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Examining the Age—Performance Relationship for Entrepreneurs: Does the Innovativeness of a Venture Make a Difference?

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*W*hether older or younger entrepreneurs may be better positioned to achieve performance outcomes for their ventures is a much debated question. Here, we draw on Galenson's theory of creativity to propose a contingency perspective for understanding the relationship between entrepreneur age and venture performance, suggesting that a venture's level of innovativeness plays a moderating role. Results from a representative sample of 1,182 nascent entrepreneurs revealed mixed support for our hypotheses. While a negative relationship was found between entrepreneur age and performance for those developing "innovative" ventures, no relationship was found between entrepreneur age and performance for those developing "imitative" ventures.

Keywords: venture performance; human capital; age; venture innovativeness; imitative versus innovative ventures

People under 35 are the people who make things happen. People over 45 basically die in terms of new ideas.
        —Venture capitalist Vinod Khosla speaking at the
                Nasscom Product Enclave, 2011

Venture capitalists talk openly about their bias toward young entrepreneurs....I think they're wrong...venture capitalists are doing themselves a big disservice by ignoring the real innovators: older, experienced people.
        —Vivek Wadwha, Director of Research, Center for
        Entrepreneurship and Research Commercialization,
                Duke University

Across current literature, and particularly in the popular press, multiple viewpoints have emerged for how an entrepreneur's age may be expected to influence venture performance. These viewpoints have moreover differed remarkably, as illustrated in the quotations above. While some argue that younger entrepreneurs may be in a better position to achieve venture success (e.g., Kammel, 2012; Wolverson, 2013), others have taken an opposing stance, suggesting that older entrepreneurs possess a distinct advantage (e.g., Conner, 2012; Wadhwa, 2011). Given these conflicting viewpoints, we offer a contingency perspective in this article for understanding the relationship between entrepreneur age and venture performance based on differences in the "degree of innovativeness" inherent in an entrepreneur's venture. This approach recognizes that considerable opportunity variation exists in entrepreneurs' development of new ventures (Samuelsson & Davidsson, 2009); and as we describe, with different levels of innovativeness unique consequences associated with entrepreneur age may come.

In constructing our arguments, we draw on Galenson's (2009a; 2010) theory of creativity as a theoretical foundation. Our deductive, theory-driven approach signifies an important contribution to current literature insomuch as many previous considerations of the entrepreneur age—venture performance relationship have been inductively derived (e.g., Bates, 1990; Lin & Tao, 2012) or based purely on anecdotal accounts. Such accounts are problematic (Ressi, 2011), especially as entrepreneurs represent a sizable portion of the population and exhibit a great deal of age diversity across industries (Spangler, 2009; Wadhwa et al., 2008). What's more, recent reports suggest that entrepreneurial activity is on the rise for individuals of all ages (Kelley et al., 2011), thus intensifying the need for systematic, theory-based research as to how, and under what conditions, an entrepreneur's age may relate to venture performance.

This article is organized into five sections, the first of which is this brief introduction. In the following section, we introduce Galenson's theory of creativity and examine how this perspective may inform the entrepreneur age–venture performance debate. We also present the study hypotheses. In the third and fourth sections, we discuss the study methodology and present our findings. We also present the results of several post-hoc analyses. Finally, in the fifth section, we close with a discussion of study results and their implications for research and practice.

Theoretical Background and Hypotheses
Galenson's Theory of Creativity
Galenson's (2009a; 2010) theory of creativity suggests that the nature of individuals' creative process-

es differs across life stages. As such, different patterns of creative behaviors may be expected in older versus younger individuals. Originally developed as a theory for understanding the creative behaviors of artists, Galenson (2006a; 2006b) observed that individuals could be classified into two overarching categories based on the means by which their most innovative works were developed. The first category, termed "experimental innovators," encapsulates those artists who developed their most creative, and ultimately successful, work through a tentative and prolonged period of learning and discovery. Experimental innovators' creative output is attributed predominantly to the experience gained on account of a lengthy trial-and-error process undergone in developing their art. In contrast, "conceptual innovators" are those artists whose most creative and successful works represent sudden and often extreme departures from current artistic practices. The creative output of these individuals rests in their ability to see beyond existing conventions; a skill which Galenson (2010) notes can diminish over time, as well as with extensive experience in a given domain.

According to Galenson (2009a; 2010), distinguishing between experimental and conceptual innovators points to an integral role for artists' age in understanding the expected pattern of their creative activities. These expectations are aligned with the nature of the creative behaviors that tend to be exhibited by experimental and conceptual innovators, respectively. For example, because experimental innovators "build their skills gradually over the course of their careers," they correspondingly are expected to "produce their best work late in their lives" (Galenson, 2009a, p.2). On the other hand, conceptual innovators are more likely to make their greatest artistic contributions early in their lives given that artists at an early career stage are less "constrained by fixed habits of thought" and remain "free to violate basic conventions" of their field (Galenson, 2009a, p.3). Viewed collectively, therefore, while Galenson's theory stipulates that creative behaviors occur in both older and younger individuals, the manifestations of these creative behaviors would be expected to differ across life stages (Galenson, 2010).

Galenson's theory of creativity and its associated age implications for understanding creative behavior has furthermore been extended beyond an examination of artists specifically to include other creative professions. For example, Galenson and Kotin (2007) illustrated that an experimental innovator versus conceptual innovator categorization could be applied to movie directors in the film industry. Likewise, an experimental innovator versus a conceptual innovator classification has been successfully applied as a framework for understanding the creative output of older versus younger authors and songwriters (Galenson, 2004; 2009b).

Applications of Galenson's Theory of Creativity to Entrepreneurship

Of interest for the current study, Galenson (2009a; 2010) further posited that his theory of creativity may be appropriate for understanding entrepreneurs' development of new ventures. In offering this suggestion, Galenson (2012, p.17) recognized that the careers of successful "entrepreneurs follow patterns similar to those of great artistic innovators…for they share the same basic approaches and motivations." The applicability of Galenson's theory further follows from the notion that the startup of any new venture reflects, on at least some level, a creative process (Fillis & Rentschler, 2010; Winslow & Solomon, 1993). As such, entrepreneurs' creative behaviors (i.e., venture creation) can also be characterized along experimental versus conceptual lines similar to other creative occupations. Accordingly, it follows from Galenson's theory of creativity that separate manifestations of creative behaviors may also be expected for successful older and younger entrepreneurs.

Experimental and conceptual perspectives of creative behaviors also enter implicitly into arguments offered on each side of the current entrepreneur age–venture performance debate. As noted, this debate is prevalent in popular press entrepreneurship literature, and can be understood as reflecting two general perspectives: (1) that there exists a positive relationship between an entrepreneur's age and venture performance (i.e., older entrepreneurs have the advantage), and (2) that there exists a negative relationship between an entrepreneur's age and venture performance (i.e., younger entrepreneurs have the advantage).[1] Specifically, arguments for a positive entrepreneur age–venture performance relationship feature viewpoints closely aligned with "experimental innovator" perspectives on creative behavior, while arguments for a negative entrepreneur age–venture performance relationship parallel "conceptual innovator" perspectives on creative behavior.

Positive Effects for Entrepreneur Age. Proponents of a positive relationship between entrepreneur age and venture performance observe that several qualities commonly associated with older age may be conducive for success. Wadhwa (2011), for example, has suggested that there is no substitute for the value of experience in an entrepreneur achieving venture success. This position is echoed by several others, who note that older entrepreneurs will have had the opportunity to build several advantages rela-

tive to their younger counterparts, including the construction of a more developed social network, the accumulation of greater financial resources, and the capacity to make more seasoned judgments (Conner, 2012). Progression of age has additionally been linked to higher levels of general wisdom (Grossmann et al., 2012), a quality which may be advantageous for entrepreneurs' decision-making processes. These arguments are further underscored by research from an upper echelons perspective (Hambrick & Mason, 1984), which has shown that older managers, given their greater levels of past experience and tendency to seek more information than younger managers, may be in a better position to make more informed strategic decisions (Taylor, 1975; Wiersema & Bantel, 1992). Research conducted by the Kauffman Foundation, as well as findings reported by the Founder Institute, have also shown that the survival rate and overall performance of new ventures increases with entrepreneur age, at least into individuals' early to mid-40s (Ressi, 2011; Robb et al., 2010; c.f., Cressy, 1996). In addition, in his review of various factors that may contribute to entrepreneurial success, Shane (2008) observed that ventures founded by older individuals (45–54 age range) tend to outperform those founded by individuals less than 35 years of age.

As noted, these perspectives on the positive effects of entrepreneur age contain parallels to the expected pattern of creative behaviors for experimental innovators described in Galenson's theory of creativity. In essence, just as experimental innovators are expected to make their greatest contributions late in life as their skills develop gradually over time (Galenson, 2009a), so too would older entrepreneurs be expected to achieve greater venture success on account of the experience, wisdom, and skills they have built throughout their careers.

Negative Effects for Entrepreneur Age. In sharp contrast to those citing positive effects for age, proponents of a negative relationship between entrepreneur age and venture performance argue that qualities commonly associated with youth, in fact, offer the greatest advantage for entrepreneurial success. For example, both Kammel (2012) and Wolverson (2013) have suggested that the energy and motivation levels of younger entrepreneurs may be greater than older entrepreneurs. Research from an upper-echelon perspective has additionally shown that younger individuals may be more willing to engage in risk-taking behaviors, be more receptive to change, and be more flexible in their decision making than older individuals (Buchholtz & Ribbens, 1994; MacCrimmon & Wehrung, 1990). Each of these practices can be important for the survival and growth of a new business. Proponents of a negative

relationship between entrepreneur age and venture performance also note that arguments suggesting that older entrepreneurs possess greater financial resources than younger entrepreneurs may be overstated, especially as outside investors tend to favor the young (Wolverson, 2013). Indeed, this view is supported by statements offered by venture capitalist Niko Bonatsos, who observed that "investors are keen on paying a premium to partner with very young first-time founders that simply think differently than the rest of us" (Farr, 2013).

Clear parallels may once again be drawn between these arguments and the expected pattern of creative behaviors for conceptual innovators described in Galenson's theory of creativity. This follows insomuch as arguments for a negative relationship between entrepreneur age and venture performance focus on younger entrepreneurs' expected levels of innovativeness, flexibility, and dynamism. Each of these traits relate to an individual's ability to see beyond, and operate outside of, existing conventions—a defining feature of the creative behavior of conceptual innovators (Galenson, 2010), and a capability that may diminish with substantial experience in a given domain (Galenson, 2009a; 2012).

An Examination of Venture "Innovativeness"

As illustrated in the preceding sections, the dual characterization of creative behaviors for experimental versus conceptual innovators proposed by Galenson (2009a; 2010) offers a foundation that supports both a positive and negative viewpoint for the influence of entrepreneur age on venture performance. However, Galenson's theory also points to important contingencies that help to specify under what conditions older versus younger entrepreneurs may possess an advantage. One such contingency is the degree of "innovativeness" inherent in a given venture.

As described above, entrepreneurship scholars generally concur that the start up of any new venture reflects, at some level, a creative process (Fillis & Rentschler, 2010; Winslow & Solomon, 1993). This does not stipulate, however, that all startup ventures require equal levels of originality in their founding, development, and management. Indeed, several entrepreneurship researchers have observed that the ideas on which new ventures are founded vary considerably in their degree of innovativeness (Baumol et al., 2009; Koellinger, 2008; Samuelsson & Davidsson, 2009). While some startups are more or less a reproduction of an existing product, process, or business model, other new ventures feature a high level of novelty. To this end, Samuelsson and Davidsson (2009) delineate a typology for classifying new ven-

tures based on their level of innovativeness, distinguishing between "imitative" and "innovative" ventures, respectively. In imitative ventures, entrepreneurs predominately emulate "products and processes that are already established in the economic environment" (p.230) where the new venture operates or is planned to operate. In contrast, in innovative ventures, entrepreneurs seek to "introduce important novelty along at least some dimension" (p.231) related to the core functions of the venture, be it a product, process, or service. Other scholars (e.g., Cliff et al., 2006; Koellinger, 2008) have offered related perspectives in distinguishing imitative and innovative new ventures as well.

This typology of imitative versus innovative ventures provides a useful framework for examining how an entrepreneur's age may be expected to contribute to venture performance. For example, in developing an "imitative venture," older entrepreneurs' longstanding familiarity with a business sector may be particularly advantageous as it allows for a better positioning of a new venture's product or service relative to others in the currently established market. Given this knowledge, older entrepreneurs may also possess a clearer understanding of the potential payoff and risks associated with an imitative venture and, as a result, be more willing to invest the necessary time and resources required to develop the new business successfully (Edelman & Yli-Renko, 2010). This premise is further supported by conceptualizations of entrepreneurial behavior as a utility function (Levesque & Minniti, 2006; 2011), a view that recognizes older individuals as less willing to commit time toward venture development if the potential rewards are perceived as unclear, too distant, or both. Consistent with these perspectives and Galenson's theory of creativity, then, it follows that in the case of imitative ventures older entrepreneurs may possess an advantage in light of the wisdom, knowledge, expertise, and more precise opportunity recognition these individuals are likely to have built over the course of their careers (Edelman & Yli-Renko, 2010; Galenson, 2009a; 2010; Wadwha, 2009).

In contrast, younger entrepreneurs may hold an advantage in "innovative ventures" as their success is based, at least in part, on the originality and novelty of the business. Here, the ability to see beyond and break from existing conventions is particularly valuable. To this end, several entrepreneurship scholars have observed that an abundance of time spent in a given domain can limit an individual's ability to be truly inventive (e.g., Baumol et al., 2009; Cliff et al., 2006). Koellinger (2008) further expanded on this view, delineating that entrepreneurs succeeding in the development of innovative ventures

are most often those who are able to draw on varied perspectives that reach beyond the traditional views of a given field. These characteristics are the hallmark of young conceptual innovators according to Galenson's (2009a; 2010) theory, thereby supporting the notion that entrepreneurs of a less advanced age may have an advantage in innovative ventures.

With the backdrop of this theory and research, therefore, we offer the following contingency hypothesis for the relationship between entrepreneur age and venture performance in imitative versus innovative ventures, respectively:

Hypothesis 1: The relationship between entrepreneur age and venture performance is contingent on the degree of innovativeness in a venture.

Along with this more general contingency hypothesis, we further expect the following pattern of relationships between entrepreneur age and venture performance for imitative and innovative ventures, consistent with the theory and research above:

Hypothesis 2a: The relationship between entrepreneur age and venture performance is positive for imitative ventures.

Hypothesis 2b: The relationship between entrepreneur age and venture performance is negative for innovative ventures.

Method

Study Sample and Data Collection

Data for this study were obtained from the *Panel Study of Entrepreneurial Dynamics II* (PSEDII). PSEDII, a longitudinal data collection project focused on developing a greater understanding of individuals in the early stages of the venture creation process, contains a total of 1,214 entrepreneurs. These individuals were identified from a representative sample of 31,845 adults living in the United States, each of whom received an initial screening contact by telephone to gauge their eligibility for the research project. To determine their eligibility, trained interviewers asked individuals to respond to a series of scripted questions concerning whether they were "currently trying to start a business" or "currently the owner of a business." A copy of the interview protocol and all scripted questions for determining eligibility can be found at http://www.psed.isr.umich.edu/psed/documentation.

Those determined to be eligible and willing to participate based on the initial screening were then contacted by phone on six occasions from 2005–

2010 as a means of data collection. A 12-month interval separated each contact, and all data were collected by trained interviewers from the University of Michigan's Institute for Social Research. All interviewers followed a standardized script to ensure consistency in data collection. During the first measurement point, interviewers predominately focused on obtaining characteristics of the entrepreneurs and their ventures. During measurement points two through six, longitudinal data concerning venture performance were collected. As such, the PSEDII dataset provides five waves of longitudinal data. Study questionnaires used at each measurement point, as well as details on interviewer protocols, can be found at http://www.psed.isr.umich.edu/psed/documentation. A further description of the PSEDII research methodology can be found in Reynolds and Curtin (2008).

For the current study, the total number of entrepreneurs identified at the first measurement point was reduced from 1,214 to 1,182 due to a small number of individuals providing incomplete data on one or more independent variables. These 32 individuals providing incomplete data were deleted listwise. The mean age of respondents was 46.57 years ($SD = 13.02$) and the majority of individuals (55%) had not previously been part of a business startup. Men comprised 63% of the sample and 57% were married at the time data collection began in 2005. In terms of individuals' educational background, 24% had a high school degree or less, 39% had some college experience or an associate's degree from a community college/vocational school, 21% had a bachelor's degree, and 16% had at least some schooling beyond the undergraduate level. About 31% of individuals were "corporate" entrepreneurs (i.e., engaged in the new business creation process on behalf of an employer). The remaining 69% were "independent" entrepreneurs. Finally, respondents on average had worked 9.39 years ($SD = 10.60$) within the industry in which their new business venture was situated.

Beginning with this initial sample of 1,182 entrepreneurs, the retention rates between data collection points ranged from 71% to 86%. Specifically, 976 individuals participated at Time 2 (82% retention rate from Time 1); 746, Time 3 (77% retention rate from Time 2); 527, Time 4 (71% retention rate from Time 3); 435, Time 5 (85% retention rate from Time 4); and 375, Time 6 (86% retention rate from Time 5). Nonrespondents at any particular time point included those that either refused to participate when contacted or were unable to be reached by an interviewer after three separate callbacks. As a result of missing data, the total number of firm-year observations used in the analyses were $N = 2,973$ drawn from 1,075 of the entrepreneurs.

Measures

Dependent Variable: Venture Performance. We assessed venture performance using a measure of entrepreneurial persistence. Persistence, which reflects an individual's level of "direction-specific behavior over time" (Kanfer, 1990, p.78), has been used previously as a performance metric in studies of nascent entrepreneurs (e.g., Liao & Gartner, 2006; Wu et al., 2007; Zhao & Wu, 2014). Persistence provides a useful metric in this research context, especially insomuch as the entrepreneurial process represents a time- and labor-intensive effort (Shane & Venkataraman, 2000). In addition, entrepreneurs' level of effort in starting and developing their venture has been linked to other firm performance indicators (Carter et al., 1996; Edelman & Yli-Renko, 2010). Persistence was captured during measurement points two through six, which constituted the five waves of longitudinal data provided in the PSEDII dataset. More specifically, for this study, *persistence* in venture development was measured at each time point using a dichotomous variable that assessed whether individuals devoted more than 160 hours (four weeks of full-time work) to their business startup over the previous 12 months (1 = Devoted more than 160 hours of full-time work to the venture during the previous 12 months, 0 = Did not).[2]

Independent Variable: Entrepreneur Age. Respondent *age* was calculated for each firm-year observation based on a single, self-reported item captured at the first measurement point.

Moderator Variable: Venture Innovativeness. Following Samuelsson and Davidsson (2009), the degree of venture innovativeness was classified as either innovative or imitative based on the results of a latent class analysis comprising four characteristics of the venture: (1) whether a patent, trademark, or related design protection had been applied for; (2) whether research and development was a core component of the new venture's strategy; (3) whether the venture offered a unique product/service in its respective market; and 4) whether the venture had direct competitors. Each of these venture characteristics was measured using dichotomous items (1 = yes, 0 = no) captured during the first measurement point. Posterior probabilities generated from the latent class analysis were used to classify entrepreneurs' new ventures—in total, 319 of the ventures in the sample were classified as innovative (27%), while 863 were classified as imitative (73%).

Control Variables. We controlled for several variables when conducting the study analyses. All control variables were captured during the initial measurement point. First, we controlled for individuals' years of *industry experience* within the industry in which the new venture is situated. Next, we controlled for *business startup experience*, captured as the number of previous businesses individuals have helped start as either an owner or part owner. Third, as it may have implications for the startup process, we controlled for whether individuals were corporate entrepreneurs engaged in a business startup on behalf of an organization, or were independent entrepreneurs (*entrepreneur type*). Given research supporting the value of social capital for nascent entrepreneurs' ability to navigate the startup process (Davidsson & Honig, 2003), we also controlled for two structural characteristics of respondents' networks: the number of individuals respondents have drawn on for advice or support pertaining to their new venture (*advice/ support network size*), and the number of individuals that have in some other way contributed to the development of their new venture (*other contributor network size*). As it is likely that entrepreneurs in our sample may be at different stages in the venture development process, additionally we controlled for previous performance. Specifically, we captured whether entrepreneurs had achieved any *previous sales* related to their venture prior to the initial measurement point (1 = yes, 0 = no). Finally, we controlled for respondents' highest level of *education* obtained.

Statistical Analysis

Analyses were conducted using the generalized estimating equations (GEE) regression method (Liang & Zeger, 1986). We report results from models specifying an independent working correlation structure, binomial distribution, and logit link function. An independent working correlation structure was used because it provided the best fit based on the quasi-likelihood under the independence model criterion (QIC) statistic (Pan, 2001). However, we also retested the study hypotheses using both an AR1 and exchangeable working correlation structure and results were substantiated. All analyses were conducted using the GENMOD procedure in SAS 9.4.

Results

Descriptive Statistics

Table 1 presents descriptive statistics and bivariate correlations for all study variables. In respect to the correlations, it is useful to note that several control variables demonstrated a bivariate relationship with entrepreneurial persistence, including industry experience ($r = .08$, $p < .01$), business startup experience ($r = .09$, $p < .01$), and previous sales ($r = .13$, $p < .01$).

Table 1. Means, Standard Deviations, and Correlations of Study Variables

Variable	M	SD	1	2	3	4	5	6	7	8	9	10	11
1. Advice network size	0.97	2.08	-										
2. Other cont. network size	1.11	2.20	.19	-									
3. Business startup exp.	1.02	1.94	.03	.02	-								
4. Industry experience	9.39	10.60	.00	-.03	.12	-							
5. Education	5.53	2.13	.01	.00	.14	.09	-						
6. Entrepreneur type[a]	0.31	0.46	.03	.00	-.07	.04	-.07	-					
7. Previous sales[b]	0.50	0.50	.01	.00	.07	.04	.04	.01	-				
8. Venture innovativeness[c]	0.27	0.44	.09	.03	.02	.01	-.09	.06	-.10	-			
9. Age	46.57	13.02	-.03	.00	.23	.35	.24	-.08	.01	-.05	-		
10. Persistence[d]	0.66	0.47	-.00	.00	.09	.08	.03	.02	.13	-.02	-.03	-	
11. Sales[e]	0.48	0.50	-.04	-.03	.10	.05	.06	-.01	.34	-.10	.02	.36	-

Note: Correlations greater than .04 in absolute value are significant at $p < .05$. Correlations greater than .05 in absolute value are significant at $p < .01$.
[a] 1 = Corporate entrepreneur, 0 = Independent entrepreneur.
[b] 1 = Had previous sales, 0 = Did not have previous sales.
[c] 1 = Innovative venture, 0 = Imitative venture.
[d] 1 = Devoted more than 160 hours (four weeks) of full-time work to the venture in the past 12 months, 0 = Did not.
[e] 1 = Achieved sales in more than 6 of the previous 12 months, 0 = Did not.

Table 2. GEE Results for the Moderating Effect of Venture Innovativeness on the Relationship between Entrepreneur Age and Venture Performance (Hypothesis 1 and Post-hoc Analysis #1)

Variable	DV = Persistence[a]		DV = Sales[b]	
	Model 1	Model 2	Model 1	Model 2
Control variables and Main effects				
Advice/support network size	-.02	-.02	-.09	-.09
Other contributor network size	.01	.01	-.05	-.05
Business startup experience	.28**	.29**	.18**	.19**
Industry experience	.21**	.21**	.10*	.10*
Education	.06	.07	.09	.09*
Entrepreneur type[c]	.04	.04	.00	.00
Previous sales[d]	.25**	.25**	.71**	.72**
Venture innovativeness[e]	-.03	-.04	-.15**	-.16**
Age	-.20**	-.19**	-.07	-.07
Interaction effect				
Age x venture innovativeness	-	-.14**	-	-.09*
Intercept	.70**	.70**	-.09*	-.09*

Note: N = 2,973 observations for persistence. N = 2,468 observations for sales. All entries are standardized estimates.
[a] 1 = Devoted more than 160 hours of full-time work to the venture in the past 12 months, 0 = Did not.
[b] 1 = Achieved sales in more than 6 of the previous 12 months, 0 = Did not.
[c] 1 = Corporate entrepreneur, 0 = Independent entrepreneur.
[d] 1 = Had previous sales, 0 = Did not have previous sales.
[e] 1 = Innovative venture, 0 = Imitative venture.
* $p < .05$, ** $p < .01$.

Hypothesis Tests

Table 2 reports the results of the GEE regression analyses for persistence. Specifically, two models are reported in a hierarchical progression, with Model 1 consisting of the control variables and main effects, and Model 2 adding the hypothesized entrepreneur age x venture innovativeness interaction.

Hypothesis 1 posited a moderating (i.e., contingency) effect on the relationship between entrepreneur age and venture performance. Hypothesis 2, then, posited that the relationship between entrepreneur age and venture performance would be positive for those entrepreneurs developing imitative ventures (Hypothesis 2a), and negative for those entrepreneurs developing innovative ventures (Hypothesis 2b). We found support for Hypothesis 1 as the age x venture innovativeness interaction was significant (β = -.14, $p < .01$, *Odds Ratio* = 0.87). To further determine the nature of this effect and assess Hypothesis 2, we divided the sample based on the new venture's degree of innovativeness and conducted separate analyses examining the relationship between entrepreneur age and persistence for imita-

tive and innovative ventures, respectively. We also created a graphical depiction of the age x venture innovativeness interaction, which is provided in Figure 1. In depicting the interaction, Figure 1 also lists the predicted probabilities of achieving a successful performance (i.e., persistence = 1) for imitative and innovative ventures at high and low values of entrepreneur age (+/- 1 *SD*).

As exemplified in Figure 1, a nonsignificant relationship between entrepreneur age and persistence was found for those developing imitative ventures (β = -.09, $p > .05$, *Odds Ratio* = 0.92). Hypothesis 2a was thus not supported as these results suggest that the odds of achieving a successful performance in imitative ventures is not meaningfully influenced by entrepreneur age. However, a significant negative relationship between entrepreneur age and persistence was found for those developing innovative ventures (β = -.55, $p < .01$, *Odds Ratio* = 0.58). This finding supports Hypothesis 2b, and suggests that holding all other predictors constant, for each one standard deviation unit increase in entrepreneur age (given that model predictors were standardized), the
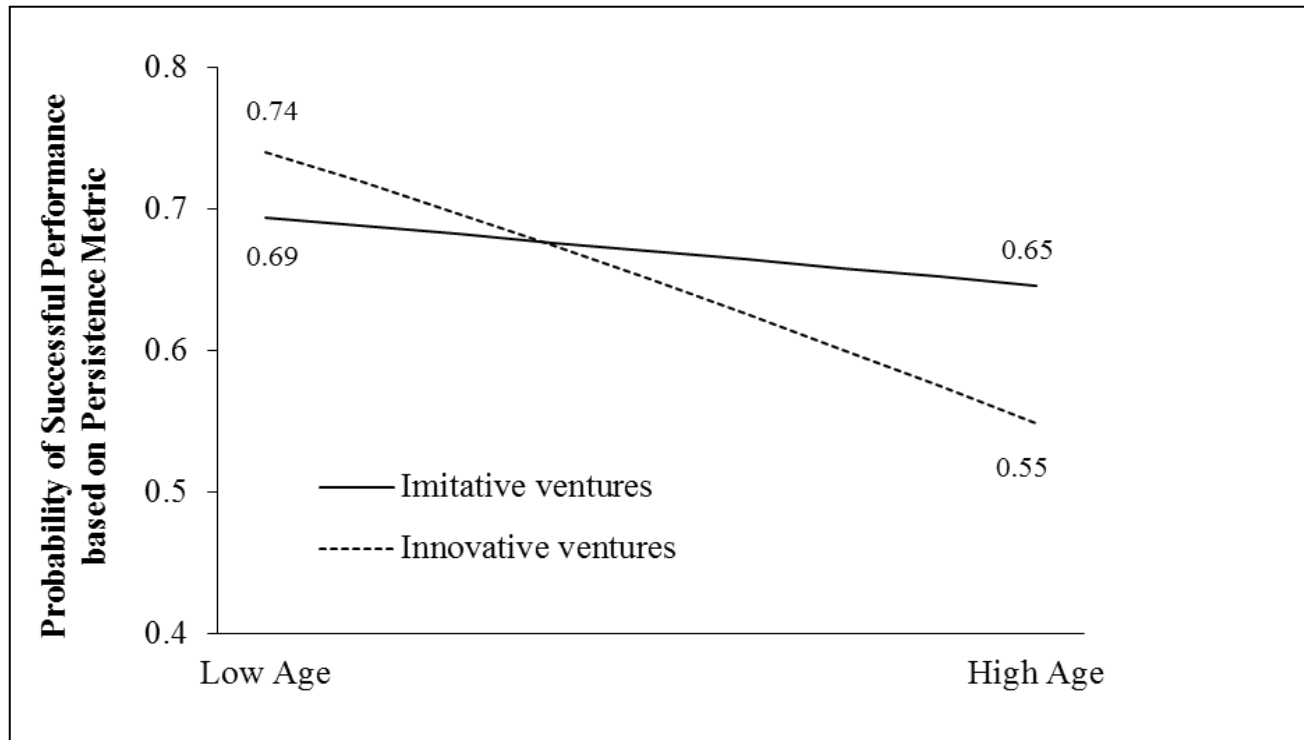
Figure 1. Moderating effect of venture innovativeness on the relationship between entrepreneur age and persistence.

odds of achieving a successful performance (i.e., persistence = 1) decreases by a factor of about 1.74. Put differently, this result could also be thought of as a one standard deviation unit increase in entrepreneur age resulting in a 74% increase in the odds of an *unsuccessful* performance (i.e., persistence = 0). On the whole, therefore, results demonstrated mixed support for our hypotheses.

Post-Hoc Analyses

We conducted two post-hoc analyses. Specifically, in our first post-hoc test, we considered an alternative performance criterion to entrepreneurial persistence as a dependent variable. This provides an important test for the robustness of study findings. In our second post-hoc test, we considered whether this study's contingency hypothesis for venture innovativeness may extend to other entrepreneur characteristics, in particular individuals' business startup experience, industry experience, and/or education. These post-hoc tests are detailed below.

Post-hoc Analysis #1: Sales as an Alternative Measure of Venture Performance. As noted above, persistence provides a useful performance metric for assessing new ventures in the early stages of development given the difficulty these fledgling firms face in

obtaining measurable levels of sales and/or profitability. Traditional entrepreneurial performance measures such as yearly sales, firm growth, or net profit are therefore not recommended for emerging new ventures (Davidsson & Honig, 2003; Samuelsson & Davidsson, 2009). However, it is conceivable that other less restrictive measures could be applied. We considered one such metric in our first post-hoc analysis—whether entrepreneurs generated any sales revenue from their new venture in more than 6 of the previous 12 months. More specifically, *sales* was measured at each time point using a dichotomous variable that assessed whether individuals experienced any level of sales in over half of the previous 12 months (1 = Achieved sales in more than 6 of the previous 12 months, 0 = Did not).

Retesting the study analyses using this measure of sales as a performance metric revealed a pattern of findings similar with the persistence metric. As shown in Table 2, the age x venture innovativeness interaction was again significant when using this sales metric as the dependent variable (β = -.09, p < .05, *Odds Ratio* = 0.92). A graphical depiction of this interaction is displayed in Figure 2. Again, predicted probabilities for achieving a successful performance (i.e., sales = 1) are displayed at high and low values of age (+/- 1 *SD*).
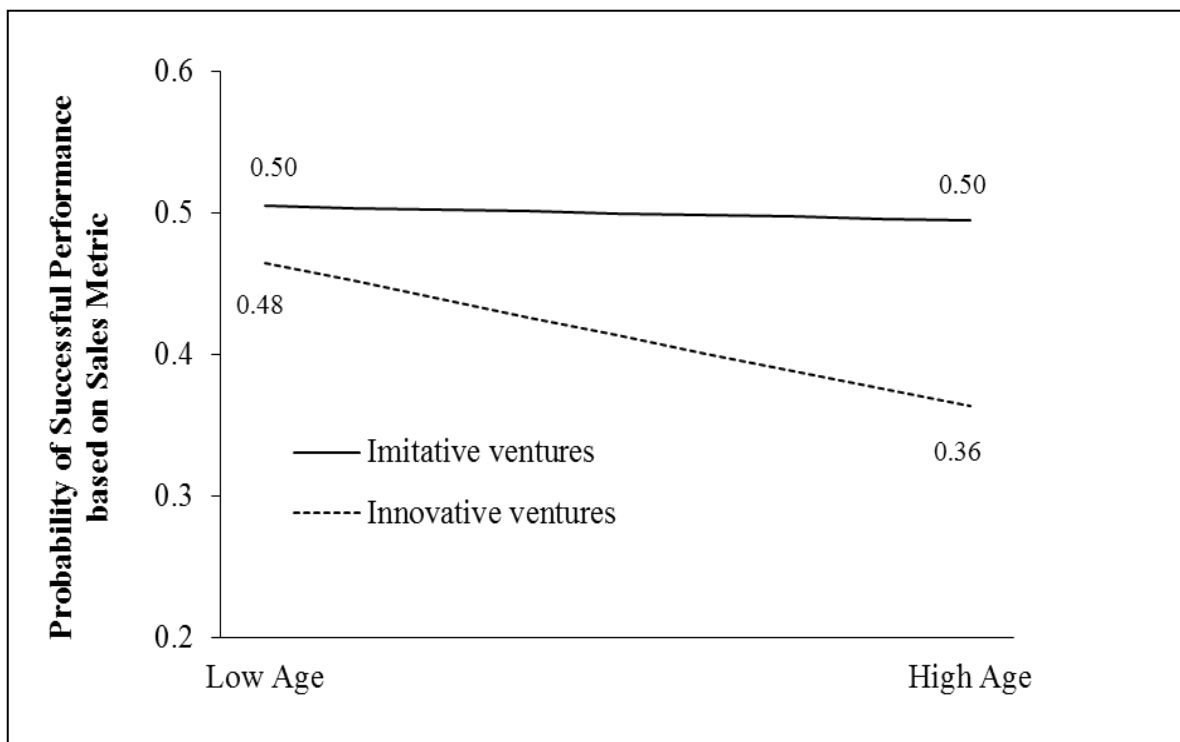
Figure 2. Moderating effect of venture innovativeness on the relationship between entrepreneur age and sales.

Also similar to findings for persistence, a nonsignificant relationship between entrepreneur age and sales was found for those developing imitative ventures (β = -.01, p > .05, *Odds Ratio* = 0.99), while a significant negative relationship between entrepreneur age and sales was found for those developing innovative ventures (β = -.25, p < .01, *Odds Ratio* = 0.78). An interpretation of this significant finding with respect to odds suggests that for each one standard deviation unit increase in entrepreneur age, the odds of achieving a successful performance (i.e., sales = 1) in an innovative venture decreases by a factor of about 1.28, holding all other predictors constant. In other words, a one standard deviation unit increase in entrepreneur age results in a 28% increase in the odds of an *unsuccessful* performance (i.e., sales = 0). These findings using sales as a performance metric confirm our earlier findings for persistence.

Post-hoc Analysis #2: Moderating Effects for Venture Innovativeness on the Relationship between Other Entrepreneur Characteristics and Venture Performance. As demonstrated in the preceding analyses, a contingency model of venture innovativeness offered a useful frame for understanding how entrepreneur age may be expected to relate to the performance of new ventures. These findings

further beg the question of whether the relationship between other entrepreneur characteristics and venture performance may also be contingent on venture innovativeness. We explored this potentiality in our second post-hoc analysis. More specifically, we considered whether venture innovativeness moderated the relationship between three additional entrepreneur characteristics and venture performance: business startup experience, industry experience, and education. Each of these constructs was included as control variables in our earlier analyses.

Table 3 presents the results for post-hoc analysis #2. As shown, null results emerged for all of the interaction effects examined (i.e., venture innovativeness x business startup experience, venture innovativeness x industry experience, and venture innovativeness x education). This was furthermore the case using either performance metric (i.e., persistence or sales).

Despite these null results for other entrepreneur characteristics, however, it is important to note that the venture innovativeness x entrepreneur age interaction continued to be supported even when modeled simultaneously with these other interactions. As shown in Table 3, results confirmed our findings for Hypothesis 1 as a significant venture innovativeness x entrepreneur age interaction again emerged for persistence (β = -.20, p < .01, *Odds Ratio* = 0.82). In addition, results confirmed our findings for the first

Table 3. GEE Results for the Moderating Effect of Venture Innovativeness on the Relationship between All Entrepreneur Characteristics and Venture Performance
(Post-hoc Analysis #2)

Variable	DV = Persistence[a]	DV = Sales[b]
Control variables and main effects		
Advice/support network size	-.01	-.08
Other contributor network size	.01	-.05
Business startup experience	.30**	.19**
Industry experience	.22**	.10*
Education	.06	.09
Entrepreneur type[c]	.03	-.00
Previous sales[d]	.25**	.72**
Venture innovativeness[e]	-.03	-.15**
Age	-.20**	-.07
Interaction effects		
Age x venture innovativeness	-.20**	-.10*
Business startup experience x venture innovativeness	.12	-.00
Industry experience x venture innovativeness	.09	.01
Education x venture innovativeness	.02	.04
Intercept	.69**	-.09*

Note: $N = 2973$ observations for persistence. $N = 2468$ observations for sales. All entries are standardized estimates.
[a] 1 = Devoted more than 160 hours of full-time work to the venture in the past 12 months, 0 = Did not.
[b] 1 = Achieved sales in more than 6 of the previous 12 months, 0 = Did not.
[c] 1 = Corporate entrepreneur, 0 = Independent entrepreneur.
[d] 1 = Had previous sales, 0 = Did not have previous sales.
[e] 1 = Innovative venture, 0 = Imitative venture.
* $p < .05$, ** $p < .01$.

post-hoc analysis as a significant venture innovativeness x entrepreneur age interaction was again found for sales ($\beta = -.10$, $p < .05$, *Odds Ratio* = 0.91). Graphical depictions of these interactions essentially mirror those displayed in Figures 1 and 2, and as such, are not displayed given space considerations.

Discussion

The question of whether older or younger entrepreneurs may be in a better position to achieve venture success continues to be a staunchly debated topic. Our goal in this study was to add a measure of clarity to this debate by adopting a contingency perspective involving the degree of innovativeness in the venture itself. Drawing on Galenson's (2009a; 2010) theory of creativity and recent entrepreneurial research on venture innovativeness (e.g., Samuelsson & Davidsson, 2009) as a foundation, we posited that older entrepreneurs may hold an advantage in devel-

oping ventures characterized by lower levels of inherent innovativeness (i.e., ventures that may be classified as "imitative" in nature); while younger entrepreneurs may hold an advantage in developing ventures characterized by higher levels of inherent innovativeness (i.e., ventures that may be classified as "innovative" in nature).

Our results offered mixed support for these propositions. While the inherent innovativeness of a venture was found to moderate the relationship between entrepreneur age and venture performance as anticipated, an entrepreneur's age was only found to have a direct influence on venture success for those developing innovative new ventures ($n = 319$ ventures). No relationship between entrepreneur age and venture performance was uncovered for those developing imitative new ventures ($n = 863$ ventures). These findings were moreover substantiated for two separate measures of venture performance, one of which gauged entrepreneurs' overall persis-

tence in the venture development process, and a second which considered entrepreneurs' progress in obtaining sales related to their venture.

In a general sense, these findings are consistent with suggestions that the relationship between an entrepreneur's age and the performance of his or her venture may be more complex than is often accredited in popular writings (Ressi, 2011). Additionally, study findings support recent suggestions that contingency perspectives may provide a more realistic means to understand the relationship between entrepreneur age and venture performance (e.g., Wadwha, 2009; Wolverson, 2013). To assert only that older or younger entrepreneurs hold an advantage in the development of successful new ventures may be an overly simplistic viewpoint.

However, it does appear that younger entrepreneurs possess certain advantages in the development of innovative ventures in particular. As illustrated in Figure 1, entrepreneurs one standard deviation below the mean age (about 33–34 years old) were nearly 20% more likely to devote considerable time and effort toward developing their innovative new venture over the course of a year than entrepreneurs one standard deviation above the mean age (about 59–60 years old). In addition, as shown in Figure 2, the difference in the likelihood of obtaining sales in more than six months during the previous year for those developing an innovative venture was about 12% greater for younger entrepreneurs compared to older entrepreneurs. These reflect notable differences, especially when considering that entrepreneurs within high-growth industries, which are more likely to reflect innovative ventures, are becoming increasingly older on balance, with the highest rate of growth being in the 55–64 age category (Wadwha, 2009; 2011; 2013b). Reports further suggest that, at a macro level, an older demographic comprises a growing proportion of current and aspiring entrepreneurs (Fairlie, 2013; Kelley et al., 2011; Wadwha, 2013a). Findings here suggest that this growing population may face some disadvantages in achieving equivalent persistence and sales incidence levels as their younger counterparts—a belief that has been suggested at times in popular entrepreneurship literature and echoed by some venture capitalists (see Farr, 2013). These findings moreover support theoretical assertions that older individuals "become less and less willing to commit time to activities that yield returns over time," especially if the time horizon for realizing returns is potentially long or unclear (Levesque & Minniti, 2006, p. 181). This is more likely to be the case for innovative ventures.

Null results for the relationship between entrepreneur age and venture performance in the case of imitative ventures additionally represents an important study finding. Imitative ventures by definition reflect those new ventures that largely emulate existing products and/or services currently available in one's environment (Samuelsson & Davidsson, 2009). As such, achieving success in these types of ventures likely involves entrepreneurs' ability to differentiate their business from similar others in some distinct way, as well as their ability to offer a superior product/service relative to competitors. Researchers have speculated that these capacities may be facilitated by such resources as access to a more developed social network of professional and community contacts and greater accumulated financial resources—both of which may be more likely to be held by older individuals (Galenson, 2010; Kelley et al., 2011; Wadwha, 2011; 2013a). Older individuals have additionally been described as better positioned to capture value from these and other resources in their strategic decision making (see Wiersema & Bantel, 1992; Amit & Schoemaker, 1993). Our results, however, suggest that these differences may be overstated, at least for the nascent entrepreneurs under examination. Indeed, in the current representative sample, younger entrepreneurs were just as likely to realize venture performance with respect to persistence and sales incidence as older entrepreneurs developing imitative ventures.

Still, especially as this null result stands somewhat at odds with arguments offered in Galenson's (2009a, 2010) theory of creativity and other entrepreneurial theory and research, we encourage scholars to examine the relationship between entrepreneur age and venture performance more closely for imitative ventures before any firm conclusions may be drawn. One possible explanation for our null finding is that younger entrepreneurs may be gaining greater access to certain resources that may mitigate some advantages once held by older individuals. For example, data collection for the PSEDII dataset occurred between 2005–2010, a time frame that follows significant growth in entrepreneurship education across U.S. colleges and universities, as well as the growth of programs and opportunities designed to connect young entrepreneurs with more seasoned individuals (Rideout & Gray, 2013; Winkel, 2013). These programs and initiatives designed to build entrepreneurship-specific skills, such as identifying and exploiting new venture opportunities in existing markets, may ultimately contribute in putting younger entrepreneurs on more of an equal footing with older individuals who have built such skills and expertise over time. We encourage future researchers to consider this possibility.

Finally, it is interesting to note two additional findings that emerged in this study. The first concerns the null effects found for the relationship between two social capital control variables and both measures of venture performance in our research model. Most entrepreneurship research has illustrated that social capital resources may be beneficial for entrepreneurs in the venture development process and in promoting venture growth (e.g., Davidsson & Honig, 2003; Prasad et al., 2013). Bearing this in mind, one possible explanation for current study findings may be our sole focus on "structural" social capital. Specifically, our social capital measures captured only the overall size of one's "advice/support network" and "other contributor network" respectively. Nahapiet and Ghoshal (1998) identified structural social capital as one of several dimensions of social capital, however, noting that relational and cognitive components also play a role in the value derived from one's social capital resources. Additionally, structural aspects beyond only network size can make a difference for entrepreneurs (e.g., network diversity). Supporting this possible explanation for current study results, Reese and Aldrich (1995) also found no relationship between a size of an entrepreneur's personal network and venture survival. We encourage future research to take a more expansive look to better understand the unique influence of entrepreneur age on venture performance beyond other social capital influences.

The second additional finding of note relates to our second post-hoc analysis, which both confirmed findings for the study hypotheses and demonstrated no significant interaction tests between venture innovativeness and three other entrepreneur characteristics. Each of these additional characteristics—business startup experience, industry experience, and education—instead held a positive main effect on venture performance across levels of venture innovativeness.

Study Limitations

In considering this study's contributions toward achieving a greater understanding of how entrepreneur age may relate to venture performance, both its strengths and weaknesses must be kept in mind. First, a key strength of this study was its utilization of a representative dataset of U.S. entrepreneurs in the early stages of the venture creation process. In addition, this longitudinal dataset provided for multiple years of performance data, as well as allowed for us to control for previous venture performance. However, with these strengths also came several limitations in using the PSEDII dataset for this study. Most notably, as with any publicly available, large-scale dataset, our construction of study measures was restricted to the specific data available. For this

reason, it is important that future research test the generalizability of our findings by considering alternative performance metrics, including those that are not susceptible to self-report biases, such as actual year-to-year change in revenues or overall business growth. In applying such metrics, however, differences in growth aspirations among entrepreneurs should be kept in mind (see Manolova et al., 2007).

As the PSEDII dataset is restricted to U.S. entrepreneurs, an examination of our findings in other cultural contexts is also warranted. Such tests could be conducted at the individual level similar to the current study, or could build on recent research examining country-level effects for entrepreneur age (Levesque & Minniti, 2011). We especially encourage researchers to extend our analyses to emerging economy contexts, where entrepreneurship has been cited as a significant driver of economic development (Lau et al., 2007; Manev & Manolova 2010). Understanding how, and under what conditions, an entrepreneur's age may relate to performance in these contexts may take on even greater importance.

Future researchers should additionally consider other conceptualizations of venture innovativeness than the imitative versus innovative classification applied in this study. While our conceptualization is aligned with previous research (e.g., Samuelsson & Davidsson, 2009), we recognize that a venture's degree of innovativeness, in reality, is not a dichotomous criterion. New ventures and their founders may also be viewed as varying in their level of innovativeness on unique dimensions. For example, while some new ventures may be built on a radical idea, others may be distinguished as innovative based on their novel method of delivery for an existing product or service. Future research exploring how venture innovativeness may influence the relationship between entrepreneur age (and/or other founder characteristics) and venture performance may want to consider such differences in innovativeness along various dimensions. Researchers could also examine a venture's level of innovativeness in more polarized terms, for example as being "radical" versus "nonradical" in nature.

Finally, although Galenson (2009a; 2012) stipulated that his theory of creativity is applicable to the field of entrepreneurship, it should be observed that the evidence on which his theoretical observations are built primarily originated in artistic spheres. To this end, while parallels can be drawn between artistic and entrepreneurial domains, determinants of success in each would not be expected to be explicitly identical. In the entrepreneurial context, for example, the development of a new venture may be influenced by entrepreneur characteristics such as age (Levesque & Minniti, 2006) along with other venture

characteristics (Prasad et al., 2013). However, the success of a new venture is also dependent on factors such as its marketability and positioning in a given market, among others. This caveat should be kept in mind when considering study results.

Conclusion

In this article we examined how the degree of innovativeness in an entrepreneurial venture can influence the relationship between entrepreneur age and venture performance—a relationship that has received extensive debate in the popular literature. In so doing, we offer a theory-driven perspective for understanding the moderating effect of venture innovativeness based on Galenson's (2009a; 2010) theory of creativity and extant research on entrepreneurship. Applying a measure of venture innovativeness used by Samuelsson and Davidsson (2009), our results for a representative sample of 1,182 nascent entrepreneurs provided in the PSEDII dataset suggest that for those ventures classified as innovative in nature, a negative relationship between entrepreneur age and venture performance exists. However, for ventures classified as imitative in nature, no relationship between entrepreneur age and venture performance was found. It is our hope that these findings will contribute to an increased understanding of how founder characteristics such as age may contribute to the success of new ventures, as well as serve as a platform for future research.

End Notes

1. Some researchers have additionally suggested that no relationship exists between entrepreneur age and venture performance (e.g., Davidsson & Honig, 2003).

2. Most participants were asked by the interviewer about their persistence at each time point (i.e., "In the past 12 months, have you devoted more than 160 hours—four weeks of full-time work—to this business startup?"). However, a small number of individuals did not receive this question, and were assumed to have met the criterion for persistence, if they responded in the affirmative to each of three earlier questions during an interview. These questions assessed whether a venture: (1) had sales in most months during the previous year, (2) recorded a profit in most months during the previous year, and (3) paid salaries to managers as part of the venture's monthly operating expenses (see pg. 55 of the PSEDII codebook, available at http://www.psed.isr.umich.edu/psed/data). For the current study, those individuals assumed to have met the criterion for persistence based on their responses to these three earlier questions were included in the persistence "success" group (i.e., persistence = 1). We also retested the study analyses excluding these individuals and all results were substantiated.

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Acknowledgments

Appendix

Generalized Estimating Equations

As noted in the discussion of study methodology, we used general estimating equations (GEE) to conduct the statistical analyses. Although entrepreneurship researchers have increasingly adopted this analytic strategy in recent years (e.g., Jääskeläinen et al., 2006; Hallen et al., 2014; Vanacker et al., 2011), its use remains limited compared to other more traditional quantitative methods. The purpose of this short appendix, therefore, is to provide additional detail on GEE, highlight a few key advantages and disadvantages for its use, and point researchers to other useful resources.

Developed by Liang and Zeger (1986), GEE is an extension of the generalized linear model that offers researchers a method for analyzing longitudinal data in which the dependent variable is not required to follow a normal distribution. Indeed, perhaps the single greatest advantage of GEE is that it allows for the analysis of dependent variables taking on many different distributions, including Poisson, binomial, and negative binomial (Ballinger, 2004). It is also an analytic method supported in many common statistical packages, including SAS (implemented using the GENMOD procedure), SPSS (implemented using GENLIN syntax), and STATA (implemented using the XTGEE command).

While flexible in terms of distributional assumptions, there are some limitations associated with using GEE for longitudinal research that should be kept in mind. Most notably, because GEE is a semiparametric method, there is no true likelihood function. Tests invoking traditional likelihood-based methods (e.g., likelihood ratio test), therefore, cannot be conducted (Agresti, 2010). Questions have also been raised regarding the flexibility of GEE for handling research designs in which the time points of repeated measures are not evenly spaced (Locascio & Atri, 2011), and additional cautions are discussed by Ballinger (2004).

GEE requires the researcher to specify three key pieces of information when constructing the research model: the distribution of the dependent variable, a link function, and a working correlation structure. Of particular interest for GEE models is the working correlation structure, which accounts for the within-subject correlation of the longitudinal data. Incorrectly specifying the working correlation structure can reduce the efficiency of parameter estimates, ultimately increasing the possibility that improper conclusions are drawn from the research model (see Fitzmaurice, 1995; Liang & Zeger, 1986). For this reason, several statistical and heuristic procedures have been proposed to guide researchers in choosing a working correlation structure that best resembles the underlying nature of the data (e.g., Chen & Lazar, 2012; Gosho, 2014; Hin & Wang, 2009; Pan, 2001). No single method has emerged, however, and this has led some researchers to conduct robustness tests in which GEE results are examined for consistency across different working correlation structures (e.g., Reuer et al., 2012; this study).

In sum, GEE, like any analytic method, offers researchers both advantages and disadvantages. For example, a key advantage of GEE is its flexibility for longitudinal data analysis with nonnormal dependent variables. However, a key disadvantage is that GEE cannot be used for tests that rely on traditional likelihood-based methods. Researchers also are required to make several decisions when constructing GEE models, and while some guidance exists, the most advisable choices are not always explicitly clear. Additional details, including more technical aspects of GEE, are provided by Agresti (2010), as well as Liang and Zeger (1986). We also refer interested readers to Ballinger (2004), who provides an in-depth, nontechnical review of GEE directed at organizational researchers.

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