

Effectuation and Firm Performance:

A Look at Partnership, Education, and Experience, and Their Relation to Firm Survival, Employee Growth and Revenue Level

57181520-8 Michael Mason Hale

Topics in Fixed Income

C.E. Prof. Yotsuzuka, Toshiki

D.E. Hibara, Nobuhiko D.E. Nemoto, Naoko

Summary

The increased attention toward entrepreneurial research over the last two decades has led to alternative frameworks to explain the behavior of new ventures in their formative years. Effectuation is a framework that has gained traction since its inception in 2001, and has been shown to be used by expert entrepreneurs in Knightian uncertain environments (Sarasvathy, 2001). Effectuation is a set of decision-making principles defined as follows:

Given means: Starting with who you are, what you know, and who you know.

Strategic Partnerships: Young ventures create strategic partnerships, rather than perform competitive analysis, to help mitigate uncertainty.

Affordable loss: Founders only invest that which they can afford to lose. Rather than focus on expected returns and all-or-nothing investments, founders invest that which they are comfortable losing.

Leverage Contingencies: Firms are flexible to changing their business plan and model based on new information, or disruptions in the market. Entrepreneurs do not shy away from uncertainty and surprises, but rather thrive in it and use it as a means to refine their product.

While the principles of affordable loss, and leveraging contingencies are moderately subjective and abstract, the principles of given means and partnership show potential to be measured empirically. This idea is supported by Read et al.'s 2009 meta-analysis that aggregated a multitude of different metrics of firm performance over 48 studies, and showed that partnerships and given means were both positively and significantly related to firm performance.

It is the goal of this study to further empirical effectuation research by using a single cohort panel survey, the Kauffman Firm Survey, to link effectuation principles to specific firm performance metrics: survivability and employee growth. We analyze each principle's association with yearly employee growth and cumulative and marginal survival rates to evaluate effectuation in a longitudinal study. Then, the independent variables are added to a multivariate regression to test firm performance at the end of the survey.

Scholars have also theorized that effectuation is more present in innovative environments (Roach et al., 2016), so we expand on our analysis to test if there is a significant difference in the relationship between effectuation principles and firm performance for innovative versus non innovative businesses. We test measures for industry and firm level innovativeness, as these have been shown to have potentially different effects on firm survival (Hyytinen et al., 2015).

Our findings show that there are positive and significant relationships between a firm's survival rate, and the independent variables of founder's education and firm's partnerships. With regard to employee growth rate, education and the founder's startup experience are both positively and significantly related. Finally, we show that industry level innovation, measured as a dummy variable for high-tech vs low-tech companies, has a significant interaction, and a multiplicative effect on partnership with regard to firm survivability at year 7, while the firm-level innovation measure had no significant interaction effect.

The results confirm what has been previously theorized, and provide empirical evidence for effectuation. The findings also reveal a glimpse at the longitudinal consequences of effectuation and new venture formation, as opposed to the almost exclusively cross-sectional literature currently available. Beyond the contributions to effectuation literature, we identify limitations in the study and identify future research opportunities.

Principles of Effectuation and Firm Performance

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and Their Relation to Firm Survival and Employee**

Growth

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1. Introduction

As the field of entrepreneurial research continues to grow, many new approaches contrast the more traditional models of entrepreneurial behavior. Historically, much of entrepreneurial research has borrowed conceptual frameworks from other disciplines such as economics, strategic management, and psychology. These frameworks are used to describe how entrepreneurial action is taken by searching for areas where demand for a product or service exceeds supply (Casson, 1982) and deciding if that opportunity should be exploited (Shane & Venkataraman, 2000). These opportunities can appear in many ways, such as the creation of new information resulting from new technologies, exploitation of market inefficiencies, and reactions to shift and relative costs and benefits of uses for resources (Drucker, 1985).

This dimension of innovation and creation is what inherently distinguishes entrepreneurial research from traditional business theories. Entrepreneurship and new venture creation are the mechanisms by which society translates technical information into new products and services (Arrow 1962). These innovative products and services are the means by which temporal and special inefficiencies are discovered and mitigated throughout an economy. Startups have provided a durable supply of new jobs and economic growth (Stangler, 2009), even in the face of recession. Hence, the absence of entrepreneurship from collective theories makes the business landscape incomplete.

Like entrepreneurial research as a whole, effectuation research has suffered from a lack of large detailed samples, and quantitative analysis. Meta-analyses, such as Read et al.'s 2009 study, have found that subdimensions of effectuation, such as the entrepreneur's given means and partnerships are linked to positive firm performance (Read et al., 2009). While Read et al.'s meta analyses used a combination of performance metrics from 48 studies to create a generalized firm performance outcome variable (a combination of performance, ROI, return on investment, sales growth, revenue growth, ROA, survival, return on assets, return on equity, ROE, and employee growth), it is the goal of this research to pinpoint more specific metrics of firm performance.

To do this, we will first examine previous entrepreneurial and effectuation literature. Then, the effectuation principles of “given means” and “strategic partnership” are tested to observe their relationship with firm survivability, employee growth, and revenue level in a sample of 4928 new ventures founded in 2004. We first look at each subdimension independently, and test for their associated effects on firm performance for each year of the firm survey to give us a longitudinal look at how the effectuation principles relate to firm performance as a venture matures. These variables are then added to a multivariate regression to test their effects on firm performance for the last year of the firm survey.

Lastly, as expert entrepreneurs are shown to use effectuation in uncertain conditions, interaction variables are introduced into the statistical analysis to see if the effects are greater for more innovative companies than less innovative companies. The effect of innovation on firm survival has historically had polarizing results in literature, with studies claiming both positive and negative effects associated with higher levels of innovation. In line with Hyytinen et al.’s theories of innovation’s effect on firm survival, we test if innovation may have different effects on firm survival dependent on if you measure innovation at the industry level versus the firm level(Hyytinen et al., 2015). This study adds to the entrepreneurial literature by supplying empirical evidence for the positive relationship between effectuation principles and firm performance, evaluating effectuation longitudinally, and investigating the effects of both firm and industry level innovation on the associations between effectuation principles and firm performance.

Literature Review

There is a long history in economics regarding the differences between risk and uncertainty (Knight, 1921), and scholars theorize that one of the biggest differences between entrepreneurial and non-entrepreneurial decision making is that the former operates under conditions of uncertainty, while the latter operates under conditions of risk (Alvarez and Barney, 2005). Entrepreneurs must often make decisions before the economic value of an opportunity is known, or even probabilistic,

and thus entrepreneurial decisions cannot be fully described using a framework that only focuses on risk.

Effectuation Principles

This differentiation between risky and uncertain environments has led to the proposal of nonconventional theoretical frameworks, such as effectuation (Sarasvathy, 2001). Effectuation is a set of decision-making principles that have been shown to be used by expert entrepreneurs creating new ventures in uncertain situations (Sarasvathy, 2001). Sarasvathy proposes the following as the four principles of effectuation.

Strategic Partnerships

Rather than performing competitive analysis, effectual entrepreneurs seek out partnerships. These partnerships often help shape the final product and help mitigate uncertainty.

Bird in Hand

The bird in hand principle, also known as the given means principle, states that entrepreneurs should start by utilizing the means that they already have. For the entrepreneurs, these given means are identified as who they are, what they know, and who they know.

Affordable Loss

Affordable loss focuses on minimizing the downside risk of a new venture by having stakeholders only invest that which they are comfortable losing, rather than large all-or-nothing investments. This decision making contrasts the causative ideology of finding an expected return and then working to minimize the associated risk.

Leverage Contingencies

Instead of trying to avoid unforeseeable outcomes, effectuators use surprises to gain insight into potential new markets and ventures. Effectual entrepreneurs keep their ventures flexible and are comfortable changing business plans based on market disruptions.

Causation

While effectuation is viewed as an alternative framework of entrepreneurship, it is often described relative to “causation”, which represents the traditional entrepreneurial frameworks and theories. In the causation framework, the entrepreneur will select a given outcome, and then make decisions accordingly to try to achieve this end goal. Causation presumes that the outcome is given and chooses the means to efficiently reach it. Effectuation on the other hand, views the entrepreneur’s means as given, and selects the best possible outcome that can be created with them.

Causation tries to predict future environments by spending resources in competitive analysis, analyzing expected returns, and systematic information gathering. Causative decision making believes that the uncertainty of the future can be measured, and that entrepreneurial opportunities can be identified before they appear (Fisher, 2012). Rather than partake in competitive analysis, effectuators combat uncertainty by forming strategic partnerships. Instead of predicting an uncertain future inaccurately, they believe that the future is unknowable, and thus view entrepreneurial opportunity as malleable and socially constructed.

Effectuation is thus a decision-making framework for environments which are characterized by problems such as Knightian uncertainty (Knight, 1921) and Marchian goal ambiguity (March, 1982). These problems with predictability and goal ambiguity are often seen in new ventures, especially those which attempt to commercialize new technologies, where the demand cannot be predicted due to the absence of existing markets. Predictions in the absence of markets are therefore of little use. Effectuation then could be used, not as a direct substitute for rational choice, but as a viable way to rationalize choices in conditions of Knightian uncertainty.

Effectual logic functions by inverting the predictive rationality of causative logic. Where prediction oriented decision making believes that to the extent in which you can accurately predict

the future, one is able to control it, effectual decision making believes that if you are able to control the future, you need not predict it. Rational decision making in the effectual framework thus lies in controlling what can be implemented with given resources. By focusing on that which the entrepreneur can control, new firms are able to use effectuation to mitigate Knightian uncertainty into entrepreneurial opportunity (Sarasvathy, 2010). Examples of this conversion in the real world could be seen as companies forming partnerships and pre-commitments with potential customers who's feedback in turn helps shape the final product and new markets.

It should be noted that while effectuation differs in many ways from rational choice, the two frameworks in reality coexist and are supplementary to each other. The distinction of use between them is situational, and each have advantages in separate problem spaces. It has been theorized these episodes in which effectuation may be preferable to causation and rational choice occur more often in early ventures that utilize new technology, where markets are in the process of creation. However, decision making often transitions to more predictive reasoning once the market has been established, and the company's goals then shift to sustaining market share and value. This transition is often shown in real world situations where the founding team must eventually step aside and bring in outside management and financial officers.

Entrepreneurship literature has long theorized that there is a positive association between company growth and replacement of the original CEO (Chandler and Jansen, 1992; Wilard et al., 1992). While many founders thrive in the fluidity of new ventures, they are often poorly suited for the formality required for sustained growth. Previous studies have shown that CEOs who implement fewer management control systems are replaced sooner, and that growth and the adoptions of higher intensity management control systems are positively related (Foster and Davila, 2007). These findings provide evidence for the transitional nature of effectuation. While effectual decision making may be more appropriate in early ventures under Knightian uncertainty, the replacement of founders and implementation of stricter management systems show a clear evolution to more causative decision making.

Previous Effectuation Testing

The first tests for effectuation were think-aloud protocols that showed that expert entrepreneurs used effectuation principles in uncertain environments (Sarasvathy, 2001). However, this study implied that effectuation principles are correlated and load together, which has been shown in multiple studies to not be the case (Chandler et al., 2011; Read, 2009). This has led scholars to theorize that effectuation may be a formative construct as opposed to a reflective construct. Due to the formative nature of effectuation, the lower order measures, or principles of effectuation in this case, shape the upper order construct of effectuation as a whole. The formative assumption of effectuation also implies that the sub-dimensions of effectuation may therefore be independent of each other (MacKenzie et al., 2005; Chandler et al., 2011).

Read et al.'s meta-analysis of effectuation was the first study to link sub-dimensions of effectuation to positive firm performance. By creating a sample from 48 previous studies, they were able to link both "given means" and "partnership" principles to positive firm performance. However, this measure of firm performance was a conglomerate of a multitude of different metrics to create an overarching firm performance variable. The sample for the analysis also varied across time, region, firm founding date, and many other characteristics.

By using the Kauffman Firm Survey, this research is able to stabilize many of the varying conditions of Read et al.'s sample, such as performance metrics, founding date, and geography. For example, firms in the Kauffman Firm Survey were all founded in the United States in 2004, and have firm specific performance data, such as revenue levels, survival information, and yearly employee totals.

Using the meta-analytical methodology of Read (2009), Roach et al. (2016) expanded on the preexisting scales of effectuation to make them innovation centric. By making their scales innovation centric, they were able to test their scales as effectual vs. non-effectual. Their research established a relationship between effectuation and firm level innovation measures (Roach et al., 2016).

The impact of innovation in startups has been widely researched with varying results. One camp, which believes that innovation and firm performance have a positive relationship, theorize that

innovativeness can improve a startup's ability to avoid competition (Porter, 1980) and increase their market power (Shumpeter, 1993). On the other hand, those who believe there is a negative relationship tend to theorize that innovation leads to more risky and complicated processes (Samuelsson and Davidsson, 2008) that face comparatively larger liability of novelty (Scherer and Harhoff, 2000). Hyttinen et al. argue that that this discrepancy could be due to the interrelated selection biases of survivorship of ideas, and survivorship bias of firms that have traded in the market successfully. In their argument, incumbent businesses are selected from a subset of successful firms from a group who entered the market originally. To address these biases, Hyttinen et al. create a study to measure innovativeness at both the firm level, as companies that plan to employ new to market processes and products, and industry level. Their findings suggest that once the survivorship biases have been addressed, the survival probability of innovative startups is 6-7% lower than non-innovative startups (Hyttinen et al., 2015).

It is the goal of this research as well to expand on the literature linking innovation and firm survival. To do this, we introduce interaction variables for innovation, such as high-tech companies vs low-tech companies and firms founded on a new product, in order to see if the effectuation principles have a greater effect on firm performance in innovative environments. By selecting these two variables, we are able to look at the effects of both firm and industry level innovation measures on new venture performance.

Lastly, previous effectuation research has been almost exclusively cross-sectional. Reymen et al. (2015) analyzed effectuation in a longitudinal survey to see how the use of effectuation usage shifts over time. However, it is to my understanding that effectuation sub-dimensions have not been evaluated in a longitudinal setting. By using the Kauffman Firm Survey, which interviewed firms yearly over an 7-year period, this research adds to the existing effectuation literature by showing how effectuation principles independently affect marginal survival rates on a yearly basis, and their effects when combined into a multivariate logistic regression for performance at the end of the survey. Effectuation has been theorized to transition into more causative decision making as companies operate in environments with less Knightian uncertainty and Marchian goal ambiguity.

Welter and Kim (2018) provided evidence for this with their NK simulation model that showed that effectuation outperformed causation in early ventures until the point where the entrepreneur could accurately predict future decisions more than 75% of the time (Welter and Kim, 2018). These findings suggest that effectuation may be comparably less suitable than causation as Knightian uncertainty and Marchian goal ambiguity are mitigated. Our research hopes to further the literature regarding how the benefits of effectuation shift through time, as uncertainty becomes risk, and future outcomes become more probabilistic.

Objectives of this study

This study aims to investigate the relationships between the effectuation principles and firm performance. This study has three main objectives:

1. Assess the relationship between independent variables -founders education, experience, and firm partnerships- and firm survival- both cumulative and marginal rates
2. Assess the relationship between effectuation principles and employee growth
3. Identify if innovative environments amplify the predicted effects of effectuation principles on firm performance
4. Evaluate effectuation over a longitudinal survey, to better understand the temporal characteristics and effects

Organization of this thesis

This thesis is structured into four sections. The first chapter addresses the background of this study- entrepreneurial literature as a whole and effectuation specifically- and identifies previous literature and tests used to test effectuation. Gaps in the preexisting literature are identified, and the objectives of this study are stated. The second chapter describes the Kauffman Firm Survey dataset and the measures used as independent variables for effectuation principles, dependent variables for firm performance, and interaction variables for testing their relationship with innovation. The third chapter presents the results: education, experience, and partnership, and their relationships to various

metrics of firm performance such as cumulative and marginal survival rates, employee growth, and revenue levels. Lastly, the fourth chapter discusses the findings of the study, limitations, and avenues for future research.

2. Methodology

Data

The data used for this analysis comes from the Kauffman Firm Survey, which was a single cohort panel survey of 4928 new businesses founded in 2004, interviewed yearly for their first 7 years. The Kauffman Firm Survey, which I will refer to as the KFS from here forward, was at the time, the largest longitudinal study of new ventures, and contains vast information regarding a business's characteristics, organization, finances, innovation, ownership, and entrepreneur characteristics.

The main objectives of the survey were to longitudinally track new firms and understand their development at both owner and business levels. The KFS tracked the same group of firms from a common founding year and recorded a vast amount of information about them over the span of 7 years. This longitudinal study with a common starting point allows researchers to investigate individual-level change, and for the aggregation of firm data over time. Because the KFS is a single-cohort panel, it is able to avoid problems with population composition changes.

To create the sample, the KFS first identified their target population: all new businesses starting as an independent business, by purchase of a pre-existing business, or by the purchase of a franchise in the 2004 calendar year in The United States. It should be noted that the KFS did not include businesses that were started as a branch of another company, inherited companies, and non-profits. At the time of the survey, there was not a single comprehensive new business register for newly formed businesses, so the Dun and Bradstreet Database was used to create the sample frame.

Businesses that had a valid legal status in 2004 were then included. The KFS identified 251,282 businesses for in the sample frame from Dun and Bradstreet, and from here a sample of 32,469 fit the criteria mentioned previously. The KFS aimed to interview 5,000 companies, so the sample was

released in rounds until the target sample size was reached. A total of 16,156 companies completed the baseline survey, and the screening criteria identified 11,228 businesses as ineligible, resulting in the eligible sample size of 4,928.

Measures

Independent Variable Measures

Partnership Measures

Sarasvathy (2001) claims that companies use strategic partnerships to help mitigate uncertainty in new ventures. I developed a dummy variable to capture if a company had strategic partnerships, `partnership_binary_3`, that shows if a company had partnered up with a government research lab, university, or other company in the first three years of the company's founding. After removing businesses that either did not respond to the survey or had already gone out of business in the first 3 years, we are left with a sample of 2837 businesses that responded that they either did or did not have a competitive advantage from a partnership.

Given Means Measures

One of the core subdimensions of effectuation is starting with your given means. Sarasvathy (2001) describes these given means as who you are, what you know, and whom you know. To capture these given means, we look at the aspects of human capital below.

Education

The KFS recorded information regarding the highest level of education achieved by the entrepreneur at the beginning of the survey in 2004. To simplify the responses, I grouped responses into the following categories. The first group's highest level of achievement was some college but no degree, and below. The second group represented associate degrees through some graduate school, but no graduate degree. The final group represented master's degrees and doctorates. This information is captured in the variable `g9_education_owner_01_0`.

Founding Experience

Another measure of given means recorded by the KFS, is experience opening a business in the same industry. Of the 4928 companies surveyed in 2004, 1021 companies were led by entrepreneurs who had opened a business in the same industry before founding their current venture. This information is captured in the dummy variable `have_owners_prev_opened_bus_0`.

Dependent Variable Measures

To see how these effectuation subdimensions affect firm performance, I selected variables to test for the firm's survival and yearly revenue at the end of the study in 2012.

Business Survival

The dummy variable `classf_x` was created to capture if a firm had survived or gone out of business for each given year of the survey. The KFS recorded 6 responses for a firm's operational status at each given year. To classify a firm as survival vs non-survival, first firms that were unable to be located, or did not respond to the survey for a given year were removed. Next, businesses that had merged or sold during a given year were removed too, as this outcome is neither a survival nor a death. Companies that had closed in previous follow ups and companies that had permanently or temporarily stopped operations during the current year were grouped together as non-survival companies. Finally, the businesses that completed the survey and responded that they were still in business in that given year were grouped together as survival businesses.

Business Revenue Level

The second metric for venture performance chosen is firm revenue. Companies responded to the yearly revenue question on the survey by indicating the range of their revenue via a response 1-9 that was representative of a range of revenue for that year. To classify companies by yearly revenue range, I split companies into 2 groups: \$0-\$100,000, and \$100,000+. This categorization was made because the median range for responses in the final survey was 7 which indicates revenue from \$25,001-\$100,000. The scope of this study was to see if effectuation principles were linked to positive performance, so firms were categorized as above median revenue, and not above median revenue.

Employee Growth

The third metric for firm performance used in this survey is employee growth. At each follow up survey, companies were asked to report their total number of employees. Seven year employee growth was then calculated by subtracting the employee total upon founding from the year seven totals and dividing by total employee count at founding. When analyzing single year growth rates, we use the formula $employee\ growth\ rate_t = \frac{employee\ total_t - employee\ total_{t-1}}{employee\ total_{t-1}}$

Interaction Effect Variables

Certain features and traits of businesses and entrepreneurs may be associated with multiplicative effects regarding firm performance. The KFS has many classifications of businesses, so we can test to see if companies with certain traits have statistically different sized predicted effects on firm performance than those without the traits.

High-Tech

The interaction variable of high-tech is used to evaluate innovativeness on an industry level. Businesses in the KFS are marked as either high-tech, medium-tech, or low-tech. The dummy variable `hightech_0` groups businesses as high-tech or not high-tech. The KFS classifies companies as high-tech via their Standard Industry Code (SIC), which was developed in the 1990s by researchers from the Bureau of Labor Statistics. The definition of high-tech comes from Hadlock, Hecker, and Gannon's 1991 article "High technology employment: another view: a novel definition of high technology yields some interesting statistics on employment, pay, and projected growth in this vital component of American industry", and classifies industries based on their percentage of R&D employment. High-tech companies are often seen as more uncertain, and therefore distinguishing them from their counterparts becomes grounds for research.

Firms Founded on New Product

The interaction variable for firms founded on new product is used to evaluate innovativeness on a firm level, rather than an industry level. The dummy variable captures the survey question "Was business founded around a new or customized product or service that was created by you or one of

the founders of the business” and recorded as `d5a_founded_newprod`. This variable is a proxy for innovativeness because it filters for only companies that are bringing a new product or service to market, rather than a product that has already been established.

Data Analysis

Statistical Analysis for the data includes multivariate logistic regressions for firm survival and revenue, and a multivariate linear regression for employee growth rate.

Logistic Regression for Survivability

A multivariate logistic regression was chosen to test the predicted effects of effectuation principles on firm survivability because firm survivability is a dichotomous (binary) outcome. For our model, 1 indicates that the outcome of survival, while a 0 indicates that the firm did not survive. We define p as the probability that the outcome is 1, or survival, then the multiple logistic regression can be expressed as follows

$$\hat{p} = \frac{\exp(b_0 + b_1X_1 + b_2X_2 + \dots + b_pX_p)}{1 + \exp(b_0 + b_1X_1 + b_2X_2 + \dots + b_pX_p)}$$

Where \hat{p} is the expected probability of survival; X_1 through X_p are the distinct independent variables; and b_0 through b_p are the regression coefficients. The following form presents the outcome as the expected log of the odds of survival:

$$\ln\left(\frac{\hat{p}}{(1 - \hat{p})}\right) = b_0 + b_1X_1 + b_2X_2 + \dots + b_pX_p$$

Substituting in the independent variables we are testing in this study leaves us with the following:

$$\ln\left(\frac{\hat{p}}{(1 - \hat{p})}\right) = b_0 + b_1\textit{Education} + b_2\textit{Startup Experience} + b_3\textit{Partnerships}$$

In addition to analyzing cumulative firm survival, we also examine the data further to see how each principle of effectuation is associated with marginal firm survival rate at each year of the

survey, in other words, the survival rate for $year_t$ given that they survived $year_{t-1}$, which can be expressed as:

$$marginal\ survival\ rate_t = \frac{survival\ rate_t}{survival\ rate_{t-1}}$$

We then run binary logistic regressions for each independent variable, at each year in the survey with yearly marginal survival rate as the dependent variable. These regressions should shed light onto the timeframes in which the effectuation principles affect firm survival.

Logistic Regression for Revenue Level

Effectuation has been proven to be used by expert entrepreneurs (Sarasvathy, 2001), and experts outperform the general population within their domain (Ericsson and Lehmann, 1996). These beliefs led to the following model for firm revenue level where effectuation principles are used as the independent variables, and firm revenue is used as the dependent variable. In this model, firm revenue is translated into a dummy variable where under \$1,000,000 is coded as 0, and over \$1,000,000 is coded as 1. The Kauffman Firm Survey records revenue data as a response from 1-9 which indicate a range of revenue. Our hypothesis is that entrepreneurs using effectuation will be associated with the highest revenue levels, and thus the principles of effectuation we test will have a positive effect on the log odds of being in the highest performing revenue category.

The logistic regression model is the same as tested previously for firm survival, however now the outcome represents the log odds that a firm is in the over \$1,000,000 revenue category.

Linear Regression for Employee Growth

Employee growth is commonly used metric to measure firm growth and performance in early-stage companies (Davila and Foster, 2007). To evaluate yearly employee growth, we ran linear regressions using education, experience and partnerships independently of each other. In these regressions for employee growth, we added the total employee count at time t-1, to take account for firm size. Finally, a multivariate linear regression with all three independent variables was run as well. For the multivariate linear regression, we also added total employee count at time of founding to compensate for initial firm size.

Addition of Interaction Variables

Roach et al. (2016) showed that effectuation is linked to innovation. Effectuation has been proven to be used more in uncertain situations (Sarasvathy, 2001), and for this reason we have decided to see if certain variables that serve as interaction terms for innovation, change the effects that the effectuation principles have on firm performance. To do this we use the following model:

$$\ln \left(\frac{\hat{p}}{(1 - \hat{p})} \right) = b_0 + b_1X_1 + b_2Z_1 + b_3X_1Z_1$$

An interaction occurs if the relationship between the independent variable, X_1 , and the dependent variable, depends on another independent variable, Z (Fisher, 1926). In the case of our model, the independent variable Z , will represent terms that express innovation such as dummy variables for high-tech and businesses that were founded around a new product. This interaction indicates a multiplicative effect tested by the addition of product $b_3X_1Z_1$ to the model. If the coefficient b_3 is significant, we can conclude that the association of the effectuation principle, X_1 , and the probability that the dependent variable is 1 (either the firm is in the survival group, or the firm is in the over \$1,000,000 revenue group), depends on the value of Z (high-tech vs non high-tech, or business founded on new product).

Test Hypotheses

Using these models, this study tests the following broad hypotheses:

Hypothesis 1: Effectuation principles are positively and significantly related to firm survival

Hypothesis 2: Effectuation principles are positively and significantly related to employee growth

Hypothesis 3: Measures of innovation have significant interactions with the effectuation principles with regard to firm performance.

3. Results

Table 1: Multivariate Logistic Regression for Year 7 Survival

Year 7 cumulative survival	Coef.	p	95% confidence interval
Partnership	1.173	0.000*	0.90-1.45
Founder's highest level of education			
College degree	0.166	0.058	-0.01-0.34
Graduate degree	0.288	0.008*	0.08-0.50
Founding experience	0.219	0.031*	0.02-0.42

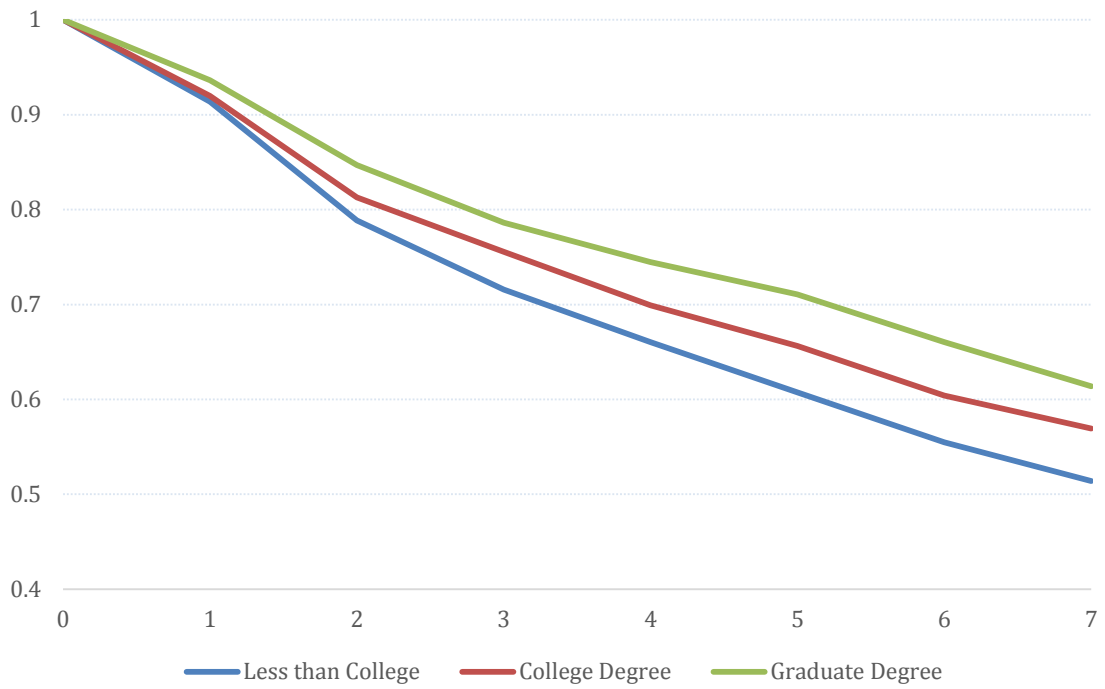
* denotes $p \leq .05$

Table 2: Logistic Regression for Marginal Survival Rates: Founder's Education

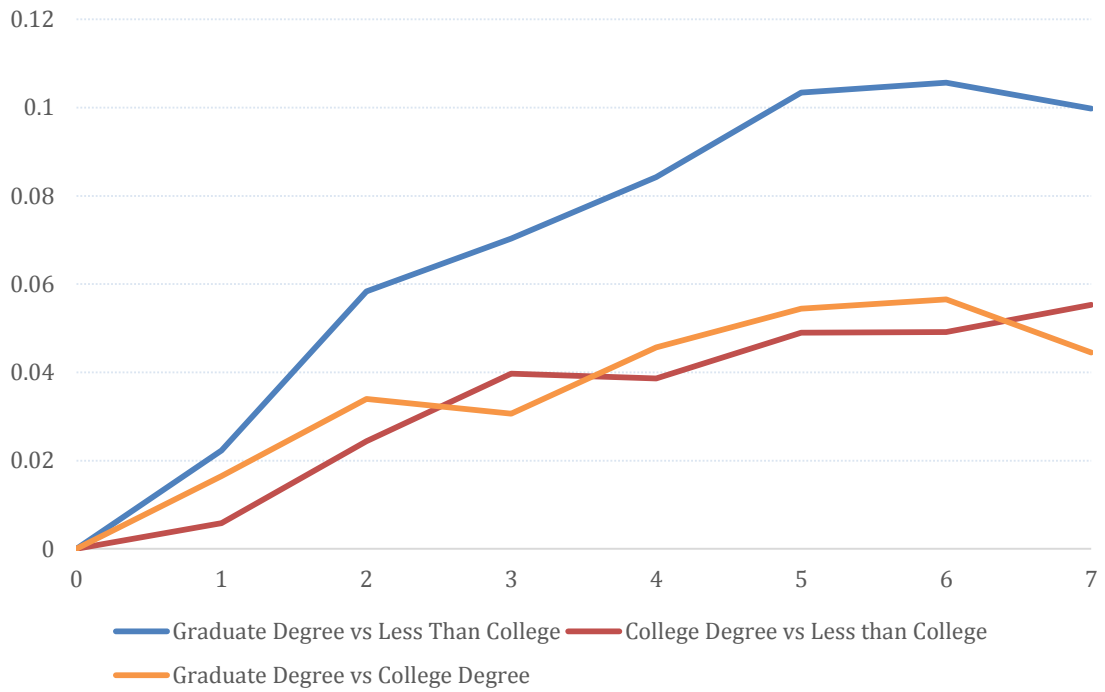
Year of marginal survival rate	Coef.	p	95% confidence interval
Year 1			
College degree	0.08	0.549	-0.17-0.33
Graduate degree	0.32	0.049*	0.00-0.65
Year 2			
College degree	0.19	0.091	-0.03-0.42
Graduate degree	0.41	0.005*	0.12-0.70
Year 3			
College degree	0.17	0.276	-0.14-0.49
Graduate degree	0.29	0.145	-0.10-0.67
Year 4			
College degree	0.14	0.465	-0.23-0.51
Graduate degree	0.54	0.033*	0.04-1.05
Year 5			
College degree	0.21	0.335	-0.22-0.65
Graduate degree	0.48	0.096	-0.08-1.04
Year 6			
College degree	0.08	0.720	-0.35-0.51
Graduate degree	0.30	0.274	-0.24-0.84
Year 7			
College degree	0.01	0.976	-0.48-0.49
Graduate degree	-0.13	0.638	-0.67-0.41

* denotes $p \leq .05$

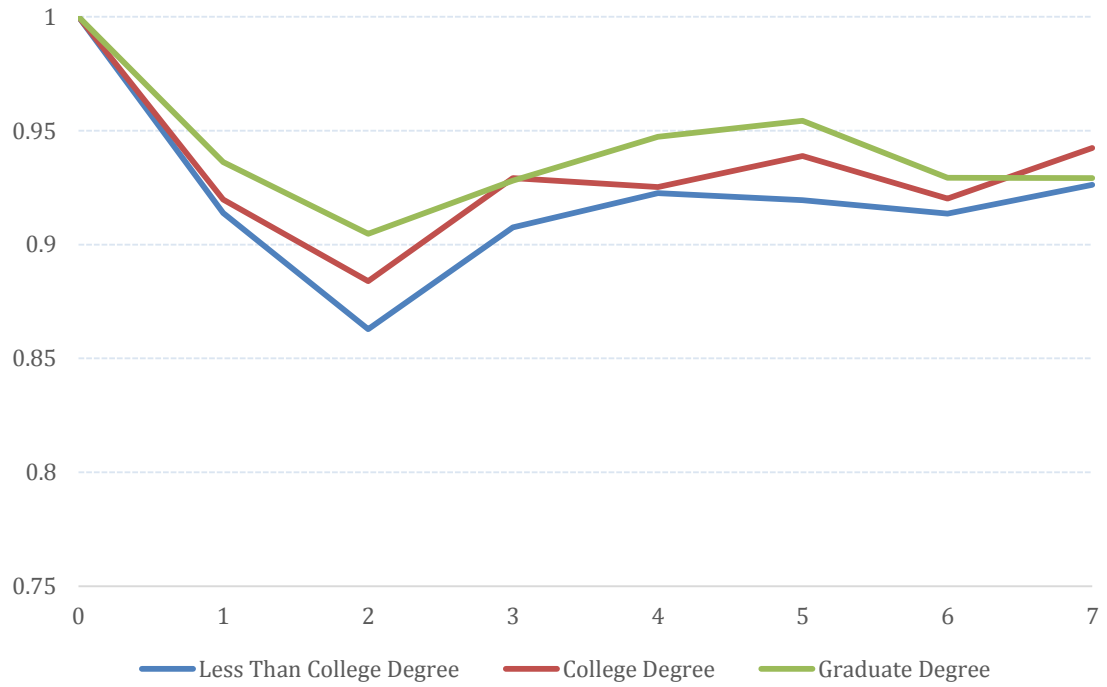
Cumulative Survival Rate: Education



Difference in Cumulative Survival Rate: Education



Marginal Survival Rates: Education



Difference in Marginal Survival Rate: Education

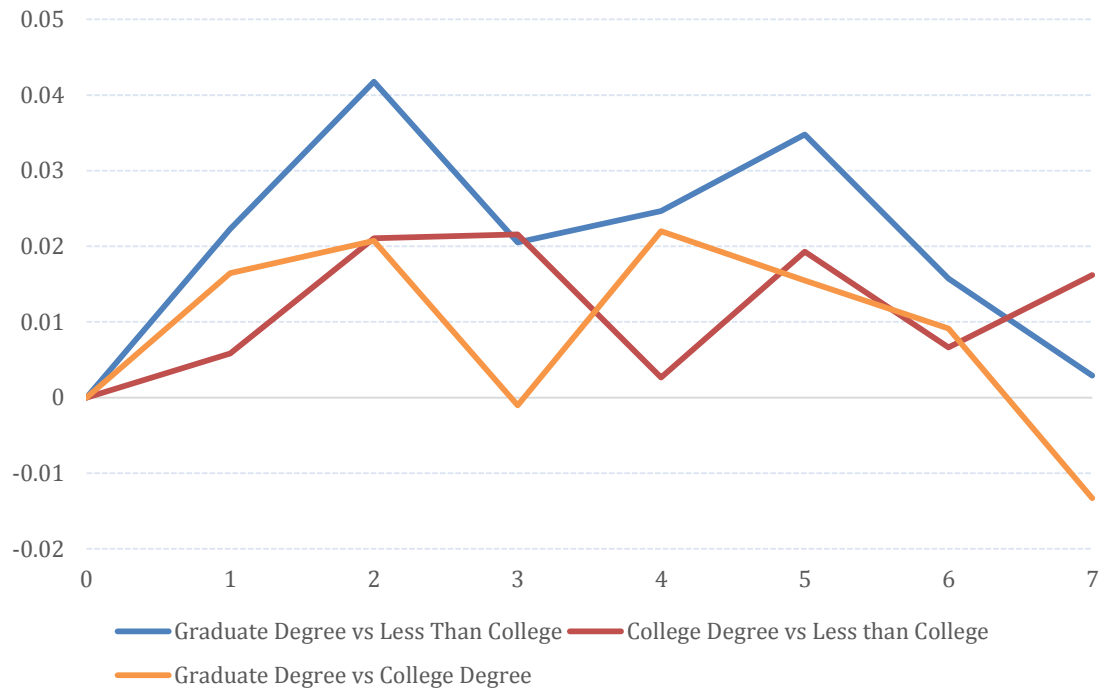
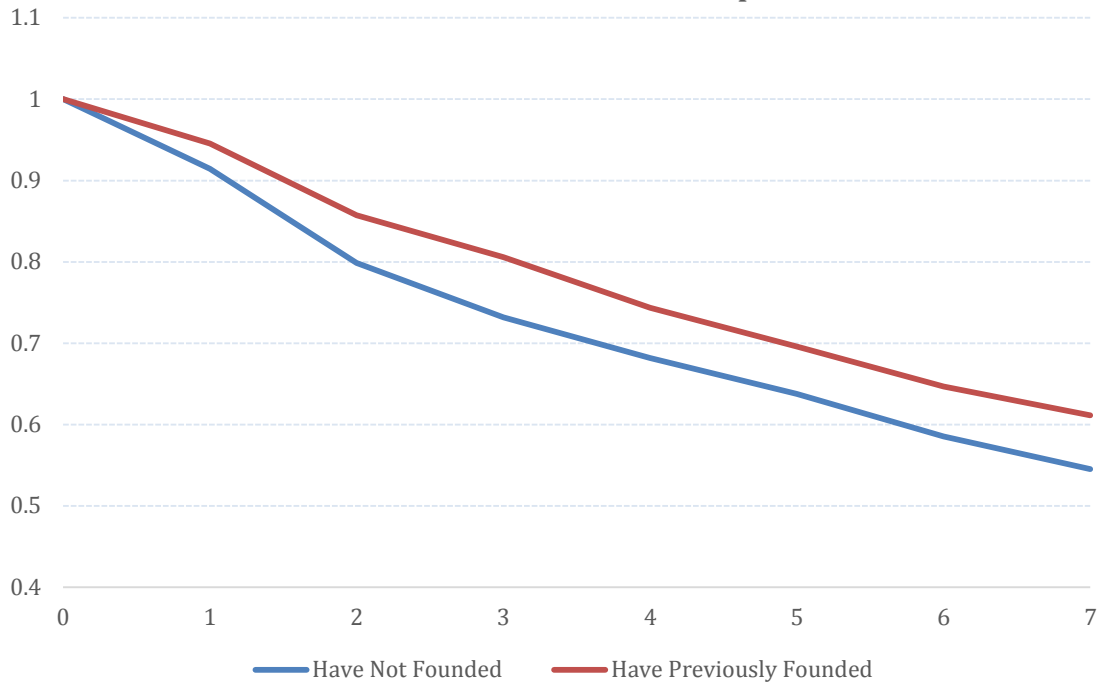


Table 3: Logistic Regression for Marginal Survival Rates: Founder's Experience

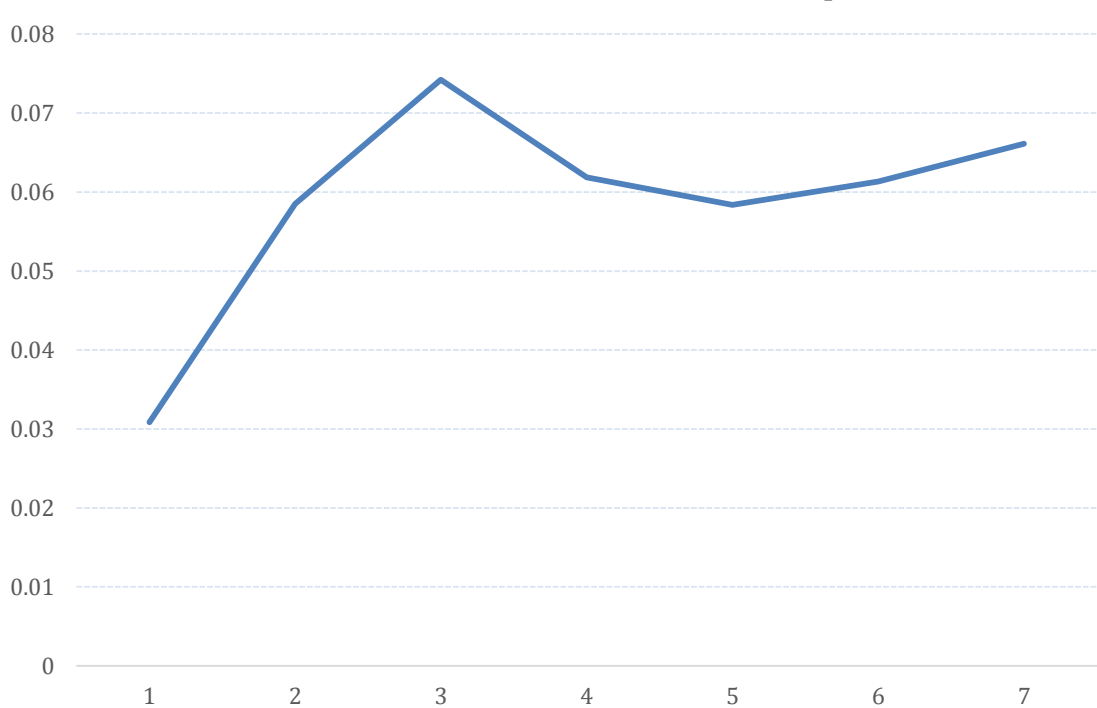
Year of Marginal Survival Rate	Coef.	p	95% confidence interval
Year 1			
Founding Experience	0.48	0.000*	0.16-0.80
Year 2			
Founding Experience	0.35	0.01*	0.07-0.62
Year 3			
Founding Experience	0.44	0.03*	0.05-0.83
Year 4			
Founding Experience	-0.15	0.463	-0.55-0.25
Year 5			
Founding Experience	0.16	0.538	-0.35-0.67
Year 6			
Founding Experience	0.42	0.126	-0.12-0.97
Year 7			
Founding Experience	0.19	0.478	-0.34-0.73

* denotes $p \leq .05$

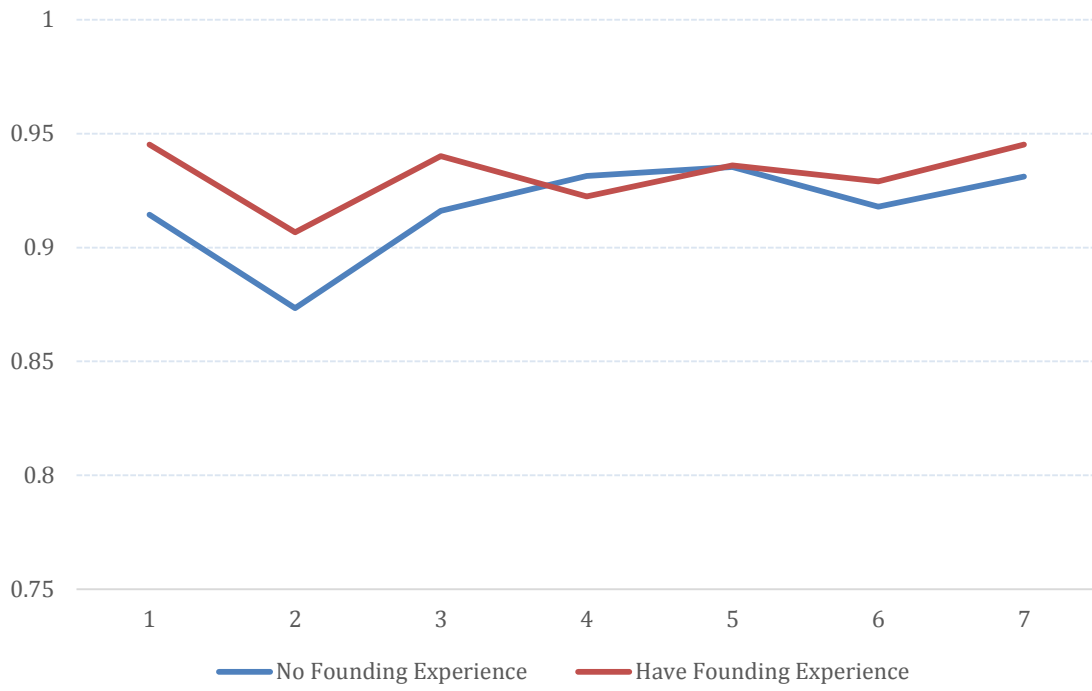
Cumulative Survival Rate: Experience



Difference in Cumulative Survival Rate: Experience



Marginal Survival Rate: Experience



Difference in Marginal Survival Rate: Experience

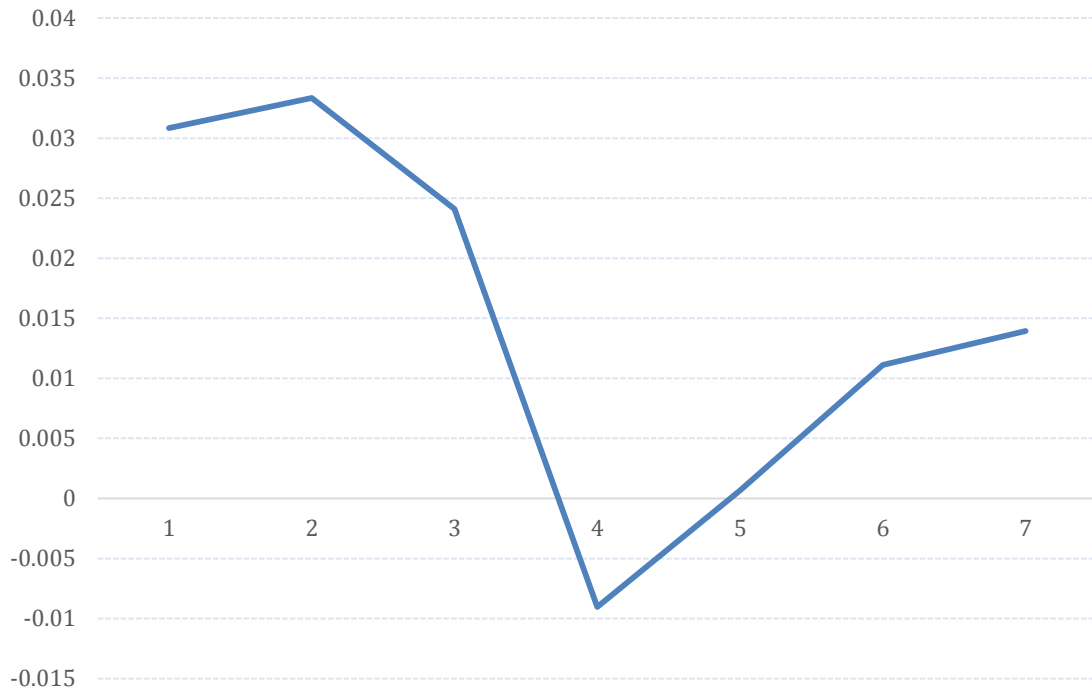
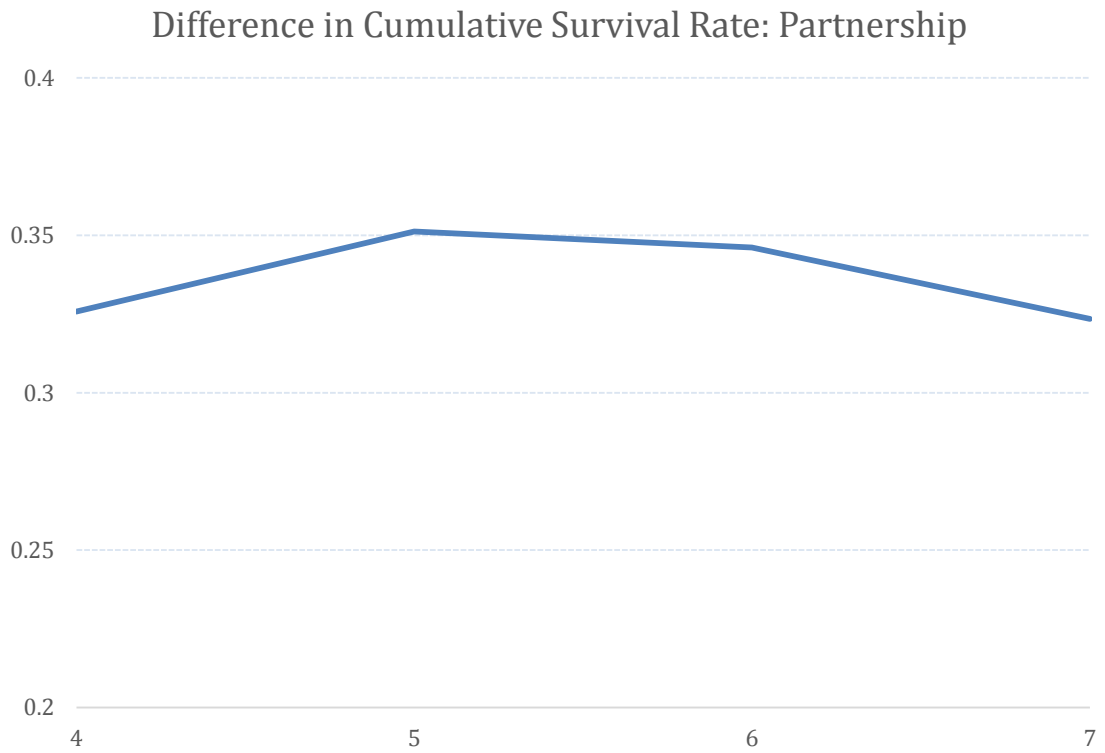
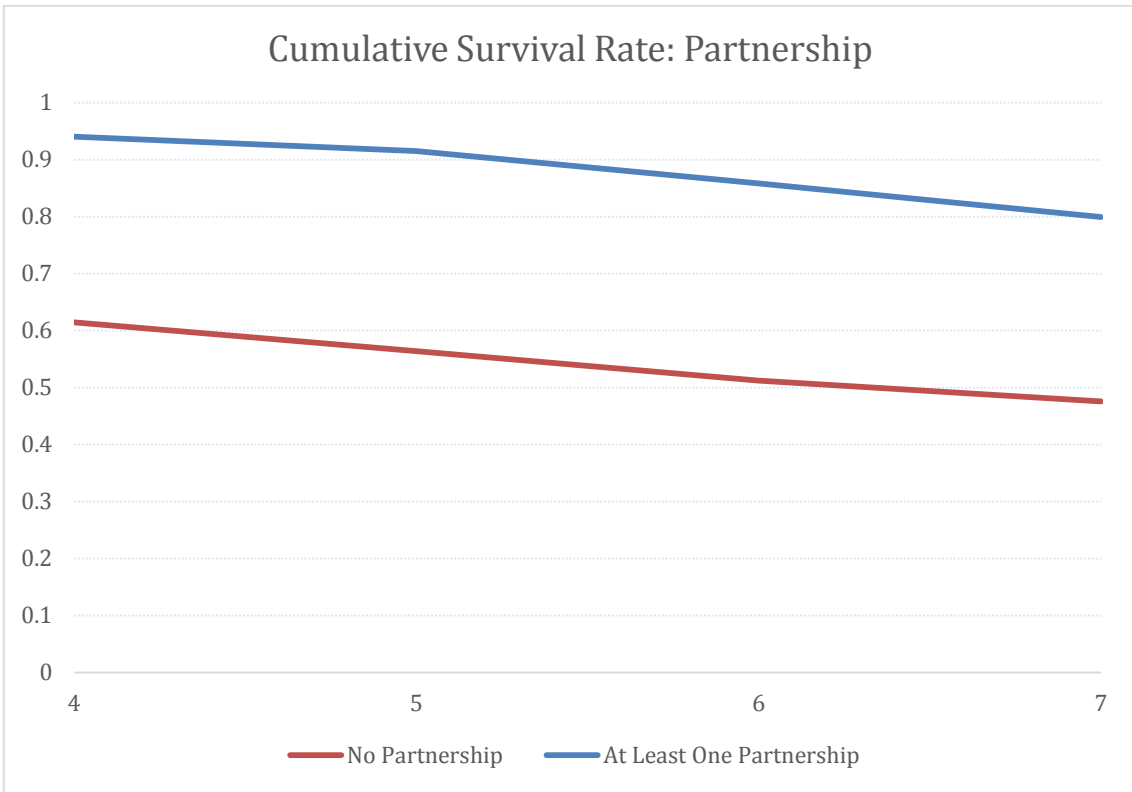


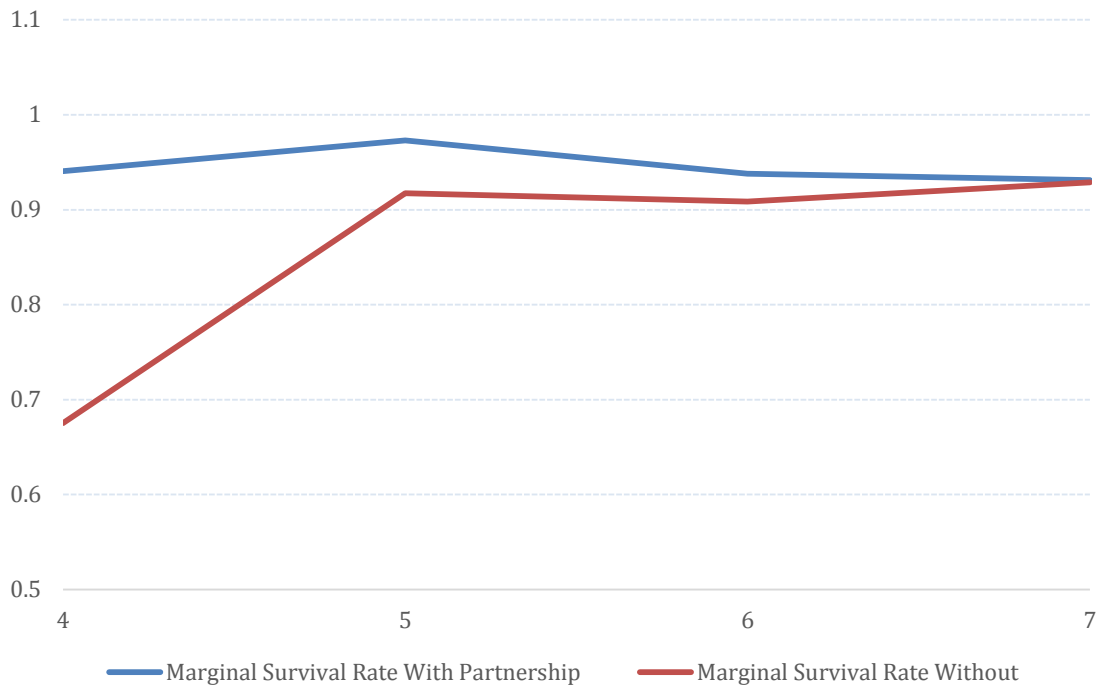
Table 4: Logistic Regression for Marginal Survival Rates: Year 3 Partnership

Year of Marginal Survival Rate	Coef.	p	95% confidence interval
Year 4 Partnership	0.84	0.000*	0.42-1.26
Year 5 Partnership	0.67	0.004*	0.21-1.14
Year 6 Partnership	0.31	0.148	-0.11-0.73
Year 7 Partnership	0.11	0.583	-0.29-0.51

* denotes $p \leq .05$



Marginal Survival Rate: Partnership



Difference in Marginal Survival Rate: Partnership

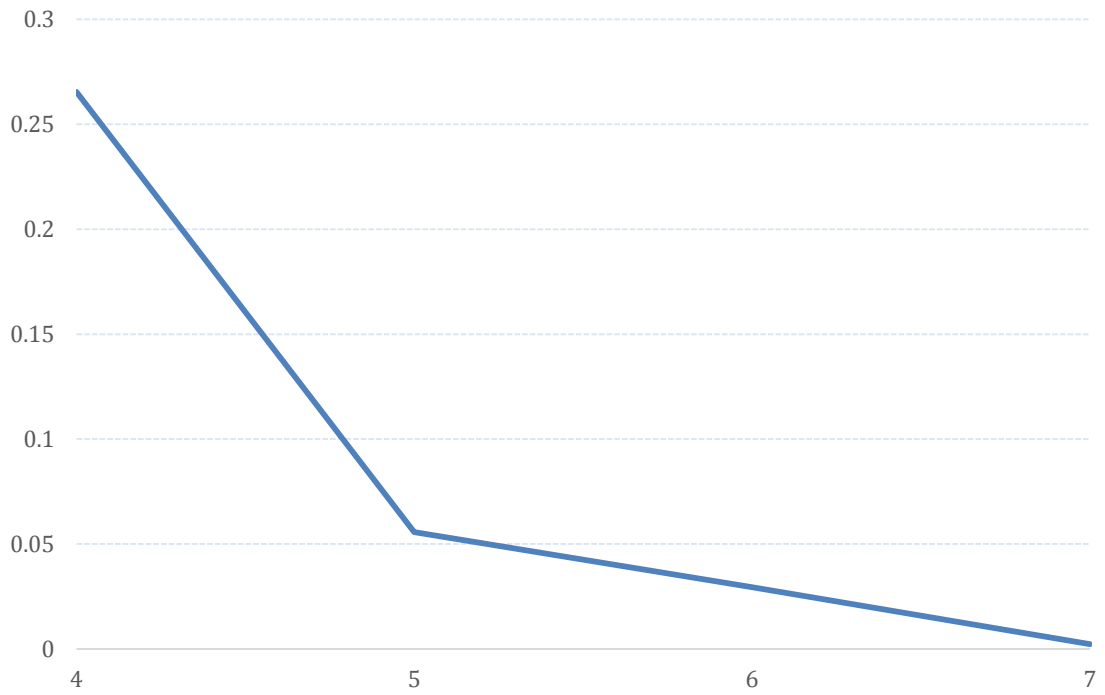


Table 5: Linear Regression for 7 Year Employee Growth Rate

Year 7 employee growth rate	Coef.	p	95% confidence interval
Partnership	-0.07	0.794	-0.61-0.47
Founder's highest level of education			
College degree	0.61	0.009*	0.16-1.07
Graduate degree	0.58	0.034*	0.04-1.12
Founding experience	0.82	0.001*	0.32-1.31
Employee count at founding	-0.09	0.001*	0.51-1.27

* denotes $p \leq .05$

Table 6: Linear Regression for Employee Growth: Experience

Yearly Employee Growth	Coef.	p	95% confidence interval
Year 1			
Experience	0.99	0.000*	0.73-1.25
Year 0 employee total	-0.01	0.710	0.79-1.07
Year 2			
Experience	0.23	0.057	-0.01-0.48
Year 1 employee total	-0.06	0.000*	-0.08--0.04
Year 3			
Experience	0.25	0.038*	0.01-0.49
Year 2 employee total	0.02	0.010*	0.01-0.04
Year 4			
Experience	0.12	0.322	-0.12-0.36
Year 3 employee total	-0.14	0.000*	-0.16--0.13
Year 5			
Experience	0.09	0.480	-0.15-0.32
Year 4 employee total	-0.09	0.000*	-0.11--0.07
Year 6			
Experience	0.36	0.123	-0.10-0.81
Year 5 employee total	0.42	0.000*	0.39-0.45
Year 7			
Experience	-0.19	0.284	-0.54-0.16
Year 6 employee total	-0.02	0.013*	-0.03-0.00

* denotes $p \leq .05$

Table 7: Linear Regression for Employee Growth: Partnership

Yearly Employee Growth	Coef.	p	95% confidence interval
Year 3			
Partnership	0.34	0.010*	0.08-0.59
Year 2 employee total	0.03	0.004*	0.01-0.04
Year 4			
Partnership	0.06	0.641	-0.19-0.31
Year 3 employee total	-0.14	0.000*	-0.16--0.13
Year 5			
Partnership	-0.11	0.384	-0.36-0.14
Year 4 employee total	-0.09	0.000*	-0.11--0.07
Year 6			
Partnership	0.15	0.549	-0.33-0.63
Year 5 employee total	0.43	0.000*	0.39-0.46
Year 7			
Partnership	0.04	0.841	-0.34-0.41
Year 6 employee total	-0.02	0.008*	-0.04--0.01

* denotes $p \leq .05$

Table 8: Linear Regression for Employee Growth: Education

Yearly Employee Growth	Coef.	p	95% confidence interval
Year 1 employee growth			
College degree	0.08	0.528	-0.16-0.32
Graduate degree	0.27	0.062*	-0.01-0.56
Year 0 employee total	0.01	0.468	-0.02-0.04
Year 2 employee growth			
College degree	-0.08	0.502	-0.30-0.14
Graduate degree	-0.13	0.328	-0.39-0.13
Year 1 employee total	-0.06	0.000*	0.48-0.83
Year 3 employee growth			
College degree	0.15	0.188	-0.07-0.37
Graduate degree	0.32	0.017*	0.06-0.57
Year 2 employee total	0.03	0.003*	0.01-0.04
Year 4 employee growth			
College degree	0.13	0.260	-0.09-0.35
Graduate degree	0.29	0.030*	0.03-0.55
Year 3 employee total	-0.14	0.000*	-0.16--0.13
Year 5 employee growth			
College degree	0.04	0.738	-0.18-0.25
Graduate degree	0.10	0.431	-0.15-0.36
Year 4 employee total	-0.09	0.000*	-0.11--0.07
Year 6 employee growth			
College degree	0.03	0.876	-0.38-0.45
Graduate degree	-0.28	0.253	-0.77-0.20
Year 5 employee total	0.43	0.000*	0.39-0.46
Year 7 employee growth			
College degree	-0.03	0.862	-0.35-0.29
Graduate degree	0.11	0.575	-0.27-0.49
Year 6 employee total	-0.02	0.008*	-0.04--0.01

* denotes $p \leq .05$

Table 9: Logistic Regression with Innovation Interaction Variable “High-tech”

Year 7 Survival	Coef.	p	95% confidence interval
Partnership	0.87	0.000*	0.62-1.13
High-tech	0.16	0.180	-0.07-0.39
Partnership x High-tech Interaction	0.89	0.024*	0.12-1.66

* denotes $p \leq .05$

Table 10: Logistic Regression for Year 7 Revenue Level of Over \$1,000,000

Year 7 revenue level	Coef.	p	95% confidence interval
Experience	0.72	0.000*	0.44-1.00
Founder's education			
College degree	0.41	0.009*	0.10-0.73
Graduate degree	0.57	0.001*	0.22-0.92
Partnership	0.26	0.120	-0.07-0.59
Year 0 revenue level	0.11	0.000*	0.07-0.15

* denotes $p \leq .05$

4. Discussion

The results offer interesting insights into the entrepreneurial landscape and provide evidence that effectuation principles are positively and statistically linked to performance metrics. While effectuation principles have been linked to positive performance in previous literature, this study adds to existing literature by showing how they affect firm survival, revenue, and employee growth specifically. Unlike previous literature that almost exclusively focuses on cross-sectional data and effects, this study uses marginal survival rates to shed light on how the relationship between effectuation principles and firm performance changes through time. Additionally, the data supports the notion that innovative environments may have a multiplicative effect on the association between effectuation principles and firm performance.

Survival

This study found that forming a partnership with a government lab, university, or other company in the first three years of founding had a positive and statistically significant ($p=.000$) relationship with surviving through the end of the 7 year firm survey. These findings are in line with Read et al.'s meta-analysis that linked effectuation to positive firm performance. This study found that firms that secured one of these partnerships within the first three years had a cumulative survival rate 32.3 percentage points higher than those who did not at the end of the survey. While this gap is large, when looked at from a marginal survival basis, the relationship between partnerships and survival is only statistically significant for the two years after the partnership was recorded ($p=.000$, $p=.004$). Our study found that companies with a partnership had a staggering 26.5 percentage point difference in marginal survival for the year after the partnership was recorded, but the gap in marginal survival rate drops to 5.5, 2.9, and .22 percentage points in the years following. This suggests that securing a partnership could give a firm a large boost in short term survival, but the effects are diminishing with time. These findings are in line with previous theories that suggest that start-ups mitigate uncertainty by securing partnerships (Chandler et al, 2011).

The founder's previous experience founding a business in the same industry was also statistically significant ($p=.031$) in the multivariate logistic regression for firm survival at the end of the survey. While those with founding experience out survived those without it, the benefits of having experience seem to be nested in the early years of the venture. This is shown by the founder's experience being statistically and positively related to marginal firm survival rate in the first three years of founding when ran in a simple binary logistic regression. Similar to partnerships, having founding experience suggests a short-term boost to survival, but the effects fade with time. This could be explained by a possible learning curve with founding a business. Those who have previously founded businesses may be better prepared or informed to handle the problems of the early years of a venture.

The level of founder's education was statistically significant at the 5% level for graduate degrees ($p=.008$), and significant at the 10% level for college degrees ($p=.058$) with regard to survival through the end of the survey. This drop in significance between graduate and college degrees is an interesting finding. Founders who's highest academic attainment was a college degree survived at a rate only 5.53 percentage points higher than those without a college degree through the end of the survey, and the relationship between college degrees and marginal firm survival was insignificant in every year. This result is contrary to what was hypothesized, as one would think that higher education would be associated with better firm performance. On the other hand, graduate degrees did a statistically significant relationship with marginal firm survival in years 1 ($p=.049$), 2 ($p=.005$), and 4 ($p=.033$). It is reasonable to theorize that the difference in survival rates between college and graduate degrees could be explained by the difference in the nature of graduate and undergraduate programs. Graduate programs tend to be more specialized as opposed to the more generalized education of an undergraduate degree, especially in STEM related fields. The benefit of a graduate degree over a college degree could also be explained by the networks associated with graduate schools. The value of business schools and MBA programs specifically, for example, focus not only on management coursework, but also on connecting with industry participants and leaders. With

highly regarded graduate schools, also comes the prestige associated with it or graduates. Similar to how a partnership can indicate that a firm has been evaluated by a third party and deemed trustworthy, a graduate degree from a top program can signal to the market that an entrepreneur is credible, and thus help reduce the liability of newness that young ventures face. Along with the associated credibility, being introduced to a university's network is extremely valuable as well. The connections created through networking this way could reasonably lead to future clients and partnerships. Overall, the additional benefit of completing a graduate degree could lead to increased industry knowledge, networking, and resources available to the founder, which could positively impact early firm performance.

The experience and skills of the management teams have been shown to be the most common selection criteria among Venture Capital Firms (Zacharakis and Meyer, 2000). Studies have found that as many as 60.5% of business failures are attributed to management inexperience (Williams, 1987). This inexperience can be manifested in a multitude of ways, such as failing to prepare and access information to assist in decision making. Haswell and Holmes (1989) also found an association with lack of managerial experience and failure to prepare and uphold adequate accounting practices, while the frequency of financial statement reporting was positively related to firm success (Williams, 1987). Overall, more experienced founders appear to be better prepared to survive the early years than those without practical experience. These findings are consistent with this research, which also displayed a positive and statistically significant relationship between a founder's experience and year 7 cumulative survival rate as well as the marginal survival for each of the first three years of a firm's life. However, our findings showed that given a firm survives the first three years, previous experience becomes insignificant with regard to marginal survival rates for years 4-7. It is plausible that the knowledge and skillset a founder acquires from starting a business are learned during the first three years, so that the advantage that comes with previous experience is learned by the inexperienced founders by year four, thus leveling the playing field.

Historically, new businesses are notoriously bad at surviving the early years, and previous studies have shown that upwards of 60% of startups fail in the first 5 years (Krishna, Agrawal, & Choudhary, 2016).

Young ventures suffer from a “liability of newness”(Stinchcombe, 1965). This liability of newness addresses the unique difficulties that young firms have with regard to acquiring resources such as financial and human capital, power, and perceived legitimacy. This in turn gives the new firm a relatively smaller ability to improve the environment around it by acting on both competitive and market conditions compared to more mature and established companies. Additionally, legitimacy of a young venture can be challenging to prove without an established track record of success and reliability. It is then reasonable to assume that increasing a firm’s perceived legitimacy could help fend off this liability of newness. Baum and Silverman (2004) argue that forming partnerships signals that a startup has been externally evaluated and positively reviewed by a knowledgeable actor. This positive review can be viewed as confirmation that a startup has both resources and knowledge necessary for early performance. This decrease in the liability of newness could help explain the findings of this study regarding the positive association between firm survival and partnerships.

Employee Growth

While employment growth is one possible way of measuring growth, other measures such as equity valuation are not as accessible for new ventures as public companies. Additionally, due to the private nature of new ventures, accounting data is typically unavailable as well. As such, employee growth rate is the main growth measure used in this study. While employee growth rate serves as a proxy, previous studies have shown a positive and statistically significant association between change in employees and percentage change in equity value of startups (Davila et al., 2003).

Not only were the effectuation principles linked to higher survival rates, but our findings link effectuation principles to a higher employee growth rate and yearly revenue level in the final year of the study. Our study found that the founder’s experience($p=.001$) and both college ($p=.009$) graduate degrees ($p=.034$) were positively and significantly related to the seven year employee growth rate.

When looking at absolute employee growth and accounting for firm size at time t-1, founder's experience was positively and significantly associated with employee growth in years 1 ($p=.000$ and 3 ($p=.038$) at the 5% level, and year 2 ($p=.057$) at the 10% level. This is consistent with the marginal survival rate findings previously discussed, where the associated benefits of experience are exhibited in the first three years of founding. The diminishing returns of experience have been theorized previously in entrepreneurial literature such as Jovanovic's learning theory (Jovanovic, 1982), where new firms are more uncertain of their managerial and entrepreneurial abilities than incumbents until they enter the market. As firms become aware of their real efficiency, they adjust their output accordingly to maximize their profits. Thus, firms that over-estimate their own abilities will be forced to reduce their output or exit the market, while firms that underestimate their abilities will expand production in the following periods. Jovanovic introduced time as an element of the firm's growth and learning, suggesting that as a firm ages, the additional benefit it gains from experience and hands on learning diminish. While Jovanovic's model only accounted for experience gained from running the current business, our findings suggest that perhaps this experience can be gained from previous experience founding a company in the same industry.

While both graduate and college degrees have significant association with employee growth rate through the end of the survey, only graduate degrees have statistical significance with regard to yearly employment growth. Graduate degrees in year 3 ($p=.017$) and year 4 ($p=.03$) were positively and significantly relate to yearly employee growth during the given year at the 5% level and year 1 ($p=.062$) at the 10% level. This difference between graduate and college degrees mirrors the survival findings as well, however the time frames are different. Graduate degrees seem to offer a benefit in the middle terms of the survey. This could also plausibly be explained by the liability of newness. As previously discussed, firms without a proven track record of success may have a harder time accessing capital than established mature firms. As the firm survives the first two years, it could potentially overcome aspects of this liability by creating partnerships and displaying other signs of legitimacy to distinguish themselves from the competition. With a proven track record, the firm may finally have access to the capital needed to fully utilize the specialization that comes from a

graduate degree. While the short term could benefit from previous experience founding, once the firm overcomes the liability of newness, the marginal benefit of a graduate degree comes to light. The only year in which the dummy variable for having a partnership in the third year was statistically significant was in year 3 ($p=.01$), when the partnership was observed. The positive association could possibly be explained by the increased labor needed due to execute joint projects and manage partner relations. The lack of significance for the years following the partnership implies that forming a partnership alone is not enough to significantly outgrow competition, as growth is only higher while in an active partnership.

Revenue Level

In addition to employee growth rate, this study examines the associations between the effectuation principles and total yearly revenue level at the end of the survey. While the employee growth examined the rate in which the firms grew, the yearly revenue level analysis examines the relationship between the principles, and achieving the highest level of revenue in the study, after accounting for firm revenue at time zero.

At the beginning of the study, roughly 2% of all companies already had a yearly revenue of over \$1,000,000. By the end of the survey, this percentage rose to almost 15%. To account for starting size of companies, we added a variable for time zero revenue into a multivariate logistic regression along with the effectuation principles as independent variables, to observe the predicted relationship with achieving over \$1,000,000 yearly revenue at the end of the survey. Our findings showed that the founder's experience ($p=.000$), college degrees ($p=.009$), and graduate degrees ($p=.001$) were all positively and significantly associated with the highest level of revenue, while partnership ($p=.12$) was insignificantly related. These findings are consistent with the results regarding employee growth rate discussed previously.

Innovation Interaction Variables

The final aspect of this research addresses previous literature that suggests that innovation measures be associated with different levels of firm performance. To do this, we tested the

effectuation principles of given means and partnerships, with regard to both firm and industry level innovation measures, to see if innovation has a significant interaction and multiplicative effect on the relationships to various firm performance metrics. However, our findings only show a statistically significant interaction between partnership and industry level innovation with regard to survival at the end of the survey. The positive interaction variable coefficient suggests that strategic partnerships could have a greater effect on predicted firm survival in high-tech companies than for low tech companies. . This supports Roach et al.'s meta-analysis findings that effectuation and innovation are linked. It is reasonable to theorize that high-tech firms could face higher levels of uncertainty than their low-tech counterparts, and thus the benefit of these partnerships is observed to be greater. Partnerships could mitigate early uncertainty, to more manageable risk and lend market credibility, knowledge, and resources to help keep a venture alive in its formative years. It should be noted, however, that while this innovative measure is significant for firm survival, it is insignificant for employee growth. So while these innovative companies observe a proportionally larger benefit to survival rate than their low-tech counterparts, their growth is not significantly different.

Implications

From the perspective of the entrepreneur, the empirical validation of effectuation as a legitimate framework supplies the firm with the ability to rationalize decision making in (Knightian) uncertain environments where predictive rational choice would fail otherwise. Effectuation gives the entrepreneur to mitigate uncertainty to opportunity. Our findings also suggest that there is a positive relationship between partnerships and increases in both employee growth and survival rates in the short term and this association could be useful when evaluating business decisions.

Venture capitalists and angel investors may also benefit from the findings of this study. While education and experience are already among some of the most important metrics for evaluating new ventures, our research shows the temporal associations with these variables. Increased understanding of the timeframe in which these measures are related to positive firm performance can lead to more informed investment in young firms.

Limitations and Future Research

Based on the findings in this study, there is initial empirical evidence for a positive relationship between the effectuation principles of given means and strategic partnership, and firm performance. Additionally, our results shed light on the temporal dynamics of these effects, and how they interact with innovation. However, these findings do not come without limitations. Our research focuses specifically on the given means and strategic partnership principles of effectuation but leaves a gap in research with regard to the affordable loss and leverage contingencies principles. While these two untested principles are more subjective in nature, their absence leaves room for further research into effectuation and its association with firm performance.

For identifying factors that could be identified as given means for the entrepreneur, our study was limited to the questions asked on the survey. Founding experience and education were chosen due to their selection in Read et al.'s meta-analysis of effectuation, but many other definitions of given means are possible. For example, the given means chosen in this study focus on the characteristics of the entrepreneur upon the first year of the survey, but fail to acknowledge potential change in given means gained throughout the life of the business. Sarasvathy (2001) describes the given means principle as who you are, what you know, and who you know. All three of these given means are liable to change throughout the life of the business. Future research could examine how the initial attributes of entrepreneurs change with time.

With regard to firm survival tests in this survey, companies that were sold were dropped from the analysis, as this was not viewed as strictly survival nor death. In reality, being acquired in the first 7 years of founding is often viewed as a successful exit. It is reasonable to suggest that very successful companies are acquired by larger firms early in their life, and the absence of these businesses from firm performance metrics could limit the generalization of our findings. The relationship between effectuation principles and successful mergers also opens further avenues for future research as well.

This survey only found significance in the interaction of industry level innovation with partnerships, and further research into the empirical link between effectuation and innovation would greatly benefit the entrepreneurial literature. For example, our firm level measure of innovation is

based on whether the company was founded on a new product, but firm level innovation could be articulated in a multitude of other ways such as new services, new implementations of existing technology, or bringing an existing product to a new region.

It should also be mentioned, that this survey took place over the time-span of 2004-2011 and thus the 2008 financial crisis and following stimulus bills could have potentially affected firm performance metrics due to economic conditions. For example, in 2009, the number of jobs lost due to contracting firms rose from 21,987 to 32,280. With financial crises comes added uncertainty, and research into the how the relationship between effectuation and firm performance in a recession versus in a boom could add to our current understanding of the business landscape.

Previous literature has also discussed the relationship between the three firm performance metrics discussed in this study: survival, revenue levels, and employee growth. Davila and Foster (2007) theorize that revenue is a proxy for a company's product's demand. Because the demand is determined by the needs of the customers, it is a value exogenous to the company. The number of employees hired by the firm is then determined by this exogenous variable of market demand. Assuming that the company is behaving optimally, they will hire enough people to serve the last marginally profitable sale (Davila and Foster, 2007). While Davila and Foster suggest that increased demand will in turn increase employee growth and revenue, Romanelli (1989) argues that excess demand alone should improve the likelihood of survival in young firms. Due to the theorized relationships between demand, and the measures of firm performance in this study, future research should look into not only how the effectuation principles are associated with each other, but also how metrics of firm performance are related.

Lastly, while our research identifies a positive association with the given means of founder's education and experience to firm performance, further research into which given means have negative or non-significant associations would add to the existing literature as well. For example, in the data used for this study, the presence of patents at the inception of the firm was insignificant with regard to firm survival and employee growth rate. Sarasvathy (2001) warns that effectuation is not a substitute for good business practices nor rational action. As shown by the insignificance of patents,

just because one possesses given means, does not mean that a business will be successful.

Effectuation is a framework that should supplement and coexist with rational business decisions, not replace it.

Conclusion

This study adds to the existing literature in three distinct ways: by providing evidence for an empirical link between effectuation principles to specific firm performance measures, how these associated effects evolve throughout a longitudinal study, and how they interact with measures of innovation. The results are consistent with and expand upon previous entrepreneurial literature, and further our understanding of the business landscape as a whole. The implications of this study can help inform both entrepreneurs and investors, while the limitations suggest avenues of future study for researchers.

While this research provides evidence for an empirical link between the principles of effectuation and firm performance, effectuation literature is still underdeveloped when compared to traditional frameworks. It is the intent of this paper to further the current understanding of the business and entrepreneurial landscapes and point to avenues of further research to help better understand how effectuation is observed and used in the real world.

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