Learning About Failure: Bankruptcy, Firm Age, and the Resource-Based View

Stewart Thornhill • Raphael Amit
Richard Ivey School of Business, University of Western Ontario, 1151 Richmond St. N., London, Ontario, Canada N6A 3K7
Management Department, Room 2012 SH-DH, The Wharton School, University of Pennsylvania, 3620 Locust Walk, Philadelphia, Pennsylvania 19104-6364
sthornhill@ivey.uwo.ca • amit@wharton.upenn.edu

Abstract
Systematic differences in the determinants of firm failure between firms that fail early in their life and those that fail after having successfully negotiated the early liabilities of newness and adolescence are identified. Analysis of data from 339 Canadian corporate bankruptcies suggests that failure among younger firms may be attributable to deficiencies in managerial knowledge and financial management abilities. Failure among older firms, on the other hand, may be attributable to an inability to adapt to environmental change.
(*Liability of Newness*; *Resource-Based View*; *Bankruptcy*)

Introduction
Firms are at the greatest risk of failure when they are young and small. Beyond an early peak in mortality rates, often described as the liability of adolescence, exit rates monotonically decline to a positive asymptote (Carroll 1983, Freeman et al. 1983, Sorensen and Stuart 2000). While much prior research has focused on the age-mortality relationship, the mechanics of firm failure remains an understudied phenomenon (Baldwin et al. 1997, Bruderl et al. 1992, McGrath 1999). Given that the incidence of exit varies as a function of firm age, what is it about firms at different ages that leads to the observed pattern of failure?

The present research seeks to answer this question by examining determinants of failure within a sample of bankrupt enterprises. Rather than examining which firms exit in contrast to those that do not, we evaluate causes of failure among firms that exited the economy at different ages. By so doing, we are able to get beyond the observed age-mortality relationship and begin to understand why young firms fail at consistently higher rates, and also why failure continues to haunt firms that have survived their initial liabilities of newness and smallness.

Bankruptcy occurs when firms lack sufficient capital to cover the obligations of the business (Boardman et al. 1981). For new firms, the critical challenge then is to establish valuable resources and capabilities that lead to the generation of positive cash flow before initial asset endowments are depleted (Levinthal 1991). Considerable attention has been paid to early failures (new and adolescent firms). Research into large, dramatic megaflops has also been advanced in the literature (D'Aveni 1989, Hambrick and D'Aveni 1988). However, though many firms exit between these extreme positions, there is a considerable gap in our understanding of why. This paper examines, in some detail, failure across a wide range of firm ages.

We suggest that underlying age-variant processes within organizations have a direct bearing on mortality risk. Age is an easily observable characteristic, but it may not be age that matters; rather, it is how well a firm's resources and capabilities are aligned with the demands of the competitive environment (Amit and Schoemaker 1993). Young firms strive to develop a competitive edge. Many fail and exit when their internal asset stocks are exhausted. Others successfully develop resources and capabilities that enable them to survive beyond infancy and adolescence. The development of a viable competitive position, whether deliberate (e.g., investment in specialized assets) or inadvertent (e.g., due to path dependency or causal ambiguity), may subsequently expose firms to mortality risks if the competitive landscape changes and the well-founded organizational assets hinder adaptation to the new environment (Hannan and Freeman 1977, 1984; Leonard-Barton 1992). We thus expect to observe different causal mechanisms between firms that fail early and those that fail at a later stage. Young failures should be attributable to inadequate resources and capabilities (relative to initial endowments). Older failures should be attributable to

1047-7039/03/1405/0497
1526-5455 electronic ISSN

a mismatch between resources and capabilities and the demands of the competitive environment. These internal processes will manifest themselves in nonviable business models, i.e., those that fail to generate positive cash flow.

We evaluate the general proposition that the causes of failure vary as a function of firm age with unique data from a sample of Canadian bankruptcies. By examining instances of bankruptcy in some detail, we are able to extend our understanding of mortality dynamics beyond the scope of age, size, and population density mechanisms. Specifically, we examine the relationship between firm age at failure and firm-level resources and capabilities, along with industry competitive conditions. The data provide support for our contention that failure is attributable to different reasons at different firm ages. Failure among young firms is attributed to deficiencies in general management skills, while an evolving competitive environment is identified as a significant influence in the demise of older organizations. These findings are consistent with the expectations of the resource-based view, and complementary to population-level studies of mortality. Our results reinforce the importance of resource and capability development by young firms as well as confirming the hazards of rigidity and inertia among more established firms.

Theory

The resource-based view of the firm depicts firms as heterogeneous bundles of idiosyncratic, hard-to-imitate resources and capabilities (e.g., Barney 1991; Conner 1991; Rumelt 1984, 1991; Wernerfelt 1984). Amit and Schoemaker define resources as "stocks of available factors that are owned or controlled by the firm" (1993, p. 35). Capabilities are "information-based, tangible or intangible processes that are firm-specific and are developed over time through complex interactions among the firm's resources" (1993, p. 35). Competitive advantage can be derived from a firm's resources and capabilities to the extent that they are valuable, rare, inimitable, and organized to be exploited (Barney 1991). Of these elements, value and rarity are necessary but insufficient in the pursuit of competitive advantage. It is the presence of isolating mechanisms (Rumelt 1984, 1987) that completes the equation. Resources themselves can be inimitable (e.g., due to causal ambiguity or well-protected intellectual property) or the nature of the organization and its managerial processes can deter imitation. Management has been specifically identified in the literature as a source of competitive advantage (Castanias and Helfat 1991, Coff 1997). Teece et al. concur, asserting that a firm's competitive position derives from "its managerial and organizational processes, shaped by its (specific) asset position, and the path available to it." (1997, p. 518).

The critical role of organizational routines was articulated by Stinchcombe (1965) in his seminal paper on the liability of newness. He identified four aspects of new organizations that make them more prone to failure than are older, more established organizations: (a) new organizations must get by with general knowledge until members learn new, specific roles, and functions; (b) during the role identification and formation process, there may be conflict, worry, and inefficiency; (c) relations with outside individuals and organizations must be forged, and an initial lack of trust may be a liability; and (d) new organizations lack stable ties with the customers they wish to serve.

In addition to the organizational liabilities noted by Stinchcombe, young firms may also lack knowledge about what they can do or should do (Jovanovic 1982, Lippman and Rumelt 1982), or may not be sufficiently endowed with the requisite resources to execute their strategy (Lussier 1995, Venkataraman et al. 1990). Fichman and Levinthal (1991) suggest that the liability of newness is not a monotonically decreasing function of firm age, but that there is an initial "honeymoon" period during which initial assets buffer the new organization. They argue that variations in the levels of initial assets affect the way time affects mortality rates. The time dependence occurs because the longer an organization survives (due to initial capital endowments), the more it will be able to develop relationship-specific capital and adapt to the environment.

Although the resource-based view has principally been employed in the study of above-normal performance, it is instructive to apply its tenets in the context of below-normal performance. Superior performance is more likely when resources and capabilities are aligned with strategic industry factors—characteristics of the competitive environment that are determinants of firm-level profitability (Amit and Schoemaker 1993). Conversely, we suggest that failure is more likely when there is misalignment between what a firm can do and what the competitive environment requires.

Managers of new firms are able to observe the competitive environment before entry into a particular market. Except for very rare circumstances, new entrants must take competitive conditions as exogenous and craft their strategies accordingly. The ability to generate positive operating cash flows is a function of a firm's resources and capabilities—both their initial endowments and those that are developed in the course of

doing business. The challenge of survival when young is exacerbated by resource constraints and the absence of established organizational routines. Younger firms may have great difficulty generating sufficient revenue while concurrently dealing with start-up costs that older enterprises have long since absorbed.

Firms that survive through the early years face very different issues than do young enterprises. As noted by Aldrich and Auster, "the major problem facing smaller and younger organizations is survival, whereas larger and older organizations face the problem of strategic transformation" (1986, p. 193). The established routines of older organizations, which in many cases were critical to their initial survival, can become liabilities in the face of changing competitive conditions (Hannan and Freeman 1984). Organizational ecology asserts that the environment will select out unfit organizations, and that the ability to survive over time is both a function of whether an organization is suited to the current environment and its ability to adapt appropriately if the environment evolves. Misalignment with the environment may expose firms to a liability of obsolescence (Barron et al. 1994). Whether an organization ages well or badly thus depends on whether the effects of learning over time result in increased (positive) competence or increased (negative) rigidity (Sorensen and Stuart 2000). In many instances, managers simply do not acknowledge that previously successful strategic postures have become uncompetitive (Harrigan 1985, 1988). Amburgey et al. (1993) noted that while older organizations may be severely affected by change, they are often well suited to withstand shocks by virtue of their accumulated asset stocks. Selection due to environmental change should affect those firms that lack the ability to change as required by the evolution of their market or industry context. The tension between resource slack and efficiency is well known. In stable environments, the efficiency of older organizations should be an asset; however, this can quickly become a liability in unstable or uncertain markets.

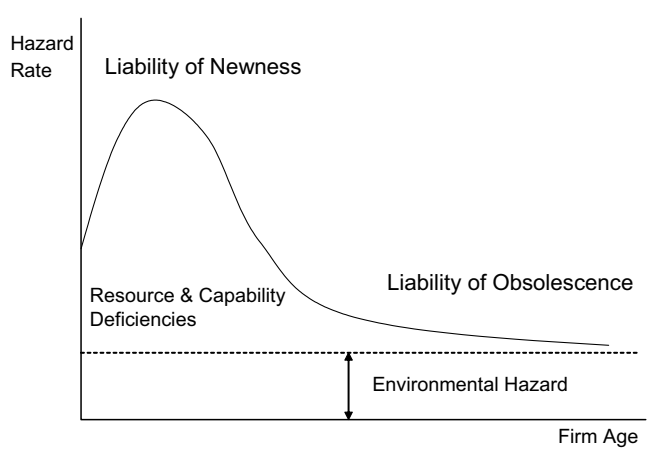
There is some irony to be found in the observation that the very qualities of resources and capabilities that confer competitive advantage—inimitability and organization—may be the very ones that instill organizations with inertia and consequently limit their adaptability. Commitment to an expensive, dedicated production facility (Ghemawhat 1991) or a specific technology regime (Christensen 1997) can lock a firm into a competitive position from which it may be very difficult to deviate. The nature of isolating mechanisms may imbue a firm with core rigidities that subsequently constrain the options and paths available to it (Leonard-Barton 1992). Resource and capability development can confer survival advantage when firms are young, and yet expose the same firms to threats of obsolescence in when they are more mature. The commonly observed pattern of exit rates as a function of firm age is presented in Figure 1. The high mortality rate among young firms, and the lower exit rates among older firms, is consistent with a model of resource deficiencies early in life and rigidity later. This interpretation extends both the resource-based view and the population ecology perspective on firm-failure dynamics.

For any firm, bankruptcy will occur when negative cash flow erodes available asset stocks to the point where creditors cannot be satisfied. For young firms with a given initial capital endowment, having resources and capabilities that are well matched to the demands of the competitive environment will enhance the prospects of initial survival. For older firms, sustaining the connection between internal resources and capabilities and external strategic industry factors is what matters. If firms fail because of an inability to adapt to changing competitive circumstances, this represents a significantly different process of failure than that articulated by the liability of newness. As presented in Figure 1, age is not the prime determinant of mortality, despite the strong correlative evidence that age is a strong predictor of failure. Instead, age is a proxy for internal organizational processes that evolve over time. This leads to our first hypothesis.

HYPOTHESIS 1 (H1). *Failure of young firms will be attributable to different causes than failure of older firms.*

As depicted in Figure 1, we propose that young organizations are more likely to suffer from resource and

Figure 1 Firm Age and Mortality Risk



capability deficiencies than are older firms. This is the essence of the liability of newness expressed in the language of the resource-based view. Older firms, having presumably developed valuable resources and capabilities in their evolution from being young to being older, will be prone to hazards of environmental change. Thus, a resource-based perspective can also be applied to the liability of obsolescence. The age-specific failure dynamics are stated more formally in the following two hypotheses.

HYPOTHESIS 2 (H2). *Failure of older firms will be attributable to changes in the competitive environment.*

HYPOTHESIS 3 (H3). *Failure of young firms will be attributable to deficiencies in resources and capabilities.*

The latter hypothesis regarding the role of resources and capabilities in the liability of newness is amenable to futher refinement. Resources and capabilities encompass a broad array of assets, tangible and intangible, as well as numerous ways of deploying such assets. Levinthal (1991) observed that firms fail when poor performance erodes asset stocks. His definition of assets includes not only financial assets, but also market position, distribution systems, manufacturing infrastructure, and technological capabilities. Levinthal refers to this conglomeration of financial and nonfinancial assets as "organizational capital." D'Aveni (1989) describes organizations as accumulators of financial and managerial assets. The net asset base of a firm influences the risk of default to creditors. We can thus describe young firms as being prone to shortages of tangible assets (e.g., real capital) and/or intangible assets (e.g., human capital).

A review of prior research makes it clear that the fitness of a firm is damaged by managerial deficiencies in a number of areas (Gaskill et al. 1993, Larson and Clute 1979, McKinlay 1979). From our review of firm-level empirical studies (see Table 1), general management and financial planning and control were the most commonly cited contributors to firm mortality, followed by the development of a sound product-market strategy. Consistent with our position that firm-specific resources and capabilities, rather than age, are critical to survival or demise, we suggest that general, financial, and marketing management deficiencies will play a significant role in the failure of young firms.

The crux of our argument is that the liability of newness is triggered, in part, by specific elements that originate with the management of a firm. With the passage of time, managers gain greater breadth and depth of knowledge about customers, suppliers, competitors, etc. Consequently, any knowledge deficiencies in these domains should diminish and thus become less of a liability as firms age. Young firms will be more prone to failure as a function of general management because time is required to develop the necessary firm-specific knowledge, skills, and abilities.

Poor general management skills have been associated with firm mortality in prior research (e.g., Larson and Clute 1979, Wichman 1983, Gaskill et al. 1993). Cooper et al. noted that industry-specific know-how would benefit firms by "providing a tacit understanding of the key success factors in an industry, specialized knowledge of the product or technologies, or accumulated goodwill with customers and/or suppliers" (1994, pp. 374–375). Just as high-quality management can confer competitive advantage (Coff 1997, Castanias and Helfat 1991), so can deficiencies in general management skills pose a significant threat to firm survival.

HYPOTHESIS 3A (H3A). *Failure of young firms will be attributable to deficiencies in general management skills.*

Boardman et al. examined the issue of financial management and firm failure. In addition to the oft-cited issue of insufficient capital at inception, they noted that unsuccessful managers frequently mismanaged available resources and/or failed to determine appropriate policies to finance subsequent growth of the business. Their empirical results also reveal that "failed companies exhibited an increasingly unfavorable position with respect to the size of long-term debt to total assets" (1981, p. 39). The management of capital and the maintenance of an appropriate capital structure are thus critical to the survival of young firms.

HYPOTHESIS 3B (H3B). *Failure of young firms will be attributable to deficiencies in financial management skills.*

Developing a customer base is critical to the survival of any business, regardless of industry or the nature of the product or service offering. Inefficient marketing was explicitly identified as a cause of failure in Hall's (1992) comprehensive study of business failure in the United Kingdom. Mitchell, in his study of the medical equipment product market, concluded that "from a combined economic and ecological perspective, a business ceases to be a candidate for dissolution as soon as it creates commercially successful routines" (1994, p. 599). Litvak and Maule, in a longitudinal study of business failures, reported that "The most significant business problem area was that of marketing, of the lack of it" (1980, p. 76).

HYPOTHESIS 3C (H3C). *Failure of young firms will be attributable to deficiencies in market development skills.*

Table 1 Empirical Studies of Organizational Mortality

	Firm Attributes				Owner/Manager Attributes			Operational Characteristics			
	Age	Size	Industry/ Environ.	Initial Capital	Age	Education	Experience	Performance	Prod./Mkt. Strategy	General Mgmt.	Financial Control
Population-Level Studies											
Amburgey et al. (1993)	X		X								
Bates (1990)	X	X		X	X	X					
Bates and Nucci (1989)	X	X						X			
Bruderl and Schussler (1990)	X	X									
Carroll (1983)	X		X								
Carroll and Delacroix (1982)	X		X								
Carroll and Huo (1986)			X								
Dunne et al. (1988)	X	X	X								
Freeman et al. (1983)	X	X									
Levinthal (1991)	X	X		X							
Phillips and Kirchhoff (1989)	X	X	X								
Preisendorfer and Voss (1990)	X		X		X		X				
Ranger-Moore (1997)	X	X	X					X			
Stearns et al. (1995)			X						X		
Multilevel Studies											
Fichman and Levinthal (1991)	X	X		X							
Gimeno et al. (1997)	X	X				X	X				
Henderson (1999)	X	X	X					X	X		
Pennings et al. (1998)	X					X	X				
Singh et al. (1986a)	X		X								
Singh et al. (1986b)	X		X								
Firm-Level Studies											
Baldwin et al. (1997)										X	X
Boardman et al. (1981)	X	X	X					X		X	
Bruderl et al. (1992)						X	X				
Carter et al. (1997)				X		X	X		X		
Cooper et al. (1994)			X	X		X	X				X
Daily (1995)		X									X
D'Aveni (1989)			X			X	X	X			
Fredland and Morris (1976)	X	X	X				X				
Gaskill et al. (1993)			X		X	X		X		X	X
Hall (1992)	X	X	X	X					X	X	
Hall (1994)	X	X			X	X					
Hambrick and D'Aveni (1988)	X	X	X							X	
Kalleberg and Leicht (1991)	X		X				X				
Keasey and Watson (1987)	X				X			X			
Larson and Clute (1979)										X	X
Litvak and Maule (1980)										X	X
Lussier (1995)				X	X	X	X				X
McKinlay (1979)								X		X	X
Mitchell (1991)											
Mitchell (1994)			X				X	X			
Mitchell et al. (1994)								X			
Moulton and Thomas (1993)		X							X		
O'Neill and Duker (1986)			X								
Venkataraman et al. (1990)	X	X		X							

In summary, we argue that while age is strongly correlated with probability of survival or failure, this association is underpinned by a resource-based process. Over time, firms succeed or fail as a function of their ability to create and capture value in the marketplace. Bankruptcy, a specific type of discontinuance, occurs when a firm fails to capture sufficient value to cover the costs of doing business. In the next section, we evaluate our hypotheses with data from 339 bankruptcies.

Methods

Our empirical analysis includes only bankrupt firms. This restricted set of business exits excludes other types of firm exits (e.g., merger) that are typically captured in organizational ecology studies. However, bankruptcy does capture failure in the extreme, differentiating it from voluntary exit. Firms that are insolvent to the point of legal proceedings have clearly failed to meet the market's threshold of fulfilling their financial obligations. Cochrane (1981) depicted failure as a series of nested conditions. The most general definition is discontinuance. Then, in increasing order of specificity and decreasing order of subset size are failures as opportunity costs, termination with losses or to avoid losses, and, finally, bankruptcy. Performance thresholds are also important to consider in the context of business failures. Gimeno et al. (1997) established that a significant factor in the continuance-discontinuance decision for many entrepreneurs is their own acceptable threshold of performance. Firms that appear to be underperformers may persist if their thresholds are sufficiently low, while other, relatively superior performers may exit if their thresholds are sufficiently high.

The data described below is comprised entirely of firms that have exited by way of bankruptcy. We are therefore unable to investigate the issues of survival versus failure; for this it would be necessary to have matching information on both failures and survivors. There is, however, much that can be learned from a postmortem analysis of failures. The research question and the answers we glean are different from the more usual queries into survival and discontinuance. We propose that the determinants of failure vary with firm age at failure. To understand whether this is so, we examine a sample of unsuccessful companies. The ability to dig down into the causes of failure by studying the specific details of failed businesses, rather than macroeconomic indicators, is a unique strength of our data.

Data

The data used in this study originate from a survey of bankruptcy trustees who completed a questionnaire while they were handling active bankruptcy files. The real-time method of data collection mitigates problems of retrospective recall bias. The survey was developed with the Canadian Insolvency Practitioners Association and compiled by Statistics Canada (Baldwin et al. 1997). All corporate bankruptcies in Canada are processed through the office of the Superintendent of Bankruptcies, which assigns a trustee to each case. Chartered insolvency practitioners are individuals (typically, chartered accountants) who have completed three years of prescribed study under the National Insolvency Qualification Program and successfully completed the National Insolvency Examination. As independent investigators, the trustees can provide arms-length reporting of the circumstances of each bankruptcy. They thus bring valuable objectivity and experience in evaluating the causes of failure.

There was a total of 1,910 bankruptcies in Canada in the six-month period from March to August 1996.[1] Surveys were sent to a random sample of trustees for 1,085 of these cases and 550 responses were obtained (51%). A total of 339 of these surveys contained complete responses to the items of interest to this research study, including the age of the business at the time of bankruptcy. Means, standard deviations, and interitem correlation coefficients are presented in Table 2.

The dependent variable in our models is firm age at time of bankruptcy. Due to the highly skewed nature of the age distribution in our sample, we log-normalized age to better approximate a normal distribution. Of the firms in the sample 29% were one or two years old at the time of bankruptcy, 40% were in the three- to nine-year-old range, and the remaining 30% were ten years old or more. The mean age of the firms in our sample was 7.8 years (median 5.0).

We use a total of four predictor variables to test our hypotheses. Our measure of industry competitive conditions is derived from survey items in which the bankruptcy trustees were asked to report on the extent to which the firm was affected by: (a) changes in market conditions, (b) changes in technology, and (c) legislative changes. Respondents used a five-point Likert-type scale to indicate the extent to which a given factor contributed to the bankruptcy. Principal components analysis indicated that these items loaded strongly on a single factor with an eigenvalue of 1.84. (See Appendix for details of survey questions, factor loadings, and alpha coefficients.) The derived factor variable serves as our proxy for the level of industry turbulence and change. This

Table 2 Correlation Matrix and Summary Statistics

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Firm Age	1.00												
2. Assets ($M)	0.19*	1.00											
3. Technological Change	0.12*	−0.02	1.00										
4. Market Change	0.15*	0.06	0.62*	1.00									
5. Legal Change	0.08	0.01	0.32*	0.29*	1.00								
6. Capital Structure	−0.01	0.13*	0.28*	0.23*	0.14*	1.00							
7. Undercapitalization	−0.12*	−0.02	0.16*	0.13*	0.12*	0.52*	1.00						
8. Breadth of Knowledge	−0.12*	0.13*	0.09	0.02	0.12*	0.30*	0.28*	1.00					
9. Depth of Knowledge	−0.06	0.12*	0.09	0.05	0.10	0.29*	0.29*	0.80*	1.00				
10. Operational Control	−0.04	0.13*	0.19*	0.12*	0.13*	0.19*	0.19*	0.49*	0.52*	1.00			
11. Pricing	−0.09	0.05	0.17*	0.20*	0.22*	0.27*	0.21*	0.30*	0.31*	0.20*	1.00		
12. Product Quality	0.06	−0.03	0.41*	0.39*	0.19*	0.18*	0.18*	0.08	0.11*	0.18*	0.24*	1.00	
13. Niche Marketing	0.06	−0.01	0.31*	0.29*	0.22*	0.13*	0.08	0.11*	0.18*	0.17*	0.33*	0.43*	1.00
Mean	7.81	0.28	0.99	1.44	0.89	2.82	3.04	2.62	2.58	2.28	2.00	1.32	1.27
Std. Dev.	7.83	0.67	1.06	1.37	0.93	1.79	1.70	1.47	1.48	1.57	1.46	1.22	1.16

Note. Correlation coefficients >0.105 are significant at $p < 0.05$.

measure was used to evaluate our hypothesis on the liability of obsolescence (H2).

We also used the principal components technique to create three other composite factor variables, each of which was used to evaluate our specific hypotheses on the liability of newness (H3). A general management factor was derived to test Hypothesis 3a based on the manager's (a) breadth of knowledge, (b) depth of knowledge, and (c) control. Breadth was defined as the level of knowledge across functional areas (e.g., marketing, finance, operations), while depth was the extent of knowledge within the functions. The derived factor variable serves as a proxy for general managerial abilities.

A two-item factor was used to test for the impact of financial management resources and capabilities within the failed organizations. The relative contributions of unbalanced capital structure and poor capitalization are captured in our variable for H3b. Our final variable for market development (H3c) evaluated the impact of (a) pricing strategy, (b) product quality, and (c) the establishment of market position. By decomposing the firm's resources and capabilites into the specific areas of general management, financial management, and market development, we are able to gain more detailed estimates about the causes of failure than would be possible through the use of common human capital measures such as level of education attained.

In addition to the independent variables described above, we also included control variables for industry membership and firm size in our regressions. Indicator variables were used for the following industry categories: (1) wholesale and retail ($n_1 = 132$); (2) food, accommodation, and beverages ($n_2 = 43$); (3) other services ($n_3 = 93$); and (4) primary and manufacturing industries ($n_4 = 71$).[2] Seventy-eight percent of the bankrupt firms were in service industries, a proportion that is representative of the general composition of the Canadian economy (Baldwin et al. 1997; Thornhill and Amit 1998, 2000).

We also include a measure of firm size: assets at time of failure. The inclusion of this variable is more problematic in the study of bankruptcies than in studies of successful firms, for which the use of asset levels to define size is relatively unambiguous. In the case of defunct enterprises, it is highly probable that asset depletion has occurred along the road to ruin (Hambrick and D'Aveni 1988). However, there is also a well-established relationship between size and likelihood of failure: the liability of smallness (cf. Delacroix and Swaminathan 1991, Baum and Oliver 1991). Inclusion of firm asset level as a control variable is intended to capture variance associated with this known effect and thus improve our ability to evaluate the influence of the hypothesized age-specific relationships.[3]

Table 3 Regression Results[5]

n = 339	Model 1 Controls and Industry	Model 2 All Variables
Control Variables		
Firm Assets ($M)	0.246**	0.287***
Retail and Wholesale	0.281*	0.255†
Food, Accommodation, and Beverage	−0.399*	−0.416*
Other Services	−0.014	−0.090
Predictor Variables		
H2: Industry Change	0.088*	0.126**
H3a: General Management		−0.086*
H3b: Financial Management		−0.075†
H3c: Market Development		−0.019
Intercept	1.466***	1.488***
F	7.71***	6.50***
Adjusted R^2	0.090	0.115
RSS	303.7	292.7

Note. Significance levels (p-values): †<0.10; *<0.05; **<0.01; ***<0.001.

Analysis

We utilized ordinary least squares (OLS) regression models to evaluate the effects of our control and predictor variables. The results of the regression analyses are presented in Table 3. Two models are reported. The first includes our control variables plus the measure for industry change (H2). The second model includes all variables from Model 1 plus the three factor variables specified in Hypothesis 3.[4]

The measure for firm size was positively and significantly associated with age at failure, confirming the expected age-size relationship. Two of the industry dummy variables were also significant. The positive sign of the coefficient for retail and wholesale indicates that failures in this industry segment typically were older firms, while the opposite effect was evident in the food, accommodation, and beverage sector, where failures were generally younger.

All three of the managerial variables had negative coefficients in the regression models, indicating greater influence among younger bankruptcies, although there was strong significance ($p < 0.05$) for only general management (H3a). The financial management variable (H3b) was significant at $p < 0.10$. Market development was not significant in the analysis.

We may conclude from our regression results that there are, in fact, differences in the attributed causes of

bankruptcy that vary with age at failure. This supports Hypothesis 1. The positive, significant coefficient for industry change also provides support for the liability-of-obsolescence mechanism articulated in Hypothesis 2. Among the subhypotheses offered in explanation of the liability of newness, there were varying degrees of support, permitting us to conclude that Hypothesis 3 was partially supported by the data.

A closer examination of the individual item mean scores (Table 2) reveals that, independent of size, age, or industry context, undercapitalization was the issue given the greatest importance by the bankruptcy trustees. Next, in decreasing order of importance (i.e., mean score) were capital structure problems, breadth of knowledge, depth of knowledge, financial planning and control, and product pricing strategy. These results are consistent with the studies cited in Table 1.

Thus, while confirming that deficiencies in general management and financial management are common culprits in firm insolvency, the fresh findings to emerge from this research are the relationships between age at failure and the nature of the contributing causes. Failure while young is more likely to be due to deficiencies in general management and financial management. Failure when older is more likely a function of external market forces. Industry effects were also evident in the data: Bankruptcies in food, accommodation, and beverages typically affected young firms, while retail and wholesale insolvencies were more common for senior enterprises. These issues are discussed in greater detail below.

Discussion

In her paper on entrepreneurial failure and real options reasoning, McGrath noted that there are benefits to be gained from the study of failures: "By carefully analyzing failures instead of focusing only on successes, scholars can begin to make systematic progress on better analytical models of entrepreneurial value creation" (1999, p. 28). In a similar vein, Sitkin suggested, "failure is an essential prerequisite for learning" (1992, p. 232). Studies of failure can contribute to the eventual success of those who learn from their own mistakes as well as those who can learn vicariously from the experiences of others.

This paper attempts to extend our understanding of age-varying determinants of firm failure. We began with the general proposition that there are different mechanisms at work when firms of differing ages become bankrupt. Younger firms are more likely to become insolvent if their initial asset endowments are exhausted before they develop and deploy value-creating strategic assets. Older firms, while having demonstrated the ability to survive the liabilities of newness, may find themselves in a disadvantageous and potentially lethal position if they allow their resources and capabilities to lose relevance in a changing competitive environment. Core rigidities and organizational inertia can prove fatal in such an instance. In this view, it is not youth or age that causes failure. Rather, age may be seen as a proxy for underlying operational differences among firms that have been in existence for different periods of time. After controlling for firm size and industry membership, bankruptcy among younger firms was attributable to different causes than was bankruptcy among older firms. From this research, we can draw a number of conclusions and observations.

First, our findings lend empirical support to the resource-based view of the firm. While much empirical work has sought to establish a link between firm resources and capabilities and success, the flip side of the coin implies that a deficiency of strategic assets may lead down the road to insolvency. Whether firms are young and trying to establish a viable competitive position, or older and trying to maintain or grow as the environment changes, the match between resources and capabilities and strategic industry factors is paramount.

Second, this research contributes to a finer-grained understanding of the mechanisms underlying the well-known liability of newness. From Stinchcombe's (1965) original statement of the concept through a wealth of population ecology refinements, there are few relationships in social science as well established as the negative correlation between age and mortality risk. The value added by the present research comes from the articulation of the different age-dependent determinants of one specific type of failure: bankruptcy. We found young firms to be at risk due to a lack of valuable resources and capabilities. Older firms were vulnerable if they did not adapt to the demands of a changing competitive environment.

Third, the results confirm that industry membership influences firm survival. Failure at an early age was more prevalent in the food, beverage, and accommodation sector. Businesses such as pubs and restaurants are notorious for being short-lived, and it has been suggested that these "unglamorous" businesses may be prone to different strategy/performance dynamics than are firms in manufacturing or high-tech sectors of the economy (Brush and Chaganti 1999). In contrast, firms in wholesale and retail typically were older at the time of insolvency. This may be a consequence of recent changes to industry practices. For example, the emergence of

Internet vendors and "big-box" outlet stores may be eroding the competitive position of established, traditional wholesale and retail businesses. This evidence, coupled with the positive relationship between age and environmental change, is consistent with a liability of obsolescence among firms in rapidly evolving industries (Barron et al. 1994). However, while the assertion that industry matters is congruent with population ecology models of environmental selection, our findings also suggest that there may be different selection mechanisms at work within different industry settings. One scenario involves increasing competition in a market space that leads to selection against "unfit" organizations. Alternatively, changes in demand or technology, rather than pressure from new entrants, may lead to selection based on the resources and capabilities of incumbent firms. Although the present research cannot definitively disentangle selection dynamics, it suggests that the nature of selection pressure is heterogeneous between, and possibly within, industry contexts.

Finally, this study adds credence to the view that there is value to be gained from the study of failed organizations. Just as medical science would be unlikely to progress by studying only healthy individuals, organization science may be limited in the knowledge attainable only from the study of successful firms.

While these results shed new light on why firms fail at different ages, much remains to be learned about firm failure. We suggest that systematic differences exist between the failure mechanisms of younger and older bankruptcies. However, beyond the liabilities of newness and obsolescence, a wide range of forces act on firms from within (e.g., loss of key employees) and without (e.g., currency shocks). The direct and interactive effects of such forces are beyond the scope of the present research, but they may represent interesting and valuable areas for future exploration. Lines of study include (1) broadening the scope of exits to include modes of discontinuance other than bankruptcy, (2) extending the range of industries to encompass regulated and unregulated competitive dynamics, and (3) contrasting young and old failures with a comparable population of young and old survivors.

Our findings are also constrained by limitations of our data. Perhaps most obvious is the fact that the sample is drawn from a population of bankrupt enterprises. Clearly, the inclusion of surviving firms with comparable demographic characteristics would allow us to broaden our range of inferences about mortality dynamics. However, postmortem analysis is not without precedent, nor is it without value, and the differences that have emerged between the younger and older failed firms contribute to our understanding of firm mortality. Another limitation is the cross-sectional nature of our data. Longitudinal research would be able to shed more light on the dynamics of evolving competitive conditions. Our research design also relies on the perspectives of individual bankruptcy trustees in their analysis of each case of insolvency. Multiple perspectives, perhaps through case studies, would allow for tests of interrater reliability.

The existence of firm-specific failure determinants offers support to the resource-based theory of the firm, and contributes a more fine-grained perspective to the study of organizational ecology. Our finding that managerial deficiencies may trigger bankruptcy is consistent with the resource-based perspective that firm performance is a reflection of heterogeneous resources and capabilities. The role of environmental change supports both the selection argument of organization ecology and the resource-based emphasis on strategic assets and strategic industry factors. We found that the environment, age, and size all matter, but there is more to the puzzle. At the heart of the matter is management: the skillful deployment of limited resources in competitive conditions. This last implication should be of particular interest to managers. If the quality of management makes a difference for a population of failures, it surely matters for successful firms.

Acknowledgments

The authors are most grateful for the generous financial support of the Social Sciences and Humanities Research Council of Canada (Grant # 412 98 0025). They are also grateful to the Micro-Economic Analysis Division of Statistics Canada and to Jim Brander, Dev Jennings, and Craig Pinder for their helpful comments.

Appendix. Details of Bankruptcy Survey Items

Survey Items and Interitem Summary Statistics		
H2: Industry Turbulence and Change		
To what extent did the following factors contribute to bankruptcy: (Not at all (1) to A great deal (5))		
(a) Fundamental change in technology within the industry		
(b) Fundamental change in market conditions within the industry (such as product obsolescence)		
(c) Labour or industrial relations legislation		
Eigenvalue: 1.84	*Variance explained: 61%*	*Coefficient alpha: 0.68*
H3a: General Management		
To what extent was bankruptcy caused by deficiencies in: (Not at all (1) to A great deal (5))		
(a) Breadth of knowledge (*across* financing, marketing, operations, etc.)		
(b) Depth of knowledge (*within* financing, marketing, operations, etc.)		

Appendix. (cont'd.)

Survey Items and Interitem Summary Statistics		
(c) Control		
Eigenvalue: 2.22	*Variance explained: 74%*	*Coefficient alpha: 0.82*
H3b: Financial Management		
To what extent did the following contribute to insolvency: (Not at all (1) to A great deal (5))		
(a) Unbalanced capital structure (e.g., excessive reliance on short term debt)		
(b) Undercapitalization		
Eigenvalue: 1.52	*Variance explained: 76%*	*Coefficient alpha: 0.68*
H3c: Market Development		
To what extent was bankruptcy caused by: (Not at all (1) to A great deal (5))		
(a) Poor pricing strategy (over- or underpricing)		
(b) Inferior or poor quality of product		
(c) Failure to establish a market niche		
Eigenvalue: 1.67	*Variance explained: 56%*	*Coefficient alpha: 0.58*

Endnotes

[1]During the time of data collection, there were no extraordinary shocks or other triggering events that made this a noteworthy period of Canadian economic history. The Canadian economy typically shadows the dominant United States economy and, while different, should be representative of business processes in most OECD nations. The data collection period of six months was determined by dual considerations of desirable sample size and costs of data acquisition.

[2]The requisite omitted industry in our models is (4) primary and manufacturing industries. When this industry is specified and another industry omitted as the base case (e.g., other services), manufacturing is not a significant predictor of age at failure.

[3]When the asset variable is excluded from the regressions, the results are qualitatively the same.

[4]To evaluate whether the inclusion of the management variables represented a significant improvement over Model 1, we calculated an F-statistic to compare the nested models (Hamilton 1992).

$$F^{H}_{n-K} = \frac{(RSS\{K-H\} - RSS\{K\})/df_1}{[RSS\{K\}/df_2]} \tag{1}$$

The resulting $F^{3}_{330} = 4.14$, which is significant at $p < 0.01$. Thus, Model 2 is a significant improvement over Model 1 in explanatory power.

[5]As an alternative test, we ran regressions on the individual survey items and performed clustered f-tests of statistical significance. The results are qualitatively the same. We also evaluated alternative models in which the attribution factors (e.g., industry change) were on the left-hand side of the regression and age plus controls were predictors. The findings were consistent with those obtained when age at failure is the dependent variable.

References

Aldrich, H. E., E. R. Auster. 1986. Even dwarfs started small: Liabilities of age and size and their strategic implications,. *Res. Organ. Behavior* **8**(1) 165–198.

Amburgey, T. L., D. Kelly, W. P. Barnett. 1993. Resetting the clock: The dynamics of organizational change. *Admin. Sci. Quart.* **38** 51–73.

Amit, R., P. J. H. Schoemaker. 1993. Strategic assets and organizational rent. *Strategic Management J.* **14** 33–46.

Baldwin, J., T. Gray, J. Johnson, J. Proctor, M. Rafiquzzaman, D. Sabourin. 1997. *Failing Concerns: Business Bankruptcy in Canada*. Minister of Industry, Ottawa, Canada.

Barney, J. B. 1991. Firm resources and sustained competitive advantage. *J. Management* **17**(1) 99–120.

Barron, D. N., E. West, M. T. Hannan. 1994. A time to grow and a time to die: Growth and mortality of credit unions in New York City: 1914–1990. *Amer. J. Sociology* **100** 381–421.

Bates, T. 1990. Entrepreneur human capital inputs and small business longevity. *Rev. Econom. Statist.* **72** 551–559.

——, A. Nucci, 1989. An analysis of small business size and rate of discontinuance. *J. Small Bus. Management* **27**(4) 1–7.

Baum, J. A. C., C. Oliver. 1991. Institutional linkages and organizational mortality. *Admin. Sci. Quart.* **36** 187–218.

Boardman, C. M., J. W. Bartley, R. B. Ratliff. 1981. Small business growth characteristics. *Amer. J. Small Bus.* **5**(Winter) 33–42.

Bruderl, J., R. Schussler. 1990. Organizational mortality: The liability of newness and adolescence. *Admin. Sci. Quart.* **35** 530–547.

——, P. Preisendorfer, R. Ziegler. 1992. Survival chances of newly founded business organizations. *Amer. Sociological Rev.* **57** 227–242.

Brush, C. G., R. Chaganti. 1999. Businesses without glamour? An analysis of resources on performance by size and age in small service and retail firms. *J. Bus. Venturing* **14** 233–257.

Carroll, G. R. 1983. A stochastic model of organizational mortality: Review and reanalysis. *Soc. Sci. Res.* **12** 303–329.

——, J. Delacroi. 1982. Organizational mortality in the newspaper industries of Argentina and Ireland: An ecological approach. *Admin. Sci. Quart.* **27** 169–198.

——, Y. P. Huo. 1986. Organizational task and institutional environments in evolutionary perspective: Findings from the local newspaper industry. *Amer. J. Sociology* **91** 838–873.

Carter, N. M., M. Williams, P. D. Reynolds. 1997. Discontinuance among new firms in retail: The influence of initial resources, strategy, and gender. *J. Bus. Venturing* **12** 125–145.

Castanias, R., C. Helfat. 1991. Managerial resources and rents. *J. Management* **17**(1) 155–171.

Christensen, C. M. 1997. *The Innovators Dilemma*. Harvard Business School Press, Cambridge, MA.

Cochrane, A. B. 1981. Small business mortality rates: A review of the literature. *J. Small Bus. Management* **19**(4) 50–59.

Coff, R. W. 1997. Human assets and management dilemmas: Coping with hazards on the road to resource-based theory. *Acad. Management Rev.* **22**(2) 374–402.

Conner, K. R. 1991. A historical comparison of resource-based theory and five schools of thought within industrial organization economics: Do we have a new theory of the firm? *J. Management* **17** 121–154.

Cooper, A. C., F. J. Gimeno-Gascon, C. Y. Woo. 1994. Initial human and financial capital as predictors of new venture performance. *J. Bus. Venturing* **9** 371–395.

Daily, C. M. 1995. The relationship between board composition and leadership structure and bankruptcy reorganization outcomes. *J. Management* **21** 1041–1056.

D'Aveni, R. A. 1989. Dependability and organizational bankruptcy: An application of agency and prospect theory. *Management Sci.* **35**(9) 1120–1138.

Delacroix, J., A. Swaminathan. 1991. Cosmetic, speculative, and adaptive organizational change in the wine industry: A longitudinal study. *Admin. Sci. Quart.* **36** 631–636.

Dunne, T., M. J. Roberts, L. Samuelson. 1988. Patterns of firm entry and exit in U.S. manufacturing industries. *Rand J. Econom.* **19**(4) 495–515.

Fichman, M., D. A. Levinthal. 1991. Honeymoons and the liability of adolescence: A new perspective on duration dependence in social and organizational relationships. *Acad. Management Rev.* **16** 442–468.

Fredland, J. E., C. E. Morris. 1976. A cross-sectional analysis of small business failure. *Amer. J. Small Bus.* **1**(1) 7–18.

Freeman, J., G. R. Carrol, M. T. Hannan. 1983. The liability of newness: Age dependence in organization death rates. *Amer. Sociological Rev.* **48** 692–710.

Gaskill, L. R., H. E. Van Auken, R. A. Manning. 1993. A factor analytic study of the perceived causes of small business failure. *J. Small Bus. Management* **31**(4) 18–31.

Ghemawat, P. 1991. *Commitment: The Dynamic of Strategy*. The Free Press, New York.

Gimeno, J., T. B. Folta, A. C. Cooper, C. Y. Woo. 1997. Survival of the fittest? Entrepreneurial human capital and the persistence of underperforming firms. *Admin. Sci. Quart.* **42** 750–783.

Hall, G. 1992. Reasons for insolvency amongst small firms—A review and fresh evidence. *Small Bus. Econom.* **4** 237–250.

——, 1994. Factors distinguishing survivors from failures amongst small firms in the U.K. construction sector. *J. Management Stud.* **31** 737–760.

Hambrick, D. C., R. A. D'Aveni. 1988. Large corporate failures as downward spirals. *Admin. Sci. Quart.* **33** 1–23.

Hamilton, L. C. 1992. *Regression with Graphics*. Duxbury Press, Belmont, CA.

Hannan, M. T., J. Freeman. 1977. The population ecology of organizations. *Amer. J. Sociology* **82** 929–964.

——, ——. 1984. Structural inertia and organizational change. *Amer. Sociological Rev.* **49** 149–164.

Harrigan, K. R. 1985. *Strategic Flexibility*. D.C. Heath and Co., Lexington, MA.

——. 1988. *Managing Maturing Businesses*. D.C. Heath and Co., Lexington, MA.

Henderson, A. D. 1999. Firm strategy and age dependence: A contingent view of the liabilities of newness, adolescence, and obsolescence. *Admin. Sci. Quart.* **44** 281–314.

Jovanovic, B. 1982. Selection and the evolution of industry. *Econometrica* **50**(4) 649–670.

Kalleberg, A. L., K. T. Liecht. 1991. Gender and organizational performance: Determinants of small business survival and success. *Acad. Management J.* **34** 136–161.

Keasey, K., R. Watson. 1987. Non-financial symptoms and prediction of small company failure: A test of Argenti's hypothesis. *J. Bus. Finance Accounting* **14** 335–354.

Larson, C. M., R. C. Clute. 1979. The failure syndrome. *Amer. J. Small Bus.* **4**(2) 35–43.

Leonard-Barton, D. 1992. Core capabilities and core rigidities: A paradox in managing new product development. *Strategic Management J.* **13**(Special Issue) 111–126.

Levinthal, D. A. 1991. Random walks and organizational mortality. *Admin. Sci. Quart.* **36** 397–420.

Lippman, S. A., R. P. Rumelt. 1982. Uncertain imitability: An analysis of interfirm differences in efficiency under competition. *Bell J. Econom.* **13**(2) 418–438.

Litvak, I. A., C. J. Maule. 1980. Entrepreneurial success or failure—Ten years later. *Bus. Quart.* **45**(4) 68–78.

Lussier, R. N. 1995. A nonfinancial business success versus failure prediction model for young firms. *J. Small Bus. Management* **33**(1) 8–20.

McGrath, R. G. 1999. Falling forward: Real options reasoning and entrepreneurial failure. *Acad. Management Rev.* **24**(1) 13–30.

McKinlay, R. A. 1979. Some reasons for business failures in Canada. *Cost Management* **53**(3) 17–21.

Mitchell, W. 1991. Dual clocks: Entry order influences on incumbent and newcomer market share and survival when specialized assets retain their value. *Strategic Management J.* **12** 85–100.

——. 1994. The dynamics of evolving markets: The effects of business sales and age on dissolutions and divestitures. *Admin. Sci. Quart.* **39** 575–602.

——, J. M. Shaver, B. Yeung. 1994. Foreign entrant survival and foreign market share: Canadian companies' experience in United States medical sector markets. *Strategic Management J.* **15** 555–567.

Moulton, W. N., H. Thomas. 1993. Bankruptcy as a deliberate strategy: Theoretical consideration and empirical evidence. *Strategic Management J.* **14** 125–135.

O'Neill, H. M., J. Duker. 1986. Survival and failure in small business. *J. Small Bus. Management* **24**(1) 30–37.

Pennings, J. M., K. Lee, A. Witteloostujin. 1998. Human capital, social capital, and firm dissolution. *Acad. Management J.* **41** 425–440.

Phillips, B. D., B. A. Kirchhoff. 1989. Formation, growth, and survival: Small firm dynamics in the U.S. economy. *Small Bus. Econom.* **1**(1) 65–74.

Preisendorfer, P., T. Voss. 1990. Organizational mortality of small firms: The effects of entrepreneurial age and human capital. *Organ. Stud.* **11**(1) 107–129.

Ranger-Moore, J. 1997. Bigger may be better, but is older wiser? Organizational age and size in the New York life insurance industry. *Amer. Sociological Rev.* **62** 903–920.

Rumelt, R. P. 1984. Towards a strategic theory of the firm. R. Lamb, ed. *Competitive Strategic Management*. Prentice-Hall, Englewood Cliffs, NJ.

——. 1987. Theory, strategy and entrepreneurship. D. Teece, ed. *The Competitive Challenge*. Ballinger, Cambridge, MA.

——. 1991. How much does industry matter? *Strategic Management J.* **12** 167–185.

Singh, J. V., R. J. House, D. J. Tucker. 1986a. Organizational change and organizational mortality. *Admin. Sci. Quart.* **31** 587–611.

——, D. J. Tucker, R. J. House. 1986b. Organizational legitimacy and the liability of newness. *Admin. Sci. Quart.* **31** 171–193.

Sitkin, S. B. 1992. Learning through failure: The strategy of small losses. B. M. Staw, L. L. Cummings, eds. *Res. Organ. Behavior*, Vol. 14. JAI Press, Greenwich, CT, 231–266.

Sorensen, J. B., T. E. Stuart. 2000. Aging, obsolescence and organizational innovation. *Admin. Sci. Quart.* **45** 81–112.

Stearns, T. M., N. M. Carter, P. D. Reynolds, M. Williams. 1995. New firm survival: Industry, strategy and location. *J. Bus. Venturing* **10** 23–42.

Stinchcombe, A. L. 1965. Organizations and social structure. J. G. March, ed. *Handbook of Organizations*. Rand-McNally, Chicago, IL.

Teece, D. J., G. Pisano, A. Shuen. 1997. Dynamic capabilities and strategic management. *Strategic Management J.* **18** 509–533.

Thornhill, S., R. Amit. 1998. Growth management of emergent firms in Canada. P. Reynolds et al. eds. *Frontiers of Entrepreneurship Research*. Babson College, Babson Park, MA, 381–392.

——, ——. 2000. Young firm growth: An analysis of strategy and context. R. Bresser et al. eds. *Winning Strategies in a Deconstructing World*. John Wiley & Sons, Sussex, U.K.

Venkataraman, S., A. H. Van de Ven, J. Buckeye, R. Hudson. 1990. Starting up in a turbulent environment: A process model of failure among firms with high customer dependence. *J. Bus. Venturing* **5** 277–295.

Wernerfelt, B. 1984. A resource-based view of the firm. *Strategic Management J.* **5** 171–180.

Wichman, H. 1983. Accounting and marketing—Key small business problems. *Amer. J. Small Bus.* **7** 19–26.