

6-9-2012

A SYSTEMATIC ASSESSMENT AND EXTENSION OF THE THEORY OF THE GROWTH OF THE FIRM

Robert S. Nason

Syracuse University, rnason@syr.edu

Jan Brinckmann

ESADE

Johan Wiklund

Syracuse University

Recommended Citation

Nason, Robert S.; Brinckmann, Jan; and Wiklund, Johan (2012) "A SYSTEMATIC ASSESSMENT AND EXTENSION OF THE THEORY OF THE GROWTH OF THE FIRM," *Frontiers of Entrepreneurship Research*: Vol. 32: Iss. 9, Article 2.

Available at: <http://digitalknowledge.babson.edu/fer/vol32/iss9/2>

This Paper is brought to you for free and open access by the Entrepreneurship at Babson at Digital Knowledge at Babson. It has been accepted for inclusion in Frontiers of Entrepreneurship Research by an authorized administrator of Digital Knowledge at Babson. For more information, please contact digitalknowledge@babson.edu.

A SYSTEMATIC ASSESSMENT AND EXTENSION OF THE THEORY OF THE GROWTH OF THE FIRM



Robert S. Nason, Syracuse University, USA

Jan Brinckmann, ESADE, Spain

Johan Wiklund, Syracuse University, USA

ABSTRACT

We assess Penrose's Theory of the Growth of the Firm (1959) based on aggregate findings to date and suggest that her theory may be useful to unify the fragmented field of growth research. We develop theoretical constructs originating in Penrose's theory and analyze the overall and relative strength of their relationship to firm growth by using meta-analysis techniques on 128 samples, 531 bivariate correlations and a total sample size of 57,659 firms. Our results support many of Penrose's arguments, identify gaps where further research is needed and provide concrete empirical recommendations for future research on firm growth. We discuss implications for future research which will allow consistent knowledge accumulation and stimulate stalled theoretical development on firm growth.

INTRODUCTION

Firm growth is a foundational topic of management and entrepreneurship research. Yet, it is fair to say that knowledge accumulation on growth has been notably slow (Lockett, Wiklund, Davidsson & Gima, 2011). Over the last few decades, hosts of empirical studies explaining variance in growth rates have been conducted, invoking a broad array of theories. Theoretical advancement, however, has been limited, leading to a fragmented field of study. This fragmentation prevents comprehensive knowledge accumulation and theoretical development. Consequently, this paper provides a systematic synthesis of the research to date by means of a theoretically driven meta-analysis.

We build on Penrose's Theory of the Growth of the Firm (henceforth, TGF) originating in the 1950s (Penrose, 1959). It provides one of the most comprehensive, popular, and well developed theory on firm growth to date. Indeed in the history of management theory, Penrose is one of the foundational theories (Nair, Trendowski & Judge, 2008). Many scholars have aimed at implicit or explicit testing of the theory (e.g. Hutzschenreuter, Voll & Verbeke, 2011; Lockett, Wiklund, Davidsson & Girma, 2011; Pettus, 2001); however, to date there has been no synthesis of these findings, leading to limited knowledge about the validity of key propositions, boundary conditions and methodical insights regarding its empirical testing. Utilizing concepts from Penrose's theory, we organize empirical studies into theoretically meaningful categories. We then use these theoretical constructs to test their overall and relative strength in explaining firm growth. We use meta-analytic techniques on a sample of 128 studies spanning a total of 57,569 firms to conduct this examination. To the best of our knowledge, we are the first to test central propositions of the TGF based on the aggregate empirical findings existent to date.

As opposed to previous meta-analyses in the strategy area (Crook, Ketchen Jr., Combs & Todd, 2011), we focus specifically on firm growth and develop theoretical categories for variables explicitly part of Penrose's theory or used in existing research which may be conceptualized as part of Penrose's theory. These categories include types of resources such as human capital (on individual and team level), social capital (internal and external), intellectual capital, financial capital, and organizational slack. Our categorizations also include non-resource categories discussed by Penrose including absorptive capacity, innovation, organizational size, and past growth. As a result, we are able to determine the absolute and relative strengths of these relationships to firm growth based on aggregate evidence. We also examine measurement determinants of the strength of those relationships and are able to provide concrete empirical direction for future research.

By assessing and extending Penrose's growth theory on the basis of recent research we make several contributions. First, aggregating and testing firm growth research through a Penrosian lens facilitates defragmentation of the field. Part of the fragmentation in the field of growth is due to the lack of a common set of variables used as an antecedent to growth. By conceptualizing existing variables in use in the literature as part of Penrose's theory and aggregating findings across them, we are able to synthesize a toolbox of common variables to be used in future growth studies and theory development. Second, we systematically test the relationships between internal firm factors and growth across existing studies. This provides a valuable aggregation of knowledge on the topic of growth. Our results provide summary of direct effects of Penrosian concepts on firm growth as well as the relative strength of each category which individual studies can only provide to a limited extent. Third, using the summary of accumulated knowledge on growth as a foundation and test of measurement moderators, we stimulate a future research agenda for firm growth in a consistent and productive direction. Fourth, drawing on an evidenced-based research approach we hope to move towards bridging the gap identified between research and practice in the field of growth (Achtenhagen, Naldi & Melin, 2010).

In order to make the above contributions, this paper is structured as follows. First, we elaborate on the underlying theoretical foundations all of which have their roots in Penrose's TGF. Second, we discuss the methods of our meta-analysis. Third, we present our results. Fourth, we discuss the implications of our findings and elucidate promising areas for future research.

THEORETICAL FOUNDATIONS

One of Penrose's central contributions was her break from traditional economic theories of growth to recognize the idiosyncratic differences between individual firms rather than seeing them solely as a function of their external environment (Pitelis, 2002). In the development of TGF, she identified certain resource categories that differentiate firms from each other and that may be associated with growth. Later research utilizing resource-based approaches have identified additional resource categories and refine those originated by Penrose. We follow this approach and identify resource categories that relate to Penrose's arguments. By doing so, we develop a theoretical model that allows us to identify salient variables in the empirical research and link them to higher order theoretical constructs founded in TGF. These theoretical constructs include: human capital (individual and team level), intellectual capital, social capital (internal and external), financial capital, organizational slack, absorptive capacity, innovation, organizational size and past growth. We will briefly review each of them below, identify their Penrosian origins and explicate their importance for firm growth.

Human Capital

Human capital theory has evolved from viewing employees as labor to sources of knowledge and heterogeneous skills that can be valuable for firm outcomes (Becker, 1964). Studies have demonstrated the positive impact of human capital on entrepreneurial outcomes, growth and profitability (Unger, Rauch, Frese, & Rosenbusch, 2011). We suggest that human capital can best be understood by differentiating between individual and team level of analysis. Individual level human capital refers to the knowledge and skills of the CEO or entrepreneur who represents the head of the organization. Measures of individual human capital include an individual's level of education, previous start up experience, and years of industry experience (Unger et al, 2011). The team level of human capital refers to the knowledge, skills and effectiveness of the management or start-up team. Empirical measures of team human capital include number of founding partners, perceptions of management quality and top management team tenure together (Eisenhardt & Schoonhoven, 1990).

Penrose (1959) suggests that the productive outcomes of material resources will depend on the knowledge possessed by human resources. These material and human resources together create a subjective opportunity set that is unique to each firm and influences the growth rate and direction for firms. Penrose also refers to team human capital when she discusses that the management team represents more than the pure summation of individual capabilities. She especially highlights their capacity to work as a team to administer growth. This managerial capacity in consequence represents a central restriction to the growth of the firm.

Intellectual Capital

Nahapiet and Goshal's (1998: 245) prominent work conceptualizes intellectual capital as "the knowledge and knowing capability of a social collectivity." These authors go on to explain, "we have elected to adopt this terminology because of its clear parallel with the concept of human capital, which embraces the acquired knowledge, skills, and capabilities that enable persons to act in new ways (Coleman, 1988)." In this way, intellectual capital is similar to the knowledge and experience embedded within individuals within human capital theory, but extends to knowledge and experience institutionalized within organizations. As a result though, intellectual capital is notably difficult to measure, leading some to question whether it should be characterized as a capital factor of production (Dean & Kretschmer, 2007). We are not concerned with its categorization as an economic form of capital, but rather with its ability to create value and stimulate growth as has been suggested by different scholars (Bogner & Bansal, 2007; Teece, 1998; Thornhill, 2006). Thus, we consider measurements of intellectual capital which seek to capture the firm level knowledge and experience including alliance experience (Wu, Wang, Chen & Pan, 2008), strategic planning expertise (Hopkins & Hopkins, 1997) technology skills (Park & Lou, 2001), entrepreneurial culture (Bradley, et. al., 2011), and firm specific knowledge (Autio, Sapienza & Almeida, 2000).

The roots of intellectual capital theorizing stem back to Penrose. In fact, in their landmark article Nahapiet and Goshal (1998) draw on Penrose to highlight how shared experience within a firm can generate intellectual capital. Nahapiet and Goshal (1998: 248) explicitly cite Penrose's assertion that that shared experience "develops an increasing knowledge of the possibilities for action and the ways in which action can be taken by ... the firm. This increase in knowledge not only causes the productive opportunity of a firm to change ... but also contributes to the "uniqueness" of the opportunity of each individual firm (1959:53)."

Social Capital

Social capital refers to the "...resources embedded within, available through, and derived from the network of relationships possessed by an individual or social unit" (Nahapiet & Ghoshal, 1998: 243). We suggest that it is useful to differentiate between internal social capital and external social capital (Adler & Kwon, 2002). Internal social capital is essentially the resources which are embedded within a social system, in this case an organization or team. Internal social capital can also be understood as bonding social capital (Adler & Kwon, 2002) within an organization. The internal social capital view emerges from sociological tradition and includes Coleman's view of social capital as a community resource which facilitates collective action (1990). Measurement of internal social capital includes team cohesion (Ensley et al, 2007), relational capability (Brinckmann & Hoegl, 2011), and team shared cognition (Ensley & Hmieleski, 2005). External social capital is essentially the resources which are available through and derived from a network. External social capital can also be understood as bridging social capital (Adler & Kwon, 2002) between organizations. Theories of external social capital include weak tie (Granovetter, 1973) and structural-hole theory (Burt, 1992). Measurement of external social capital includes network size and strength (Collins & Clark, 2003), board interlocks (Kor & Sundaramurthy, 2009) and relationships with affiliated subsidiaries (Chung, Lee, Beamish & Isobe, 2010).

Both internal and external dimensions of social capital can be seen to have roots in Penrose (1959). Penrose argued that the firm is essentially "a collection of individuals who have had experience in working together, for only in this way can 'teamwork' be developed (1959:46)". She proceeds to argue that firms differ in the level of teamwork experience each has, which can be a source of advantage and growth. Such a view clearly articulates the critical role the internal (bonding) social capital within firms. The importance of external networks and particularly interorganizational multi-national networks can also be traced back to Penrose (Rugman & Verbeke, 2003).

Financial Capital

Financial capital represents the traditional economic conception of capital and refers to the tangible monetary resources of the firm. Financial capital impacts growth since it is part of the pools of resources which shape the productive opportunity sets of firms described by Penrose (1959). Financial capital uses include venture capital investment to stimulate early stage growth (Davila, Foster & Gupta, 2003), capital raised through IPO proceeds to sustain fast growth (Florin, Lubatkin & Schulze, 2003) or patient capital left in a firm to allow opportunities with a longer return time horizon to be exploited (Zellweger, 2007).

Organizational Slack

Organizational slack refers to "potentially utilizable resources that can be diverted or redeployed for the achievement of organizational goals (George, 2005: 661)." Slack has been measured primarily through financial ratios such as current ratio (assets / liabilities), liquidity (debt/assets) or working capital available minus working capital required (George, 2005; Bradley, et al, 2011). Other studies have attempted to capture more elusive non-financial slack measures such as human resource slack (Mishina, Pollock & Porac, 2004) and physical resource slack (Moreno & Casillas, 2008).

We follow Penrose in focusing on unused resources as this is a concept which Penrose explicitly incorporated into TGF. She argued that there is always some resource slack because firms are

never able to fully utilize all of their resources and that slack resources increase the productive opportunity set of the firm (Neck, 2001). In this way, firm growth is directly sourced in part from putting these idle resources to use (Penrose, 1959; Tsang, 1998). However, as recent scholarship has pointed out (Bradley, Wiklund & Shepherd, 2011) slack may have an indirect adverse effect on growth due to a negative influence on entrepreneurial management (Stevenson & Jarillo, 1990). Bradley et al (2011) demonstrate that managers of firms with much financial slack develop path dependencies based on past success, are not pressured to creatively combine currently utilized resources for more productive means and in turn it negatively impacts growth over time.

Absorptive Capacity

Absorptive capacity has been defined as “a firm’s ability to recognize the value of new information, assimilate it, and apply it to commercial ends” (Cohen & Levinthal, 1990: 128). Empirically, absorptive capacity is predominantly measured using R&D data including absolute R&D expenditures (Zahra & Hayton, 2009) and intensity, which is R&D spending as a percentage of sales (Filatotchev & Piesse, 2011).

Penrose (1959) emphasized the role of knowledge and resource assimilation. For instance, she suggested that new employees and management team additions will not be necessarily productive immediately, but rather need time to learn or be integrated into the existing organizational system (Penrose, 1959). Penrose explicitly discusses absorbing resources in the context of firm acquisitions. When one firm acquires another it needs time to absorb the new management and other resources into the current organization. Thus, the time and ability to integrate new resources into productive use represented a constraint on firm growth. As a result, we can expect that the increased ability of a firm to recognize new information and assimilate it, as measured by absorptive capacity, will have a positive overall impact on firm growth.

Innovation

Penrose viewed innovation as a primary source of long term corporate growth, as opposed to short term growth which may be derived from market power or monopolistic behavior. In this way she followed closely the early work of Schumpeter (1934) and noted the importance of his ideas for established firms. “The Schumpeterian process of ‘creative destruction’ has not destroyed the large firm; on the contrary, it has forced it to become more and more ‘creative’ ... (Penrose, 1959: 22-23). To Penrose, innovation was necessary not so much for the creation of new product revenue streams, but rather to generate technology and capabilities that can be leveraged across a diverse range of opportunities. As a result, experimentation was a critical component of a successful firm. As she states (1959: 114-115), “There is no reason to assume that the new knowledge and services will be useful only in the production of a firm’s existing products; on the contrary, they may well be useless for that purpose but still provide a foundation which will give the firm an advantage in some entirely new area.”

Past Growth

Penrose suggested that a firm’s past growth will influence current growth in dual ways. On the one hand, it creates the current set of resources which a firm can implement for future growth. On the other, there will be adjustment costs related to reconfiguring the resources generated by past growth into a productive opportunity set that will create current and future growth (Lockett,

Wiklund, Davidsson & Gima, 2011). Past growth can create path dependencies and core rigidities that prevent firms from adapting their productive opportunity set to a rapidly changing external environment (Baker & Cullen, 1993). However, other research has shown past growth to increase firm motivation for future growth (Delmar & Wiklund, 2008). Past growth, as current growth, is primarily measured as change in number of employees, sales or assets (Achtenhagen, Naldi and Melin, 2010).

Organizational size

Penrose suggests that firm growth is essentially unrelated to its organizational size. While she discusses the possible positive effects economies of scale for firms of a certain size (1959: 79), she also recognizes that economies associated with growth are quite different and expansion to a certain size may have little bearing on the new opportunity set for future growth. Moreover, she invokes an evidence-based argument by noting that there is a preponderance of small and medium firms which would not be the case if large firms were necessarily the most efficient user of societal resources. Thus she argues, “the result of a past growth – the size attained at any time – may have no corresponding advantages (1959: 91).”

Relative Strengths and Moderating Relationships

While many of the above categories described should reasonably be expected to have positive overall effects on firm growth, far less is known about the relative importance of each of these categories i.e., which internal firm factor has the strongest impact on firm growth? Since little is known about these effects, we take an exploratory approach to investigate the relative strengths of the theoretical constructs which we have suggested should influence firm growth.

In addition, it is important to recognize that methodological choices have important consequences on knowledge accumulation and empirical testing (Shepherd & Wiklund, 2009). In order to explore the effect of these research choices we examine both measurement and sampling moderators. We treat the measurement of firm growth as a moderator and consider the varied effects of absolute, relative and self-report scale based measures (e.g. growth vs. competitors). While beyond the scope this paper, we realize that sample selection may influence results as well and thus we will consider firm age, size and industry as moderators in future analysis. Such moderators are important to assess the boundary conditions of the TGE, such as if the theory is applicable in both new and established firms, small and large firms and in high technology and non-high technology firms.

METHOD

This study provides a systematic meta-analysis of results from the last 25 years of research on firm growth. This is an appropriate technique as meta-analysis is recommended to reach conclusions on a body of accumulated findings (Combs, Ketchen Jr., Crook and Roth, 2011), establish the status of concepts (Rauch & Frese, 2006) and enhance statistical accuracy by aggregating findings (Lipsey & Wilson, 2001). Our meta-analysis enables a robust estimate of the average effect sizes of the key relationships predicting firm growth and thus goes beyond estimates derived in individual studies which might suffer from data constraints of individual studies, limited statistical power, or individual biases. Furthermore, meta-analysis is useful to investigate contextual factors which may be at the source of inconsistencies between findings (Brinckmann, Grichnik & Kapsa, 2010).

Sample

In order to identify studies for inclusion in our meta-analysis we conducted a thorough review of the literature. First, we searched for the word “growth” in the titles, abstracts and keywords of relevant journals identified by Wiklund & Shepherd (2009), but extended the time period to cover the last 25 years.¹ Second, we did a targeted search in EBSCO Host Research Databases Business Source Premier and Social Sciences Citation Index, Dissertations and Theses Database (Proquest) databases combining the term “growth,” with “team,” “resource,” and “Penrose.” This resulted in a total pool of 1,407 articles.

From this pool of 1,407 articles we screened each for inclusion based on the criteria of a study using i) a quantitative empirical sample and ii) a measure of growth as a variable. This resulted in a list of 196 studies. The significant decrease in studies is primarily due to the use of the word growth in contexts outside of firm growth such as “growth of literature” or “theoretical growth.” Of these 196 studies we identified sample characteristics including sample size, country of origin and data structure.

For the purpose of the analysis in the paper, we then further screened articles to include only those that were conducted at the firm level (as opposed to e.g., the industry level), included established measures of growth (cf. Shepherd & Wiklund, 2009), included variables related to the theoretical constructs of TGF, and included full bivariate correlation data. This resulted in 128 samples, 531 bivariate correlations and a total sample size of 57,659 firms.³

Coding

One of the primary contributions of this paper is the development of theoretical constructs which can be conceptualized as part of Penrose’s TGF. In this way, we engage in comprehensive academic “sensemaking” (Weick, 1995) on the topic of firm growth. We began with the full range of empirical studies examining firm growth and recorded every variable used in each study including details on each variable such as the source, measurements, and role of growth in the study. The resulting database includes 196 studies and 2,053 variables studied in relationship to firm growth.² This technique allowed us to not only predetermine variables explicitly part of Penrose’s theory but also inductively identify variables used in existing growth research which may be conceptualized as part of Penrose’s theory.

Two raters reviewed the studies and began to develop a coding system for each of the variables in studies which coincided with Penrose’s TGF. An iterative process of generating new categories, combining categories and deleting categories was undertaken until saturation was achieved. Once a full list of categories was established, one rater coded every variable in the studies identified. A random subset of 50 variables was tested among all three raters and an inter-rater reliability above .8 was achieved for the categorization. Specific examples of measurements in each category were included in the theoretical foundations sections. When we evaluate total resources we include only the groups human capital (on individual and team level), social capital (internal and external), intellectual capital, financial capital, and slack and exclude non-resource specific categories such as absorptive capacity, innovation, organizational size, and past growth.

Meta-analytic procedures

We estimated the true mean effect size (r_{cor}) based on bivariate correlations for categories predicting firm growth using Hunter and Schmidt's (2004) validity generalization methods. Specifically, we corrected for two artifacts which have been shown to distort effect sizes. Hence, we follow recommendation for the application of meta-analysis techniques specifically for the management research (Geyskens, Krishnan, Steenkamp & Cunh, 2009). The first is the reliabilities of measurements in both the independent and dependent variable. The second is an artificial dichotomization of the independent or dependent variable (Geyskens, et al, 2009).

If one study included several variables related to a particular theoretical construct, we relied on the average of these variables. For instance, if a particular study measured both CEO education and past start up experience, we averaged the two effect sizes to generate one individual human capital effect size for that study. In addition, if a study included multiple growth measures (e.g. growth in sales and employees) we took the simple average of the effect on these multiple growth measures.

We followed standard meta-analysis techniques (Lipsey and Wilson, 2001) using Comprehensive Meta-Analysis software (CMA). In order to identify the overall corrected bivariate correlation mean we used fixed and random effect models. Due to space limitations, we report only the random effects results. In order to test the moderating role of growth measurement, we calculated the simple average for all resource categories in each study and then calculated an overall resource mean effect size. As a next step we introduced growth measurement (absolute, relative or VS) as a moderator and used the Heterogeneity Q value as measure of difference between these groups.

RESULTS

Table 1 provides a summary of the results testing the overall and relative effects of each theoretical category on firm growth. We find a strong significant positive corrected mean effect sizes in each of the following categories: Human Capital Team ($r_{cor}=.10$, $p<.01$, 95% CI =.05-.14), Intellectual Capital ($r_{cor}=.14$, $p<.01$, 95% CI =.10-.18), Internal Social Capital ($r_{cor}=.11$, $p<.01$, 95% CI =.02-.20), External Social Capital ($r_{cor}=.09$, $p<.01$, 95% CI =.04-.13), Financial Capital ($r_{cor}=.15$, $p<.01$, 95% CI =.07-.23), Absorptive capacity ($r_{cor}=.09$, $p<.01$, 95% CI =.04-.14), Innovation ($r_{cor}=.13$, $p<.01$, 95% CI =.07-.18) and Past Growth ($r_{cor}=.14$, $p<.01$, 95% CI =.09-.20).

We found further significance, but lower overall effect sizes for Human Capital Individual ($r_{cor}=.05$, $p<.05$, 95% CI =.01-.09) and Organizational Size ($r_{cor}=.05$, $p<.05$, 95% CI =.01-.09). The lower limit of the 95% confidence interval reveals that these are only marginally significant and in fact, upon further review, we see that they are not significant in the fixed effects analysis. We also found no significance in the relationship between Organizational Slack and growth in the random effects analysis ($r_{cor}=.061$, $p>.01$, 95% CI =-.03-.15)

A closer examination of the relative strength of the each variable reveals that financial capital, intellectual capital, past growth and innovation have the strongest impact on growth. However, since the 95% CI of all of those constructs overlap, it is not possible to definitively determine which has the overall strongest effect on firm growth. Individual human capital, size and slack have the weakest effects.

We further examined the overall corrected mean effect size between all resource categories (individual and team human capital, internal and external social capital, intellectual capital, financial capital, and slack) and firm growth. The results are displayed in Table 2 below. We found an overall significant overall resource effect of $r_{cor} = .09$ ($p < .01$, 95% CI = .062-.108).

We looked at measurement of firm growth as a moderator in the resource to firm growth relationship. Specifically, we found that resources have a stronger relationship with absolute measures of firm growth (e.g. total sales growth) and scale based measures of firm growth (e.g. growth in sales vs. competitors) than relative measures (e.g. percentage of sales growth.) Absolute measures ($r_{cor} = .11$, $p < .01$, 95% CI = .07-.15) and scale based measures ($r_{cor} = .12$, $p < .05$, 95% CI = .036-.192) are both higher than relative measures (.06, $p < .01$, .034-.089). Further investigation of the confidence interval reveals that only absolute measures can be considered significantly higher than relative measures as their CI's do not overlap.

DISCUSSION

The results of our meta-analysis indicate that Penrose's TGF holds significant explanatory power. This is true both regarding her original conceptualizations as well as the later theoretical development in strategic management which she inspired. However, while the results are significant and generally positive the effect sizes are quite small (r_{cor} range = .03 - .15). This draws attention to the fragmentation of growth research and lends support to our argument that there is an advantage in focusing on theoretical constructs. Our results lend support to our assertion that much of growth research can be conceptualized as part of TGF and these categories may serve as a uniting factor to defragment the field and allow consistent knowledge accumulation in future research.

Our results also indicate that that some of the strongest effects on firm growth remain some of the least studied, while some of the weakest effects are the most studied. For instance, organizational size is by far the most frequently occurring variable across samples (94 of 128), most often as a control variable, but it has little to no overall effect on growth. This indicates that either size is not an important predictor of firm growth or the methods use to measure size are not accurately capturing it's predicated effect on growth. In addition, individual human capital is one of the more frequently studied variables (29 of 123), but also has little to no effect on firm growth. Meanwhile, financial capital (19 of 128) and past growth (12 of 128) have stronger effects on firm growth, but are much less studied. External social capital also has one of the stronger effects on firm growth, but is the least studied construct in our sample (9 of 128). This suggests that further research is especially needed in the areas of financial capital, external social capital and past growth.

We believe that past growth in particular has interesting implications for future research. While past growth can create path dependencies that are detrimental to long-term growth the resources generated clearly can be put to use to achieve future growth. In addition, we also recognize that firms go through phases or stages of firm growth in heterogeneous manners (Levie & Lichtenstein, 2010). Since studies are not neatly conducted in between distinct stages of firm growth or decline, delineations between past and current growth are arbitrary. As a result, at any given time in the samples we analyze, the past growth of a firm may also represent part of its current growth. Indeed some measures of past growth were conducted at one year previous while still others were three years previous or more. Due to fact that past growth represents a proven record that may overcome

liabilities of newness or smallness (Stinchcombe, 1965) and the strong possibility that past growth directly feeds into current growth, the strong effect we found of past growth on current growth makes sense. At the very least, our results suggest that further growth research should seek to control for past growth in their empirical analysis. However, since there may be overlap in the measurement of past and current growth, useful further research may seek to isolate distinct stages of growth and/or decline to gain a deeper understanding of how past growth precisely effects current growth.

Our overall analysis on the impact of firm resources has several interesting implications. First our positive and significant effect of resources on growth is generally in line with the positive effect on performance found for strategic resources by Crook et al (2008) but with a lower overall effect size. In addition, the high overall and significant Q value for heterogeneity (308.95) indicates that there may be many moderators in the relationship between resources and firm growth. Such moderators may be contextual or empirical in nature. We specifically demonstrate that the choice of measurement for growth has a significant impact such that absolute measures lead to higher effect sizes while relative measures lead to lower effect sizes between resources and growth. Further research should be conducted to identify additional moderators in the resource-growth relationship both overall and within individual resource categories.

In our analysis of individual resource constructs, we see that intellectual capital has one of the strongest effects on firm growth. This is consistent with Penrose who essentially argued firm growth rate was the result of its productive opportunity set. This productive opportunity set was created by the combination of a manager's abilities to "see" the opportunities which are prevalent in the external environment and organize their firm resource in a way to exploit those opportunities. As Penrose states (1959:79-80), "I have placed the emphasis on the significance of the resources with which a firm works and on the development of the experience and knowledge of a firm's personnel because these are the factors that will to a large extent determine the response of the firm to changes in the external world and also determine what it 'sees' in the external world." Our strong results for intellectual capital, which represents the collective knowledge of the organization may lend support to Penrose's view that firm and management knowledge is necessary to both recognize opportunities in the external environment and configure existing resources effectively. It is particularly remarkable that Penrose recognized the importance of institutionalized firm knowledge in the context of the large industrial firms which she studied. This perspective is more readily visible in today's contemporary environment. The importance of intellectual capital as a dominant productive factor in firm growth is consistent with the view of the "knowledge economy" (Dean & Kretschmer, 2007). Further research; however, should test the precise boundary conditions of intellectual capital to see if the strength of this relationship holds in new and emerging firms as well as across industry boundaries.

One unexpected result within specific resource dimensions was that individual human capital had little to no effects on firm growth. This is particularly surprising given that human capital has been found in meta-analysis to have a positive impact on entrepreneurial success, which includes firm growth (Unger et al, 2011). However, in our analysis we included human capital measures which we believe make up the knowledge and experience of individuals but may not be predicated to have a positive or negative effect on firm growth such as age or marital status (non-task related human capital). Moreover, as firms are increasingly lead by teams, the effect of one individual may be too distal of a factor. However, further research may test whether this holds across new

and small ventures since literature suggests that individuals such as founders are seen as critical (Nelson, 2003). However, a more important factor in human capital research may be to look at their heterogeneous human capital configurations for instance within a founding team, top management team or governance board (Brinckmann, Grichnik & Eichinger, 2012).

Innovation was also found to have one of the strongest impacts on firm growth. This finding strongly supports Penrose's view that innovation is necessary for growth over time. This result has several subsequent implications and possible interpretations. For one, it may support Penrose's argument that innovation is critical not only to create new products which serve as revenue streams, but to build up a base of technology and knowledge resources which can be exploited across a broad range of competitive arenas (Rosenbusch et al, JBV). Thus, innovation creates the capabilities which will allow an organization to survive, adapt and grow in an unpredictable environment. A second interpretation could be that innovation represents the implementation or process of putting resources to productive use. In fact, we know that as Sirmon, Hitt & Ireland (2007: 274) state, "value is created only when resources are evaluated, manipulated, and deployed appropriately within the firm's environmental context." If innovation represents the deployment of firm resources, this lends strong support to the importance of recent research on resource management and orchestration to explaining firm growth (Sirmon et al, 2007; Sirmon, Hitt, Ireland & Gilbert, 2010).

Another point worth discussing is a result of the measures themselves. Many of the measures used in these studies to operationalize powerful concepts such as organizational slack and absorptive capacity were heavily biased towards financial measures. Many have acknowledged that slack (George, 2005) and absorptive capacity (Cohen & Levinthal, 1990) do not represent exclusively financial resources. However, due to mandatory financial reporting and empirical convenience, operationalizations of these constructs in management research are based nearly exclusively on financials. For instance, if cognitive capacity, prior related knowledge and diversity of background (Cohen & Levinthal, 1990) represent important components of absorptive capacity, does R&D intensity alone fully capture absorptive capacity? Future research should seek to develop alternative measures of slack and absorptive capacity which take into account non-financial components.

LIMITATIONS

There are several limitations of this manuscript, which we hope may serve as future research opportunities as well. First, attempting to test Penrose's TGF is a difficult endeavor questioned by Penrose herself, "The testing of the theory set forth here is difficult indeed; all sorts of factors other than those controlling its 'maximum' rate of growth will affect the actual rate of growth of an individual firm in specific circumstances at a particular time (1959: 213)." There are many external variables (e.g. environment and industry) and internal firm variables which we were not able to conceptualization as part of Penrose's theory. For instance, our coding captured variables which can be considered as part of "strategy" or "structure" but these variables were too heterogeneous to categorize in a consistent direction or framework at this stage. While these remain important predictors of firm growth they may require more context specific fit as they are implemented in focal firms.

Second, as with many meta-analysis which synthesize data from existing studies there is danger of losing some of the context specificity built into an individual study and the judgment associated

in the reclassification process. However, we attempted to reduce potential biases by following recent methodological suggestions as described in the methods section. Moreover, one of the objectives of this meta-analysis is to be able to aggregate findings across diverse research contexts and hence depict the state of the research and provide some guidance for future scholarship. Further, part of the novel contribution comes from this classification and we took great precaution to ensure consistency through an agreed upon coding schema and inter-rater reliability check.

Third, while we found support for many of Penrose's arguments it is important to recognize that Penrose's theory was developed over 50 years ago, within the context of large, industrial firms and thus its applicability to today's contemporary environment could be called into question (Lockett & Thompson, 2004). We believe that the significant results and historical roots of contemporary constructs in Penrose's theory is a clear testament to her remarkable vision; however, there is still much work that needs to be done to understand the antecedents and processes of firm growth in the post-industrial contemporary firm.

Fourth, we currently do not include unpublished studies in our meta-analysis. We are in the process of collecting unpublished studies and will then be able to identify if predictors of firm growth have suffered from a publication bias. Fifth, our meta-analysis included studies from a broad range of national and cultural contexts and caution should be exerted in interpreting the results outside of these boundaries. Further research should investigate the effect of cultural (e.g. Hofstede, 1980) and institutional (e.g. Scott, 1987) factors in the relationship between resources and firm growth.

CONCLUSION

Our study aggregates findings on predictors to firm growth to date, but draws attention to the fragmented nature of growth research. We argue that Penrose's TGF offers meaningful theoretical constructs that may help serve to unify future growth research to allow consistent knowledge accumulation. We hope that this assessment and extension of Penrose's TGF will serve to provide a helpful status of the field and more importantly stimulate the stalled theoretical development on firm growth.

CONTACT: Robert S. Nason, rnason@syr.edu; (T): 610.209.3299; Whitman School of Management, Syracuse University, 721 University Ave., Syracuse, NY, USA 13244.

NOTES

1. Journals identified by Wiklund & Shepherd (2009) include: Academy of Management Journal, Administrative Science Quarterly, Organization Science, Strategic Management Journal, Journal of Management, Journal of Management Studies, Management Science, Journal of Business Venturing, Entrepreneurship Theory and Practice, Strategic Entrepreneurship Journal, Journal of Small Business Management and Small Business Economics. We added Journal of International Business Studies and Journal of Finance due to their relevance for our purpose.

2. This does not include unique combinations, but rather total number of variable to firm growth measure bivariate combinations.

3. A full list of references used for the meta-analysis are available from the authors upon request.

REFERENCES

- Adler, P. S., & Kwon, S.-W. (2002). Social Capital: Prospects For A New Concept. *Academy of Management Review*, 27(1), 17-40.
- Autio, E., Sapienza, H. J., & Almeida, J. G. (2000). Effects Of Age At Entry , Knowledge Intensity, And Imitability On International Growth. *Academy of Management Journal*, 43(5), 909-924.
- Becker, G. S. 1964. *Human Capital*. New York: Columbia University Press.
- Bradley, S. W., Wiklund, J., & Shepherd, D. A. (2011). Swinging a double-edged sword: The effect of slack on entrepreneurial management and growth. *Journal of Business Venturing*, 26(5), 537-554.
- Brinckmann, J., & Hoegl, M. (2011). Effects of initial teamwork capability and initial relational capability on the development of new technology-based firms. [10.1002/sej.106]. *Strategic Entrepreneurship Journal*, 5(1), 37-57.
- Brinckmann, J., Grichnik, D., & Kapsa, D. (2010). Should entrepreneurs plan or just storm the castle? A meta-analysis on contextual factors impacting the business planning, performance relationship in small firms. *Journal of Business Venturing*, 25(1), 24-40.
- Brinckmann, J., D. Grichnik, F. Eichinger. 2012. When the difference makes the difference: A meta-analysis on the top management team diversity-performance relationship in small and medium sized firms. Barcelona, Spain: ESADE Business School.
- Burt, R. S. 1992. *Structural holes: The social structure of competition*. Cambridge, MA: Harvard University Press.
- Cohen, W. M., & Levinthal, D. A. (1990). Absorptive Capacity: A New Perspective on Learning and Innovation. *Administrative Science Quarterly*, 35(1), 128-152.
- Coleman, J. S. 1988. Social capital in the creation of human capital. *American Journal of Sociology*, 94: S95-S120.
- Combs, J. G., Ketchen Jr, D. J., Crook, T. R., & Roth, P. L. (2011). Assessing Cumulative Evidence within 'Macro' Research: Why Meta-Analysis Should be Preferred Over Vote Counting. *Journal of Management Studies*, 48(1), 178-197.
- Crook, T. R., Ketchen Jr, D. J., Combs, J. G., & Todd, S. Y. (2008). Strategic resources and performance: a meta-analysis. *Strategic Management Journal*, 29(11), 1141-1154.
- Davila, A., Foster, G., & Gupta, M. (2003). Venture capital financing and the growth of startup firms. *Journal of Business Venturing*, 18(6), 689.
- Dean, A., & Kretschmer, M. (2007). Can Ideas Be Capital? Factors Of Production In The Postindustrial Economy: A Review And Critique. *Academy of Management Review*, 32(2), 573-594.
- Eisenhardt, K. M., & Schoonhoven, C. B. (1990). Organizational Growth: Linking Founding Team, Strategy, Environment, and Growth among U.S. Semiconductor Ventures, 1978-1988. *Administrative Science Quarterly*, 35(3), 504-529.
- George, G. (2005). Slack Resources And The Performance Of Privately Held FirmS. *Academy of Management Journal*, 48(4), 661-676.
- Geyskens, I., Krishnan, R., Steenkamp, J.-B. E. M., & Cunha, P. V. (2009). A Review and Evaluation of Meta-Analysis Practices in Management Research. *Journal of Management*, 35(2), 393-419.
- Granovetter, M. S. 1973. The strength of weak ties. *American Journal of Sociology*, 78: 1360-1380.
- Hofstede, G. H. 1980. Cultural consequences: International differences in work-related values. Hunter, J.E., Schmidt, F.L., 2004. *Methods of Meta-Analysis: Correcting Error and Bias in Research Findings*. Sage Publications Inc, Thousand Oaks, CA.
- Lei-Yu, W., Chun-Ju, W., Cheng-Ping, C., & Lee-Yun, P. (2008). Internal Resources, External Network, and Competitiveness during the Growth Stage: A Study of Taiwanese High-Tech Ventures. *Entrepreneurship: Theory & Practice*, 32(3), 529-549.
- Levie, J., & Lichtenstein, B. B. (2010). A Terminal Assessment of Stages Theory: Introducing a Dynamic States Approach to Entrepreneurship. *Entrepreneurship: Theory & Practice*, 34(2), 317-350.

- Lipsey, M.W., Wilson, D.B., 2001. *Practical Meta-Analysis*. Sage Publications Inc, Thousand Oaks, CA.
- Lockett, A., & Thompson, S. (2004). Edith Penrose's Contributions to the Resource-based View: An Alternative Perspective. *Journal of Management Studies*, pp. 193-203
- Moreno, A. M., & Casillas, J. C. (2008). Entrepreneurial Orientation and Growth of SMEs: A Causal Model. *Entrepreneurship: Theory & Practice*, 32(3), 507-528.
- Nahapiet, J., & Ghoshal, S. (1998). Social Capital, Intellectual Capital, And The Organizational Advantage. *Academy of Management Review*, 23(2), 242-266.
- Nair, A., Trendowski, J., & Judge, W. (2008). The Theory of the Growth of the Firm. [Book Review]. *Academy of Management Review*, 33(4), 1026-1028.
- Neck, H. M. (2001). Firm growth following the initial public offering: The impact of organizational slack on the productive opportunity of high-technology entrepreneurial firms. Unpublished Ph.D., University of Colorado at Boulder, USA.
- Nelson, T. (2003). The persistence of founder influence: Management, ownership, and performance effects at initial public offering. *Strategic Management Journal*, 24(8), 707-724.
- Penrose, E. T. 1959/1995. *The Theory of the Growth of the Firm*, 3rd ed. Oxford University Press, Oxford, UK.
- Pettus, M. L. (2001). The Resource-Based View As A Developmental Growth Process: Evidence From The Deregulated Trucking Industry. *Academy of Management Journal*, 44(4), 878-896.
- Pitelis, C. N., ed. 2002. *The Growth of the Firm—The Legacy of Edith Penrose*. Oxford University Press, Oxford, UK..
- Rosenbusch, N., Brinckmann, J., & Bausch, A. (2011). Is innovation always beneficial? A meta-analysis of the relationship between innovation and performance in SMEs. *Journal of Business Venturing*, 26(4), 441-457.
- Rugman, A. M., & Verbeke, A. (2002). Edith Penrose's Contribution to the Resource-Based View of Strategic Management. *Strategic Management Journal*, 23(8), 769.
- Rugman, A. M., & Verbeke, A. (2004). A Final Word on Edith Penrose. *Journal of Management Studies*, pp. 205-217.
- Scott, W. R. (1987). The Adolescence of Institutional Theory. *Administrative Science Quarterly*, 32(4), 493-511.
- Schumpeter, J. A. 1934. (Reprinted in 1962.) *The theory of economic development: An inquiry into profits, capital, credit, interest and the business cycle*. Cambridge, MA: Harvard University Press.
- Shepherd, D., & Wiklund, J. (2009). Are We Comparing Apples With Apples or Apples With Oranges? Appropriateness of Knowledge Accumulation Across Growth Studies. *Entrepreneurship: Theory & Practice*, 33(1), 105-123.
- Sirmon, D. G., Hitt, M. A., & Ireland, R. D. (2007). Managing Firm Resources In Dynamic Environments To Create Value: Looking Inside The Black Box. *Academy of Management Review*, 32(1), 273-292.
- Sirmon, D. G., Hitt, M. A., Ireland, R. D., & Gilbert, B. A. (2011). Resource Orchestration to Create Competitive Advantage: Breadth, Depth, and Life Cycle Effects. *Journal of Management*, 37(5), 1390-1412.
- Stevenson, H.H., Jarillo, J.C., 1990. A paradigm of entrepreneurship: entrepreneurial management. *Strategic Management Journal* 11, 17-27
- Stinchcombe, A.L., 1965. Social structure and organizations. In: March, J.G. (Ed.), *Handbook of Organizations*. Rand McNally, Chicago, IL.
- Teece, D. J. (1998). Capturing Value from Knowledge Assets: The New Economy, Markets For Know-How, And Intangible Assets. *California Management Review*, 40(3), 55-79.
- Unger, J. M., Rauch, A., Frese, M., & Rosenbusch, N. (2011). Human capital and entrepreneurial success: A meta-analytical review. *Journal of Business Venturing*, 26(3), 341-358.
- Weick, K. E. (1995). *Sensemaking in organizations*. London: Sage.
- Zellweger, T. (2007). Time Horizon, Costs of Equity Capital, and Generic Investment Strategies of Firms. *Family Business Review*, 20(1), 1-15.

APPENDIX

Table 1: Overall and Relative Effects of Penrose Categories

Summary of Random Effects Analysis						
Group	# of Studies	Effect Size and 95% interval			Test of null (2 tail)	
		Point Estimate	Lower Limit	Upper Limit	Z-value	P-value
ABSORPTIVE CAPACITY	16	0.09	0.04	0.14	3.45	0.001
FINANCIAL CAPITAL	19	0.15	0.07	0.23	3.47	0.001
HUMAN CAPITAL - INDIVIDUAL	29	0.05	0.01	0.09	2.18	0.029
HUMAN CAPITAL - TEAM	29	0.10	0.05	0.14	4.25	0.000
INNOVATION	23	0.13	0.07	0.18	4.33	0.000
INTELLECTUAL CAPITAL	40	0.14	0.10	0.18	6.54	0.000
PAST GROWTH	12	0.14	0.09	0.20	5.00	0.000
SIZE	94	0.03	0.00	0.06	1.66	0.096
SLACK	9	0.06	-0.03	0.15	1.30	0.193
SOCIAL CAPITAL - EXTERNAL	28	0.09	0.04	0.13	3.94	0.000
SOCIAL CAPITAL - INTERNAL	9	0.11	0.02	0.20	2.31	0.021

Table 2: Resource Effect on Firm Growth: Overall and Moderating Role of Growth Measurement

	Effect Size and 95% interval				Test of null (2 tail)		Heterogeneity		
	# of Studies	Point Estimate	Lower Limit	Upper Limit	Z-value	P-value	Q-value	df (Q)	P-value
Overall Resources	90	.09	0.06	0.11	7.21	0.00	308.95	89	0.00

Group	Effect Size and 95% interval				Test of null (2 tail)		Heterogeneity		
	# of Studies	Point Estimate	Lower Limit	Upper Limit	Z-value	P-value	Q-value	df (Q)	P-value
Absolute	28	0.11	0.07	0.15	5.28	0.00	78.98	27.00	0.00
Relative	48	0.06	0.03	0.09	4.35	0.00	133.62	47.00	0.00
VS	14	0.11	0.04	0.19	2.85	0.00	69.21	13.00	0.00