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The rise and fall of startups: Creation and destruction of revenue and jobs by young companies

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Abstract

Using a large multi-country multi-industry sample of over 158,000 companies, the early-stage company sector is documented to have sizable destruction of revenues and jobs and as well as sizable gross creation of revenues and jobs. The creation aspect has captured the dominant attention of researchers, commentators, and policy makers. Destruction, despite its large magnitude, has long been a backwater of research and most commentary on this sector. Destruction is not simply non-growth but rather prior growth that is subsequently reversed. This paper analyzes creation and destruction evidence across 10 different countries and across eight different major industry groups. Yearly growth/decline rates using revenues and headcount for Years 2 to 5 are analyzed. In each of the three growth years examined there are large amounts of destruction as well as creation simultaneously occurring. For example, in Year 5 gross revenue destruction is 34% of gross revenue creation whilst gross job destruction is 65% of gross job

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creation. A small percentage of companies accounts for a large percentage of the total job and revenue destruction each year. This small percentage of large destroyers is especially interesting because they had to have had, by necessity, prior sizable creation. This rapid rise and subsequent rapid fall has been very much ignored in the research literature. Regression analysis highlights this aspect for the sample of destroyers. The diverse sources of revenue and job destruction are discussed and potential fruitful research directions highlighted.

1. Introduction

The growth and contributions that early-stage companies make to the economy are the dominant themes in much of the research and business literature as well as the government policy debate. Growth in jobs, and to a lesser extent growth in revenues, is the focus of many discussions. Governments struggling with high unemployment numbers see the sector as an important platform to make significant progress in creating new jobs. The Obama Administration motivated its Startup America Partnership as follows: "Companies less than five years old account for all of the net growth in our country between 1980 and 2005."[1] Groups seeking major changes in society often see the early-stage company sector as a key catalyst for those changes—clean energy startups, for example, have been highly promoted by groups seeking major reductions in fossil-fuel consumption. Countries seeking to strengthen their entrepreneurial capacity frequently will look to the early-stage sector for major contributions. For example, Google Australia commissioned a paper by PWC on "The startup economy: How to support tech startups and accelerate Australian innovation". A key conclusion was that the "Australian tech startup sector has the potential to contribute $109 billion or 4% of GDP to the Australian economy and 540,000 jobs by 2033."[2]

Whilst there is recognition in the research and business literatures and the policy arena that destruction of revenues and jobs as well as their growth is a characteristic of the early-stage sector, there is not a systematic documentation of the magnitude and the simultaneous nature of that destruction. Most studies and descriptions where destruction is recognized focus on the experiences of an individual company or unemployment statistics related to a country. Individual company descriptions of destruction are often tabloid-like with a "train-wreck" theme. Country based descriptions of destruction typically highlight job destruction with minimal or zero coverage of revenues. This extensive omission of revenue destruction analysis is a major gap in the literature as without company revenues, there can be no sustained job creation at the individual company level.

This paper examines and discusses the evidence relating to destruction of both revenues and jobs in the early-stage company sector across 10 different countries and across eight different industry groups. Years 2 to 5 of a company and the path of its growth or decline are analyzed. Section 2 uses evidence from a literature and web search to document the relative neglect of the destruction story as opposed to the growth story. Section 3 overviews the threads of evidence on destruction found in a diverse set of research areas. Section 4 outlines the country and industry breakdown of the sample of early-stage companies examined. New evidence at both a multi-country and multi-industry level of the magnitude and nature of destruction, as well as creation, is presented in Section 5. Sections 6, 7, and 8 extend the existing literature in three areas—the contribution of a dominant few companies to destruction as well as creation (Section 6), the "ladders

and snakes" growth path of many companies (Section 7), and the simultaneity of revenue changes and job/headcount changes at the individual company level (Section 8). The potential sources of destruction are discussed in Section 9 where we highlight that the destruction phenomenon is a far more complex one than individual research areas have recognized. Potential fruitful research directions on destruction are discussed in Section 10. We posit that decline/destruction is simply not the inverse of the growth/creation story that has been the dominant focus in many literatures and policy discussions.

2. Early-stage company decline as a backwater of research

Compelling evidence exists that company growth/firm growth occupies front and center stage of research with company decline/firm decline very much in the backwater. Using the FACTIVA database,[3] searches were made for the frequency with which the following phrases were used—"company growth" vs. "company decline," and "firm growth" vs. "firm decline." The search was restricted to peer-reviewed journals in the database. Over the 1993 to 2012 period, the percentage of mentions is 99% for "company growth" vs. 1% for "company decline" and 98% for "firm growth" vs. 2% for "firm decline."

Google searches on the frequency with which these four phrases are part of a broader dialogue yielded a similar result. Here there is a much wider set of articles, journals, newspapers, etc. being searched. The percentage of mentions for "company growth" is 99% vs. 1% for "company decline." The same 99% to 1% comparison holds for "firm growth" vs. "firm decline." Clearly, "company decline" and "firm decline" are very low on the radar screen of this broader dialogue as compared to its dominant focus on "company growth" and "firm growth".

3. Literature review

The evidence and literature on company growth and company decline is spread across many disciplines. Coad's (2009) book on *The Growth of Firms: A Survey of Theories and Empirical Evidence*[4] cites over 450 articles and books that are drawn from many areas. It is instructive that Coad chose to recognize only "growth" and not "growth and decline" in the title of his book. Moreover, Coad's index has 45 separate line items for "growth" but zero line items for "decline" or "destruction." This section overviews some diverse literatures where destruction is recognized to varying degrees—entrepreneurship, economics, strategy/management, sociology, and accounting/finance.

Several patterns are apparent in the below overview of the literature. First, whilst there is recognition of destruction relating to early-stage companies, there is limited research that gives destruction a central or even major part of the analysis. Second, the available evidence predominantly relates to job destruction with very little analysis of revenue destruction.[5] Contributions here from labor economists have been the most pertinent. Third, almost all studies adopt a single country focus.[6] There has been very little attempt to apply a common methodology across multiple countries to gain a richer insight into the destruction phenomenon.

3.1. Entrepreneurship research literature

Research on entrepreneurship was initially found in many of the functional business areas (such as economics, accounting, finance, strategy/management, sociology, and so on). More recently, entrepreneurship has emerged as a field with its own journals (such as *Entrepreneurship Theory and Practice* and *Journal of Business Venturing*). Multiple scholars now describe their "core discipline" as entrepreneurship rather than a traditional functional area. Extensive "survey" type papers

or books can be found. Key areas covered in this research and the reviews pertinent to the growth vs. decline focus of this paper include:

3.1.1. Choice of growth/decline variables. Gilbert et al. (2006), in a review of 48 empirical studies, note that "although there is no single overriding measure of new venture growth, our review of the literature suggests that the most important measures of new venture growth are in terms of sales, employment and market share."[7] The sales (revenues) and employment (headcount) variables are typically more readily available at the company level across large samples of companies. Papers that analyze individual or a small number of company case studies often will highlight that the "growth" concept is more complex than is often found in the research literature—see, for example, the Achtenhagen et al. (2010) review "56 articles investigating business growth and which referred to 'growth' in the title." Qualitative variables that may describe decline were not discussed by these co-authors.

3.1.2. Analysis of company growth/decline rate distributions. Coad (2009), in a chapter on "Growth rate distributions", surveys multiple papers. His discussion places great emphasis on the "heavy tailed" nature of distributions. "Heavy tailed" here refers to the positive "extreme growth events" that "make a disproportionately large contribution to the evolution of industries".[8] Although plots of growth rates are shown with negative parts of the distribution, the magnitude and frequency of this part of the distribution was not the core focus of Coad's summary.

3.1.3. Analysis of the growth/decline path and the frequency of continuations vs. reversals. Garnsey et al. (2006) present evidence that "new firm growth is non-linear and prone to interruptions and set-backs to an extent overlooked in the literature."[9] The samples examined are: (a) headcount data for 237 UK technology companies founded in 1990; (b) headcount and revenue data for 136 German technology companies founded in 1991–1992; and (c) headcount data for 25 fast-growing Dutch companies founded in 1990–1995. A key focus of the empirical analysis was documenting the number of reversals. The relative magnitudes of the headcount or revenue growth vs. decline in the three samples were not examined.

3.1.4. Stages of growth/decline for companies over their "life-cycle". A large literature uses the "human aging" analogy of birth to growth to decline to death when analyzing the path of development and management of companies. A key feature missing from this "stages of growth" literature is recognition of the relatively high frequency of deaths and declines in early-stage companies vs. that found in human demographics. If one used human mortality statistics as a guide, there would be a very small percentage of companies that had a death in their early years. Yet, there is very consistent evidence of a high death rate in early-stage companies. Indeed, the concept of the "liability of newness" has been part of the entrepreneurship literature for many years to describe this widely observed empirical regularity.[10] Levie and Lichtenstein (2010) review over 90 studies that have proposed or exposited the "stages of growth" approach. Their conclusion is a pessimistic one: "We find there has been no agreement about model features, nor has any particular stages model become dominant in the field."[11] Missing from this literature has been modeling or examining the stages of a company that in a very short period has both rapid growth followed by rapid decline.

3.1.5. Early-stage company growth drivers/determinants. This large literature has the dominant theme of identifying variables that explain (ideally predict) why some early-stage companies grow faster or in a more sustained way than other companies. Invariably, decline is not a central or even a secondary aspect of this research. Much of this literature is best described as identifying empirical

regularities that have some plausible causal validity as to potential growth drivers. The "theories" tested rarely have sufficient structure to predict either the magnitude or the speed of company growth. McKelvie and Wiklund (2010), in an extensive review where over 100 articles/books are cited, conclude that "the development of firm growth research has been notably slow. We argue that a major reason for this lack of development is the impatience of researchers to prematurely address the question of 'how much?' before adequately providing answers to the question 'how'".[12] The samples examined in this research invariably concentrate on "growth" companies. For example, Barringer et al. (2005) conducted a "quantitative content analysis of the narrative descriptions of 50 rapid-growth firms and a comparison group of 50 slow-growth companies."[13] Not included in the research was a sample dominated by either "rapid decline" or "slow decline" over the same benchmark three-year period. Many companies examined in this study, especially the slow-growth companies, were well beyond being described as an early-stage company.

3.2. Economics literature

The economics literature has long recognized destruction as an essential part of competitive markets and economic growth. Joseph Schumpeter, in 1942 in his *Capitalism, Socialism and Democracy*, discussed the concept of "creative destruction": "Capitalism … incessantly revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating a new one. This process of Creative Destruction is the essential fact about capitalism."[14]

Labor is the main area of economics where destruction has been the subject of much analysis. Labor economists have for many years examined employment patterns across industries and across countries. Both job losses as well as job gains have been given central attention. For example, *Job Creation and Destruction* by Davis et al. (1996) contains an industry by industry analysis for manufacturing industries in the US. The most extensive overlap with this paper is research by John Haltiwanger and his colleagues relating to gross and net job creation. The source was the Census Bureau's Longitudinal Business Database for all firms and establishments in the US non-farm business sector for the period 1976 to 2005. They conclude that "firm births contribute substantially to both gross and net job creation…. (There is) a rich 'up or out' dynamic of young firms in the U.S. That is, conditional on survival, young firms grow more rapidly than their more mature counterparts. However, young firms have a much higher likelihood of exit so that job destruction from exit is also disproportionately high among young firms."[15] Not included in this research was the creation or destruction of the revenues of the companies examined.

3.3. Strategy/management literature

Extensive analysis on corporate destruction is found in studies of companies that have been major players for many years (even decades) and then later decline or exit. Two extensive studies are Olson et al. (2008) and Collins (2009). Olsen et al. examine the growth histories of Fortune 100 and Global 100 companies "that experienced (growth) stalls between 1955 and 2006." In-depth case studies were developed for 50 companies that in successive 10-year periods had a sizable shift from relatively high growth to minimal or negative growth. They note that "after a burst of energy, growth does not descend gradually: it drops like a stone."[16] They concluded that 87% of the causes of the declines were "internal"/"within management control" and only 13% of the declines were attributable to external factors.

Collins (2009) in *How the Mighty Fall and Why Some Companies Never Give In* adopts a paired sample design. One sample was comprised of companies that were "a great company at some point in history" but later declined. Each paired company "attained and/or sustained exceptional results

during the era that the corresponding fallen company had its negative inflexion."[17] The companies examined were all, at some stage, established companies with decades of corporate history. A major conclusion of the research was that decline is largely "self-inflicted." This finding is consistent with the Olson et al. research referenced earlier.

Although neither of these research projects focused on early-stage companies, the conclusion that decline is more attributable to internal rather than to external factors has potentially much relevance to better understanding destruction in the early-stage company sector. Two examples of large-scale early-company destruction (Myspace and Webvan/HomeGrocer) that many commentators would attribute to self-inflicted wounds are presented in Appendix 1.

3.4. Sociology literature

An important stream of research where decline/destruction is of central concern comes from sociologists and is labeled "organizational ecology." Hannan and Carroll (1992) summarize work done in the prior 15 years:

> our efforts in this book… concentrate on the dynamics of organizational density. We define density of an organizational population as the number of organizations it contains… Organizational populations initially grow slowly from zero, increase very rapidly over a brief period, reach a peak, and then often decline moderately before stabilizing for some, usually extended, period. Patterns of growth and takeoff are more regular than patterns of decline, which are sometimes rapid and sometimes gradual.[18]

Detailed analyses of the evolution of companies in the automobile, commercial banking, and brewing industry are frequently referenced parts of the organizational ecology literature. Although the decline of companies is a pivotal part of this literature, the focus is typically on industry "density" over extended periods (multiple decades). Characteristics of individual companies in their very early years are not a systematic part of this research thrust. Barnett (2008) notes that the emphasis in much of this research is on factors external to the individual companies in an industry: "Ecological models characterize organizations without saying much regarding the actions of individual managers… an ecological model depicts individuals as driven by forces largely outside their immediate control."[19]

3.5. Accounting/finance literature

An ongoing area of accounting and finance research relating to company destruction first emerged in a rigorous way in the 1960s. For example, research by Beaver (1966) and Altman (1968) used univariate and multivariate approaches to identify the characteristics of failed companies (typically operationalized as a "bankrupt" company) vs. paired non-failed companies.[20] A typical finding is Ohlson (1980): "it was possible to identify four basic factors as being statistically significant… these are (i) the size of the company: (ii) a measure(s) of the financial structure: (iii) a measure(s) of performance: and (iv) a measure(s) of current liquidity."[21] Ohlson noted that "most of the analysis should simply be viewed as descriptive statistics and no theories of bankruptcy or usefulness of financial ratios are tested."[22] Some evidence relating to very early-stage companies was indirectly presented in this literature. For example, one financial ratio included in Altman's (1968) multivariate failure prediction model was Retained Earnings/Total Assets (RE/TA). Altman (2013) highlighted that this ratio could capture the higher failure rate of younger companies:

> the age of a firm is implicitly considered in this ratio. For example, a relatively young firm will probably show a low RE/TA ratio because it has not had time to build up its cumulative profits. Therefore, it may be

argued that the young firm is somewhat discriminated against in this analysis, and its chance of being classified as bankrupt is relatively higher than another older firm, ceteris paribus. But, this is precisely the situation in the real world. The incidence of failure is much higher in a firm's earlier years.[23]

The focus of this area of the accounting and finance literature has typically been taking an external perspective of a company (especially as represented in its financial statements) to assess its likelihood of failure. The relative magnitude of destruction associated with failed companies vs. creation by non-failed companies is not the central concern of the accounting and finance researchers. Nor does this research have a focus on failed early-stage companies as opposed to the more general category of failed companies of any age.

4. Sample selection: Multi-country data pertaining to early-stage company revenues and jobs

Almost all early-stage companies in their formative years are privately held rather than publicly listed. Disclosure regulation for private companies varies widely across the world. Some countries have requirements that enable the tracking of revenue and jobs of many companies from their early years. We accessed the ORBIS database[24] to identify companies founded in the 1999–2004 period outside the financial, banking, and insurance industries. To examine revenue and job creation and destruction, we selected those companies with both revenue and headcount data for Year 2 to Year 5 of their first five years. The observation period for each company will lie between 1999 and 2009. Year 1 is not uniformly the same for each company as they start at different times in their first fiscal year. In an attempt to exclude non-pure startups (such as spinoffs from existing companies or new names for existing companies), we imposed additional criteria. In particular, only those companies with less than US$20m revenue and less than 100 employees in their first year and less than US$40m revenue and less than 200 employees in their second year were selected. Ten countries have a sizable number of companies to analyze, including eight European countries (United Kingdom, France, Italy, Spain, Belgium, Sweden, Norway, and Finland) and two Asian countries (Japan and South Korea)—see Table 1 (Panel A). There are 158,681 companies that have both revenue and headcount for Years 2 to 5.[25] The sample will include startups within a country, and in some cases startups new to that country but with a parent company elsewhere. The database does not enable us to distinguish between the two types of startups.

Table 1 (Panel B) shows the Standard Industrial Classifications (SIC) industry breakdown of the sample. The largest industry groups are Services, Mining, Retail Trade, and Wholesale Trade. One benefit of an industry analysis, as an addition to the country analysis, is that the results are less affected by specific differences across countries in their public disclosure requirements. Aggregating at the industry level across different country private company disclosure regimes means any consistency across results for the separate country and industry analyses for destruction are likely to reflect underlying destruction patterns as opposed to country sample selection artifacts.

Our analysis examines Years 2 to 5 of companies that have both revenue and headcount data. There is a survivorship bias in the sample that likely understates the large magnitude of destruction. The most extensive evidence of early-stage company survival rates is from the US. The US Bureau of Labor Statistics reports survival rates for US establishments which started in the 1994 to 2010 period.[26] The data is presented on a calendar year by year basis for survival rates in Year 2, 3, 4, 5, etc. of companies since their establishment. The low-end of the survival rates for Years 2 to 5 for the calendar years with available data are Year 2 (74.4%), Year 3 (62.4%), Year 4 (54.9%), and Year 5 (49.3%). It is likely that most very early-stage exits included in the above statistics are for closed/ shutdown ventures which would involve destruction as opposed to trade sales which can be either

Table 1. Panel A: Composition of country/company sample.

Country	Total no. of companies with revenue and headcount information	Percent (%)
UK	6271	3.95
France	23,370	14.73
Italy	5194	3.27
Spain	71,705	45.19
Belgium	1670	1.05
Sweden	36,505	23.01
Norway	3421	2.16
Finland	2717	1.71
Japan	1919	1.21
South Korea	5909	3.72
Total	158,681	100.00

Panel B: Composition of industry sample.

US SIC nine categories	Frequency	Percent (%)
Agriculture, forestry, and fishing	2782	1.75
Construction	9644	6.08
Manufacturing	12,825	8.08
Mining	28,880	18.20
Retail trade	26,707	16.83
Services	45,714	28.81
Transportation, communication, electric, gas, and sanitation	9030	5.69
Wholesale trade	19,097	12.03
Others	4002	2.52
Total	158,681	100.00

cases of destruction or creation. Trade sales can range from those at deeply discounted prices ("fire-sales") for struggling ventures (likely destruction) to early acquisitions of highly promising ventures (likely creation). However, even high profile acquisitions of promising startups are often based on future revenues and profitability rather than the existing size of the acquired company. For example, *Instagram* (a 2010 startup) was acquired by *Facebook* for approximately US$1bn in April 2012. At this time *Instagram* had fewer than 20 employees and minimal revenue.

5. Early-stage sector evidence on simultaneous creation and destruction

The relative magnitude of creation vs. destruction in the early-stage sector can be showcased in several ways. We first use a graphic approach that captures the full distribution of creation and destruction. Figure 1 presents what we call the Mountain of Creation and the Valley of Destruction for both revenues and jobs. These two figures are twin representations of the same data, but each with a very different emphasis. Consider first revenue creation. Figure 1 (Panel A) plots, for all 10
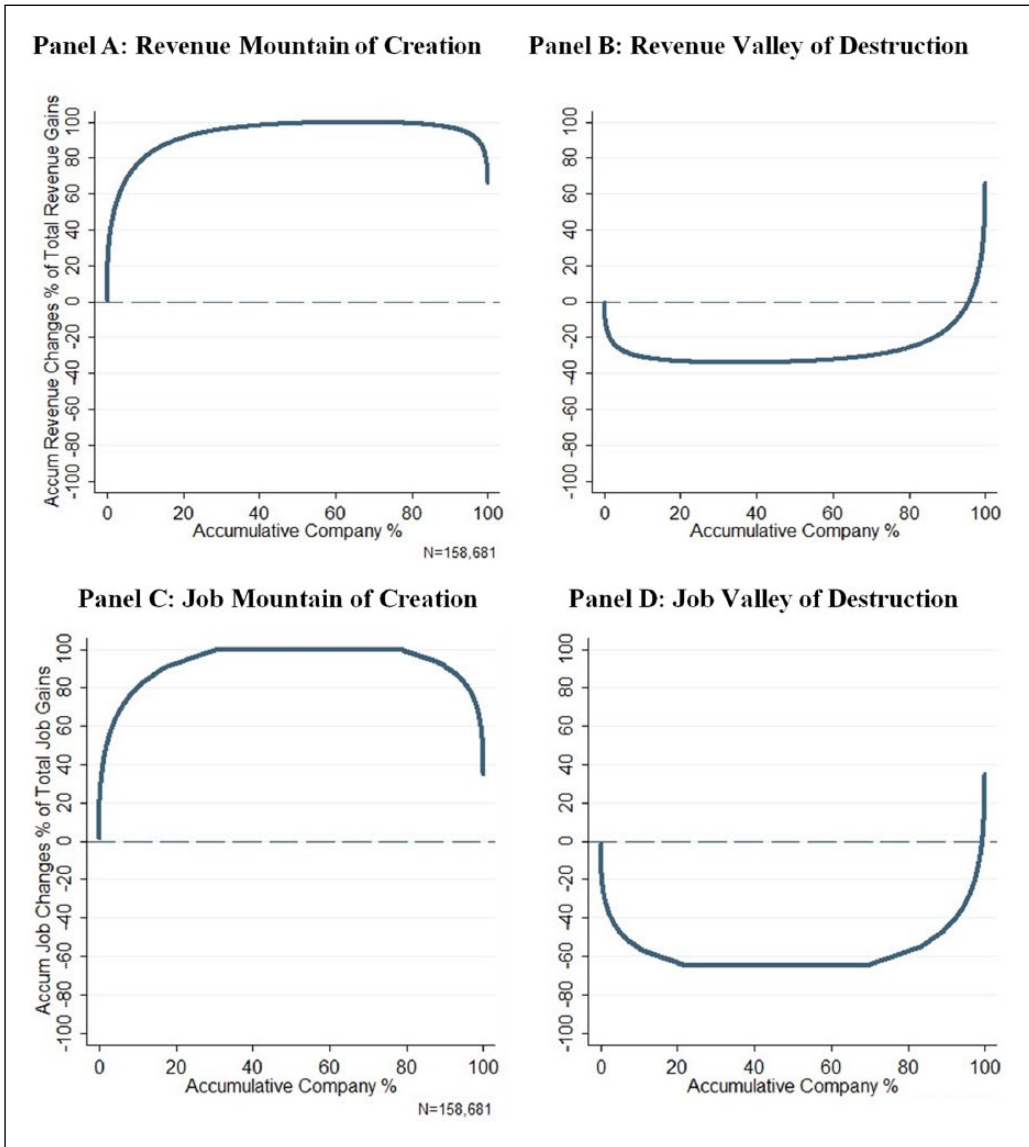
Figure 1. Mountains of Creation and Valleys of Destruction for Revenue and Job Change in Year 5: Pooled Sample.

countries pooled, the cumulative gross revenue created (*Mountain of Revenue Creation*) in Year 5. The Mountain of Revenue Creation is based on a ranking from the company with the most new revenue created in the year of focus at the top to the company with the most revenue destroyed in that same year at the bottom. By construction, each company appears only once in each plot. The creation curve in Panel A plots the cumulative amount of revenue created in the sector. The curve keeps increasing as long as the next company being added has revenue creation in the chosen year. The curve is flat for those companies that have no change in revenue in the chosen year. The curve then declines as companies with revenue losses in that year are successively cumulated. The last

company added to the curve will be the one with the largest revenue loss in that year. The *Valley of Revenue Destruction* (Figure 1, Panel B) is the reverse of the Mountain of Revenue Creation. Companies are ranked from the highest revenue destroyer in the given year to the highest revenue creator. Each horizontal axis in Figure 1 goes from 0% to 100%, representing the full set of companies being analyzed. The maximum level of the vertical axis is 100%, which is set using the total gross revenue created in that year by the companies with available data. This occurs when the cumulative curve goes flat. If there is net revenue creation in that year, the cumulative Mountain of Revenue Creation curve will always sit above the 0% horizontal line. The minimum level of the vertical axis will be influenced by whether there is net revenue creation (in which case it will be between 0% and –100%) or net revenue destruction (in which case it will be the ratio of the gross revenue destroyed to gross revenue created expressed as a percentage—e.g. –120% if the total amount of revenue destroyed is 120% of the total gross revenue jobs created in that same year). Both the creation curve and the destruction curve in Figure 1 for the same year will end at the same point, which is the net revenue created by all companies in that year. Panels C and D of Figure 1 present the same two cumulative plots for job creation and job destruction, respectively. While we report only Year 5 results in Figure 1, the same patterns are also observed for Years 3 and 4.

There are several important facts showcased by Figure 1. First, there is net revenue creation and net job creation in Year 5 for all 10 countries pooled. This is consistent with the early-stage sector being an engine of growth for economies. Second, there is a sizable amount of both revenue and job destruction simultaneously occurring each year. This is a much less appreciated aspect of the sector. Third, the percentage of destruction is larger for jobs than for revenue. For example, 65% of the total gross jobs created by those companies creating jobs in Year 5 are simultaneously being lost by those companies reducing headcount in that same Year 5. In contrast, for revenue the comparable destruction percentage is only 34%. Sustained creation of jobs appears to be a sizably bigger challenge than sustained creation of revenue for early-stage companies.

The results in Figure 1 pertain to all 10 countries pooled. Table 2 presents, for each of the 10 countries, a summary of net gains as compared with total gross gains and the total losses compared with total gross gains for both revenue and headcount. Table 2 has summary data for each of Years 3, 4, and 5. The patterns that hold in the pooled data in Figure 1 are, with few exceptions, also found for each of the 10 countries. In every country, there is systematic net revenue and net job creation each year. A second pattern is that destruction is more marked for jobs than for revenue. Summary results for an equal weighting of companies are:

Equal weighting summary results			
Scenario	Year 3	Year 4	Year 5
Job destruction	31%	47%	65%
Revenue destruction	13%	19%	34%

This result is a broad-based one at a country-by-country level. It is observed in nine out of 10 countries in Year 3 (Belgium being the exception), 10 out of 10 in Year 4, and nine out of 10 in Year 5 (with Japan as the exception). Thus, in 28 out of 30 comparisons in Table 2, the percentage for job destruction exceeds the percentage for revenue destruction in the year being examined.

There are considerable differences across the 10 countries in the magnitude of creation or destruction. For example, Norway has a very high percentage of job destruction in each of Years 3 (78%), 4 (79%), and 5 (93%). In contrast, the UK has a relatively low amount of job destruction,

Table 2. Simultaneous creation and destruction of revenue and jobs: Individual country and pooled sample results for Years 3, 4, and 5.

Country	Panel A: Revenue creation			Panel B: Revenue destruction		
	Net gains/Gross gains (%)			Total losses/Gross gains (%)		
	Year 3	Year 4	Year 5	Year 3	Year 4	Year 5
UK	89	81	64	11	19	36
France	81	88	70	19	12	30
Italy	92	83	63	8	17	37
Spain	87	78	66	13	22	34
Belgium	64	85	66	36	15	34
Sweden	79	80	64	21	20	36
Norway	85	85	70	15	15	30
Finland	63	50	47	37	50	53
Japan	84	74	64	16	26	36
South Korea	92	82	72	8	18	28
Country eq wt[a]	82	79	65	18	21	35
Company eq wt[b]	87	81	66	13	19	34

Country	Panel C: Job creation			Panel D: Job destruction		
	Net gains/Gross gains (%)			Total losses/Gross gains (%)		
	Year 3	Year 4	Year 5	Year 3	Year 4	Year 5
UK	77	75	55	23	25	45
France	70	56	47	30	44	53
Italy	80	47	25	20	53	75
Spain	64	46	25	36	54	75
Belgium	75	56	36	25	44	64
Sweden	70	52	46	30	48	54
Norway	22	21	7	78	79	93
Finland	62	49	30	38	51	70
Japan	83	72	75	17	28	25
South Korea	71	60	36	29	40	64
Country eq wt[a]	67	53	38	33	47	62
Company eq wt[b]	69	53	35	31	47	65

[a]Each country is weighted equally (10%) to compute pooled percentages.
[b]Each company is weighted equally (1/158,681) to compute pooled percentages.

especially in Years 3 (23%) and 4 (25%). Year 5 for the UK has a job destruction of 45%, which is the second lowest of the 10 countries. Japan, in general, has below-average destruction in jobs in Years 3 (17%), 4 (28%), and 5 (25%). It is beyond the scope of this paper to develop and probe alternative explanations for these country differences. Countries differ in multiple areas—such as their early-stage company ecosystems, the relative amount of government program support, and the social and cultural environments in which success or failure of startup entrepreneurship is viewed. They also differ in the comprehensiveness of their mandates for public disclosures. An extension of our research would be to probe the relative importance of these and other factors in explaining country differences of the kind reported in our research.

Table 3. Simultaneous creation and destruction of revenue and jobs: Individual industry and pooled sample results for Years 3, 4, and 5.

Country	Panel A: Revenue creation			Panel B: Revenue destruction		
	Net gains/Gross gains (%)			Total losses/Gross gains (%)		
	Year 3	Year 4	Year 5	Year 3	Year 4	Year 5
Agriculture, forestry, and fishing	81	80	55	19	20	45
Construction	86	81	73	14	19	27
Manufacturing	88	83	69	12	17	31
Mining	86	76	56	14	24	44
Retail trade	84	86	69	16	14	31
Services	86	80	63	14	20	37
Transportation, communication, electric, gas, and sanitation	92	88	75	8	12	25
Wholesale trade	86	79	71	14	21	29
Others	85	80	52	15	20	48
Industry eq wt[a]	86	81	65	14	19	35
Company eq wt[b]	87	81	66	13	19	34

Country	Panel C: Job creation			Panel D: Job destruction		
	Net gains/Gross gains (%)			Total losses/Gross gains (%)		
	Year 3	Year 4	Year 5	Year 3	Year 4	Year 5
Agriculture, forestry, and fishing	59	53	17	41	47	83
Construction	69	45	1	31	55	99
Manufacturing	72	48	35	28	52	65
Mining	63	39	15	37	61	85
Retail trade	64	40	35	36	60	65
Services	76	66	52	24	34	48
Transportation, communication, electric, gas, and sanitation	74	57	47	26	43	53
Wholesale trade	56	60	32	44	40	68
Others	74	60	30	26	40	70
Industry eq wt[a]	67	52	29	33	48	71
Company eq wt[b]	69	53	35	31	47	65

[a]Each industry is weighted equally (10%) to compute pooled percentages.
[b]Each company is weighted equally (1/158,681) to compute pooled percentages.

Table 3 reports results based on an industry breakdown of the sample of companies. Across the eight specific industries in Table 3, there is the same consistent pattern observed for the 10 countries of large-scale destruction. By Year 5, the range of gross destruction to gross creation for revenues is from 27% for Construction to 45% for Agriculture, Forestry and Fishing. For jobs/headcount, the comparable range is from 48% for Services to 99% for Construction. For each of the eight industries in each year, the level of destruction for jobs/headcount is larger than the level of destruction for revenues.

One pattern in Tables 2 and 3 is the growing percentage of destruction in the early-stage sector as companies age. For companies surviving their first five years, the percentage of total losses to total gains for all countries pooled (each company weighted equally) increases as follows:

Equal weighting summary results—5-year survival

	Year 3	Year 4	Year 5
Job destruction	31%	47%	65%
Revenue destruction	13%	19%	34%

For 9 of the 10 countries, a pattern of year by year increasing job destruction as a percentage of total jobs created as companies age is found—Japan is the exception, with Year 3 (17%), Year 4 (28%), and Year 5 (25%). For seven of the eight industries in Table 3, the same increasing pattern is found—wholesale trade is the exception. This pattern is less consistent for revenues. For six of the 10 countries, there is a pattern of year by year increasing revenue destruction as companies get older. For seven of the eight industries this pattern holds—retail trade is the exception. It is important to caveat that the survivorship bias in our sample likely contributes, in part, to this aging effect. Companies not surviving to Year 5 could well have destruction that would increase the reported percentages in Tables 2 and 3 for Year 3 and Year 4.

6. The dominant few contributors to creation and destruction

There is much evidence that a small number of highly successful companies contribute a disproportionately high percentage of the gains from the early-stage sector. For example, Sahlman (2010) reports a breakdown of the payoffs of a successful US venture capital fund that made 127 investments from 1996 to 2005.[27] Seventeen of the 127 investments, requiring only 11.9% of the portfolio outlays, contributed 85.2% of the total portfolio returns. Morle et al. (2012) report evidence from the Startup Genome database that includes over 1000 Australian respondents.[28] Ventures in this database are classified into discovery, validation, efficiency, and scale. Only 4.8% of startups in Sydney and Melbourne were reported to be "successfully scaling." What is predictably but still importantly absent in commentary or research on "the dominant few" is comparable analysis of the percentage of destruction that is contributed by differing numbers of companies.

The slope of the Mountain of Creation and Valley of Destruction cumulative curves in Figure 1 provides insight into how creation and destruction are spread across the total population of early-stage companies being analyzed. The steeper the slope of each curve at its start and end, the higher the percentage of total creation and destruction that is contributed by a smaller percentage of companies. Table 4 presents these percentages at the country by country and pooled levels for the largest creators—top 1%, 5%, and 10% for revenue creation (Panel A) and job creation (Panel C) in Year 5. The same percentages are presented for the largest destroyers—for revenue destruction in Table 4 (Panel B) and for job destruction in Table 4 (Panel D). Table 5 presents comparable percentages at the industry by industry and pooled levels.

For the pooled samples the contributions of the top 1%, 5%, and 10% are highly skewed for both creation and destruction, and for both revenue and jobs. The business literature frequently refers to the 80/20 rule in many contexts to emphasize the key importance of a disproportionate few.[29] In the revenue and job contexts examined in this paper, the role of the disproportionate few is even higher than the classic 80/20 rule. Table 6 shows the pooled results for Year 3, Year 4, and Year 5 with each company weighted equally. Note that each of the 1%, 5%, and 10% groupings of companies in Table 6 for destruction have a higher percentage of the total destruction than the comparable % groupings for creation do. For example, the Year 5 destruction for revenues was 91% for the top 10% compared to the comparable Year 5 creation by the top 10% for revenues of

Table 4. The disproportionate few creators and destructors in Year 5: By country and pooled sample.

Country	Panel A: Revenue creation			Panel B: Revenue destruction		
	As % of gross revenue created			As % of gross revenue destroyed		
	Top 1%	Top 5%	Top 10%	Top 1%	Top 5%	Top 10%
UK	35	66	81	38	76	91
France	36	68	83	60	85	93
Italy	38	62	75	43	73	87
Spain	35	60	73	43	73	86
Belgium	34	57	71	37	76	91
Sweden	39	64	77	45	75	87
Norway	21	51	69	47	77	89
Finland	25	60	79	63	87	94
Japan	25	52	67	37	70	85
South Korea	25	51	65	42	74	88
Country eq wt[a]	31	59	74	46	77	89
Company eq wt[b]	41	68	81	53	81	91

Country	Panel C: Job creation			Panel D: Job destruction		
	As % of gross jobs created			As % of gross jobs destroyed		
	Top 1%	Top 5%	Top 10%	Top 1%	Top 5%	Top 10%
UK	48	73	86	37	72	87
France	41	68	81	37	66	81
Italy	43	68	81	48	75	86
Spain	33	61	75	44	70	84
Belgium	24	55	71	40	69	83
Sweden	39	67	82	40	73	88
Norway	33	66	84	39	68	85
Finland	34	68	84	44	77	90
Japan	47	70	82	44	82	95
South Korea	24	52	69	37	66	81
Country eq wt[a]	37	65	80	41	72	86
Company eq wt[b]	40	67	80	46	74	86

[a]Each country is weighted equally (10%) to compute pooled percentages.
[b]Each company is weighted equally (1/158,681) to compute pooled percentages.

81%. In short, the destruction story is even more concentrated in a smaller set of companies than the creation story.

7. Ladders-and-snakes growth path[30]

High-growth startups are often showcased as having continuous growth paths. Companies such as *eBay* and *Google* (US), *Baidu* and *Tencent* (China), *Atlassian* (Australia), or *Bharti Airtel* (India) have each shown consistent growth since in their early years (and beyond). There is much evidence that this continuous growth path is more the exception than the rule even among so-called growth companies—see Section 3 of this paper. To extend the available evidence and

Table 5. The disproportionate few creators and destructors in Year 5: By industry and pooled sample.

Country	Panel A: Revenue creation			Panel B: Revenue destruction		
	As % of gross revenue created			As % of gross revenue destroyed		
	Top 1%	Top 5%	Top 10%	Top 1%	Top 5%	Top 10%
Agriculture, forestry, and fishing	30	58	72	44	74	86
Construction	38	67	81	46	81	92
Manufacturing	29	59	74	49	81	92
Mining	32	60	74	44	74	87
Retail trade	40	65	77	47	74	86
Service	44	72	83	60	84	92
Transportation, communication, electric, gas, and sanitation	44	70	81	53	83	93
Wholesale trade	38	64	78	45	78	90
Others	47	74	86	53	83	93
Industry eq wt[a]	38	65	78	49	79	90
Company eq wt[b]	41	68	81	53	81	91

Country	Panel C: Job creation			Panel D: Job destruction		
	As % of gross jobs created			As % of gross jobs destroyed		
	Top 1%	Top 5%	Top 10%	Top 1%	Top 5%	Top 10%
Agriculture, forestry, and fishing	34	63	78	44	73	87
Construction	34	62	76	56	77	87
Manufacturing	29	58	74	37	68	83
Mining	29	59	75	38	68	83
Retail trade	41	67	80	42	68	82
Service	50	75	87	50	78	90
Transportation, communication, electric, gas, and sanitation	31	60	75	41	73	87
Wholesale trade	31	58	73	50	75	87
Others	49	77	89	41	72	86
Industry eq wt[a]	36	64	79	44	72	86
Company eq wt[b]	40	67	80	46	74	86

[a]Each industry is weighted equally (10%) to compute pooled percentages.
[b]Each company is weighted equally (1/158,681) to compute pooled percentages.

link it to the destruction story, we classified the annual growth paths of companies using the sign of their year-to-year growth in revenue and headcount: positive (+), no change (0), and negative (−). We focus on growth in Year 3 (Year 3 end vs. Year 2 end), Year 4, and Year 5. We start the analysis using Year 2 data because Year 2 is typically the first year with a full fiscal year of revenue. For each of Years 3 to 5, companies are classified as either growing [+], stable/no change [0], or declining [−]. Table 7 shows the 27 combinations of the +/0/− classification over the three successive growth periods (Years 3, 4, and 5) for both revenue and headcount. A summary of the percentage of companies for combinations of these growth/decline paths in Table 7 is:

Combinations of sign of growth/ decline over three consecutive years—Years 3, 4, and 5	Revenue	Jobs
[+,+,+]	35.61%	7.53%
[0, 0, 0]	0.02%	22.14%
[–, –, –]	2.23%	1.17%
Two +'s and one other	44.94%	24.27%
Two 0's and one other	0.01%	18.78%
Two –'s and one other	16.63%	9.31%
One each of +,0,–	0.55%	14.03%

Table 6. The disproportionate few creators and few destroyers for pooled sample: Percentage of gross gains/gross destruction by top 1%, top 5%, and top 10% in Years 3, 4, and 5.
Panel A: Largest creators.

Year	Revenues			Jobs		
	Top 1%	Top 5%	Top 10%	Top 1%	Top 5%	Top 10%
Year 3	40	67	79	37	63	76
Year 4	39	66	78	42	67	80
Year 5	41	68	81	40	67	80

Panel B: Largest destroyers.

Year	Revenues			Jobs		
	Top 1%	Top 5%	Top 10%	Top 1%	Top 5%	Top 10%
Year 3	56	84	94	52	80	92
Year 4	60	87	95	47	76	89
Year 5	53	81	91	46	74	86

Sustained growth in revenue or headcount, even over a three-year period, does not describe the growth path of the majority of companies we examine. Sustained growth, while not occurring for the majority of companies, is more frequent for revenue than for headcount. Whereas 35.61% of companies experience a sequence of three growth years in revenue, only 7.53% do so with respect to headcount. The fact that sustained headcount growth for startups is sizably less prevalent than sustained revenue growth highlights the deep challenge that policy makers face in seeking solutions to high unemployment and job losses by relying on short-run initiatives for the early-stage company sector.

Of the companies in Table 7 that have positive revenue growth in Year 3, it is more likely that they will have a sequence in Years 4 and 5 of at least one revenue decline than they will have a sequence of two more positive revenue years. Of the companies that have positive revenue growth in Year 3, only 48.01% (35.61%/74.17%) have a [+, +] sequence in Years 4 and 5. In contrast, 51.36% of the companies that have positive revenue growth in Year 3 have a decline in revenue in either Year 4 or Year 5—or in both years.

The most common path for company headcount in Table 7 is a sequence of no change in each of Years 3, 4, and 5—the [0, 0, 0] path. Many companies in our large database start small and stay

Table 7. Growth/decline path sequences of early-stage companies: Pooled sample based on sign of change in revenue/jobs in Years 3, 4, and 5.

Path no.	Panel A: Revenue			Panel B: Job/Headcount		
	Year 3	Year 4	Year 5	Year 3	Year 4	Year 5
	Frequency	Frequency	Frequency	Frequency	Frequency	Frequency
1			35.61% (+)			7.53% (+)
2		55.48% (+)	0.2% (0)		16.15% (+)	3.66% (0)
3			19.67% (−)			4.96% (−)
4			0.17 (+)			3.42% (+)
5	74.17% (+)	0.27% (0)	0.00% (0)	38.07% (+)	11.82% (0)	5.6% (0)
6			0.1% (−)			2.8% (−)
7			11.91% (+)			3.87% (+)
8		18.42% (−)	0.09% (0)		10.1% (−)	3.18% (0)
9			6.42% (−)			3.05% (−)
10			0.22% (+)			3.55% (+)
11		0.34% (+)	0.00% (0)		11.44% (+)	4.83% (0)
12			0.12% (−)			3.06% (−)
13			0.01% (+)			5.32% (+)
14	0.48% (0)	0.03% (0)	0.02% (0)	46.84% (0)	30.19% (0)	22.14% (0)
15			0.00% (−)			2.73% (−)
16			0.07% (+)			1.71% (+)
17		0.11% (−)	0.00% (0)		5.21% (−)	2.57% (0)
18			0.04% (−)			0.93% (−)
19			12.77% (+)			2.24% (+)
20		18.71% (+)	0.08% (0)		6.01% (+)	1.74% (0)
21			5.86% (−)			2.03% (−)
22			0.09% (+)			1.54% (+)
23	25.35% (−)	0.14% (0)	0.01% (0)	15.07% (−)	5.47% (0)	3.05% (0)
24			0.04% (−)			0.88% (−)
25			4.22% (+)			1.27% (+)
26		6.5% (−)	0.05% (0)		3.59% (−)	1.15% (0)
27			2.23% (−)			1.17% (−)
N		158,681			158,681	

small, certainly as regards headcount in their early years. Of the 38.07% of the companies that have job growth (+) in Year 3, only 19.78% also have positive job growth in both Year 4 and Year 5 (7.53%/38.07%). The more common path is a sequence in which there is at least one decline in headcount in either Year 4 or Year 5. Collectively, 31.21% of those with initial job growth in Year 3 will have a sequence of [+,−], [−, +] or [−,−] in Years 4 and 5. We use the concept of ladders-and-snakes growth to reflect growth through a combination of ups and downs. Managing startup companies means not only managing expansion but also understanding how to manage downturns so as to increase the likelihood that the company will return to the growth path.

   Table 7 uses only the sign of the growth/no change/decline classification to create 27 alternative growth sequences. We now look at the magnitude of the revenue and job impacts of companies in one or more of the growth path sequences using the rankings on the sign of the revenue change in

each year (Panel A of Table 7). Three of the growth paths in Table 7 dominate the contribution to aggregate/gross revenue creation (and the associated aggregate/gross job creation) in Year 5:

Growth path over three consecutive years— Years 3, 4, and 5	Percentage of companies	Contribution to gross revenue creation in Year 5	Contribution to gross job creation in Year 5
[+, +, +]	35.6%	66.8%	76.7%
[+, −, +]	11.9%	15.8%	7.6%
[−, +, +]	12.8%	14.0%	14.2%

Three groups dominate the contribution to aggregate/gross revenue destruction and the associated aggregate/gross job destruction in Year 5:

Growth path over three consecutive years— Years 3, 4, and 5	Percentage of companies	Contribution to gross revenue destruction in Year 5	Contribution to gross job destruction in Year 5
[+, +, −]	19.7%	67.2%	45.1%
[+, −, −]	6.4%	17.6%	34.4%
[−, +, −]	5.9%	10.9%	12.0%

Companies that destroy sizable revenues or headcount in Year 5 must have had revenue or job creation in one or more prior years. This is apparent in the above three paths that contribute 95.7% of the aggregate gross revenue destruction and 91.5% of the aggregate gross job destruction in Year 5.

8. Simultaneity of revenue changes and headcount changes

Revenues and headcount represent different measures of growth or decline. Revenues represent interactions between the company and its customers. Headcount represents interactions between the company and its labor market. The relationship between revenue changes and headcount changes in early-stage companies can be affected by multiple factors. One factor is the time between the start of a company and when its first revenue generating product comes to the market. In some industries there can be a very close link (such as a consulting company startup), whilst in other cases there can be many years from company genesis to a marketable product (such as in a life sciences drug discovery startup). A second factor is the employment practices of the startup. Companies that outsource major functions to third parties can show a different relationship than companies that hire their human capital as full-time employees. A third factor is the financial capacity of a company to aggressively increase headcount as part of a strategy to build a growth platform for subsequent revenues.[31]

Table 8 (Panel A) presents Spearman rank correlations between changes in revenues and changes in changes in headcount for the full sample of companies. Given three yearly change observations (Year 3, Year 4, and Year 5) there are 15 pairwise combinations that capture contemporaneous and lead/lag relationships between revenue change and headcount change. All pairwise correlations in Table 8 are significant at the .05 level. The most significant correlations are for the contemporaneous relationship between revenue change and headcount change—the Spearman correlations are 0.34 for Year 3, 0.32 for Year 4, and 0.31 for Year 5.

Regression results for the full sample reinforce the highly significant positive association between revenue changes in one year and headcount changes in the same year—see Table 8 (Panels B and C). Separate analysis is reported in Table 8 for the subsample with creation in Year 5 and the subsample

Table 8. Association between changes in revenues and changes in headcount.

Panel A: Spearman rank correlations.

Rev year	ΔRev Yr.3	ΔRev Yr.4	ΔRev Yr.5	ΔHC Yr.3	ΔHC Yr.4
ΔRev Yr.4	0.23*	–	–	–	–
ΔRev Yr.5	0.10*	0.14*	–	–	–
ΔHC Yr.3	0.34*	0.21*	0.11*	–	–
ΔHC Yr.4	0.18*	0.32*	0.16*	0.05*	–
ΔHC Yr.5	0.09*	0.16*	0.31*	0.04*	0.03*

*Significant at .05 level.

Panel B: Rank regressions with revenue Year 5 as dependent variable.

Independent variables	Creators $\beta_i/t(\beta_i)$	Destroyers $\beta_i/t(\beta_i)$
Δ Rev. Year 3	0.21 (118.07)	−0.12 (−95.16)
Δ Rev. Year 4	0.21 (117.67)	−0.11 (−87.15)
Δ HC. Year 5	0.11 (58.21)	0.06 (42.91)
R-square	0.303	0.289
Number of Observations	103,273	54,699

Panel C: Rank regressions with headcount Year 5 as dependent variable.

Independent variables	Creators $\beta_i/t(\beta_i)$	Destroyers $\beta_i/t(\beta_i)$
Δ HC. Year 3	0.05 (39.92)	−0.03 (−33.03)
Δ HC. Year 4	0.04 (30.89)	−0.02 (−19.09)
Δ Rev. Year 5	0.06 (50.85)	0.01 (12.23)
R-square	0.122	0.042
Number of Observations	48,353	34,283

with destruction in Year 5. The positive coefficients on all three independent variables in both Panels B and C for creation highlights the momentum factor of many early-stage companies where growth in Year 5 was preceded by growth in Years 3 and 4. The results for destruction reinforce the findings noted in Section 7. Companies that have significant destruction in Years 5 will by necessity have had sizable creation in one or more earlier years. Destruction is not possible without prior creation! For the Year 5 destroyers' regressions in Panels B and C of Table 8, the coefficients on the Year 3 and Year 4 independent variables are significantly negative. This result is consistent with the prior growth of revenues or headcount, some of which is then destroyed in Year 5. The positive coefficient on the Year 5 independent variable for the Year 5 destroyers in both Panels B and C of Table 8 is consistent with the contemporaneous revenue and headcount destruction correlation evidence in Table 8 (Panel A).

9. The complexity of revenue and job destruction and hypothesis formulation

One of the challenges of research on destruction is the complexity of the phenomenon. This section illustrates the diversity of potential hypotheses/explanations for a startup having initial years with

substantive growth and then a reversal with substantive decline. In some cases, this decline may be temporary. In other cases, the losses are never recovered and may well be part of a continuing decline that can end in shutdown/bankruptcy or a "fire-sale" transaction.

9.1. Explanation #1

New startups grow at the expense of previously growing startups. Appendix 1 illustrates this outcome in the social networking space. *Facebook* appears to have created revenue and jobs, in part, at the expense of the previously growing *Myspace*. Multiple startups may be in an emerging market, and several may show early growth due to the expansion of the aggregate size of the total market. However, even in growing markets, some startups typically will experience both absolute declines and relative market share declines. This is the saga of *Myspace*!

In some new areas, multiple startups will be formed at a similar time and each may have early growth. However, one or more then continues growing whilst others decline. An example is in the Latin American online "auction" market. Both *MercadoLibre* and *DeRemate* started in 1999 as "eBay type market" new ventures in multiple Latin American countries. Both had initial growth but over time *MercadoLibre* continued its growth path whilst *DeRemate* declined. *DeRemate* was fully acquired by *MercadoLibre* in 2008.[32]

9.2. Explanation #2

Large established domestic companies take revenue from a startup that had earlier created or grown a new market. These established companies can enter after a delay and then aggressively seek to take revenue and market share in the newly emerging market. This can lead to revenue increase and possibly job creation at the established company but revenue and job losses at the previously rapidly growing startup. Startups who help build new market areas need to anticipate the advent of competition from well-resourced, established companies. These established companies may even acquire one or more competing startups to fast-track their market position in the newly evolving area.

9.3. Explanation #3

The startup enters an established market with a business model that ex post turns out to be economically nonviable. While there may be a short-run transfer of revenue from the established players that revenue may return to the established players when the startup declines or possibly goes bankrupt. The saga of *Webvan* and *HomeGrocer*, described in Appendix 1, illustrates this scenario.

9.4. Explanation #4

Competition from companies in other geographies leads to revenue and job losses at a previously rapidly growing startup. Several US startups in the solar industry saw rapid growth as they built up research and development, and in some cases significant productive capacity. However, competition in their targeted market from well-resourced and, in some cases, government subsidized non-US competitors exporting into the US market (as well as US competitors) resulted in revenue losses and a scaling back in jobs by the US startups. *Solyndra* is a high-profile example. Founded in 2005 in Fremont, California, it manufactured solar panels viewed as being on the cutting edge of technology. Revenue in 2010 was US$140m, with a headcount over 1000. However, large drops

in the prices of competing conventional solar panels (many of which were manufactured in China) led to *Solyndra* facing severe liquidity problems, despite receiving over US$500m in loans from the US Department of Energy. In August 2011, it filed for bankruptcy and laid off more than 1100 employees.[33] While some *Solyndra* revenue and lost jobs may be transferred to other, better-positioned, US-based solar companies, it is likely that some of the revenue and many of the jobs have been "exported" to other countries.

9.5. Explanation #5

Discovery-type startup ventures build headcount (and in some cases revenue), but then encounter technical or market problems that cause a reversal of prior growth. The life-sciences sector is one area where startups can attract sizable front-end investment and build headcount to explore the potential of new technologies. When a "promising" new technology fails to deliver, there is great pressure to reduce the headcount. A classic example is *Helicos Biosciences*, which was founded in 2003 and went public in May 2007 with a headcount of 79. Its S-1 offering document stated that it was a "life-sciences company developing innovative genetic analysis technologies." Headcount reached 114 in December 2007, and its market capitalization was over US$200m by January 2008. However, when the hoped for signs of breakthrough advances for *Helicos* did not occur, it began a cycle of headcount reductions—headcount was 22 by December 2010 and 10 by December 2011. Non-grant revenue of *Helicos* was minimal. Market capitalization in April 2012 was US$8m. It filed for bankruptcy in November 2012.[34] Short of a sudden, major technical breakthrough, a likely exit strategy here is a fire-sale of the company and its patents, with minimal headcount transfer to the acquiring company. The technical uncertainties in such life-science ventures means that such "rise and fall" headcount sagas are often the norm rather than the exception even in companies that are managed in a highly competent and disciplined way.

9.6. Explanation #6

Lawsuits and related litigation places constraints on the ability of a company to continue to grow and can lead to its decline. *GenPharm* was a US/Netherlands 1988 startup that quickly became a leader in the research and development of transgenic animal technology for human healthcare products. It was able to quickly ramp up its headcount via investments from leading venture capital firms and research grants from the Netherlands government. In early 1994, *GenPharm* attempted an Initial Public Offering (IPO). By then, a competitor (*Cell Genesys*) had successfully completed its IPO in January 1993. Jonathan MacQuitty (CEO) noted:

> On February 1, 1994, a few days before we were to have filed for our IPO, *Cell Genesys* filed a lawsuit in state court against *GenPharm*, charging the company with having stolen a trade secret for inactivating a mouse gene… With a lawsuit hanging over our head, the board again decided to pull the IPO.

While the lawsuit was subsequently settled, the failure to raise the money meant that *GenPharm* had to scale back. The Chairman of *GenPharm*, Sam Colella, noted:

> What was left in the U.S. in 1995 was a really shrunk-down organization. At one point, we had about 70 people in the U.S., but we had to scale down to just nine people. The tragedy is that in the end there was no evidence of wrongdoing, and a company that had been on an accelerated growth path ended up being sold, with the subsequent acquirer growing the business into its final multibillion-dollar realization.[35]

The *GenPharm* saga illustrates that factors substantially out of the immediate control of management can cause a spiraling down even when much technical progress is being achieved by a startup.

9.7. Explanation #7

Change in government regulations can result in a sudden contraction of demand, with resultant layoffs. Many startups are accelerated by favorable government economic incentives. The cleantech/green-energy sector is one area in which multiple startups were reliant on a continuation of government programs. However, a change of government or a change in the economic/social environment facing a government can cause sudden shifts in demand for the products of early-stage companies. *Suntech Power*, a 2002 Chinese startup, saw its revenue from Spain go from $US719m in 2008 to $US61m in 2009 when the Spanish government reduced its highly subsidized feed-in tariff terms. In 2011, *Suntech Power* was the world's largest solar panel maker. By 2013 it had to restructure its balance sheet after a sizable destruction in its market capitalization.[36]

9.8. Explanation #8

Macro-economic industry or sector factors lead to a sudden downturn in which some former fast-growing startups become "collateral damage" and suffer rapid declines in revenue or headcount. This occurs regularly with companies in the construction and real estate sectors. These companies often use high financial or operating leverage to exploit "windows of opportunities". They hire a large number of employees either before or as revenue begins to grow quickly. Yet, their fate can turn quickly when the window of the market opportunity shuts down. The change in the global market in 2008 and 2009 caught many such companies with a very high exposure to the downturn. Commodity price declines in the natural resources and agricultural sectors can also dramatically lead to sudden and major declines in the revenues of companies selling those commodities. The 2000/2001 decline in the tech-sector worldwide resulted in many companies that previously had a sequence of ever increasing revenues and headcount suffer declines in both. *Check Point Software Technologies* (a 1993 Israeli startup in computer security) had rapid and sustained increases in both revenues and headcount from 1994 to 2000. In 2001, it reported a more than 20% reduction in revenues and later in 2003 reduced its headcount as a response to dramatic reductions in tech spending by many customers.[37]

The above eight explanations (as well as potentially others) are relatively disparate. It is likely that the building of a credible set of hypotheses that capture the timing, magnitude, and causes of early-stage company destruction will have a predominantly heavy empirical thrust in its early days as opposed to being driven by cohesive economic or organization-based theories.[38]

10. Some fruitful research directions on corporate destruction

Given the pervasive nature of early-stage company destruction and the paucity of existing research, many areas of fruitful analysis exist. Some examples are:

1. Identifying the various growth/decline paths of early-stage companies. Table 7 used a sequence of three years of growth/decline. There are many alternative paths that could be further explored using a longer time frame. One path is a temporary decline and then a return to growth. Paths related to decline include: (a) a rapid decline; and (b) a more gradual decline. Decline can result in a smaller company surviving or a subsequent shutdown, bankruptcy or "fire-sale" transaction. Evidence on the frequency of different growth/

decline paths would help researchers better understand destruction and its many facets. It is important to look at alternative growth/decline paths from both a going forward basis and from an ex post basis. Going forward there can be much uncertainty as to the subsequent path whereas ex post that uncertainty is resolved. Decisions that may increase the probability of subsequent growth can still have some outcomes of sizable decline.

2. Understanding the relative importance of internal vs. external factors as causes of decline/destruction. Section 3.3 discussed the Olson et al. (2008) and Collins (2009) research where internal factors were argued to be the dominant cause of the decline of once large established players. There is no shortage of potential hypotheses from the general business literature on early-stage companies as regards internal factors causing destruction to probe in research. Graham (2006), the founder of *Y Combinator*, discusses "The 18 Mistakes That Kill Startups."[39] There are multiple articles with titles such as "The Worst Startup Failures" and the "10 Biggest Internet Startup Failures"[40] that make conclusions as to reasons for failures. One challenge for the academic literature is its predominant focus on the growth side rather than the decline side as regards developing and building hypotheses to empirically test. Lower values of variables whose higher values are hypothesized to accelerate growth need not be the key drivers of company decline.[41]

3. Risk management and growth/decline paths. Early-stage companies often face many challenges as regards risk management. Considerable upside can occur when a high risk strategy is taken albeit with an associated high downside risk. Consider dominant customer risk. The *Full Bloom Baking Company* was a 1989 startup in Silicon Valley. In 1992 it started supplying baking products to *Starbucks* which was also in its very early days. It quickly became the dominant customer for the young startup. Over the 1995 to 2011 period, the *Starbucks* account was never less than 60% of *Full Bloom's* total revenues and in many years it was over 80%. Several times *Starbucks* reorganized and *Full Bloom* ran the risk of losing its dominant customer. However, each time *Full Bloom* was able to renegotiate the account and was able to have its growth propelled by *Starbucks* continued rapid expansion.[42] In June 2012 *Starbucks* acquired a major competitor to *Full Bloom* (*Le Boulange*) with the result that the downside of the dominant single customer profile was encountered. Many other early-stage companies also have faced this dominant customer dilemma.[43] Other examples of high risk exposure include single supplier risk for a key component, dominant employee risk, and dominant financing partner risk. An important research area on early-stage company destruction is understanding the dynamics of risk exposure and risk mitigation strategies. There can be a tradeoff between reducing key areas of downside risk and maintaining high growth momentum.

4. Organization and human resource challenges with managing a rapidly declining early-stage company, especially one that has previously experienced high growth in its first several years. There are substantive challenges at the CEO level that warrant research attention. One relates to CEO leadership in adverse times. Consider the following comment by the CEO of *IGN Entertainment* who was facing very large revenue and income losses and making large layoff decisions:

> I will never forget the words of an employee who said to me, upon notification of being laid off: 'This is what I get for all of my dedication and hard work? I have been here from the beginning. I've stuck with you through thick and thin, have always been a believer, and in return, you shred me and toss me into the street. Is this how you repay loyalty?' Dealing with failure is the hardest of all tasks for a CEO, especially when it's staring you in the face. When the ramifications of failure are clear and measurable, it's hard not to internalize the lion's share of fault. The real issue is not internalizing blame, but rather what happens next.[44]

5. Developing richer information bases to further probe growth and decline drivers. Revenue and headcount, the two metrics examined in this paper, are both frequently used metrics in empirical research on entrepreneurship—see Gilbert et al. (2006). However, there need not always be a one-to-one correspondence between growth in revenues or growth in head-count and other variables that could be of high interest—such as profitability or market capitalization. Future research could probe contexts where different growth/decline metrics are directionally the same and cases and where they directionally differ. For example, corporate restructuring initiatives such as divestitures or spinoffs are often presented as ways to increase market capitalization but have the effect of the subsequent revenue and head-count series of the "surviving" company appearing to be declining. As a second example, strategic initiatives that stress "core competencies" can lead companies to outsource "non-core" functions or activities. Again the result of such initiatives can be a company whose market capitalization or profitability increases but its headcount going forward is lower. Research in this area could examine multiple growth metrics and probe those cases where there are differences in the sign (ideally sign and magnitude) of growth metrics. For early-stage companies, this research could highlight cases where management revamps its strat-egy in a relatively rapid way in an attempt to build growth in metrics that its key stakeholders view as pivotal—such as profitability or market capitalization for investors.

There are also interesting research issues with human resource motivation in the midst of layoffs. The CEO of *Keynote Systems* made the following comments in regard to making heavy layoffs after rapid growth in its first five years:

> The dark moments really came when we started to execute on the restart plan and the execution included firing a lot of people. But there are two parts to that darkness. One is letting them go because that is always a hard thing. But the second part is there are people all around you who are just gloomy and feel like it's the end of the world. So how do you keep their spirits up during this period of letting go and seeing your business go down month-on-month … We had to remind people that "from profitability comes stability."[45]

At present, the literature in this area is predominantly individual case studies without systematic attempts to build a more generalizable body of knowledge about human resource strategy in a rapidly declining startup. The consequences of good decisions here could increase the likelihood of the downturn being temporary whilst poor decisions could increase the likelihood of company demise.

The above areas are illustrative of what are a rich set of research questions. A potential limiting factor here is the lack of willingness of many executives associated with company decline to relive and reflect in a balanced and minimally emotive way on the causes and consequences of destruction they have been associated with. There can also be a self-selection aspect in that the executives most likely to participate are those where there has been some turnaround rather than those where there was sustained large-scale destruction. There is also the challenge of history being reinterpreted/rewritten, especially if a new man-agement team arrives and seeks to place as much "blame" on the prior management team.

11. Overview

Revenue and especially headcount destruction is a major part of early-stage company dynamics across all 10 countries examined and across all eight industries examined. The research literature has under-recognized and even more under-researched this dynamic and its many areas of richness.

Of much interest here is understanding what parts of destruction are more due to internal "self-inflicted wounds" and which parts are more due to external market forces. By building a better understanding of the former, executives can take proactive steps to learn and potentially reduce the magnitude of subsequent destruction in their ongoing ventures.

Policy makers who promote the early-stage sector as a key growth engine in the economy are in a better position to develop policies to increase the net contribution of this sector if they recognize the potential areas of lost contributions. An overemphasis on policy decisions during the startup era of early-stage companies and an under emphasis on the higher priority continued scaling era can result in lost opportunities from this vitally important sector of economies. A better understanding of corporate destruction, especially for previously high growth startups, can assist in the making of better policy decisions as regards the scaling era of early-stage companies.

Notes

1. www.s.co/about/fags website (accessed 26 February 2012).
2. PWC (2013: 3).
3. Factiva is a business information and research tool with search, alerting, dissemination, and other information management capabilities. For more information, refer to: http://www.dowjones.com/factiva/
4. Coad (2009).
5. An example is Haltiwanger et al. (2012).
6. An exception is Garnsey et al. (2006).
7. Gilbert et al. (2006: 929). An earlier extensive review of growth/decline variables used in research is Weinzimmer et al. (1998).
8. Coad (2009: 26).
9. Garnsey et al. (2006: 1).
10. Stinchcombe (1965) is an early expositor of this concept. See also Freeman et al. (1983). Coad (2009) summarizes the evidence on the high failure rate of high growth aspiring early-stage companies. Extensive year-by-year based "survival rates of establishments" is in US Bureau of Labor Statistics (2012), Chart 3 on "Survival rates of establishments, by year started and number of years since starting, 1994–2010, in percent."
11. Levie and Lichtenstein (2010: 318).
12. McKelvie and Wiklund (2010: 261). See also Shepherd and Wiklund (2009).
13. Barringer et al. (2005: 674–675). Additional papers are reviewed in Parker et al. (2010).
14. Schumpeter (1942: 82–83).
15. Haltiwanger et al. (2012: 2). See also Kane (2010), Haltiwanger (2013), and Hathaway (2013).
16. Olson et al. (2008: 52).
17. Collins (2009: 135).
18. Hannan and Carroll (1992: 5). Reference to over 200 books and papers are included in this book. See also Carroll and Hannan (2000) and Carroll et al. (2010).
19. Barnett (2008: 230).
20. There are multiple reviews of bankruptcy research in the accounting and finance literatures—see Ball and Foster (1982) for an early review and Piesse et al. (2006) for a more recent review.
21. Ohlson (1980: 110).

22. Ohlson (1980: 111).
23. Altman (2013: 433). As noted previously, the entrepreneurship literature has called this the "liability of newness"—see Stinchcombe (1965).
24. ORBIS is a global company database produced by Bureau van Dijk—see www.bvdinfo.com.
25. There are many more companies with revenue data for Years 2 to 5 than companies with headcount data for Years 2 to 5. In an earlier version of this paper, we reported results for separate samples of 381,865 companies with revenue data and 168,685 companies with headcount data. The pattern of results for the sample of 158,681 companies with both sets of data are similar to the pattern of results presented in the revised version of this paper.
26. US Bureau of Labor Statistics, Business Employment Dynamics, Entrepreneurship and the US Economy, 2012. See also *Statistic Brain* (2013).
27. Sahlman (2010: 5).
28. Morle et al. (2012: 9).
29. The 80/20 rule has its roots in observations by the Italian economist Vilfredo Pareto, when analyzing the disproportionate amount of land in Italy owned by a small percentage of the population. It has subsequently been used in multiple contexts. An example in an entrepreneurial context is Starak (2006).
30. This phrase is taken from the "Snakes and Ladders" board game where growth would be viewed as a ladder to advance and decline would be viewed as a snake to go backwards. In the US the board game is also known as "Chutes and Ladders."
31. Chandler et al. (2009) is one of the few papers to explore the relationship between revenue changes and headcount growth. "Growth" rather than "growth and decline" was their central focus. The paper examined the "relationship between sales growth and employment growth in emerging ventures" (p. 386).
32. See *MercadoLibre* Executive Case in Foster et al. (2011: 205–208).
33. A summary of articles on *Solyndra* is on *The New York Times* website—topics.nytimes.com/top/news/business/companies/solyndra/index.html.
34. Form 8-K for *Helicos Biosciences*, 15 November 2012.
35. See the *GenPharm* Executive Case in Foster et al. (2011: 291–294).
36. One article described *Suntech*'s demise with the comment that "Chinese solar PV maker Suntech Power Holdings has been down for so long that anything must look like up" Ausick (2013). For a description of *Suntech Power*'s growth era see the *Suntech Power Holdings* Executive Case in Foster et al. (2011: 240–243).
37. See the *Check Point Software Technologies Ltd* Executive Case in Foster et al. (2011: 131–134).
38. Coad (2009) makes a similar point: "We recommend a Simonian methodology…facts are first pursued through empirical investigations, and in a second stage theories are formulated as attempts to explain the 'stylised facts' that emerge" (p. 59).
39. Graham (2006). These include "bad location," "marginal niche," "derivative idea," "hiring bad programmers," "launching too early," and "having no specific user in mind."
40. Hoyt (2013) "4 of the Worst Startup Failures of All Times" and Anonymous (2012) "10 Biggest Internet Startup Failures".
41. An early argument for this position is in Freeman and Hannan (1975): "Virtually all research on the demography of organizations presumes that relations among components are identical in growth and decline. We advance arguments to the contrary" (p. 215).
42. Rosenthal and Foster, *Full Bloom Baking Company* (2012), Stanford Graduate School of Business Case.
43. For example, *eSilicon* (a startup in 2000) was a fabless semiconductor company with *Apple* as its major customer. It lost this account when a competitor, as part of a bundled sale of multiple components to *Apple*, significantly discounted its comparable component. The CEO of *eSilicon* commented: "We lost our biggest revenue source, which was probably 65–70% of our revenue. That was a nightmare. There's no diving catch to be made"—see *eSilicon* Executive Case in Foster et al. (2011: 158–161).
44. *IGN Entertainment* Executive Case in Foster et al. (2011: 298–300).
45. *Keynote Systems* Executive Case in Foster et al. (2011: 194–197).
46. Gillette (2011).

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Appendix 1

Examples of the rise and fall of early-stage companies

Social networking sector: The rise and fall of Myspace. The social networking sector is a good example of the rise and fall of startups. Several companies had early success and then declined. There were also multiple companies starting but gaining minimal aggregate market share. An early social networking company was *Sixdegrees*, founded in 1997, on the idea that a person could access anybody by going through, at most, six contacts. The company gathered visibility in the media but failed to build a large set of users, reaching only one million members at its peak. *Sixdegrees* was shut down in 2001, but it was quickly copied. Other examples include *LiveJournal* (1999), *BlackPlanet* (1999), and *Cyworld* (2001). *Myspace* was founded in 2003. In 2006 it was the most popular social networking website when *News Corp.* bought it for US$580m. *Myspace* had 1600 employees at its peak. Its headcount was reduced to 1000 in 2009 and to 400 by 2011. A business commentator noted that:

> at its December 2008 peak, *Myspace* attracted 75.9 million monthly unique visitors in the U.S., according to comScore. By May 2011, that number had dropped to 34.8 million. Because *Myspace* makes nearly all of its money from advertising, the exodus has a direct correlation to its revenue. In 2009, the site brought in $470 million in advertising dollars, according to EMarketer. In 2011, it is projected to generate $184 million.[46]

News Corp. sold *Myspace* in June 2011 for US$35m.

Facebook, founded in 2004 around the concept of college social networks, quickly expanded in the academic market. It then expanded to the larger public, commanding the leading position today in social networks. Summary data (in millions) on monthly unique visitors from *comScore* highlights the rise and rise of *Facebook* versus the rise and fall of *Myspace*:

	Facebook (millions)	Myspace (millions)	Ratio of Facebook/Myspace
August 2005	8.264	21.819	0.38
December 2005	12.414	32.209	0.39
December 2006	19.105	60.887	0.31
December 2007	34.658	68.905	0.50
December 2008	54.552	75.919	0.72
May 2009	70.278	70.255	1.00
December 2009	111.888	68.318	1.64
December 2010	153.886	50.101	3.07
December 2011	162.486	12.135	13.39

In the growing social networking market, *Myspace* fist suffered declining market share and then subsequently suffered absolute declines in monthly unique visitors.

Online grocery early stage companies: The rise and fall of Webvan and HomeGrocer. The creation and destruction saga can play out in a high-profile and rapid way. The related sagas of *Webvan* and *Homegrocer.com* are examples. *Webvan* was started in December 1996. Its stated focus was to be

an "Internet retailer offering delivery of consumer products … focused on food, non-prescription drug products, and general merchandise." Its chosen "go it alone" strategy required very high upfront capital cost and involved the build-out of new physical warehouses as well as a delivery truck and driver infrastructure as opposed to leveraging the resources of existing grocery chains. *Webvan* received financial capital from blue-ribbon investors and recruited high-profile executives to its management ranks. San Francisco was the first target market. It went public with an IPO in November 1999. *HomeGrocer.com* was very similar to *Webvan* in strategy. It started in January 1997 with Seattle and Portland as its early target markets. It also attracted blue-ribbon investors and went public with an IPO in March 2000. In June 2000, the two companies announced an all-stock merger that valued *HomeGrocer.com* at an estimated US$1.2bn. *Webvan* was the continuing name of the two combined companies. The following financials are taken from *Webvan's* public filings (in US$millions):

Timeframe	Capital expenditures	Revenue	Gross margin	Operating profit	Headcount (period end)
1 Jan to 30 June 1999	25.940	0.395	(0.024)	(33.941)	414
1 Jan to 31 Dec 1999	64.253	13.305	2.016	(155.909)	959
1 Jan to 31 Dec 2000	32.669	178.456	47.217	(479.191)	4,476

The 1 January to 31 December 2000 results above incorporate the financials of the combined companies. *HomeGrocer.com* announced revenue of US$51.008m and a loss from operations of US$106.224m for the 26 weeks ending 1 July 2000. It reported headcounts of 100 in January 1999 and 950 in November 1999.

A high-capital-intensive strategy in an industry in which the gross margins have been historically low required either continued large capital infusions from investors or a dramatic surge in both revenue and operating profit. Neither occurred. Despite both *Webvan* and *HomeGrocer.com* receiving very favorable customer ratings, neither was able to deliver any positive operating profits. For example, accumulated operating losses for *Webvan* in 1999 and 2000 were over US$633m. The merger with *HomeGrocer.com* failed to save the combined companies. One commentator observed that the merger was "like 2 people with a bad flu getting together for a bout of pneumonia." *Webvan* declared bankruptcy on 13 July 2001. This bankruptcy largely arose from a strategy that had minimal margin for error or bad outcomes. The headcount reduction for *Webvan* started in 2000, and after the bankruptcy all employees were terminated. The business idea of home deliveries of groceries and related products has subsequently been developed by existing retailers who can operate with an existing infrastructure and a better business model than either *Webvan* or *HomeGrocer.com* had developed.