenberg (1976) p. 66
[7] Acs and Audretsch (1991) 39-40
[8] Scherer (1988) 4-5, cited in Acs and Audretsch (1991) 40
[9] Arrow (1982)
[10] Scherer (1982) 234-235, cited in Acs and Audretsch (1991) 42
[11] Scherer (1983) 115-116, cited in Acs and Audretsch (1991) 43
[12] Winter (1984) 267
[13] Acs and Audretsch (1991) 59
[14] Steffens (1993) p. 197
[15] Steffens (1993) p. 179-181
[16] Steffens (1993) p. 197
[17] Estimates supplied by Joanne Guiniven, Electronics Consultant, McKinsey & Co.
[18] Moore (1996) p. 166
[19] Correspondence with Joanne Guiniven, Electronics Consultant, McKinsey & Co..
[20] The discussion on sub-contracting draws on and extends an unpublished working paper by Bhide and Stevenson (1986)
[21] Schumpeter (1934) p. 64, note 1 cited in Elster (1993) p.114
[22] Schumpeter (1939) p.85, cited in Rosenberg (1976) p. 67
[23] Schumpeter (1934) 88, cited in Baumol (1993) 6
[24] Schumpeter (1944) p10. cited in Rosenberg (1976) p. 67
[25] Rosenberg (1976) p. 77
[26] Rosenberg (1976) p. 67
[27] Rosenberg (1976) p.71
[28] Rosenberg (1976) p.71
[29] Rosenberg (1976) p.72-73
[30] Rosenberg (1976) p.67
[31] Rosenberg (1976) p.75
[32] Rosenberg (1976) p.75-76
[33] Schumpeter (1961) PP. 81,83-84
[34] Jensen (1993) p. 833
[35] McCraw and Tedlow (1997). P.267-268
[36] U.S. Department of Commerce, Bureau of the Census (1975). p. 716
[37] Cringely (1996) p. 125-126
[38] U.S. Department of Commerce (1998) p. 4
[39] U.S. Department of Commerce (1998) p. 6
[40] U.S. Department of Commerce (1998) p. 6
[41] Petroski (1990)
[42] Kirchoff and Phillips (1989)
[43] Flint (1998)
[44] Jensen (1993) p. 838
[45] Jensen (1993) p. 835
[46] Jensen (1993) p. 841
[47] Jensen (1993) p. 841
[48] Bartlett and Ghoshal (1993), cited in Nohria (1996) p. 22
[49] Caves and Kreps (1993), cited in Nohria (1996) p.22

50 Acs and Audretsch (1990) p. 15
[51] Arrow (1972)
[52] Fukuyama (1995)
[53] Akerlof (1970)
[54] Axelrod (1984) p.178
[55] McCraw (1997) p. 316
[56] Acs and Audretsch (1990) p.4-5
[57] Acs, Audretsch and Carlsson (1990) p. 141-142
[58] Scherer (1980) p. 98
[59] Sahlman (1990)
[60] Copeland and Weston (1979), cited in Nohria (1996) p.10
[61] Chandler (1990)
[62] Nohria (1996) p. 16
[63] Brokaw (1993)
[64] McCraw (1997).p327
[65] McCraw (1997).p330
[66] Braudel (1986) p.586-589
[67] Bhide and Stevenson (1990)
[68] Florida, R. (1994) p. 58
[69] Jensen (1993) p. 858
[70] Goldberg (1976)
[71] Zingales, L., (1997)
[72] Donna Coch (1997) provides a good lay overview of Fischer's work.
[73] Schumpeter (1939) p. 44
[74] Fisher (1989) 119.
[75] Sutton (1996) p. 324