ENTREPRENEURIAL STRATEGIC GROUPS: HOW CLUSTERING HELPS NASCENT FIRMS

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ABSTRACT

Our study examines how strategic groups consisting of nascent ventures outperform other firms. An entrepreneurial strategic group is defined as firms that pursue a similar founding strategy, belong to the same industry, and compete in the same geography. We show that firms belonging to an entrepreneurial strategic group have higher levels of performance in terms of lower exit rates and higher annual growth. In addition, there are diminishing returns to membership in an entrepreneurial strategic group. As group size increases, performance levels decrease.

INTRODUCTION

One of the most long standing debates in strategic management focuses on the sources of competitive advantage for new and existing firms. While some argue that competitiveness emerges mostly from the unique set of resources and capabilities within a given firm (Barney, 1991, 2001), others emphasize that industry and environmental factors are equally relevant to understanding the sources of competitive advantage (Davidsson & Wiklund, 2001; Wiklund & Shepherd, 2005). This latter perspective draws mainly upon Porter's work (Porter, 1980, 1996) and regards the need for strategic planning as a response to uncontrollable market forces.

An intermediate level of analysis between firm and industry falls under the strategic group literature. Strategic groups are groups of firms with similar business models following similar strategies in terms of key decision variables (Porter, 1979, p. 215). Within strategic groups, firms' behavior will resemble one another and members are mutually dependent (Caves & Porter, 1977). McGee and Thomas (1986) suggest that mobility barriers are the defining characteristic of strategic groups and that competition within group is more intense as a consequence of the similar strategies taken by individual firms. Indeed, empirical studies have shown that performance differentials within groups are bigger than across groups (McNamara, Deephouse, & Luce, 2003).

Empirical research on strategic groups has traditionally identified them as subunits of larger industries. For instance, McGahan and Porter (1997) use 4-digit SIC codes to defined strategic groups while others choose characteristics such as firm size (Mas-Ruiz & Ruiz-Moreno, 2011), product breadth (Porter, 1979), financial performance (Desarbo & Grewal, 2008) or cognitive models (McNamara, et al., 2003) to deduct strategic group membership. Many of these operationalizations overlook the real strategies of organizations and cluster companies according to some observe similarities of their behavior (McGee & Thomas, 1986).

This paper advances the notion of entrepreneurial strategic groups (ESG) as a strategic group consisting of geographically concentrated firms following a similar entrepreneurial strategy. Entrepreneurial strategies differ from other kinds of strategies to the extent that they involve the re-creation of an organization's fundamental relationship with its environment (Murray, 1984; p. 1). Further, entrepreneurial strategies are typically ends-based and firms following these kinds of strategies are more concerned with long term effectiveness than immediate efficiency (Murray, 1984; p. 3).

We explore this notion by analyzing empirically how membership in a ESG affects performance and survival of new firms. Specifically, we use a dataset of 53,759 new ventures to investigate how industrial geographic concentration and the strategic choice to pursue incubation affects their exit rates, sales growth, and employment growth. Among these firms, 18,611 of them were observed to have pursued incubation, while the remainder represent an equivalent matched control group that serve as the counterfactual for analyzing differences in performance due to belonging to a ESG.

THEORETICAL BACKGROUND AND HYPOTHESES

The literature on strategic groups view them as an intermediate configuration between the firm and industry levels (Short, Payne, & Ketchen, 2008). This literature has often sought to understand competitive behavior and its sources. The rationale for classifications like strategic groups is to minimize economic asymmetry across a certain industry grouping firms, for instance, in terms of their product range (McGee & Thomas, 1986, p. 142). In more theoretical refinements of the concept, Porter introduced the notion of a common strategy as the defining feature of firms belonging to a strategic group (Porter, 1979). These groups emerge as a consequence of mobility barriers, which work as entry barriers on the strategic group level, and provide an advantage to firms within the strategic group over others (McGee & Thomas, 1986).

Most empirical literature identifies strategic groups as subgroups of industry using industry classification coding such the North-America SIC. McGahan and Porter (1997) use 4-digit SIC codes and find that there are performance differentials across strategic groups but only for certain industrial sectors which include entertainment and services. Others have used similar methods to compare the impact of firm-, strategic group- and industry-level effects on performance (Short, Ketchen Jr, Palmer, & Hult, 2007). Results show that firm-level effects are the strongest while strategic group-level effects outweigh the industry-level effects in some industries. Drawing on Porac and colleagues notion of cognitive communities formed by competitive groups (Porac, Thomas, & Baden-Fuller, 1989), it has been shown that performance differentials are more significant within strategic groups than across strategic groups (McNamara, et al., 2003).

All these grouping variables illustrate the supply side facet of strategic group research thus far. Rather than grouping firms that share similar *strategies*, research has mostly focused on firms *behavior* or *performance*. Few studies have in fact identified strategies as means to delineate a strategic group (e.g. Kline and Smith, 1995). We advance the notion of entrepreneurial strategic group (ESG) to highlight the characterization of a strategic group as consisting of nascent firms following similar strategies.

What are entrepreneurial strategic groups?

We define ESG as groups of nascent firms which are, by definition and as a result of establishing a new company, follow a similar founding strategy in the same industry and geography. Entrepreneurial strategies differ from other strategies and consist of

> "…the creation or re-creation of the fundamental set of relationships characterizing a organization's behavior: its environmental, internal and input-output parameters" (Murray, 1984, p. 3).

These kind of strategies are not necessarily related to nascent firms or pro-active. Entrepreneurial strategies can be enacted as a response to environmental changes and can be followed in greater or lesser extent by any firm regardless of its innovativeness (Murray, 1984).

However, for purposes of defining a ESG, we only consider nascent firms since those will forcibly follow similar strategies.

Nascent firms experience a lack of internal capabilities to cope with fast changing environments. Typically, all new firms go through a process of learning by doing until they finally create and establish the necessary routines and capabilities that will in the future define their operation (Levitt & March, 1988). It follows that nascent firms will experience similar difficulties and therefore follow the same strategies with the aim of establishing the necessary internal routines to thrive.

ENTREPRENEURIAL STRATEGIC GROUPS AND FIRM PERFORMANCE

In recent years, the idea of an entrepreneurial ecosystem has been gaining ground (Isenberg, 2010). These ecosystems consist of supporting environments where nascent firms can more easily thrive surrounded by more experienced start-ups, established companies as well as universities and regional governments. The main assumption of creating such ecosystems is that firms locating within this supportive environment will enjoy more support and therefore increases their chances of survival and experience higher levels of performance.

Business incubators are one example of entrepreneurial micro-ecosystems. A business incubator is an organization that supports the creation and growth of new businesses by providing subsidized office space, shared administrative services, access to capital and financing, networking opportunities, and assistance with legal, technology transfer, and export procedures (Allen & Weinberg, 1988; Erlewine & Gerl, 2004; Hackett & Dilts, 2004). In addition, local governments and policymakers support business incubation because they assume incubators can generate employment, innovation, and growth by helping new businesses avoid liabilities of newness (Erlewine & Gerl, 2004; Stinchcombe, 1965).

When new firms enter a market, their survival often hinges on their ability to overcome three forms of novelty: market, production, and management (Shepherd, Douglas, & Shanley, 2000). Being new to a market, to production processes, and to management can hinder a firm's survival and growth until the firm establishes legitimacy, efficiencies, and organizational systems (Shepherd, Douglas et al., 2000) that enable it to maintain a flow of heterogeneous resources necessary for production and exchange (Nelson & Winter, 1982). By offering free or subsidized space and management training, business incubators protect new ventures from the full forces of the external competitive environment and reduce barriers to market entry (Porter, 1980). Business incubators believe their services strengthen new ventures so that they can emerge from the incubator and compete successfully in their local economy (Erlewine & Gerl, 2004).

The pursuit of business incubation in order to reduce a firm’s liabilities of newness and tap into an incubators network of experienced business leaders and management consultants for mentorship characterizes our definition of an entrepreneurial strategy (Murray, 1984, p. 3.) New ventures that pursue incubation and are selected for incubation are fundamental creating and re-creating a set of economic and social relationships that seek to align their input-output parameters with specific conditions limited by their external environment. In essence, they seek to introduce a new set of input-output processes within an unfamiliar and resource limited environment. Their pursuit of incubation as an intermediary step towards attaining acceptance and sustainability in the marketplace is a proactive step in gaining control of economic and knowledge resources meant to help them compete against established competitors and other new firms in their industry.

Hypothesis 1: Business incubation as an entrepreneurial strategy has a positive effect on firm performance.

Hypothesis 2: Business incubation as an entrepreneurial strategy has a positive effect on firm performance post-incubation.

Further, noting that not all entrepreneurial strategies are equivalent and that heterogeneity among business incubators exists (Grimaldi & Grandi, 2005; Zedtwitz & Grimaldi, 2006), one might expect that the outcomes of a business incubation strategy might differ based on the attributes of other incubated ventures. For example, some incubators specialize in helping commercialize research from emerging fields while others pursue a more generalist approach. Therefore, it can be argued and observed that within certain incubators, new ventures might be concentrated not only in terms of their founding strategy but also in terms of their competitive industry. Thus, within business incubators, entrepreneurial strategic groups might arise that allow them to collaborate and compete simultaneously within the same market.

Hypothesis 3: Entrepreneurial strategic groups, observed as incubated ventures concentrated in the same industry, increase firm performance within.

However, the notion that all firms within a strategic group are similar implies that, to some extent, they are able to anticipate each other's reaction and will eventually create a rival environment (McGee & Thomas, 1986). This means that there are several levels of advantageous concentration within a strategic group that can be explored and not all of them are equally beneficial to individual firm performance. However, industry concentration can also increase rivalry and decrease individual firm performance. Therefore, we suggest that

Hypothesis 4: As the size of an entrepreneurial strategic group increases, individual firm performance for members of the entrepreneurial strategic group decreases.

DATA AND METHODS

Analytical Approach

This study utilizes a quasi-experimental design to decipher differences in exit and sales and employment growth due to entrepreneurial strategies and strategic group membership. The design strengthens "casual inferences when random assignment and controlled manipulation are not possible" (Grant & Wall, 2009). In our specific case, incubation managers determine which new ventures to incubate and which to exclude. While a true field experiment is possible, it was deemed impractical and lacking in external validity (Grant & Wall, 2009) since incubation is known to vary across time and settings (Clarysse, Wright, Lockett, Van de Velde, & Vohora, 2005; Zedtwitz & Grimaldi, 2006). Instead, our quasi-experimental design takes account of incubation by examining its effects on multiple organizations across time, in varying types of incubator settings, and with the use of a posttest measure. Further, the research design reduces potential selection bias due to unobserved differences between incubated ventures and their non-incubated peers by using a matched comparison group (Hirano, Imbens, & Ridder, 2003; Shadish, Cook, & Campbell, 2001; Wooldridge, 2002). These features of our research design help minimize the risk of many of the validity threats identified by Campbell, Cook and Shadish (2001) when using quasi-experimental designs for generalized casual inference.

Data

We assembled and merged three datasets: a population panel of business incubators operating in the U.S. between 1955 and 2007 and two panels of organization level data from the National Establishment Time-Series (NETS) database provided by Walls & Associates (Walls, 2009). All of this data are structured in an event history format, where each record corresponds to a single organization-year spell.

Unlike previous research on incubated ventures that has relied on small, non-random samples often conducted by incubator sponsors (McAdam, Galbraith, McAdam, & Humphreys, 2006), this dataset represents the population of business incubators that have existed since 1955 and their associated business tenants beginning in 1992.

Business incubator panels. We created the most inclusive and exhaustive census of business incubators possible by collecting membership rosters of the National Business Incubation Association, 23 state associations of business incubators, and economic development resource lists from 50 state governments. Because the majority of business incubators incorporate as nonprofit organizations, we searched for missing incubators through the National Center for Charitable Statistics (NCCS), a clearinghouse of data on the nonprofit sector. In addition, we cross-referenced our panel with a national roster from the University of Central Florida Business Incubation Program for the year 2007. Finally, Walls & Associates conducted a final search for missing incubators using the NETS database. In total, we identified a population consisting of 833 business incubators with operations in approximately 1,000 unique addresses.

Incubated ventures panel. Because data on incubated businesses that experience exit is more difficult to find than data on successful ones (Hackett & Dilts, 2004a), we extracted a sample that represents the majority of the population of all incubated ventures from the NETS database. The NETS database holds annual observations for over 36.5 million business establishments and is built from annual snapshots of Dun & Bradstreet (D&B) data (Walls, 2009). This database provides annual geographic, descriptive, and performance data, such as every known address for an organization, the year in which a business moved into or out of a particular address, industry codes, founding and termination years, and employment and sales levels (Walls, 2009).

Because the NETS defines business establishments as a "business or industrial unit at a single physical location that produces or distributes goods or performs services" (Neumark, Zhang, & Wall, 2005), we were able to conduct an address-based query to extract a population of incubated organizations using the known addresses of business incubators. This generated a panel of approximately 23,500 likely incubated ventures. However, the dataset of incubated ventures pulled from the NETS also contained several businesses that were not incubated because many incubators are located in business parks and commercial centers where non-incubated organizations also reside. This required that we carefully cull the panel so that it would represent the true population of incubated ventures contained in the NETS database.

In the past new venture data from D&B data has been criticized for ignoring unregistered nascent new ventures (Yang & Aldrich, 2012). This problem arose from practices by D&B prior to 1992, when data collection ignored yellow pages listings and relied exclusively on government records (Hmieleski & Baron, 2009; Neumark, Zhang, & Wall, 2006). Since then, D&B and NETS data at the establishment level has been found to be highly accurate when independently verified and their higher level data such as industry and employment trends correlate highly with similar databases such as the Quarterly Census of Employment and Wages (Neumark, Zhang, & Wall, 2006). To mitigate these prior concerns, we limited our sample to observations after 1991.

Culling and validation of incubated ventures. Based on the definition of incubation and the entrepreneurship literature, we narrowed our population frame to ventures deemed to be young and small-medium enterprises at the time of founding. Thus, we narrowed down the NETS data by dropping organizations that were deemed large corporations with over 100 employees and older than 5 years when they moved into an incubator's address. Hence, we dropped 746 organizations which were clearly large publicly traded corporations, 207 organizations with employment over 100, and approximately 3,400 businesses that were over 5 years when their associated business

incubator was founded. These culling steps reduced the initial population of 23,500 potentially incubated organizations to approximately 19,000.

As a precaution, we also assessed the accuracy of the address matching process in identifying all former and current tenants of business incubators through a data audit. A random sample of 65 incubators and their incubated ventures (1,200 businesses) was pulled from the dataset. The 65 incubators were surveyed via e-mail, asking their managers to report which of the listed organizations were current or former tenants. The survey generated a 49% response rate, indicating that at least 80% of the businesses identified as incubated ventures were correctly identified as current or former incubator tenants.

Independent control group. We designed a valid matching method to generate a control group that would serve as our counterfactual for all hypotheses. Following the work of Rosenbaum (2002) and Hirano, Imbens and Ridder (2003) who demonstrate that selection bias can be attenuated with the use of propensity score matching when estimating the average treatment effect of an intervention, we created matched groups of incubated and non-incubated organizations comparable across industry, geography, founding dates, and the gender and minority identity of the entrepreneur. Thus, by identifying a representative population of all incubated organizations and a matched group of non-incubated organizations we were able to conduct an analysis that could reliably estimate the effect of incubation on exit rates.

The design and extraction of a comparison group of non-incubated ventures required two steps. In the first stage, each incubated venture was matched to approximately seven non-incubated ventures based on founding year, county, 2-digit industry codes, and the gender and minority identity of the entrepreneur. Due to the high dimensionality of some of the observed covariates (i.e. founding year and county and industry codes) (Caliendo & Kopeinig, 2008), an exact one to one matching technique was ruled out because it would have resulted in many unmatched cases. Hence, 420 matching strata were created to represent the general founding years, county codes, industry, and entrepreneur's gender of the 19,103 incubated ventures. These 420 strata reflected seven general geography codes, five ranges of founding years, six industry groups, and two gender categories. For each incubated organization that fell into one of the 420 strata, seven randomly matched non-incubated organizations were pulled out of the NETS. This dataset represented the universe of non-incubated ventures contained within the NETS, which were similar to the incubated group in terms of geography, founding year, industry, and gender of the entrepreneur.

A second stage matching process allowed us to make the comparison group more equivalent to the incubated ventures by using a propensity score, which is defined as the probability of being incubated given observed covariates (Rosenbaum, 2002). The use of a propensity score to create a matched dataset helps overcome the problem of dimensionality among observed covariates that makes exact one to one matching difficult (Caliendo & Kopeinig, 2008). This matching method helps reduce bias in observational studies when random assignment to treatment is impossible. The validity of propensity score matching rests on the assumption that matching incubated and control cases with similar probabilities of being incubated allows for direct comparison of outcomes. In other words, if one can estimate a model for determining incubation using observed traits of incubated and non-incubated cases, then one can create valid comparison groups without randomization (Rosenbaum, 2002).

Thus in the second stage of matching, we calculated a propensity score for each incubated and non-incubated venture, taking into account 50 state dummy variables, 1,048 county dummy variables, founding years, nine industry dummy variables, and two dummy variables for the gender and racial identity of the entrepreneur. Based on the calculated propensity scores, each

incubated venture was matched to its three closest non-incubated ventures. In some cases, one independent control group firm serves as the counterfactual to two or more incubated firms.

In order to determine that incubated and non-incubated ventures shared similar likelihoods of incubation, we compared the density and distribution of their scores using a propensity score histogram. Based on the low levels of overlap for propensity scores higher than 0.5, we decided to drop those cases from the analysis.

Measures

Dependent variables. Our dependent variables include organizational exit, which is a relevant measure of firm performance when firms are young (Geroski, 1995) and sales and employment growth. In our study, the exit variable is equal to 1 if the last year of activity reported for an venture occurs on or before 2007, the last year of observation in our data. Sales growth is the log difference between annual sales at time (*t*) and sales at time (*t-1*). Annual sales figures were first adjusted to 2008 dollars based on the consumer price index before being log transformed. Similarly, employment figures were first log transformed and then differenced in order to calculate annual employment growth.

Entrepreneurial strategic group variables. The time-series and cross-sectional aspects of our data allow for measurement of several firm level and industry level variables. *Incubation* is a dummy variable that equals one for ventures pursuing an entrepreneurial strategy or zero otherwise. *Post-incubation* is a time series variable equal to 1 in years after which incubated ventures no longer receive incubation services.

Our observation of strategic group membership is based on Blau's index (also known as Herfindahl's index), which measures diversity among groups (Harrison & Klein, 2007). We calculated the Blau index for each incubator by year based on the two digit NAICS industry classification of incubated firms. The Blau index ranges from 0 to 1, where 0 indicates a low level of diversity and 1 indicates a high level of diversity. The mean and standard deviation of the Blau index for business incubators was .72 and .17 respectively and indicated a high level of industry diversity among firms pursuing incubation as a strategy. Thus, we coded incubated firms as 1 to indicate membership in an entrepreneurial strategic group if the Blau index of their associated incubator was 2 standard deviations below the mean and the firm belonged to the most highly represented industry in the incubator. Thus, approximately 1,500 of the firms pursuing an entrepreneurial strategy belong to an entrepreneurial strategic group. Additionally, we measured the size of a strategic group by counting how many firms in the incubator belonged to the most highly represented industry.

Firm variables. The variables *founding size (log sales)* and *founding size (log employment)* measure total sales and total employment respectively of a firm in its first year of existence. We include one of these variables in our models because ventures that start larger may have survival advantages (Agarwal & Audretsch, 2001; Geroski, 1995). Our data also includes a small number of organizations (approximately 2.7% of observations) that experienced a change in ownership through a merger or acquisition. Because changes in ownership can confound estimates of organizational exit (Cefis & Marsili, 2011), we controlled for this possibility by including the variable, *ownership change*, which is coded 1 after a business undergoes a merger or acquisition. We do not treat ownership changes as exits since the NETS allows for distinct observation of both events. If the business is subsequently closed due to the change of ownership, then this is treated as an exit on the year in which that business is last known to have operated in a particular

establishment. Additionally, we ran all of our models with and without organizations that experienced a change in ownership and our results remained consistent. *Firm age* is a series of time-period variables that measure the age of a firm from founding in our exit models and it is a single variable that measures age in our growth models.

Industry variables. We include 18 NAICS dummy variables that control for industry effects. Miscellaneous and unclassified industries represent the excluded category in the models. Because most incubated entrants operate locally during and after incubation (Erlewine & Gerl, 2004a), all industry density measures were constructed geographically at the county level and based on an organization's 3 digit NAICS classification. Annual data to build county-level industry density measures was extracted from the County Business Patterns database provided by the U.S. Census Bureau. *Founding density* is a count of the number of organizations in the same 3 digit NAICS code of an entrant divided by 1,000 in the year the organization was founded. *Density* is the annual number of organizations in the same industry and county as an organization divided by 1,000. *Density squared* is included to account for the U-shaped density dependence model of disbandings (Hannan & Freeman, 1989).

Other controls. To control for contemporaneous correlation with economic cycles, we included annual dummy variables from 1993 to 2006 that capture the economic cycles during economic expansions and contractions (Certo & Semadeni, 2006). If an observation falls within each of these time spans it is coded 1. Further to control for geographic differences in economic activities, we included 48 *state dummies*, which are not reported due to space limitations.

Empirical Models and Analyses

Our interest lies in estimating the probability of organizational exit and sales and employment growth, due to incubation and the interaction between incubation and strategic group membership and strategic group size. To avoid parametric misspecification in our exit models, we chose to model organizational exit using a piecewise model that allows the hazard curve to vary by age period (Blossfeld & Rohwer, 2007).

We estimated our growth models using the use the Arellano-Bond system GMM estimator in Stata (Roodman, 2006). This was necessary due to the inclusion of a lagged dependent variable which raised concerns of endogeneity, serial autocorrelation, and heteroscedasticity. Additionally, this estimation technique helps address the potential problem of treatment selection bias given its robustness checks for autocorrelation across time periods and exclusion of instrumental variables.

Endogeneity Test of Self Selection into Incubation

The empirical tests of our hypotheses rest on the assumption that the use of a quasi-experimental research design eliminates self-selection bias between incubated organizations and the control group. Pursuit of an incubation strategy is a function an entrepreneur's decision-making and the heterogeneous selection processes of incubators. We tested for validation that self-selection bias was eliminated by our data gathering process with a two stage least squares instrumental variables method as recommended by Wooldridge (2002). This method identifies whether self-selection and omitted variable bias exists when unobservable attributes of organizations that predict self-selection into incubation might also predict organizational exit or future growth (Wooldridge, 2005; Wooldridge, 2002).

To conduct this test, we collected data on three instrumental variables by state that indicated if a state government had enacted a business incubation policy, a small business loans program, and/or a state incubated venture capital fund. The data came from reviewing laws enacted by state

governments as reported by the websites of their respective secretary of state. These three variables are coded 0 in years prior to enactment of the respective policy and 1 in years after enactment of the respective policy. We argue that the enactment of these kinds of policies at the state level introduce exogenous changes in available economic development services that alter the behavior of entrepreneurs regarding public services that they might seek to found and grow a business. In addition, these changes also alter the selection processes of currently existing business incubators. We used these dummy variables in the first stage to predict self-selection into business incubation. Our method of testing relied on the Stata command ivreg2 written by Baum, Schaffer, and Stillman (2003) and our cluster robust results reveal that residuals from the first stage of the analysis were not significant in the second stage; in other words the Hansen J statistic shows that the joint null hypothesis is accepted because the excluded instruments were deemed uncorrelated with the error term in the second stage and also correctly excluded from the estimated equation (Baum et al., 2003). Given these results, we felt safe to continue with our analysis and test the hypotheses.

FINDINGS

In Table 1, we present the piecewise model regression results for the proportional hazard of exit for incubated and non-incubated ventures. Model 1.1 presents baseline results for comparison with Models 1.2-1.4 which test the hypotheses 1-4. The proportional effect of a given coefficient on the hazard of exit can be interpreted as $r(t) \equiv \exp(\beta t)$, where β is the estimated coefficient for a given time t. Therefore, as the coefficient increases, the exit rate increases. A negative coefficient for time-invariant variables can be interpreted as a reduction in the rate of exit, while a positive coefficient can be interpreted as an increase in the rate of exit. In cases where a measure varies with time, a unit decrease in the measure proportionally reduces the rate of exit for negative coefficients and a unit increase in the measure proportionally increases the rate of exit for negative coefficients. To interpret the effect of hypothesized variables, we anti-logged their estimated coefficients ($\exp[\beta t]$) to obtain an odds ratio.

Model 1.2 shows that the coefficient *incubation* is negative and indicates that ventures pursuing an incubation strategy have a hazard rate that is .95 times ([exp (-.047)]; $p<.10$) lower than that of the control group. This finding supports hypothesis 1. However, the model also shows that the coefficient *post-incubation* is positive and indicates that incubated ventures that move out of incubation have a hazard rate that is 1.21 times ([exp (.193)]; $p<.05$) higher than that of non-incubated ventures. Thus, the effects of incubation do not last and do not support hypothesis 2.

Model 1.3 reveals that membership in a strategic group among firms pursuing an incubation strategy decreases exit rates. These firms have a hazard rate that is .81 lower ([exp (-.211)]; $p<.05$) than that of the control group and incubated firms that are not part of an entrepreneurial strategic group. This supports hypothesis 3. In model 1.4, hypothesis 3 is further supported and evidence exists to support hypothesis 4. As the size of an entrepreneurial strategic group increases, the benefits of strategic group membership dwindle. According to the results, one additional member in an entrepreneurial strategic group, increases their hazard rate of its members by .02 ([1-exp (.021)]; $p<.10$). Thus, there are diminishing returns to strategic group membership.

In Table 2, we present results for annual sales growth due to pursuit of an incubation strategy and membership in an entrepreneurial strategic group. Model 2.1 presents baseline results for comparison with Models 2.2-2.4 which test the hypotheses 1-4. A positive coefficient for time-invariant variables can be interpreted as increasing sales growth rates for those firms sharing that attributes, while a negative coefficient can be interpreted as decreasing sales growth rates. In cases

where a measure varies with time, a unit increase in the measure proportionally increases sales growth rates for positive coefficients. A similar logic applies for negative coefficients.

Model 2.2 shows that the coefficient *incubation* is positive and indicates that ventures pursuing an incubation strategy have annual sales growth rates that are 2.3% higher than non-incubated firms. This finding supports hypothesis 1. However, the model does not support hypothesis 2, given that *post-incubation* is not significant.

Model 2.3 reveals that membership in a strategic group among firms pursuing an incubation strategy also increases annual sales growth rates. Their annual sales growth rates are 3.2% higher than incubated firms that are not part of an entrepreneurial strategic group. This supports hypothesis 3. In model 2.4, hypothesis 3 is further supported and evidence exists to support hypothesis 4. As the size of an entrepreneurial strategic group increases, the benefits of strategic group membership diminish. The effect is small but statistically significant. A one unit increase in the size of strategic group decreases annual sales growth rates by .3%.

In Table 3, we present results for annual employment growth due to pursuit of an incubation strategy and membership in an entrepreneurial strategic group. Model 3.1 presents baseline results for comparison with Models 3.2-3.4 which test the hypotheses 1-4. Coefficients are interpreted similarly as in Table 2.

Model 3.2 shows that the coefficient *incubation* is positive and indicates that ventures pursuing an incubation strategy have annual employment growth rates that are 1.8% higher than non-incubated firms. This finding supports hypothesis 1. However, the model does not support hypothesis 2, given that *post-incubation* is not significant.

Model 3.3 reveals that membership in a strategic group among firms pursuing an incubation strategy also increases annual employment growth rates. Their employment growth rates are 2.9% higher than incubated firms that are not part of an entrepreneurial strategic group. This supports hypothesis 3. In model 3.4, hypothesis 3 is further supported but evidence does not exist to support hypothesis 4.

DISCUSSION AND IMPLICATIONS

This study improves on past measures of strategic groups, which typically rely on industry measures, by taking into account a shared founding strategy, industry and geographical location. This improved measurement of strategic groups will help us evaluate prior findings that show performance differences are greater within unique strategic groups than across groups (McNamara et al., 2003) and that smaller firms decrease the performance of the group (Mas-Ruiz & Ruiz-Moreno, 2011). Further, these results can be generalized to firms pursuing an incubation strategy across multiple regions, industries, and time periods. The use of multiple dependent variables also enhances the conclusion of our findings.

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TABLE 1

Results of Piecewise Models Predicting the Likelihood of Firm Exit for Incubator Tenants & Strategic

Variables	Model 1.1		Model 1.2		Model 1.3		Model 1.4	
1993	0.333**	(0.137)	0.330**	(0.137)	0.331**	(0.137)	0.331**	(0.138)
1994	0.533***	(0.039)	0.528***	(0.039)	0.529***	(0.039)	0.529***	(0.039)
1995	0.754***	(0.042)	0.748***	(0.041)	0.749***	(0.042)	0.749***	(0.042)
1996	0.954***	(0.063)	0.949***	(0.062)	0.950***	(0.063)	0.950***	(0.063)
1997	0.840***	(0.047)	0.835***	(0.046)	0.835***	(0.046)	0.835***	(0.046)
1998	0.942***	(0.031)	0.937***	(0.030)	0.937***	(0.030)	0.937***	(0.030)
1999	1.011***	(0.041)	1.006***	(0.041)	1.007***	(0.041)	1.007***	(0.041)
2000	0.734***	(0.043)	0.730***	(0.043)	0.731***	(0.043)	0.731***	(0.043)
2001	0.804***	(0.048)	0.801***	(0.048)	0.801***	(0.048)	0.801***	(0.048)
2002	0.674***	(0.023)	0.671***	(0.023)	0.671***	(0.023)	0.671***	(0.023)
2003	0.547***	(0.032)	0.544***	(0.032)	0.544***	(0.032)	0.544***	(0.032)
2004	0.662***	(0.039)	0.660***	(0.039)	0.660***	(0.039)	0.660***	(0.039)
2005	0.951***	(0.046)	0.948***	(0.047)	0.948***	(0.047)	0.948***	(0.047)
2006	0.396***	(0.023)	0.394***	(0.022)	0.393***	(0.022)	0.393***	(0.022)
Agriculture	-0.059	(0.104)	-0.073	(0.101)	-0.074	(0.101)	-0.073	(0.101)
Utilities	0.024	(0.143)	0.016	(0.142)	0.015	(0.142)	0.015	(0.142)
Construction	-0.063	(0.096)	-0.075	(0.093)	-0.074	(0.093)	-0.074	(0.093)
Manufacturing	-0.131*	(0.072)	-0.141**	(0.069)	-0.140**	(0.070)	-0.139**	(0.070)
Wholesale trade	0.074	(0.080)	0.064	(0.077)	0.064	(0.077)	0.064	(0.077)
Retail	0.099	(0.095)	0.089	(0.093)	0.089	(0.093)	0.089	(0.093)
Transportation	-0.082	(0.093)	-0.098	(0.088)	-0.098	(0.088)	-0.097	(0.088)
Information	0.063	(0.103)	0.059	(0.102)	0.059	(0.102)	0.059	(0.102)
Finance	-0.048	(0.093)	-0.056	(0.091)	-0.056	(0.091)	-0.056	(0.091)
Real estate	-0.066	(0.086)	-0.080	(0.082)	-0.079	(0.082)	-0.079	(0.082)
Technical services	-0.110	(0.079)	-0.114	(0.077)	-0.111	(0.078)	-0.111	(0.078)
Administrative support	0.046	(0.098)	0.035	(0.095)	0.035	(0.095)	0.035	(0.095)
Educational	-0.345***	(0.092)	-0.354***	(0.090)	-0.354***	(0.090)	-0.353***	(0.090)
Health care	-0.089	(0.102)	-0.103	(0.099)	-0.100	(0.101)	-0.102	(0.099)
Entertainment	-0.087	(0.123)	-0.102	(0.119)	-0.101	(0.119)	-0.101	(0.119)
Food services	-0.061	(0.151)	-0.076	(0.147)	-0.076	(0.147)	-0.075	(0.147)
Other services	-0.073	(0.102)	-0.090	(0.096)	-0.090	(0.096)	-0.089	(0.096)
Founding density	-0.010*	(0.006)	-0.010*	(0.006)	-0.010*	(0.006)	-0.010*	(0.006)
Density	0.001	(0.006)	0.001	(0.006)	<.001	(0.006)	<.001	(0.006)
Density squared	<.001	(<.001)	<.001	(<.001)	<.001	(<.001)	<.001	(<.001)
Firm age: 1 year	-2.984***	(0.136)	-2.974***	(0.128)	-2.975***	(0.128)	-2.974***	(0.127)
Firm age: 2 years	-2.880***	(0.132)	-2.870***	(0.125)	-2.872***	(0.125)	-2.870***	(0.124)
Firm age: 3-5 years	-2.632***	(0.134)	-2.623***	(0.127)	-2.624***	(0.127)	-2.623***	(0.126)
Firm age: 6-10 years	-3.220***	(0.096)	-3.214***	(0.092)	-3.215***	(0.092)	-3.214***	(0.091)
Firm age: 11+ years	-3.385***	(0.117)	-3.382***	(0.113)	-3.384***	(0.113)	-3.382***	(0.113)
Founding size (log sales)	-0.011*	(0.006)	-0.010*	(0.006)	-0.009*	(0.006)	-0.009*	(0.006)
Ownership change	0.024	(0.058)	0.023	(0.058)	0.022	(0.057)	0.022	(0.057)
Incubation			-0.047*	(0.026)	-0.044*	(0.027)	-0.044*	(0.027)
Post incubation			0.193**	(0.088)	0.192**	(0.089)	0.193**	(0.089)
Strategic group member					-0.211**	(0.101)	-0.361**	(0.153)
Strategic group size							0.021*	(0.011)
df	85		86		87		88	
Log-likelihood	-51680		-51673		-51670		-51669	

[a] Robust clustered standard errors in parentheses for 833 incubators. N = 245,620 organization years. Total firms=53,759. Firm exits = 23,335.

[b] * p < 0.10; ** p < 0.05 ; *** p < 0.01

TABLE 2

Results of Sales Growth Models for Incubator Tenants & Strategic Groups [ab]

Variables	Model 2.1		Model 2.2		Model 2.3		Model 2.4	
1992	0.001	(0.008)	-0.008	(0.008)	-0.008	(0.008)	-0.008	(0.008)
1993	-0.001	(0.006)	-0.004	(0.006)	-0.004	(0.006)	-0.004	(0.006)
1994	0.034***	(0.006)	0.033***	(0.006)	0.032***	(0.006)	0.032***	(0.006)
1995	0.040***	(0.005)	0.040***	(0.005)	0.039***	(0.005)	0.039***	(0.005)
1996	0.055***	(0.005)	0.055***	(0.005)	0.055***	(0.005)	0.055***	(0.005)
1997	0.095***	(0.006)	0.096***	(0.006)	0.096***	(0.006)	0.096***	(0.006)
1998	0.085***	(0.008)	0.085***	(0.008)	0.085***	(0.008)	0.085***	(0.008)
1999	0.069***	(0.007)	0.070***	(0.007)	0.070***	(0.007)	0.070***	(0.007)
2000	0.031***	(0.006)	0.032***	(0.006)	0.031***	(0.006)	0.031***	(0.006)
2001	0.023***	(0.004)	0.023***	(0.004)	0.023***	(0.004)	0.023***	(0.004)
2002	0.009**	(0.004)	0.010**	(0.004)	0.010**	(0.004)	0.010**	(0.004)
2003	-0.032***	(0.004)	-0.032***	(0.004)	-0.032***	(0.004)	-0.032***	(0.004)
2004	-0.028***	(0.005)	-0.028***	(0.005)	-0.028***	(0.005)	-0.028***	(0.005)
2005	-0.065***	(0.004)	-0.065***	(0.004)	-0.065***	(0.004)	-0.065***	(0.004)
2006	-0.016***	(0.005)	-0.015***	(0.005)	-0.015***	(0.005)	-0.016***	(0.005)
Agriculture	-0.022	(0.018)	-0.016	(0.018)	-0.016	(0.018)	-0.016	(0.018)
Utilities	0.040	(0.037)	0.037	(0.038)	0.037	(0.038)	0.038	(0.038)
Construction	0.027*	(0.015)	0.029**	(0.014)	0.029**	(0.014)	0.029**	(0.014)
Manufacturing	0.044***	(0.015)	0.046***	(0.014)	0.046***	(0.014)	0.046***	(0.014)
Wholesale trade	0.022	(0.015)	0.024*	(0.014)	0.024*	(0.014)	0.024*	(0.014)
Retail	0.016	(0.014)	0.019	(0.014)	0.019	(0.014)	0.019	(0.014)
Transportation	0.020	(0.015)	0.026*	(0.015)	0.026*	(0.015)	0.026*	(0.015)
Information	0.023	(0.015)	0.022	(0.015)	0.022	(0.015)	0.022	(0.015)
Finance	0.035**	(0.015)	0.037**	(0.014)	0.037**	(0.014)	0.037**	(0.014)
Real estate	0.010	(0.014)	0.016	(0.014)	0.016	(0.014)	0.016	(0.014)
Technical services	0.034**	(0.014)	0.033**	(0.014)	0.033**	(0.014)	0.033**	(0.014)
Administrative support	0.009	(0.014)	0.012	(0.014)	0.012	(0.014)	0.012	(0.014)
Educational	0.011	(0.016)	0.014	(0.016)	0.014	(0.016)	0.014	(0.016)
Health care	0.018	(0.014)	0.025*	(0.014)	0.024*	(0.014)	0.024*	(0.014)
Entertainment	-0.012	(0.015)	-0.005	(0.015)	-0.006	(0.015)	-0.006	(0.015)
Food services	0.032**	(0.015)	0.040***	(0.015)	0.040***	(0.015)	0.040***	(0.015)
Other services	0.001	(0.014)	0.009	(0.014)	0.009	(0.014)	0.009	(0.014)
Founding density	<.001	(0.001)	<.001	(0.001)	<.001	(0.001)	<.001	(0.001)
Density	<.001	(0.001)	<.001	(0.001)	<.001	(0.001)	<.001	(0.001)
Density squared	<-.001	(<.001)	<-.001	(<.001)	<-.001	(<.001)	<-.001	(<.001)
Sales growth lag	-0.100	(0.070)	-0.100	(0.070)	-0.101	(0.070)	-0.101	(0.070)
Founding size (log employment)	-0.012***	(0.001)	-0.013***	(0.001)	-0.013***	(0.001)	-0.013***	(0.001)
Firm age	<-.001	(<.001)	<-.001	(<.001)	<-.001	(<.001)	<-.001	(<.001)
Ownership change	0.013*	(0.007)	0.014*	(0.007)	0.014*	(0.007)	0.014*	(0.007)
Incubation			0.023***	(0.002)	0.023***	(0.002)	0.023***	(0.002)
Post incubation			0.016	(0.011)	0.016	(0.011)	0.016	(0.011)
Strategic group member					0.032**	(0.016)	0.054**	(0.023)
Strategic group size							-0.003*	(0.002)
Constant	-0.045**	(0.018)	-0.055***	(0.019)	-0.056***	(0.019)	-0.056***	(0.019)
df	83		85		86		87	
Total instruments	157		159		160		161	
AR(1) Test	-5.82		-5.82		-5.83		-5.82	
p-value of AR(1)	0.00		0.00		0.00		0.00	
AR(2) Test	-0.79		-0.79		-0.80		-0.80	
p-value of AR(2)	0.43		0.43		0.42		0.42	
Hansen J statistic	77.26		80.23		79.55		79.17	
p-value of Hansen statistic	0.34		0.26		0.28		0.29	

[a] Robust clustered standard errors in parentheses. N = 149,239 organization years. Total firms=34,841.

[b] * p < 0.10; ** p < 0.05 ; *** p < 0.01

TABLE 3

Results of Employment Growth Models for Incubator Tenants & Strategic Groups [ab]

Variables	Model 3.1		Model 3.2		Model 3.3		Model 3.4	
1992	-0.015**	(0.007)	-0.022***	(0.007)	-0.022***	(0.007)	-0.023***	(0.007)
1993	-0.017***	(0.006)	-0.018***	(0.006)	-0.019***	(0.006)	-0.019***	(0.006)
1994	-0.005	(0.006)	-0.005	(0.006)	-0.006	(0.006)	-0.006	(0.006)
1995	-0.009**	(0.004)	-0.009**	(0.004)	-0.009**	(0.004)	-0.009**	(0.004)
1996	-0.008*	(0.004)	-0.007*	(0.004)	-0.007*	(0.004)	-0.008*	(0.004)
1997	-0.012***	(0.004)	-0.012***	(0.004)	-0.012***	(0.004)	-0.012***	(0.004)
1998	0.003	(0.004)	0.004	(0.005)	0.004	(0.005)	0.004	(0.005)
1999	0.002	(0.004)	0.003	(0.004)	0.002	(0.004)	0.002	(0.004)
2000	0.003	(0.003)	0.003	(0.003)	0.003	(0.003)	0.003	(0.003)
2001	0.004	(0.003)	0.005	(0.003)	0.005	(0.003)	0.005	(0.003)
2002	0.006*	(0.003)	0.006*	(0.003)	0.006*	(0.003)	0.006*	(0.003)
2003	-0.041***	(0.003)	-0.041***	(0.003)	-0.041***	(0.003)	-0.041***	(0.003)
2004	<.001	(0.009)	0.002	(0.009)	0.001	(0.010)	0.001	(0.010)
2005	-0.008**	(0.003)	-0.007**	(0.003)	-0.007**	(0.003)	-0.007**	(0.003)
2006	0.004	(0.004)	0.004	(0.004)	0.004	(0.004)	0.004	(0.004)
Agriculture	0.009	(0.012)	0.014	(0.012)	0.014	(0.012)	0.014	(0.012)
Utilities	0.032	(0.024)	0.031	(0.025)	0.032	(0.025)	0.032	(0.025)
Construction	0.019*	(0.010)	0.022**	(0.010)	0.022**	(0.010)	0.022**	(0.010)
Manufacturing	0.028***	(0.010)	0.030***	(0.010)	0.031***	(0.010)	0.031***	(0.010)
Wholesale trade	0.027***	(0.010)	0.029***	(0.010)	0.030***	(0.011)	0.030***	(0.011)
Retail	0.010	(0.010)	0.014	(0.010)	0.014	(0.010)	0.014	(0.010)
Transportation	0.012	(0.011)	0.017	(0.011)	0.018	(0.011)	0.018	(0.011)
Information	0.024**	(0.010)	0.024**	(0.010)	0.024**	(0.010)	0.024**	(0.010)
Finance	0.022**	(0.010)	0.024**	(0.010)	0.024**	(0.010)	0.024**	(0.010)
Real estate	0.009	(0.010)	0.014	(0.010)	0.014	(0.010)	0.014	(0.010)
Technical services	0.025***	(0.010)	0.025***	(0.010)	0.025***	(0.010)	0.025***	(0.010)
Administrative support	0.014	(0.010)	0.017*	(0.010)	0.017*	(0.010)	0.018*	(0.010)
Educational	0.011	(0.011)	0.014	(0.011)	0.014	(0.011)	0.014	(0.011)
Health care	0.011	(0.010)	0.016*	(0.010)	0.016*	(0.010)	0.016*	(0.010)
Entertainment	0.004	(0.010)	0.009	(0.010)	0.009	(0.010)	0.009	(0.010)
Food services	0.009	(0.011)	0.015	(0.011)	0.015	(0.011)	0.015	(0.011)
Other services	-0.007	(0.010)	<.001	(0.009)	<.001	(0.009)	<.001	(0.009)
Founding density	<.001	(0.001)	<.001	(0.001)	<.001	(0.001)	<.001	(0.001)
Density	<.001	(0.001)	<.001	(0.001)	<.001	(0.001)	<.001	(0.001)
Density squared	<-.001	(<.001)	<-.001	(<.001)	<-.001	(<.001)	<-.001	(<.001)
Employment growth lag	0.092	(0.146)	0.108	(0.149)	0.102	(0.151)	0.099	(0.152)
Founding size (log sales)	-0.008***	(0.001)	-0.009***	(0.002)	-0.009***	(0.002)	-0.009***	(0.002)
Firm age	-0.001***	(<.001)	-0.001***	(0.000)	-0.001***	(0.000)	-0.001***	(<.001)
Ownership change	0.001	(0.006)	0.001	(0.006)	0.001	(0.006)	0.001	(0.006)
Incubation			0.018***	(0.003)	0.018***	(0.003)	0.018***	(0.003)
Post incubation			0.006	(0.009)	0.006	(0.009)	0.006	(0.009)
Strategic group member					0.029**	(0.013)	0.039**	(0.019)
Strategic group size							-0.002	(0.002)
Constant	0.114***	(0.023)	0.109***	(0.023)	0.110***	(0.023)	0.110***	(0.023)
df	83		85		86		87	
Total instruments	132		134		135		136	
AR(1) Test	-3.87		-3.86		-3.79		-3.76	
p-value of AR(1)	0.00		0.00		0.00		0.00	
AR(2) Test	0.63		0.72		0.67		0.65	
p-value of AR(2)	0.53		0.47		0.50		0.52	
Hansen J statistic	58.21		59.20		59.32		59.36	
p-value of Hansen statistic	0.15		0.13		0.13		0.13	

[a] Robust clustered standard errors in parentheses. N = 149,391 organization years. Total firms=34,891.

[b] * p < 0.10; ** p < 0.05 ; *** p < 0.01