The M&A Exit Outcome of High-Tech Startups

Carmen Cotei*
University of Hartford, USA

Joseph Farhat
Central Connecticut State University, USA

In this paper we analyze which factors explain the M&A exit outcome of high-technology startups using the confidential version of the Kauffman Firm Survey data. Our findings reveal that innovation activity is the most important factor in explaining the M&A exit outcome which indicates that acquirers value the growth potential signaled through intellectual property rights, research and development activity and therefore, businesses with high quality innovations are the most attractive targets for acquisitions. We also show that new, high-tech ventures owned by highly educated entrepreneurs are more likely to exit via M&A. These owners have better access to financial and social capital, which positively impacts the entrepreneur's ability to create a business that is harvestable and increases the chance that the business will, indeed, be harvested. (JEL: L11, L25, D21, C1)

Keywords: mergers and acquisitions; entrepreneurial exit; innovation; technology-based startups

Article history: Received: 8 March 2020, Received in final revised form: 14 September 2020, Accepted: 22 September 2020, Available online: 22 November 2020

I. Introduction

The literature on small business survival has posed many questions

* Corresponding author. Acknowledgements: The authors would like to thank the editor and two anonymous reviewers for their invaluable comments and suggestions that significantly improved the quality of the article. We would also like to thank the participants of the 2018 Multinational Finance Society Annual Conference for feedback on an earlier draft of the paper. Carmen Cotei gratefully acknowledges financial support from the Barney School of Business at the University of Hartford.

(*Multinational Finance Journal*, 2020, vol. 24, no. 3/4, pp. 183–209)

regarding various factors predicting entrepreneurial survival and success. Yet, relatively few studies have focused on entrepreneurial exit and the factors that affect the exit route taken. In light of the risks associated with new technology-based firms, we examine those factors that play a role in their survival as well as the exit routes taken by those firms that do not survive. New technology-based firms have been important contributors to both the U.S. and global economies. In addition to creating more new jobs than larger firms, small firms generate an impressive number of patents. According to the Small Business Association (SBA), large firms generated 1.7 patents per hundred employees, whereas small firms generated 26.5 patents per employee. At the macroeconomics level, the SBA reports that 43 percent of high-tech employment and one-third of the export value is generated by small businesses. It is important, therefore, to analyze startup firms and especially technology-based ones, since they play a significant role in the areas of employment, innovation, and global competitiveness.

The business exit is a complex and heterogeneous process to empirically investigate and measure because it requires retrospective recall (Wennberg et al., 2010). It involves collecting data by asking business owners post-exit to share information about the type of exit and whether it had a positive outcome (i.e., IPO, M&A, voluntary closures) or negative outcome (i.e. financial insolvency). To complicate matters even further, business exit and entrepreneurs' exit have not always been treated as separate events, although they may have different underlying causes and implications (DeTienne, 2010). In spite of all these challenges, exit research has emerged in the literature as an important component of understanding the entrepreneurial process. This article adds a new dimension to research into small business exits by examining the link between the innovation capabilities and exit behavior of U.S. technology-based firms started in 2004 and tracked over time until 2011.

We focus on the exit outcomes of technology-based startups for several reasons. First, unlike publicly traded targets, newly formed businesses are very heterogeneous with respect to quality (Guzman & Stern, 2016) and growth potential (Hurst & Pugsley, 2011). Most small businesses start small and stay small throughout their lifecycle. These types of businesses offer existing products or services to an existing customer base. Ex-ante, most business owners report no desire to either grow or to innovate in any observable way. More than fifty percent of new business owners reported non-pecuniary benefits as the most

important reason for starting a business. Very few reported innovation and growth as the primary reason as to why they formed a new venture. Given this heterogeneity among small businesses, it is worth exploring the link between the firms' innovative capabilities and their exit outcome. Building on Cotei and Farhat (2018) we focus on high-tech firms that are organized as corporations due to the fact that startup features and growth trajectories of corporations are significantly different from those of sole proprietorships. Ex-ante, some businesses are formed for growth-related reasons (i.e. new business idea, offer a new product to new markets), while some businesses are formed for lifestyle reasons (i.e. nonpecuniary benefits).

Second, an exit through acquisition is considered a successful exit. Established businesses typically pay high premiums to acquire high-potential startups, and these result in large rewards for startup founders. If M&A exits are desirable outcomes for business owners, then it is important to identify which factors explain these outcomes. Data have shown that over the last 15 years a small business was much more likely to exit through acquisitions than to go public. In addition, BizBuySell.com reported that after the whopping 28% decrease in M&A transactions in 2009, small business acquisitions increased 2.9% in 2010 and 3.3% in 2011. These trends indicate that, due to the cost of going public (high cost of complying with the disclosure and governance regulations after an IPO) and/or market conditions (high volatility in the equity market), many small businesses exited through M&As.

This study contributes to the existing literature on the exit of new, young technology-based businesses by showing that exit via M&A is a viable outcome for young high-tech businesses that innovate and have growth potential (Cefis and Marsili, 2011; Wennberg et al., 2010). To test our hypotheses, we use the largest longitudinal dataset of newly formed businesses in the United States (KFS data). An interesting feature of this survey is that it identifies startup businesses that exited through a merger or acquisition or closed operations during the 2005-2011 period. Thus, it provides an ideal basis on which researchers can identify and examine the business, owner, and industry characteristics that influence the likelihood of an M&A outcome versus business closure. Our results show that the most important traits explaining the likelihood of M&A exit for high-tech startups are innovation and owners' high education attainment. Startups that reported money spent on research and development activities are more likely to secure patents, copyrights and/or trademarks. Such intellectual

property rights help small businesses achieve competitive advantages in the market place and make them more attractive acquisitions targets. Owners with high education attainment are better able to identify opportunities for greater wealth creation potential. As such, high-tech startups led by highly educated owners have a higher chance to extract the maximum value via a merger or acquisition transaction.

The rest of the paper proceeds as follows: in section II, we present the relevant literature and develop testable hypotheses; section III describes the survey, sample selection and descriptive statistics, while section IV presents the methodology and results; finally, section V concludes the paper.

II. Literature Review and Hypotheses Development

A. Innovation and growth

There is substantial heterogeneity among new, young businesses in terms of the extent to which they grow or innovate in any observable way. The latest surveys show that growth in innovation or employment in those businesses are very rare. The reason as to why this is the case is not the focus of this study; however, the distribution of growth and innovation among newly formed businesses is important within the context of analyzing their exit outcomes. Using various datasets, Hurst and Pugsley (2011) found that most surviving businesses do not grow by any significant margin and do not innovate in any observable way. Only a very small subset of businesses report spending resources on R&D and securing a patent, copyright, or trademark. Thus, businesses started for reasons other than innovation (i.e., non-pecuniary benefits) are less likely to grow.

Intellectual property rights, such as patents, may signal the quality of an innovative idea and the entrepreneur's commitment to developing that idea (Cefis & Marsili, 2009). Patents also protect innovative ideas from imitation, which, in turn, may help the firm to achieve competitive advantages. As a result, patents may make the firm a more attractive acquisition target and, therefore, increase the probability a strategic exit will be executed. Some recent studies document how innovation contributes to the likelihood that a firm will be acquired. For example, Mohr and Garnsey (2009) examined a sample of young, bio-tech firms from the UK and found that breakthrough science improved early exit prospects. In a separate study, Norback et al. (2016) reported that

high-quality innovations are the most attractive targets for M&As. Consistent with resource-based theory (Barney, 1991) businesses with resources that are highly valued by potential acquirers are often targeted for acquisitions. The acquisition of young, innovative businesses can be viewed as a technology-sourcing strategy (Granstrand et al., 1992) and the acquisition can be an integral part of a firm's innovation strategy (King et al., 2003). Investments in R&D are typically viewed as a path to the creation of valuable technology resources and having such resources will increase the probability a business will be acquired. To date, the majority of the existing R&D acquisition research has focused on the R&D investments of the acquiring firms and the overall findings indicate that firms with R&D investments are more likely to acquire external technology than to develop it in-house. From a valuation perspective, however, intangible assets are more difficult to assess; thus, small businesses with a significant amount of intellectual property rights (i.e., patents, copyrights, trademarks) are prone to higher adverse selection in the M&A process. Therefore, the relationship between innovation activity and M&A exit in the small business arena is still an empirical question.

Based on the theoretical predictions of resource-based theory (Barney, 1991) we hypothesize a positive relationship between innovation and the likelihood of M&A exit for high-tech startups.

B. The exit behavior of innovative new ventures

Innovative new firms show different growth and exit outcomes than other firms. Successful outcomes such as M&A, IPOs, or trade sale are important exit options for these firms. Using a cross-sectional data set of 189 firms, DeTienne et al. (2015) show that the perceived innovativeness of the entrepreneurial opportunity increases the likelihood of financial harvest (M&A or IPO) and decreases the likelihood of voluntary cessation. Cefis and Marsili (2011) analyzed a sample of Dutch manufacturing firms and showed that innovative new ventures in low-tech industries have a low probability of exit by closure, but this relationship did not hold in the high-tech industries. Thus, innovativeness seemed to be a prerequisite for survival in the low-tech industries but not sufficient in innovative industries. They also showed that young, innovative firms are preferred targets for acquisition, and that the likelihood of exiting via M&A is significantly higher for innovative firms than other firms.

Innovative environment plays an important role in the survival of

new ventures. Using a sample of more than 3,000 firms over 80 years, Sarkar et al. (2006) find that new entrants have a higher probability of survival in an environment characterized by innovation opportunities and high number of product innovations. The effect of innovative environment on survival is higher for small versus large entrants. Hence, the innovative environment mitigates scale disadvantages for small entrants.

Based on the above arguments we hypothesize a positive relation between growth in innovation and M&A exit.

C. Innovation and owners' characteristics

The research on whether the characteristics of entrepreneurs influence the innovation and the exit behavior of their ventures is very limited. Most studies have addressed the link between entrepreneurs' experiences, beliefs, capabilities and other socio-demographic characteristics and the firms' innovation outcomes (Cliff et al. 2006; Dyer et al. 2008 and Koellinger, 2008). Some studies found that entrepreneur's gender and immigrant status did not explain differences in innovation outcomes (DeTienne and Chandler 2007; Mueller, 2014). Other studies show that innovative entrepreneurs have specific traits such as high education attainment and self-confidence. Prior entrepreneurial experience plays a significant role in firm's innovation outcomes. Owners with prior business experience identify and exploit more innovative opportunities with greater wealth creation potential (Ucbasaran et al. 2009). Further studies show that more diverse founding teams with respect to industry experience and external knowledge sourcing relationships are able to identify more opportunities (Gruber et al. 2013) and that the founder's network and network abilities influence innovation outcomes (Schott and Sedaghat 2014).

Using data from high-tech firms located in a large Chinese Science park, Liu et al. (2010) show that returnee entrepreneurs (scientists and engineers returning to their native countries to start a venture) are more innovative. Further, those returnee entrepreneurs positively influence firm level innovation in other high-tech firms led by non-returnee entrepreneurs, thus creating a positive knowledge spillover effect.

Based on the above arguments we expect a positive relationship between the owners' educational attainment and the likelihood of a M&A exit.

III. Sample Selection and Descriptive Statistics

A. The sample

The sample used in this study comes from the confidential version of the Kauffman Firm Survey (KFS). The KFS consists of longitudinal panel data that provides annual tracking information on 3,140 U.S. businesses started in 2004 (baseline survey) and surveyed annually between 2005 and 2011. At the time of the seventh follow-up survey (2011) there were 1,630 surviving businesses, 200 businesses that had exited through M&A between 2005 and 2011 and 1,310 businesses that had ceased operations during the same time period. A business started in 2004 was defined as a new, independent business that was created by a single person or a team of people, the purchase of an existing business, or the purchase of a franchise. For each new, young business, the database provides information on business characteristics, strategy and innovation, business organization, HR benefits, business finances, work behavior, ownership, and demographics of up to ten active owner-operators.

In accordance with the aims of the Kauffman Foundation's intention to achieve an improved understanding of the ways in which high-tech businesses work, the chosen sample underwent stratification based on the level of industrial technology (high-tech, medium-tech, non-tech) and high-tech businesses were deliberately overrepresented. The process of stratification refers to splitting the population into strata (non-overlapping groups) using selected characteristics. It is very common practice in surveys to oversample a subgroup that has a small size or for which there is a special interest in order to make policy recommendations. To obtain unbiased estimates of target population statistics, we use the inverse probability of selection (theory of design-based inference for probability samples). To make the KFS sample a representative sample of the target population, the disproportionate stratified sample requires a weighting scheme. In the baseline survey, the initial weights were defined as the inverse of the probability of selection which were calculated in each stratum. Next, the initial weights were adjusted to compensate for the businesses that did not respond or could not be located. A logistic propensity model was used to determine the probability of locating a business as well as to determine the propensity to respond in the survey. Given both probabilities and their inverses, the weights were adjusted to count for the joint conditional probability that a business was selected for sampling, was located, and responded in the survey (Farhat and Robb,

TABLE 1. The Sample of High-Tech Startups (Unweighted And Weighted)

	Sample unweighted				Sample weighted			
Year	Surviving	M&A	Closed	Total	Surviving	M&A	Closed	Total
2004	177	6	10	193	684	46	38	768
2005	164	1	12	177	642	2	39	684
2006	148	6	10	164	577	27	37	642
2007	140	2	6	148	553	9	16	577
2008	131	2	7	140	524	7	22	553
2009	123	3	5	131	498	10	17	524
2010	119	1	3	123	486	2	9	498
2011	119	0	0	119	486	0	0	486
Total	119	21	53	193	486	104	178	768

Note: This table shows the frequency of surviving, merged and closed businesses during the 2004-2011 sample period. The sample consists of 193 high-tech startups, which represents 768 firms in the population. The Kauffman Firm Survey oversampled startups in the high-tech sector to better understand the dynamics of these businesses. All the analyses in this study take into account survey weights to adjust for both the survey non-response rate and oversampling of businesses in the high-tech sector. Source: The Kauffman Firm Survey.

2013 and 2014). All analyses in this paper are performed using the weights and stratification.

Although the missing observations in the KFS are not significant, the Kauffman foundation has released a multiply imputed data version of the KFS data. Used by statistical agencies, multiple imputation is a very popular methodology to handle nonresponse in public use surveys and to reduce measurement errors. Using chained equations method, the missing values were replaced systematically by imputed values. The imputed values are ideally independent draws from the predictive distribution of the missing values conditional on the observed values. The KFS multiply imputed data include the original data along with five complete-data imputations (m=5). All analyses in this paper are performed on the KFS multiply imputed dataset. However, the results do not change when we use the original non-complete data.

In this study we focus on the survival and exit behavior of high-technology firms. The Kauffman Firm Survey dataset contains 193 high-tech firms established in 2004 that were tracked until 2011. Out of 193 newly formed high-tech firms, a significant percentage (62%) were surviving firms as of 2011. Among those that exited the sample during 2005-2011, eleven percent exited via M&A and twenty-seven percent closed their operations. Table 1 shows the distribution of high-tech firms in the three categories: surviving, M&A and closed, both for unweighted and weighted sample.

B. Descriptive Statistics

Characteristics of high-tech firms in the startup year (2004)

We analyze differences in characteristics in the startup year between surviving firms (119) and firms that exited the sample (74); for those firms that exited we examine the differences in characteristics between M&A firms (21) and firms that closed operations (53). Our goal is to identify factors that explain why some high-tech firms survive longer that others and which factors explain the M&A exit outcome.

Table 2 shows the mean characteristics for each group and the significant differences in characteristics between surviving and exiting firms and between M&A firms and those that closed operations. Based on previous studies on survival, we use firm characteristics such as size, innovation, information opacity, the ratio of intermediate debt, the presence of external equity and whether the firm has competitive advantages in the market place (Coleman et al., 2013). We also include owners' characteristics such as experience, commitment, prior entrepreneurial experience, education, and gender to identify factors that explain high-tech firm survival or alternatively, exit. Although the literature on firm survival documented a positive relationship between firm size and survival, our results show that there is no statistical significant difference in size between surviving high-tech firms and those that exited. We measured size using the logarithm of sales, assets, the number of employees and asset categories: from as small as less than $1,000 in assets to as high as more than $100,000 in assets. None of these variables is significantly different for the two groups which means startup size does not affect the survival of high-tech firms. Innovation variables such as having a patent, trademark or copyright in the startup year show no significant difference in survival versus exit of high-tech firms. This result is surprising since previous studies found that innovation positively affected the survival of new, young firms (Cefis and Marsili, 2005). With respect to outside financing choices in the startup year, the ratio of business debt to total capital and the use of business debt do not significantly affect the survival of high-tech firms. Finally, the entrepreneurs' socio-demographic characteristics have no impact on the survival of high-tech firms. Overall, the results show that survival or alternatively, exit of high-tech firms are not a function of their characteristics in the startup year, nor a function of their entrepreneurs' characteristics.

Next, we examine the difference in characteristics in the startup year between high-tech firms that exited via M&A and those that closed

TABLE 2. Difference in Business and Owners' Characteristics in The Startup Year (2004)

Characteristics	Unit	Surviving	Exit	Closed	M&A
Sales	$	6.863	6.954	6.654	7.470
			(0.937)		(0.650)
Assets	$	9.818	10.018	9.834	10.336
			(0.817)		(0.631)
Assets < $1,000	%	0.128	0.143	0.143	0.142
			(0.849)		(0.986)
Assets $1,000-$5,000	%	0.060	0.051	0.081	0.000
			(0.807)		(0.048)
Assets $5,000-$10,000	%	0.106	0.042	0.057	0.017
			(0.312)		(0.347)
Assets $10,000-$25,000	%	0.059	0.082	0.125	0.006
			(0.523)		(0.004)
Assets $25,000-$100,000	%	0.305	0.304	0.262	0.376
			(0.992)		(0.591)
Assets $ 100,000+	%	0.343	0.379	0.332	0.459
			(0.710)		(0.488)
Employees	#	2.877	3.388	2.322	5.221
			(0.254)		(0.200)
Have patent	%	0.184	0.191	0.189	0.194
			(0.938)		(0.969)
Have trademark	%	0.179	0.276	0.288	0.255
			(0.251)		(0.800)
Have copyright	%	0.125	0.197	0.214	0.167
			(0.365)		(0.669)
Intellectual property	%	0.342	0.395	0.404	0.380
			(0.863)		(0.882)
R&D activity	%	0.397	0.542	0.403	0.782
			(0.541)		(0.003)
Innovation	%	0.795	0.697	0.544	0.960
			(0.214)		(0.000)
Competitive advantage	%	0.643	0.702	0.724	0.664
			(0.547)		(0.680)
Credit Risk Score	#	3.257	3.006	3.038	2.953
			(0.122)		(0.809)
Home Based Location	%	0.347	0.133	0.183	0.046
			(0.613)		(0.040)
Total business debt	%	0.167	0.108	0.120	0.086
			(0.371)		(0.538)
Use of Business Debt	%	0.416	0.483	0.421	0.590
			(0.670)		(0.316)
Commitment	Hours	40.767	44.018	39.797	51.277
			(0.401)		(0.080)

(*Continued*)

TABLE 2. (Continued)

Characteristics	Unit	Surviving	Exit	Closed	M&A
Work experience	Years	13.231	14.199	14.214	14.172
			(0.737)		(0.986)
Serial entrepreneur	#	1.319	2.666	2.356	3.200
			(0.757)		(0.455)
Education (college or above)	%	0.535	0.553	0.386	0.839
			(0.671)		(0.000)
Outside investors	%	0.143	0.203	0.222	0.169
			(0.645)		(0.637)
N		119	74	53	21

Note: This table shows the results from t-tests, i.e. difference in mean characteristics in the startup year between surviving and exiting high-tech firms and between firms that exited via M&A and those that closed operations. Variable definitions are presented in the appendix. The P-values for the t-tests are in parentheses.

operations during 2005-2011 period. In terms of firm size, a higher proportion of firms with very low amount of assets in the startup year (between $1,000 and $5,000 and between $10,000 and $25,000) closed their operations. A significantly higher proportion of innovative high-tech firms exited via M&A (95.97%) compared with those that exited via closure (54.43%). Moreover, a higher proportion of high-tech firms with R&D activity in the startup year (78.22%) exited via M&A versus business closure (40.27%). Firms whose business owners committed more hours per week (51.27 hours/week) exited via M&A rather than closure (39.7 hours/week). Thus, the entrepreneur's time commitment significantly affect the exit outcome of high-tech firms. Finally, a significantly higher proportion of high-tech firms led by entrepreneurs who are highly educated (college level or above) exited via M&A (83.92%) compared to business closure (38.64%). Overall, the results show that several factors affect the M&A exit outcome of high-tech firms, namely having larger amount of assets, lower information opacity and higher innovation activity in the startup year. In addition, the entrepreneurs of high-tech firms that either merged with or were acquired by other firms have higher education attainment and a higher time commitment toward their ventures.

Characteristics of M&A, permanently closed, and surviving high-tech businesses

In the previous section we concluded that the startup features do not

TABLE 3. Difference in Business and Owners' Characteristics During 2004-2011

Characteristics (2004-2011)	Unit	Surviving	Exit	Closed	M&A
Sales	$	10.508	8.240	7.584	9.583
			(0.031)		(0.023)
Assets	$	11.564	10.571	10.012	11.713
			(0.147)		(0.002)
Assets < $1,000	%	0.047	0.115	0.140	0.062
			(0.169)		(0.055)
Assets $1,000-$5,000	%	0.046	0.047	0.064	0.013
			(0.955)		(0.035)
Assets $5,000-$10,000	%	0.046	0.046	0.059	0.019
			(0.990)		(0.123)
Assets $10,000-$25,000	%	0.055	0.083	0.102	0.044
			(0.261)		(0.325)
Assets $25,000-$100,000	%	0.176	0.254	0.239	0.284
			(0.149)		(0.652)
Assets $ 100,000+	%	0.630	0.455	0.395	0.578
			(0.039)		(0.056)
Employees	#	7.910	5.727	3.603	10.069
			(0.322)		(0.001)
Have patent	%	0.234	0.294	0.253	0.379
			(0.475)		(0.117)
Have trademark	%	0.246	0.406	0.376	0.468
			(0.056)		(0.287)
Have copyright	%	0.131	0.226	0.199	0.283
			(0.117)		(0.228)
Intellectual property	%	0.386	0.505	0.452	0.612
			(0.850)		(0.093)
R&D activity	%	0.495	0.507	0.372	0.782
			(0.428)		(0.000)
Innovation	%	0.795	0.735	0.618	0.976
			(0.419)		(0.000)
Competitive advantage	%	0.654	0.714	0.675	0.794
			(0.318)		(0.061)
Credit Risk Score	#	2.871	3.024	3.099	2.870
			(0.247)		(0.186)
Home Based Location	%	0.295	0.163	0.207	0.072
			(0.209)		(0.001)
Total business debt	%	0.168	0.094	0.094	0.095
			(0.062)		(0.958)
Use of Business Debt	%	0.542	0.471	0.430	0.554
			(0.197)		(0.145)
Commitment	Hours	43.634	41.242	38.097	47.672
			(0.867)		(0.006)

(*Continued*)

TABLE 3. (Continued)

Characteristics (2004-2011)	Unit	Surviving	Exit	Closed	M&A
Work experience	Years	12.687	13.505	13.302	13.918
			(0.868)		(0.663)
Serial entrepreneur	#	1.460	2.581	2.434	2.882
			(0.957)		(0.372)
Education (college or above)	%	0.526	0.568	0.425	0.859
			(0.481)		(0.000)
Outside investors	%	0.056	0.271	0.188	0.440
			(0.681)		(0.015)
N		952	243	174	69

Note: This table shows the results from t-tests, i.e. difference in mean characteristics during the entire sample period between surviving and exiting high-tech firms and between firms that exited via M&A and those that closed operations. Variable definitions are presented in the appendix. The P-values for the t-tests are in parentheses.

explain why some technology firms survive and others don't. However, some features such as asset size and innovation explain the exit outcomes of high-tech firms. In this section, we analyze whether M&A businesses exhibited significant differences in characteristics relative to those that closed their operations or survived throughout the sample period (2004-2011). Table 3 shows the mean characteristics for each group and the significant differences in characteristics between the two groups.

Firm size is an important factor in high-tech survival. A higher proportion of firms with assets exceeding $100,000 survive compared to those with lower amount of assets. Survival is also influenced by the sales level the firm generates. The average surviving firm has a significantly higher amount of sales ($10.5) compared to a firm that exited the sample ($8.24). Table 3 also reports that a higher proportion of high-tech surviving firms (16.83%) have intermediated debt in their capital structures compared to exiting firms (9.41%). In terms of innovation output, a higher proportion of exiting firms (40.63%) report at least one patent compared to surviving firms (24.58%) but this difference is marginally significant (at the 10 percent level). The rest of innovation variables do not show any significant difference between surviving and exiting firms. This suggests that innovation output is not a significant factor in explaining the survival or exit outcome of high-tech firms.

When analyzing the exit outcomes of high-tech firms (M&A versus closure), interesting results emerge from table 3. A higher proportion of

larger firms as measured by sales, number of employees and assets above $100,000 are exiting via M&A, while smaller firms close their operations. What is really significant in explaining the M&A exit outcome is innovation, R&D activity and the firm's competitive advantages. A significantly higher proportion of high-tech firms with intellectual property rights or R&D activity exit via M&A rather than close their businesses. Although innovation is not an important factor for survival of high-tech firms, it is extremely important for the M&A exit outcome. Innovation can be viewed as a signal of quality and potential growth acquirers are looking for when they target technology-based firms. Another important factor in explaining the M&A exit outcome is the presence of external equity. Whether this external equity is provided by venture capitalists or business angels or both, a higher proportion of high-tech firms with external equity in their capital structures (43.96%) end up being acquired. This result suggests that equity providers seek a harvest strategy that maximizes their wealth. With respect to owners' characteristics, the results show that a higher proportion of firms exiting via M&A are owned by highly educated owners (85.88%) and owners with longer time commitment (47.67 hours/week). Surprisingly, we find that being a serial entrepreneur or having industry experience does not affect the survival or the exit outcomes of high-tech firms.

Growth in innovation output and employment for innovative versus non-innovative high-tech firms

If innovation is such an important factor in explaining the M&A exit outcome, we further examine the growth in innovation as well as employment growth over the life of the high-tech businesses in the KFS sample. If some high-tech businesses started with higher assets, higher innovation activity, and a higher number of employees, did they also grow at a faster pace than their competitors? We computed the change in the variable X (i.e., number of employees, patents, copyrights, and trademarks) as the difference between the value of the variable at the end of the business' life (X_T) and the value of the variable in the startup year (X_{2004}). The value X_T was measured at the time of exit (for M&A businesses and those that permanently stopped operations) or in 2011 (for surviving businesses). Table 4 shows the magnitude of growth for each of the two subgroups: innovative and non-innovative high-tech firms. Innovative firms are defined as those high-tech firms with R&D activity during the 2004-2011 sample period. There are 137 innovative

TABLE 4. Growth in Employment and Innovation During 2004-2011 Sample Period

Characteristics		Innovative	Non-innovative
Employment Growth > 1	%	0.503	0.527
			(0.589)
Employment Growth > 5	%	0.344	0.350
			(0.895)
Employment Growth > 10	%	0.231	0.262
			(0.524)
Patent Growth > 1	%	0.129	0.011**
			(0.015)
Patent Growth > 5	%	0.042	0.000***
			(0.000)
Patent Growth > 10	%	0.035	0.000***
			(0.000)
Copyright Growth > 1	%	0.075	0.010
			(0.197)
Copyright Growth > 5	%	0.023	0.000***
			(0.001)
Copyright Growth > 10	%	0.008	0.000
			(0.124)
Trademark Growth > 1	%	0.179	0.015***
			(0.000)
Trademark Growth > 5	%	0.080	0.000***
			(0.000)
Trademark Growth > 10	%	0.007	0.000***
			(0.005)
IP Growth > 1	%	0.235	0.018***
			(0.000)
IP Growth > 5	%	0.122	0.000***
			(0.000)
IP Growth > 10	%	0.042	0.000***
			(0.000)
N	#	137	56

Note: This table shows the difference in employment and innovation growth between innovative and non-innovative businesses during the sample period 2004-2011.Startups reporting R&D activity are classified as innovative businesses. We measure the growth in employment if the business added at least one employee, more than five employees or more than ten employees during the sample period. We measure the growth in each type of intellectual property right (patents, copyrights, trademarks) if the business added at least one, at least five or more than ten patents/copyrights/trademarks during the sample period. To compute the growth in the variable X (i.e., number of employees, patents, copyrights, and trademarks) we take the difference between the value of the variable at the end of the business' life (X_T) and the value of the variable in the startup year (X_{2004}). The value X_T was measured at the time of exit (for M&A businesses and those that permanently stopped operations) or the value in 2011 (for surviving businesses). Variable definitions are presented in the appendix. ***, ** and * indicate that the difference in characteristics between innovative and non-innovative high-tech ventures is significant at 0.01 , 0.05 and 0.10 levels. The P-values for the t-tests are in parentheses.

high-tech firms and 56 non-innovative high-tech firms in our sample. We measure the growth in employment by adding at least one employee, more than five employees or more than ten employees during the sample period. The results in table 4 show that there is no significant difference in employment growth between innovative and non-innovative high-tech firms. However, significant differences exist in terms of innovation growth. Growth in innovation can be evidenced by the number of patents, trademarks, and copyrights that a business acquires over the sample period. We measure the growth in each type of intellectual property right (patents, copyrights, trademarks) if the business added at least one, at least five or more than ten patents/copyrights/trademarks. The data show that a higher proportion of innovative high-tech firms have significantly higher growth in innovation outputs. Overall, the results in table 4 suggest that growth in innovation output is what differentiates innovative from non-innovative high-tech firms.

IV. Methodology and Results

We employed Multinomial Logit models with competing risk (Astebro & Winter, 2012) to analyze which factors explain the likelihood of survival and exit outcomes of new high-tech ventures. Each Multinomial Logit model we estimate has a "year dummy variable" by construction to capture the baseline hazard that depends on *t*. The model is an extension of binary models that have been used in the analysis of small business survival (Bates, 2005; Audretsch, 1991; Audretsch et al., 1999, Coleman et al,. 2013). Competing risks data come into view when the businesses under study can experience one, but not both events of interest. In this section we explain the binary model's extension to accommodate for competing risks. Assume there are *m* distinct types of events (outcomes) of interest (reasons for exit) indexed by $j \in \{1,2,\ldots,m\}$, let *x* be a vector of covariates, *f*(*t*) the probability density function, and *S*(*t*) the survival function. The maximum likelihood function for the full sample can be written as:

$$L = \prod_{i=1}^{n} \prod_{j=1}^{m} f_j\left(t_i \middle| x_{ij}, \beta_j\right) S_j\left(t_i \middle| x_{ij}, \beta_j\right)$$

where *n* is the number of observations at risk of facing *m* distinct types of events (outcomes) of interest. Let d_{ij} be an indicator variable that

takes a value of 1 if the businesses exited due to event of interest type j (outcomes) and 0 otherwise (when $d_{ij} = 0$, the observation is right censored). Integrating d_{ij} into the likelihood function yields:

$$L = \prod_{i=1}^{n} \prod_{j=1}^{m} f_j\left(t_i \middle| x_{ij}, \beta_j\right)^{d_{ij}} S_j\left(t_i \middle| x_{ij}, \beta_j\right)^{1-d_{ij}}$$

The above likelihood function for the full sample is partitioned into m sub-contributions, where failures due to risks other than m are treated as right-censored. Therefore, the likelihood function indicates that we need to estimate m binary response models where all events other than m are treated as randomly censored. While estimating separate binary response models for each type of event yields unbiased estimators, it could result in loss of efficiency. A natural extension of the logit model that accommodates competing risks is the multinomial logit model. For m possible events (outcomes), the multinomial logit estimates $m - 1$ logit models to obtain parameter estimates on the case-specific hazards. Under the multinomial logit model, the cause-specific hazard $\lambda_{j,t}$ is:

$$\lambda_{j,t} = P_{tj} = \frac{e^{x'\beta_j}}{\sum_{j=1}^{k} e^{x'\beta_k}}$$

where P_{tj} is the conditional probability that an event of type j occurs to business i at time t, given that the business didn't have any type of events prior to t.

In this study we analyze the exit outcomes (M&A or closure) and survival in a competing risk framework. Businesses in the KFS sample exited either by closure or through M&A, creating a competing risks situation. We control for firm characteristics as well as owners' characteristics that were found to have a significant role in the prior survival/exit literature. Our hypothesis that innovative firms are more likely to exit through M&A is tested in all models.

Table 5 shows the coefficients from the Multinomial Logit models where the event of interest is firm exit, regardless whether the venture exited by M&A or closed operations. The coefficient for innovation is negative and significant in all five models which suggests that innovative high-tech firms are less likely to exit, in general. High-tech ventures with growth in employment or those with growth in intellectual property rights are also less likely to exit. These results suggest that

TABLE 5. Factors Explaining the Exit Outcome of High-Tech Ventures- All Exits

Models	1	2	3	4	5
All Exits	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
Employment Growth > 1	–0.42**				–0.39*
	(0.04)				(0.06)
Comparative advantage		–0.04			–0.01
		(0.85)			(0.96)
Home-Based			–0.21		–0.25
			(0.37)		(0.26)
IP Growth > 1				–0.47***	–0.45**
				(0.01)	(0.02)
Innovation	–0.46**	–0.42**	–0.42**	–0.42**	–0.44**
	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)
Serial entrepreneur	–0.03	–0.04	–0.05	–0.04	–0.02
	(0.42)	(0.15)	(0.13)	(0.20)	(0.45)
Outside investors	–0.29	–0.32	–0.33	–0.30	–0.28
	(0.22)	(0.15)	(0.13)	(0.21)	(0.27)
Education	–0.16	–0.15	–0.16	–0.12	–0.15
	(0.46)	(0.46)	(0.44)	(0.57)	(0.49)
Business debt/	–0.31	–0.40	–0.44	–0.44	–0.38
Total capital	(0.47)	(0.37)	(0.33)	(0.31)	(0.41)
Ln (Total Assets+1)	0.07*	0.06*	0.05	0.07*	0.06
	(0.07)	(0.08)	(0.14)	(0.07)	(0.11)
Owner-employee	–0.49**	–0.53**	–0.53**	–0.54**	–0.48**
	(0.04)	(0.03)	(0.03)	(0.03)	(0.05)
Work experience	0.01	0.01	0.01	0.01	0.01
	(0.56)	(0.43)	(0.42)	(0.35)	(0.44)
Gender	0.99***	0.87***	0.76**	0.75**	0.75**
	(0.01)	(0.01)	(0.02)	(0.02)	(0.01)
Number of Owners	0.11	0.10	0.10	0.12	0.13
	(0.27)	(0.24)	(0.23)	(0.13)	(0.13)
N	1195	1195	1195	1195	1195

Note: This table shows the results from the Multinomial Logit regressions. Variable definitions are presented in the appendix. ***, ** and * indicate that coefficient is significant at 0.01 , 0.05 and 0.10 levels. The P-values for the t-tests are in parentheses.

being innovative and experiencing growth in both employment and intellectual property rights will increase the survival of high-tech firms. We control for several firm and owner characteristics and find that larger high-tech firms (higher total assets) and those led by a male entrepreneur have a higher probability of exit. If the owner of the venture is also an employee of the firm, then there is a lower probability of exit.

TABLE 6. Factors Explaining the Exit Outcome of High-Tech Ventures - Exit by Closure

Model	1	2	3	4	5
Exit by closure	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
Employment Growth > 1	–0.59**				–0.57
	0.03				0.06
Comparative advantage		–0.31			–0.26
		0.21			0.28
Home-Based			–0.04		–0.07
			0.89		0.83
IP Growth > 1				–0.72	–0.72
				0.12	0.19
Innovation	–1.04***	–1.00***	–0.98***	–0.96***	–1.00***
	0.01	0.01	0.01	0.01	0.01
Serial entrepreneur	0.01	–0.01	–0.01	–0.01	0.02
	0.61	0.77	0.71	0.82	0.54
Outside investors	–0.51	–0.52	–0.57*	–0.59*	–0.49
	0.12	0.14	0.08	0.07	0.14
Education	–0.91***	–0.88***	–0.90***	–0.85***	–0.89***
	0.01	0.01	0.01	0.01	0.01
Business debt/	–0.01	–0.08	–0.13	–0.18	–0.03
Total capital	0.98	0.84	0.76	0.68	0.94
Ln (Total Assets+1)	0.06	0.05	0.05	0.05	0.06
	0.22	0.23	0.33	0.22	0.25
Owner-employee	–0.85**	–0.90**	–0.93***	–0.93***	–0.82**
	0.01	0.01	0.01	0.01	0.02
Work experience	0.01	0.01	0.01	0.01	0.01
	0.47	0.36	0.36	0.28	0.36
Gender	1.41***	1.32***	1.21***	1.05**	1.26**
	0.01	0.01	0.01	0.03	0.02
Number of Owners	0.20	0.21	0.21	0.25*	0.26*
	0.13	0.13	0.12	0.07	0.07
N	1195	1195	1195	1195	1195

Note: This table shows the results from the multinomial Logit regressions. Variable definitions are presented in the appendix. ***, ** and * indicate that coefficient is significant at 0.01, 0.05 and 0.10 levels. The P-values for the t-tests are in parentheses.

Table 6 shows the coefficients from the Multinomial Logit models where the event of interest is exit by closure. We try to disentangle the factors that explain the two types of exit: closure and M&A exit. The coefficient for innovation is negative and significant in all models; thus innovative high-tech ventures are less likely to close their operations. In addition, high-tech ventures with growth in employment, those with

TABLE 7. Factors Explaining the Exit Outcome of High-Tech Ventures - Exit via M&A

Models	1	2	3	4	5
Exit via M&A	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
Employment Growth > 1	–0.22				–0.24
	(0.58)				(0.57)
Comparative advantage		0.52			0.51
		(0.29)			(0.30)
Home-Based			–1.11		–1.10*
			(0.11)		(0.09)
IP Growth > 1				–0.14	–0.18
				(0.73)	(0.70)
Innovation	1.38*	1.33	1.46*	1.39*	1.32
	(0.09)	(0.11)	(0.08)	(0.09)	(0.10)
Serial entrepreneur	–0.10	–0.10	–0.13	–0.10	–0.10
	(0.17)	(0.16)	(0.11)	(0.16)	(0.18)
Outside investors	–0.14	–0.18	–0.14	–0.13	–0.13
	(0.69)	(0.58)	(0.67)	(0.72)	(0.71)
Education	1.27*	1.19*	1.27*	1.28*	1.19*
	(0.07)	(0.09)	(0.07)	(0.07)	(0.08)
Business debt/	–1.82	–1.75	–2.01	–1.88	–2.00
Total capital	(0.30)	(0.32)	(0.28)	(0.28)	(0.31)
Ln (Total Assets+1)	0.08	0.08	0.05	0.08	0.06
	(0.16)	(0.17)	(0.36)	(0.15)	(0.34)
Owner-employee	–0.14	–0.17	–0.12	–0.15	–0.07
	(0.81)	(0.75)	(0.83)	(0.79)	(0.90)
Work experience	0.01	0.01	0.01	0.01	0.01
	(0.53)	(0.55)	(0.39)	(0.44)	(0.50)
Gender	1.35	1.22	0.93	1.24	0.87
	(0.14)	(0.18)	(0.26)	(0.16)	(0.29)
Number of Owners	0.02	0.01	0.01	0.01	0.01
	(0.88)	(0.92)	(0.92)	(0.94)	(0.87)
N	1195	1195	1195	1195	1195

Note: This table shows the results from the multinomial Logit regressions. Variable definitions are presented in the appendix. ***, ** and * indicate that coefficient is significant at 0.01 , 0.05 and 0.10 levels. The P-values for the t-tests are in parentheses.

highly educated owners and those whose owners are also employees in the firm are less likely to exit by closure. The only positive coefficient is for the gender variable which suggests that high-tech ventures owned by male entrepreneurs are more likely to exit by closure.

Table 7 shows the coefficients from the Multinomial Logit models where the event of interest is exit by M&A. The innovation variable is

positive and significant in three out of five models suggesting that innovative high-tech firms are more likely to exit via mergers and acquisitions. This result is consistent with the hypothesized relationship between innovation and the exit outcome. Moreover, the results show that high-tech ventures owned by highly educated owners have a higher probability of exit via M&A. Highly educated owners not only have access to financial and social capital, but also to more job opportunities outside the business they have founded. Therefore, the opportunity costs of remaining in entrepreneurship are very high. In addition to having a positive impact on an entrepreneur's ability to create a business that is harvestable, education also increases the chance that the business will, indeed, be harvested. Overall, the results in tables 5, 6 and 7 indicate that being innovative improves the chances for high-tech new ventures to be acquired.

V. Conclusions and ideas for future research

In this article we examine which factors significantly impact the exit outcomes of technology-based startups founded in 2004. Using the largest longitudinal dataset of newly formed businesses in the United States (KFS data), we analyze 193 startups classified as high-technology firms and organized as corporations. Building on Guzman and Stern (2016) we focus on the business' ability to innovate (growth in patents, trademarks, copyrights) and the growth in employment to explain its exit outcomes.

The multivariate analysis revealed that being innovative and being led by highly educated owners are the most important factors explaining the likelihood of M&A exit for high-tech ventures. Exiting a startup following acquisition was one way in which the exit could be viewed as a success. High-potential startup firms are frequently acquired by more established organizations (Bertram et al., 2012) and such acquisitions often result in the founders securing significant rewards much faster than those that would have been offered if they had continued to own and operate the business themselves (Collins, 2000). To this end, if exit following acquisition is to be a target for some entrepreneurs, it is worthwhile researching the key factors that can lead to such acquisitions.

While the theories of mergers and acquisitions (M&As) have

evolved from the study of publicly traded companies, in this paper, we argued that factors explaining the M&A exit of new, high-tech businesses may be significantly different. This study contributes to the existing literature on the exit of new, young technology-based businesses by showing that exit via M&A is a viable outcome for young, high-tech businesses that innovate and have growth potential.

There are several data limitations that restricted the opportunity for further analysis. For example, the KFS data reveal only two exit outcomes: M&A or business closures. Initial Public Offerings (IPOs) were not included, because none of the businesses had gone through an IPO process in the 8 year-span covered by the survey. It would be interesting to follow the startups beyond 2011 (when Kauffman Foundation stopped the survey) and identify which ones exited via M&A versus IPO. However, such data is not yet available. Another data limitation is the lack of information with respect to the M&A deal structure and the identity of the acquirer. For this reason, we modeled the probability of M&A exit from the target's perspective by using the characteristics of startups only. Future research could look into a model that includes both startups' and acquirers' characteristics to explain the M&A exit outcome.

Accepted by: *Prof. P. Theodossiou, PhD, Editor-in-Chief* , *September* 2020

Appendix. Variables' names and definitions

Variable Name	Definition (all variables are measured at *t*–1)
Sales	Total revenues.
Assets	The sum of cash, accounts receivable, product inventory, equipment or machinery, land and buildings, vehicles, other business owned property and other assets.
Ln(Assets+1)	The natural logarithm of one plus total assets.
Assets < $1,000	Dummy variable = 1 if Assets value <$1,000, = 0 otherwise.
Assets $1,000-$5,000	Dummy variable = 1 if Assets value between $1,000-$5,000, = 0 otherwise.
Assets $5,000-$10,000	Dummy variable = 1 if Assets value between $5,000-$10,000, = 0 otherwise.
Assets $10,000-$25,000	Dummy variable = 1 if Assets value between $10,000-$25,000, = 0 otherwise.
Assets $25,000-$100,000	Dummy variable = 1 if Assets value between $25,000-$100,000, = 0 otherwise.
Assets $ 100,000+	Dummy variable = 1 if Assets value is $100,000 or above, = 0 otherwise.
Employees	Total number of employees.
Innovation	Dummy variable = 1 if the business spent any money on research and development , = 0 otherwise.
Competitive advantage	Dummy variable = 1 if the business had a competitive advantage , = 0 otherwise.
Home Based	Dummy variable = 1 if the business operated from the owner's home , = 0 otherwise.
Total business debt	Total business loans injections divided by total loans injections.
Use of business debt	Dummy variable = 1 if the business used any type of business loans , = 0 otherwise.
Commitment	The average of weekly hours the active owner-operators spent working for the business.
Owners work experience	The average years of work experience active owner-operators have in the same industry as the current business.
Serial entrepreneur	The number of other new businesses active owner-operators started besides the current business.
Education	Dummy variable = 1 if the majority of active owner-operators have a college degree or above , = 0 otherwise.

(*Continued*)

Appendix. (Continued)

Variable Name	Definition (all variables are measured at *t*–1)
Owners - employee	Percentage of active owner-operators who are paid employees at the business.
Gender : Male	Percentage of active owner-operators who are males.
External Investors	Dummy variable = 1 if one of the following made an equity investments in the business: angels, investment companies or venture capitalists , = 0 otherwise.
Number of Owners	Total number of owners.
T	*T* =2011 for surviving businesses. *T* = the year the business stopped operations for businesses that closed operations. *T* = the year the business sold or merged for M&A businesses.
Employment Growth > 1	Dummy variable = 1 if the change in number of employees between time *T* and 2004 is greater than 1, = 0 otherwise.
Employment Growth > 5	Dummy variable = 1 if the change in number of employees between time *T* and 2004 is greater than 5, = 0 otherwise.
Employment Growth > 10	Dummy variable = 1 if the change in number of employees between time *T* and 2004 is greater than 10, = 0 otherwise.
Have patent	Dummy variable = 1 if the business have a patent, = 0 otherwise.
Patent Growth > 1	Dummy variable = 1 if the change in number of patents between time *T* and 2004 is greater than 1, = 0 otherwise.
Patent Growth > 5	Dummy variable = 1 if the change in number of patents between time *T* and 2004 is greater than 5, = 0 otherwise.
Patent Growth > 10	Dummy variable = 1 if the change in number of patents between time *T* and 2004 is greater than 10, = 0 otherwise.
Have copyright	Dummy variable = 1 if the business have a copyright, = 0 otherwise.
Copyright Growth > 1	Dummy variable = 1 if the change in number of copyrights between time *T* and 2004 is greater than 1, = 0 otherwise.
Copyright Growth > 5	Dummy variable = 1 if the change in number of copyrights between time *T* and 2004 is greater than 5, = 0 otherwise.
Copyright Growth > 10	Dummy variable = 1 if the change in number of copyrights between time *T* and 2004 is greater than 10, = 0 otherwise.
Have trademark	Dummy variable = 1 if the business have a trademark, = 0 otherwise.

(*Continued*)

Appendix. (Continued)

Variable Name	Definition (all variables are measured at *t*–1)
Trademark Growth > 1	Dummy variable = 1 if the change in number of trademarks between time *T* and 2004 is greater than 1, = 0 otherwise.
Trademark Growth > 5	Dummy variable = 1 if the change in number of trademarks between time *T* and 2004 is greater than 5, = 0 otherwise.
Trademark Growth > 10	Dummy variable = 1 if the change in number of trademarks between time *T* and 2004 is greater than 10, = 0 otherwise.
Intellectual property	Dummy variable = 1 if the business have a patent, trademark or copyright, = 0 otherwise.
IP Growth > 1	Dummy variable = 1 if the change in number of intellectual properties between time *T* and 2004 is greater than 1, = 0 otherwise.
IP Growth > 5	Dummy variable = 1 if the change in number of intellectual properties between time *T* and 2004 is greater than 5, = 0 otherwise.
IP Growth > 10	Dummy variable = 1 if the change in number of intellectual properties between time *T* and 2004 is greater than 10, = 0 otherwise.

References

Aggarwal, V. A., and Hsu, D. H. 2014. Entrepreneurial exits and innovation. *Management Science* 60: 867-887.

Åstebro, T., and Winter, J. K. 2012. More than a dummy: the probability of failure, survival and acquisition of firms in financial distress. *European Management Review* 9(1): 1-17.

Audretsch, D. 1991. New Firm Survival and the Technological Regime. *Review of Economics and Statistics* 73: 441-449.

Audretsch, D. B.; Bonte, W.; and Keilbach, M. 2012. Financial signaling by innovative nascent ventures: The relevance of patents and prototypes. *Research policy* 41: 1407-1421.

Audretsch, D. B.; Santarelli, E.; and Vivarelli, M. 1999. Does startup size influence the likelihood of survival? Innovation Industry Evolution and Employment. Cambridge University Press, Cambridge: 280-296.

Barney, J. 1991. Firm resources and sustained competitive advantage. *Journal of Management* 17: 99-120.

Bates, T. 2005. Analysis of young, small firms that have closed: Delineating successful from unsuccessful closures. *Journal of Business Venturing* 20: 343-358.

Bertram, T. A.; Tentoff, E.; Johnson, P. C.; Tawil, B.; Van Dyke, M.; and

Hellman, K. B. 2012. Hurdles in tissue engineering/regenerative medicine product commercialization: a pilot survey of governmental funding agencies and the financial industry. *Tissue Engineering*, *Part A* 18(21-22): 2187-2194.

Cefis, E., and Marsili, O. 2005. A matter of life and death: innovation and firm survival. *Industrial and Corporate Change* 14: 1167-92.

Cefis, E., and Marsili, O. 2011. Born to flip: Exit decisions of entrepreneurial firms in high- tech and low-tech industries. *Journal of Evolutionary Economics* 21: 473-498.

Cliff, J. E.; Jennings, P. D.; and Greenwood, R. 2006. New to the game and questioning the rules: The experiences and beliefs of founders who stat imitative versus innovative firms. *Journal of Business Venturing* 21: 633-663.

Coleman, S.; Cotei, C.; and Farhat, J. 2013. A resource-based view of new firm survival: new perspectives on the role of industry and exit route. *Journal of Developmental Entrepreneurship* 18(01).

Cotei, C., and Farhat, J. 2018. The M&A exit outcomes of new, young firms. *Small Business Economics* 50: 545-567.

Collins, J. C. 2000. Built to Flip. *Fast Company* 32: 131-143.

DeTienne, D. R. 2010. Entrepreneurial exit as a critical component of the entrepreneurial process: Theoretical development. *Journal of Business Venturing* 25(2): 203-215.

DeTienne, D. R., and Chandler, G. N. 2007. The role of gender in opportunity identification. *Entrepreneurship Theory and Practice* 31: 365-386.

DeTienne, D. R; McKelvie, A.; and Chandler, G. N. 2015. Making sense of entrepreneurial exit strategies: A typology and test. *Journal of Business Venturing* 30: 255-247.

Dyer, J. H.; Gregersen, H. B.; and Christensen, C. 2008. Entrepreneur behaviors, opportunity recognition and the origins of innovative ventures. *Strategic Entrepreneurship Journal* 2: 317-338.

Farhat, J., and Robb, A. M. 2014. Applied survey data analysis using Stata: The Kauffman firm survey data. Available at SSRN: http://ssrn.com/abstract=2477217.

Farhat, J., and Robb, A. M. 2013. Analyzing the 2004-2011 KFS multiply imputed data. Available at SSRN: http://ssrn.com/abstract=2367300.

Granstrand, O.; Bohlin, E.; Oskarsson, S.; and Sjoberg, N. 1992. External technology acquisitions in large multi-technology corporations. *R&D Management* 22: 111-33.

Gruber, M.; MacMillan, I. C.; and Thompson, J. D. 2013. Escaping the prior knowledge corridor: What shapes the number and variety of market opportunities identified before market entry of technology start-ups? *Organization Science* 24: 280-300.

Guzman, J., and Stern S. 2016. Nowcasting and placecasting entrepreneurial quality and performance. Forthcoming in Measuring Entrepreneurial

Businesses: Current Knowledge and Challenges, Haltiwanger, Hurst, Miranda, and Schoar (Ed).

Hurst, E., and Pugsley, B. 2011. What do small businesses do? Brookings Papers on Economic Activity, Economic Studies Program, *The Brookings Institution* 43(2): 73-142.

King, D.; Dalton, D.; Daily, C.; and Covin, J. 2004. Meta-analyses of post-acquisition performance: indications of unidentified moderators. *Strategic Management Journal* 25: 187-200.

Liu, X.; Wright, M.; Filatotchev, I.; Dai, O.; and Lu, J. 2010. Human mobility and international knowledge spillovers: Evidence from high-tech small and medium enterprises in an emerging market. *Strategic Entrepreneurship Journal* 4: 340-355.

Mohr, V., and Garnsey, E. 2009. Acquisitions as business opportunity for science-based firms: a resource-based evolutionary perspective. Paper presented at the European Network on the Economics of the Firm, 2009 Workshop.

Mueller, E. 2014. Entrepreneurs from low-skilled immigrant groups in knowledge-intensive industries: Company charcteristics, survival and innovative perfromnace. *Small Business Economics* 42: 871-889.

Norback, P.; Persson, L.; and Svensson, R. 2009. Creative destruction and productive preemption. IFN Working paper.

Sarkar, M. B.; Echambadi, R; Agarwal R.; and Burkemper, A. 2006. The effect of the innovative environment on exit of entrepreneurial firms. *Strategic Management Journal* 27: 519-539.

Schott, T., and Sedaghat, M. 2014. Innovation embedded in entrepreneurs' networks and national education systems. *Small Business Economics* 43: 463-476.

Ucbasaran, D.; Westhead, P.; and Wright, M. 2009. The extent and nature of opportunity identification by experienced entrepreneurs. *Journal of Business Venturing* 24: 99-115.

Wennberg, K.; Wiklund, J.; DeTienne, D. R.; and Cardon, M. S. 2010. Reconceptualizing entrepreneurial exit: divergent exit routes. *Journal of Business Venturing* 25(2): 361-375.