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The entrepreneurial growth ceiling: Using people and innovation to mitigate risk and break through the growth ceiling in initial public offerings

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Using people and innovation to mitigate risk and break through the growth ceiling in initial public offerings

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Abstract

Purpose – In this paper the authors aim to introduce a concept that they call the "entrepreneurial growth ceiling" (EGC). They develop arguments that new venture IPOs hit the EGC prior to their IPO, and the ceiling is part of the impetus for going public. The paper argues that proceeds from the IPO will aid firms in breaking through the ceiling if the proceeds are strategically allocated.

Design/methodology/approach – The study examines a cohort of firms that went public in the same year. The authors code data from the prospectuses of 366 organizations, including how proceeds were to be spent, and then add performance data post-IPO.

Findings – The results from a longitudinal study of IPOs indicate that firms that allocate proceeds to human resources and innovation (research and development) are more likely to break through the EGC quickly and enhance long-term stock performance.

Practical implications – Entrepreneurial firms will have higher success when investing money into their human resources (people) and in research and development (innovation). Given the current high rate of change in business, the authors expect these findings are even more relevant for not just IPOs but for all organizations going through change.

Social implications – Organizations that support and fund entrepreneurship and new venture growth should consider expanding their training to include human resource management, in particular as it ties to innovation.

Originality/value – The entrepreneurial growth ceiling is a new concept introduced in this paper. This research has important implications for IPOs and other high-growth organizations.

Keywords: Entrepreneurial growth ceiling, Initial public offering, Resource based theory, Entrepreneurial growth, Human resource management in entrepreneurial firms, Human resource strategy, Innovation in new ventures, Business formation, Business development

1. Introduction

Organizational growth has become, in many ways, a "black box" in the field of entrepreneurship. Although there have been great efforts in the entrepreneurship literature to further our understanding of emerging growth companies, significant limitations continue to exist (Dobbs and Hamilton, 2007). Cooper (1993) cited varying research designs, inconsistent samples, theory shortcomings, and incongruent performance measures as barriers to proper interpretation of the extant literature. Sexton and Smilor (1997) called for more quantitative studies rather than merely quantifying qualitative research. Regardless of these and other shortcomings noted in the literature, the importance of research on firm growth cannot be disputed because "growth is the very essence of entrepreneurship" (Sexton and Smilor, 1997, p. 97).

It could be stated with some certainty that if growing a firm were an easy task then research on how firms grow would be moot. The heterogeneity of growth rates across industries and within industries indicates that some firms are more skilled than others in developing the necessary strategies to fuel growth. Furthermore, if strategy can be interpreted as allocating resources to build competitive advantage (Barney, 1991; Grant, 1991), it could be argued that the "skill" of growing firms is in their ability to allocate resources to achieve the greatest impact in the marketplace. We argue that firms allocate resources to solve problems, and, therefore, the choices they make in how to allocate resources is key to understanding the firm's ability to grow.

In this paper we focus on the ways in which entrepreneurial firms choose to solve their problems through resource allocation and how those solutions affect their ability to grow. We specifically focus on a particular stage in a firm's life, when it has multiple problems and chooses to solve those problems through an initial public offering (IPO) (Pagano *et al.*, 1998). By limiting our study to only younger (or new venture) firms, we introduce a concept we call the "Entrepreneurial Growth Ceiling" (EGC). The EGC represents a set of problems that need to be addressed and solved before a firm can continue along its growth trajectory. And we think that the IPO represents a time in a firm's life when it cannot break through the ceiling (or solve the problems they currently face) without additional and significant funding as can be obtained in an IPO.

This is not to say that all firms doing an IPO are doing so only to obtain cash; however, we do think that most new venture firms doing an IPO are engaging in this activity because they need cash (Pagano *et al.*, 1998, Arkebauer and Schultz, 1991). We are also not stating that all young firms with problems choose to solve them with an IPO. Certainly, the IPO is one of a number of means by which a firm can obtain additional funding (e.g. venture capitalists, angels, loans are also viable options) (Bowers *et al.*, 1995). But, for the sake of our research, we think that new venture IPOs represent a set of firms that need money to continue their growth, and IPOs are a class of firms for which there is growing interest (Certo *et al.*, 2009).

Because an IPO firm receives a large cash infusion (called proceeds) at the time of the offering, the added capital can be used to solve the problems inherent in the EGC. Lacking in the IPO literature, however, is a prescription of *how* the cash should be allocated throughout the IPO firm. Where should the proceeds be allocated in order to positively affect firm performance and break through the EGC? We posit that these decisions, particularly at the time when the firm's problems are significant and preventing them from moving to the next stage in their growth cycle, can have significant effects on firm performance.

Our paper is organized as follows. First, we introduce a new concept called the Entrepreneurial Growth Ceiling. Second, we build off the resource-based theory of the firm to hypothesize the strategies necessary to break through the EGC and the effects these strategies have on both long and short-term performance. Third, our methods section is presented followed by the analysis of the new venture IPO sample. Finally, we conclude with a discussion and implications sections for researchers and practitioners.

2. The entrepreneurial growth ceiling

Edith Penrose (1959) emphasized the process and limits of firm growth. Her seminal work, *The Theory of the Growth of the Firm*, categorized three potential limits to growth. These limits include managerial ability (conditions within the firm), product or factors markets (conditions outside the firm), and uncertainty and risk (combination if internal attitudes and external conditions) (Penrose, 1959, p. 43). Additionally, Hambrick and Crozier (1985) identified four major challenges of growing firms: instant size, a sense of infallibility, internal turmoil, and extraordinary resource needs. Bruton and Prasad (1997) cited management inadequacy and lack of access to distribution channels as further limitations of firm growth and survival. Growing firms evidently suffer from growing pains as they become stretched to handle internal and external pressures with limited resources (Hoy *et al.*, 1992; Covin and Slevin, 1997).

Given these growth limitations found in the literature, researchers have concluded that the number one cause limiting firm growth is cash deprivation (Hambrick and Crozier, 1985; Bruton and Prasad, 1997). Without the necessary cash requirements, a growing firm cannot buy the necessary resources from the outside nor cultivate and grow the resources it currently has internally. In other words, the firm cannot continue along its growth trajectory—the firm will hit a ceiling. Thus, the EGC is the impetus for the IPO. Bowers *et al.* (1995), pp. 2-3) offer a comprehensive list of benefits and opportunities of going public. These include: improved financial condition, greater marketability, improved value, diversification of personal portfolios, estate planning, capital to sustain growth, improved opportunities for future financing, a path to mergers and acquisitions, enhanced corporate image, and increased employee participation. Underlying many of these benefits, however, is the need for cash acquired through the equity financing of shares sold in the public offering.

Arkebauer and Schultz (1991) reported the findings of a study conducted by Young in 1985 of 562 companies that conducted an IPO between 1980 and 1984. CEO's of the IPO firms cited the cash infusion as the fundamental reason for going public. Furthermore, the cash infusion allows the company to fund start-up operations, purchase equipment for production, increase inventories, support growing receivables, expand operations, support administration, further research, develop future generations of product, retire prior debt, and increase market share. "Contained within each and every one of these capital purposes is the primary object for raising capital, to support and sustain the growth of the company" (Arkebauer and Schultz, 1991, p. 5).

The IPO represents a time when an organization encounters what we call the "Entrepreneurial Growth Ceiling" (EGC), where a new venture has accumulated multiple problems and needs cash to move forward. Rather than focusing on a categorization of problems, we think it is useful to think about the number of and extent of problems faced by a firm at this stage. One might

think of the intensity of problems faced by the firm as the "thickness" of the EGC. In order to be successful, the firm hitting the EGC needs to break through in order to reach the next stage of its growth.

However, the thicker the ceiling, the more important the strategy for breaking through becomes. If a firm uses all of its resources on an inappropriate strategy, it may never break through—particularly if the problems faced by the firm are intensive and complex (the ceiling is very thick). Or, the company may break through too slowly and lose its competitive advantage. We believe that the number of and complexity of problems encountered by an emerging growth company are important for understanding who will succeed in making it to the next stage of growth (or breaking through the ceiling).

In addition, we suggest that after an IPO, timing is critical. Breaking through the EGC is not a long-term goal for IPO firms. Because these firms are now in the public eye (e.g. they must file quarterly financials; they need to communicate with investors and the financial community), their performance the year following the IPO is critical for sustaining their stock price and for long-term financial success, which is often measured by shareholder return (Pagano *et al.*, 1998). Companies need to demonstrate that they are using their cash from the IPO wisely for financial reasons (stock value) and legal reasons (SEC requirements) (Arkebauer and Schultz, 1991). If investors see the firm performing poorly soon after the IPO, resulting from their not breaking through the ceiling, then investor interest in the firm will decline.

Investors will begin to sell shares; they will flood the market with stock, and the stock price will decline. This will only lead to additional problems for the company, and if management made poor choices about where to spend their cash, then the EGC can grow thicker rather than being reduced. In summary, we suggest that new ventures at the IPO are engaging in the IPO in order to break through the EGC. We also suggest that breaking through the ceiling (or adequately solving problems) must be done quickly, in fact, within one year after the IPO. Short-term success in breaking through the ceiling will dictate which firms will be successful in the long run.

> *General proposition.*
> Firms that break through the EGC in the year following the IPO (that solve their problems with the correct strategies or that choose to spend their cash in ways that allow them to solve their problems) will have greater long-term performance.

In this section we introduced the EGC and stated that it is a phenomenon (at least for IPO firms) that must be addressed within one year after the firm's IPO. In the next section of the paper we introduce testable hypotheses of the general proposition and discuss, in detail, ways in which the firm can best solve its problems in order to break through the EGC and ensure longer-term performance.

3. Resource allocation as problem solving strategy

Researchers of resource-based theory have grouped resources under various headings. Following economic thought, resources may be classified as land, labor, and equipment (Penrose, 1959). Hofer and Schendel (1978, p. 145) classify resources under the headings of financial resources, physical resources, human resources, organizational resources, and technological capa-

bilities. Barney offered an additional classification scheme that seems to borrow from both Penrose and Hoffer and Schendel. According to Barney (1991), a firm may have physical capital resources, human capital resources, and organizational capital resources. Another broad classification used in the literature is simply grouping resources as tangible or intangible (Hall, 1993; Conner and Prahalad, 1996). The various classification schemes do not cloud the importance of the various types of resources available to and needed by the firm. Penrose (1959, p. 74) notes that "the sub-division of resources may proceed as far as is useful, and according to whatever principles are most applicable for the problem at hand."

For purposes of our study, we think that classifying resources is less important than thinking about the number of problems that can be solved with various types of resources. When evaluated in this way, all of the classification schemes can be consolidated into two types. The first is resources that solve multiple problems, and the second is resources that solve only one specific problem or, at least, a limited number of problems.

This is somewhat different from the traditional resource-based paradigm because our focus is on short-term performance rather than long-term competitive advantage. Traditional resource-based theorists (Wernerfelt, 1984; Barney, 1986, 1991; Dierickx and Cool, 1989; Conner, 1991; Mahoney and Pandian, 1992) argue that a firm's long-term competitive advantage is the result of creating resources that are valuable, rare, inimitable, and for which there are few substitutes (Barney, 1991). The focus of the theory is how one firm performs relative to its competition, and the interest of researchers, in most cases, is in long-term performance. The long-term focus of organization performance found in resource-based theory is intuitive. The fundamental notion of resource-based theory is that firms are comprised of heterogeneous resources and this heterogeneity accounts for firm differences in performance (Peteraf, 1993). Furthermore, resources, whether growing or changing, require considerable amounts of both time and money (Wernerfelt, 1995). So, using a resource-based approach to strategy typically involves a long-term focus of building resources and capabilities that can generate economic rents over time (Grant, 1991).

The focus of our research, however, is on short-term performance after a firm's IPO (in particular the year after the IPO). Although our conclusions are not much different from what resource-based theorists would traditionally suggest, our logic in developing our arguments is somewhat different. Rather than focusing on resources that build long-term and sustainable competitive advantage, we seek to find resources that will help IPO firms quickly break through the EGC by solving the many problems they have accumulated at the time of the IPO. Thus, we suggest that the most strategic and valuable resources that can be purchased with proceeds from the IPO are those resources that can be used to solve multiple versus limited problems. This is, of course, more critical as the number of and complexity of the problems faced by the firm increases.

For example, a firm may choose between spending money on management or on a new sales campaign (advertising, print media, etc.). If the firm only faces one problem, and that problem is sales, then the choice to spend money on sales may be the appropriate one. However, if the firm has problems associated with sales, motivation, cash flow, budgeting, and risk management, then spending money on a new sales campaign may not be the best choice. Spending money on building a management team may be the better choice because

it can result in improvements in multiple problem areas. We conclude that proceeds from the IPO can be spent on resources that will solve single problems or multiple problems. Furthermore, the more problems faced by a firm (the thicker the ceiling), the more the firm will benefit from choosing to spend money on resources that will solve multiple problems.

Which resources solve multiple problems?

In order to determine which resources may solve multiple versus single problems, we now combine theory and practice. Since our study is on IPO firms, we examined the prospectuses of companies going public in order to determine ways in which these firms spend the cash obtained from the IPO. The proceeds section of the prospectus outlines in detail where cash will be allocated. Because the Securities Exchange Commission (SEC) requires the company to file continuing reports proving the money was spent as described in the prospectus or explaining otherwise, the proceeds section of the prospectus is given great attention by the issuing company (Arkebauer and Schultz, 1991). We then combined this information with the classification schemes developed by researchers studying resource-based theory and determined which methods of spending the proceeds from the IPO resulted in solving multiple problems and which resulted in solving single or limited problems. Analyzing these resource allocation decisions offered us insight into the resource-based strategies of new venture IPOs.

Solving multiple problems. We found that proceeds could be spent on two types of resources that should solve multiple problems. Those are human resources and research and development (R&D). Problems related to human resources involve managerial shortcomings, employee related issues, and the need to recruit and hire additional employees to handle company expansion and growth. Managerial shortcomings represent the inability of top management to pursue desired objectives. The top management team is lacking necessary skills to move the firm forward or maintain desired growth levels. The inability by management to delegate related to dogmatism has been found to be a source limiting growth (Meyer and Dean, 1990), as well as the firm outgrowing the founder's capacity to manage (Willard *et al.*, 1992). Meyer and Dean (1990) labeled this management capacity the "Executive Limit."

In addition to management capability, problems persist in lower levels of the organization with employees. Employee-related problems stem from the entrepreneurial firm becoming a more professionally managed organization as considerable staff additions are made to handle business growth (Welbourne and Andrews, 1996). Employee relations suffer due to the increase in number of employees without immediately putting the necessary procedures and controls in place to handle the additional layers of management and staff. New employees are often lost in the turmoil while existing employees may be resistant to the addition of new organization members who have not paid their dues in the early years of the organization's founding (Hambrick and Crozier, 1985).

R&D accounts for the second resource type with the ability to attack multiple problems. Cash deprivation limits the amount of time and money a firm can allocate to this critical component of firm growth. The inability of an organization to attend to its R&D needs can be the demise of young, growing firms. It is in this function where product development, new information technology processes, new or improved manufacturing processes, and market develop-

ment can generate entrepreneurial rents (Schumpeter, 1934) catapulting an organization further along its growth trajectory ahead of the competition.

Solving limited problems. Our research found two resource areas where allocating proceeds from the IPO can only solve limited or single problems. The first involves sales and marketing, while the second is plant and equipment. Problems related to sales and marketing include lack of access to distribution channels, inability to market to larger geographic areas, lack of funding for advertising leading to limited visibility and/or client base.

Plant and equipment is the final category of problems found in the EGC. A growing firm may not have the capacity in terms of space or equipment for production to adequately supply its market(s). The result may be customer migration to direct competitors or substitute products. As a result, firms may choose to spend money on plant and equipment to deal with those problems.

Breaking through the EGC. We argue that human resources and R&D resources are more likely to solve multiple problems for the IPO firm than sales and marketing resources and plant and equipment resources, and this is specifically true in the short-term. Ideally, a firm should concentrate on long-term survival, but the goal of our study is to examine the firm's ability to break through the EGC after the IPO, and this is a short-term strategy.

Allocating proceeds to human resources allows a firm to address problems relating to management capacity, training and development, organization structure, knowledge capacities, compensation, and motivation. Additionally, allocating proceeds to attend to problems relating to R&D can support the firm's need to expand its product line, develop next generation products, and improve production processes, which ultimately affect sales, marketing, production, and retention (thus solving multiple problems). Concentrating only on the resources that solve single or limited problems can potentially limit the effect of the resource on firm performance. Building the resource base in order to solve single or limited problems before building the resource base that can solve multiple problems may not be the most strategic decision for an IPO trying to break through a thick EGC in the short-term. Again, the thickness of the EGC is representative of multiple and complex problems that require immediate attention because the new IPO firm is in the spotlight of the public market. Thus, if a firm's ceiling is thick (as measured by the number of problems), the organization will be more successful in the short term if it allocates resources on people and R&D.

> *H1.* Firms with multiple and complex problems that spend their cash from the IPO on human resources and R&D resources are most likely to break through the EGC quickly, thus positively affecting short-term performance

It is important to note that breaking through the EGC results in the firm solving its internal problems. We are not suggesting that the stock market will necessarily recognize this short-term success, but we do think that breaking through the EGC will manifest itself in measures of internal firm performance versus manifesting itself in market-based measures. Therefore, our research focuses on the effect of successfully breaking through the EGC (*H1*) on two measures of firm performance, earnings per share and productivity. Additionally, we posit that success in breaking through the EGC will have a positive effect on the longer-term performance of the new venture IPO. Short-term success

should capture the attention of the stock market and impact longer-term share-holder return. As a result, short-term strategic resource allocation decisions can result in sustainable competitive advantage.

> H2. Positive short-term performance, indicative of breaking through the EGC and solving multiple problems, will positively affect the long-term financial success of new venture IPOs.

In summary, we posit that incorporating short-term strategies that allocate cash received from the IPO to human resources and R&D resources represent strategic initiatives to solve multiple problems in a short period of time to break through the EGC. However, these short-term resource allocation strategies are not without long-term implications. We argue that it is only through successful short-term strategies that long-term competitive advantage can be achieved.

4. Methods
Our research methodology involved selecting a specific cohort of IPO firms that went public so that we could study both short-term and long-term implications of the sample firms' strategic decisions. The number of firms was 585 (excluding real estate trusts); of those companies we were able to obtain the prospectuses for 535. Because our purpose is to analyze new venture IPOs our sample was further reduced. Following previous research (Biggadike, 1976; Miller and Camp, 1985; McDougall *et al.*, 1994), a firm is considered a new venture if it is eight years old or less; therefore, we excluded all firms that were older than eight years at the time of the IPO. Additionally, we deleted extreme outliers in terms of size as measured by number of employees. Our final new venture IPO sample was 366 firms.

Data collection and coding
The primary data source was the prospectus of each firm. The prospectus is the document mandated by the Securities Exchange Commission (SEC) prior to the IPO, and it also the document used by underwriters to assess demand from potential investors and sell the firm's securities (Arkebauer and Schultz, 1991; Bowers *et al.*, 1995). The SEC requires that firms follow strict guidelines in the format of the prospectus, and the firm is held legally liable for false or mislead-ing information (O'Flaherty, 1984; Arkebauer and Schultz, 1991). As noted by Beatty and Zajac (1994), top management is accountable to the SEC and to stock-holders regarding the contents of the prospectus. The typical prospectus writing process involves at least three lawyers (one for the company and one for each of the investment bankers), two investment banking firms, and at least one cer-tified public accountant. Each party has a vested interest in providing the pub-lic with accurate information. Given the strict regulations and liability held by all parties involved in the IPO, we can be reasonably assured that the prospectus is a useful and valid data source (Marino *et al.*, 1989; Mosakowski, 1991).

Our coding strategy was developed and refined based on earlier research on IPO firms (see method used by Welbourne and Andrews, 1996). Code sheets and a coding handbook were given to each coder after each individual attended an initial training session. A total of five coders worked on the data. In addition, weekly meetings were held with coders to discuss problems and/or inconsis-tencies in the prospectuses. Finally, we randomly cross coded every tenth pro-

spectus. For the variables used in this study, agreement was 90 percent or higher among coders. Financial data used in this study was obtained from COMPUSTAT, the Security Data Corporation database, and *Going Public: The IPO Reporter* (for financial data at the time of the IPO).

Sample characteristics

The average firm in the sample (*n* = 366) was 3.70 years old (s.d. 2.60) at the time of the IPO. Given that we classified a new venture as being eight years old or less, the range of the sample was from zero to eight years old with 71 percent being five years old or less at the time of the IPO. The average firm in the sample employed 740 people (s.d. 1,488). On average, net income per share was $0.07 (s.d. $0.55)**,** and the initial offering price (adjusted for splits, buybacks, or any other changes that affected unit price) was $10.01 (s.d. $7.87). Using the Standard Industrial Classification (SIC) index, the sample's highest concentration of new venture firms was in manufacturing (50.6 percent). A total of 18.1 percent were in financial services, while 16 percent were in the service industry. Other industries include mining (2.8 percent), construction (1.2 percent), transportation and communication (7.6 percent), wholesale (4.2 percent), and retail (8.8 percent). Only 0.2 percent of the sample was considered non-classified based on the SIC index. Table I provides a summary of the means, standard deviations, medians, and correlations used in the analysis.

Independent variables

Proceeds. We coded from the "Proceeds" section of the prospectus, which describes how the issuing firm plans to spend the cash received from the IPO. The proceeds section of the prospectus outlines in detail where cash will be allocated. Because the Securities Exchange Commission (SEC) requires the company to file continuing reports proving the money was spent as described in the prospectus or explaining otherwise, the proceeds section of the prospectus is given great attention by the issuing company (Arkebauer and Schultz, 1991).

The total amount of proceeds obtained from the IPO was obtained, and the amount of money the firm stated it would spend on each category was coded. We then calculated the percentage of total proceeds spent on each category and used the percentage for data analysis purposes. The following proceed categories are used in the analysis:

- proceeds allocated to human resources;
- proceeds allocated to R&D;
- proceeds allocated to plant and equipment; and
- proceeds allocated to sales & marketing.

These are common categories found in the prospectus, and each category was coded based on the dollar figure allocated by the firm in its prospectus.

Human resource proceeds is cash allocated to salaries, personnel, and training. Proceeds allocated to R&D indicated planned spending in such areas as product development, research, clinical trials, and testing. Sales and marketing proceeds indicate money will be spent on marketing, advertising, sales, inventory, promotion, and distribution channels. Finally, plant and equipment proceeds include plant, equipment, land, additional store locations, leasehold improvements, renovations, and construction. While it may be true that some firms are using the proceeds to retire existing debt, the IPO firm must (when

Table I. Means, standard deviations, medians, and correlations for variables used in regression analyses

	Mean	SD	Median	1	2	3	4	5	6	7	8	9	10	11	12	13
1. No. of employees	740	1,488	184	1.00												
2. Net sales ($000s)	144.33	271.65	27.26	0.75**	1.00											
3. Stock offering price adjusted for splits	10.01	7.87	8.88	0.17**	0.16**	1.00										
4. % change in sales	100.10	544.60	33.29	20.04	20.04	20.023	1.00									
5. Net income per share	0.07	0.55	0.11	0.21**	0.15**	0.12**	20.07	1.00								
6. Total number of paragraphs in risk section (total risk)	16.46	4.91	16.00	20.25**	20.28**	20.22**	0.16**	20.38**	1.00							
7. Human resource proceeds (% of total proceeds)	0.08	0.04	0.00	20.06	20.07	20.09	0.19**	20.10	0.20**	1.00						

(*continued*)

Table I. Means, standard deviations, medians, and correlations for variables used in regression analyses

Table I. Means, standard deviations, medians, and correlations for variables used in regression analyses (*continued*)

	Mean	SD	Median	1	2	3	4	5	6	7	8	9	10	11	12	13
8. R&D proceeds (% of total proceeds)	0.10	0.19	0.00	20.12*	20.16	0.02	20.02	20.36**	0.23**	20.04	1.00					
9. Plant and equipment proceeds (% of total proceeds)	0.13	0.21	0.00	20.05	20.08	20.01	20.01	20.04	0.13*	0.00	20.07	1.00				
10. Sales and marketing proceeds (% of total proceeds)	0.08	0.16	0.00	20.09	20.11*	20.08	0.04	20.26**	0.34**	0.00	0.11*	20.06	1.00			
11. Earnings per share	20.08	1.34	0.16	0.16**	0.11*	20.42	20.09	0.28**	20.36**	20.11*	20.36**	20.09	20.24**	1.00		
12. Productivity	171.38	220.38	98.82	20.05	0.03	0.12	20.03	0.09	20.16**	20.00	20.20**	20.04	20.15**	0.12**	1.00	
13. Year end stock price	0.13	0.21	0.00	0.27**	0.29**	0.21**	20.11*	0.39**	20.39**	20.14**	20.11*	20.10	20.24**	0.34**	0.27**	1.00

* Significant at 0.05
** Significant at 0.01
Industry codes, although not reported here, were used in the analysis.

applicable and in our sample the majority of firms) must describe the specific areas where the proceeds will be spent if other than paying off firm debt (Arkebauer and Schultz, 1991).

Firm problems. The "Risk" section of the prospectus was used as a proxy to assess the number of problems (thickness of the EGC) faced by the new venture IPO firms in our sample. We coded the risk section by counting and recording the total number of paragraphs in this section. Total number of paragraphs in the risk section ranged from five to 32. Common types of risks found in our sample were technological obsolescence, supplier dependence, customer dependence, limited product offering, seasonality, competition, inexperienced management, limited underwriter experience, number of years the company has been in operation, legal proceedings against the company, and government regulation. The logic underlying this proxy is that we wanted to ascertain the depth of the firms' problems or the thickness of the ceiling. As a result, the more time or text taken to describe the risks of the company, the more problems they may have. Beatty and Zajac (1994) used a similar risk measure, the total number of risks listed in the risk section of the prospectus, arguing that the number of risks identified in the prospectus is a good indicator of the riskiness of the IPO.

Dependent variables

Short-term performance. Earnings per share and productivity acquired from COMPUSTAT were used as measures of firm performance. Earnings per share is the amount of a firm's net income per share of its outstanding common stock. It is arguably the most widely used accounting ratio and is a key ratio indicating firm performance (Horngren *et al.*, 1996). Productivity is measured as sales per employee and has been a common measure used in the literature (e.g. Koch and McGrath, 1996). It should be noted that earnings per share and productivity are also used as independent variables to test *H2*.

Long-term performance. We use year-end stock price (adjusted for splits, stock buy backs, and any other events that altered the unit price of the stock) to measure the long-term performance implications of breaking through the EGC. We ran the analysis in this way rather than predicting percentage change in stock price in order to minimize errors associated with the use of change scores (Cohen and Cohen, 1983). However, we did run the analysis with change in stock price (percentage change) as a dependent variable, and the results did not change.

Year end stock price for each new venture IPO firm was acquired from COMPUSTAT. Analysts and investors view stock price growth as a measure of overall financial health in addition to an assessment of a firm's potential. It is the most widely used measure of performance in the IPO literature (see Ibbotson and Ritter, 1995, for a review).

Control variables

Several control variables were used in the analysis. In total, 19 (one omitted) industry classifications were used to control for industry effects. Additionally, we controlled for net sales and number of employees at the time of the IPO. Lastly, net income per share (a measure of firm performance) and initial stock offer price (adjusted) are included in the analyses.

5. Results

Table I presents the bivariate correlations for the variables included in the analysis (with the exception of industry codes). The results show that the total number of paragraphs in the risk section (total risk), our proxy for thickness of the EGC, is positively and significantly correlated to all the resource categories. Total risk is positively correlated with percentage spent on human resource proceeds (0.20), R&D proceeds (0.23), plant and equipment proceeds (0.13), and sales and marketing proceeds (0.34), indicating that the firms are spending the cash received from the IPO to solve problems present in the EGC.

Short-term performance

H1 stated that firms spending proceeds to solve multiple problems are more likely to break through the ECG quickly, thus positively affecting short term performance. Because we incorporated two dependent measures of short-term performance (earnings per share and productivity) into the analysis, two ordinary least squares (OLS) regression equations were used. These regressions were conducted in two steps, where in step one we entered all the control variables and independent variables of interest. In step two we entered the interaction terms. We calculated interaction terms that crossed the total number of paragraphs in the risk section with percentage of proceeds spent on each category: human resource proceeds, R&D proceeds, sales and marketing proceeds, and plant and equipment proceeds. Table II includes the results of the regression equations predicting earnings per share and productivity one year following the IPO (1994).

Table II. Regression analyses for short-term performance earnings per share and productivity

Variables	Earnings per share		Productivity	
	Beta	*t*	Beta	*t*
Step 1				
Human resource proceeds	–0.06	–1.12	0.01	0.13
R&D proceeds	–0.39	–5.27 ***	0.34	–4.32 ***
Plant and equipment proceeds	–0.11	–1.91 +	–0.05	–0.91
Sales and marketing proceeds	–0.14	`–2.46 *	–0.10	–1.54
Total risk (no. of paragraphs)	–0.25	–3.70 ***	–0.22	–3.04 **
Net sales	–0.068	–0.99	0.17	–.35 *
No. of employees	–0.01	–0.08	–0.29	–3.97 ***
Change in net sales	–0.05	–0.85	–0.02	–0.29
Net income per share	–0.02	–0.33	–0.14	–2.05 *
Change in R^2 for Step 1	0.28		0.17	
Step 2: Interaction Terms				
Human resource proceeds × total risk	0.43	1.75 +	0.66	–.47 *
R&D proceeds × total risk	0.58	–.36 *	0.19	0.73
Plant and equipment proceeds × total risk	0.28	1.35	–0.06	–0.26
Sales and marketing proceeds × total risk	0.10	0.44	0.16	0.65
Change in R^2 for Step 2	0.02		0.02	
Total R^2	0.30		0.19	
F	3.66 ***		2.23 ***	

*** $p \le 0.001$; ** $p \le 0.01$; * $p \le 0.05$; + $p \le 0.10$
Standardized beta coefficients are reported. Industry codes, although not reported, were included in the analysis.

The change in R^2 associated with the second step for each equation was significant ($p \leq 0.001$). As hypothesized, the interactions that were significant were total risk with human resource proceeds ($p \leq 0.10$) and total risk with R&D proceeds ($p \leq 0.05$). However, the only interaction term significant when predicting productivity in 1994 is total risk with human resources proceeds ($p \leq 0.05$). Nevertheless, the direction of the interaction of total risk with R&D proceeds is still positive. This analysis provides support for *H1* when earnings per share is predicted and partial support when productivity is predicted.

Long-term performance

H2 stated that short term performance, indicative of breaking through the EGC and solving multiple problems, will positively affect the long-term financial success of the new venture IPO. To test this hypothesis, we used OLS regression to predict stock price. As in *H1*, we used two steps in the regression analysis. In step one we entered all of the control variables. As additional controls, we included the two use of proceeds that we hypothesized would enhance the firm's short-term performance (human resources and R&D) and the interaction of those two proceeds factors with risk (representing the firm's strategy for overcoming the EGC). In step 2 we entered the short-term performance measures that were used as dependent variables to test *H1* (earnings per share and productivity for 1994). Table III includes the results of this regression analysis predicting stock price change.

The change in R^2 associated with the second step was significant ($p \leq 0.001$). As hypothesized, earnings per share and productivity (which represent success in overcoming the EGC) were both significant ($p \leq 0.001$) in predicting stock price growth from the time of the IPO through year-end 1996. This analysis provides support for *H2*, indicating the positive effect of the short-term resource allocation strategy on longer-term performance.

Table III. Regression analyses for longer-term performance year-end stock price

Variables	Year-end stock price	
	Beta	*t*
Step 1		
Total risk (no. of paragraphs)	–0.32	–4.70 ***
Net sales	0.25	3.93 ***
Number of employees	–0.04	–0.65
Human resource proceeds	–0.19	–0.77
R&D proceeds	–0.10	–0.43
Stock offer price (adjusted for splits)	0.06	1.01
Human resource proceeds × total risk	0.16	0.64
Technology and R&D proceeds × total risk	0.09	0.37
Change in R^2 for Step 1	0.28	
Step 2: Short term performance		
Earnings per share	0.50	7.20 ***
Productivity	0.20	4.07 ***
Change in R^2 for Step 2	0.14	
Total R^2	0.42	
F	7.36 ***	

*** $p \leq 0.001$; ** $p \leq 0.01$; * $p \leq 0.05$; + $p \leq 0.10$
Standardized beta coefficients are reported. Industry codes, although not reported, were included in the analysis

6. Discussion

The challenges that growing firms face in trying to maintain momentum along their growth trajectory are many (e.g. Hambrick and Crozier, 1985; Hoy *et al.*, 1992; Bruton and Prasad, 1997; Covin and Slevin, 1997). In this paper we introduce the EGC as a phenomenon associated with new venture IPOs, and we suggest that the firm's ability to quickly (within one year of the IPO) break through the ceiling is critical for their overall long-term performance. The EGC represents a set of problems that need to be addressed before the firm can continue along its growth trajectory. We also suggest that the thicker the ceiling, as determined by the number of problems being faced by the firm, the more important the decision becomes on how to spend the cash or proceeds from the IPO; thus, there is a need to strategically allocate proceeds to firm resources.

We depart from, but also expand, the traditional resource-based theory of the firm and focus primarily on short-term performance rather than long-term, sustainable competitive advantage (Wernerfelt, 1984; Barney, 1986, 1991; Dierickx and Cool, 1989; Conner, 1991; Mahoney and Pandian, 1992). Rather than analyzing those resources that can predict long-term performance, our research purpose is to identify those resources that would aid the new venture in breaking through the ceiling. As a result, this effort requires a short-term strategic orientation—one year following the IPO.

We look at two set of resources; those that solved multiple problems and those that solved a specific, or limited number, of problems. Our research results support the hypothesis that firms allocating resources that solve multiple problems are most likely to break through the EGC in the year following the IPO (as measured by increases in earnings per share and productivity). Furthermore, those resources allowing a firm to solve multiple problems were identified as human resources and R&D resources. We also show that success in breaking through the ECG the year after the IPO has a positive effect on long-term stock performance for our sample of new ventures.

Our findings suggest support for a somewhat different interpretation of the resource-based view of the firm. At least in the case of growing firms, such as new venture IPOs, a short-term resource allocation strategy is necessary in building the internal resource base of the firm for the long-term. Young firms are resource starved, and an influx of large amounts of cash, as in the case of an IPO, can be a dream turned nightmare for many new ventures because there is little strategic direction of how to spend the cash. Without a short-term strategic direction for allocating resources immediately following an IPO, can a long-term competitive advantage ever be achieved?

Furthermore, our findings suggesting the need to allocate more proceeds from the IPO to human resources and R&D resources points to a critical component of resource-based theory—knowledge. Conner and Prahalad (1996) state that knowledge is an emerging view of the resource-based perspective, and the knowledge held by a firm is a source of competitive advantage. If proceeds are being spent on hiring people, training, development, and technology, a firm is, in essence, building its knowledge base. And knowledge can be a resource that meets Barney's (1991) VRIO framework stating a resource can be a source of competitive advantage if it is valuable, rare, inimitable, and organizationally complex.

This study not only contributes to the resource-based theory literature, but

it also contributes to the entrepreneurship literature addressing firm survival. We speculate that most new ventures (not just IPOs) will eventually hit the EGC. Moreover, hitting the EGC will most likely occur for new ventures earlier in the life of the firm rather than later. So, perhaps, the question of which firms fail and which firms succeed may best be addressed through resource allocation and problem solving strategies.

Directions for future research

Research that further examines the ways in which the proceeds from an IPO are used would be useful for theory building and assessing the generalizability of our work to non-IPO firms who receive large cash infusions from other sources (e.g. venture capitalists, angels, bank loans, etc.). The importance of resource allocation strategies set forth in this paper can help frame future research. Continuing research analyzing not only how the money is being spent, but also what problems (multiple versus single) are being solved, can further develop the position and findings presented by this study.

This study is not without limitations. First, our measure to determine the number of problems faced by the new venture IPO firms was the total number of paragraphs reported in the risk section of the prospectus. Though there are alternative ways to measure risk (Beatty and Zajac, 1994), we felt this was a strong attempt to capture the thickness of the ceiling. Secondly, using the proceeds section of the prospectus to determine where the money from the IPO was used is a limited measure. Future research would benefit from confirming these reported figures with surveys asking the top management how the proceeds were actually used versus what they planned. However, how the money is used compared to what is stated in the prospectus is scrutinized by the SEC; therefore, we thought it was a valid and accurate measure.

Implication for practitioners

Conventional wisdom and actual practice seem to suggest the opposite of our findings. The popular press is inundated with reports of layoffs and the downsizing of support functions such as training and development. Additionally, there have been marked decreases in R&D spending over the last few years. In efforts to increase productivity and produce positive earnings to shine for investors and the stock market, perhaps, management is overlooking the new fundamentals of business—building people and knowledge.

Conclusion

Edith Penrose (1959) gave rise to the first theory of firm growth. In order to build a theory of firm growth one needs to understand:

- what principles guide and govern growth; and
- how fast and how long a firm can grow.

Penrose's basic argument was that the growth of the firm is unlimited, but the rate of growth will eventually become restricted by the size of the firm and its competitive environments. The concept of an EGC introduced in this paper parallels the Penrosian notion of growth rate limits. The EGC prevents a firm from continuous growth, and the growth limits placed on the firm is due to specific resource shortages resulting in complex problems that can be overcome through the strategic use of the proceeds acquired from the IPO. Our

expansion of the resource-based view of the firm and our contribution to the theory of firm growth is that short-term resource allocation strategies targeting human and R&D resources will allow the firm to solve multiple problems, break through the EGC, and setting the stage for long-term performance and competitive advantage.

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