



Contents lists available at ScienceDirect

Journal of Business Venturing

journal homepage: www.elsevier.com/locate/jbusvent



Age and entrepreneurial career success: A review and a meta-analysis



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ARTICLE INFO

Keywords:

Age
Entrepreneur
Gender
Diversity
Performance
Career success
Meta-analysis

ABSTRACT

Entrepreneurship has become an attractive career option for both the young and the old, but age has not been thoroughly examined as a variable of interest among entrepreneurship scholars. In this review, we present 12 theoretical perspectives regarding the effect of age on entrepreneurs' success and our critiques. We then present results of an exploratory meta-analysis with effect sizes from 102 samples. The results show that age has a weak, positive linear relationship with overall entrepreneurial success, but it does exhibit signs of a U-shaped relationship, with the relationship being negative among younger samples but positive among older samples. The positive effect size becomes more pronounced when more females are included in the sample. The effect size of age does not differ by entrepreneurs' tenure running the firm. In terms of the type of success measures, age has a negative effect on growth but a positive effect on subjective success, firm size, and financial success, and no effect on survival. We compare our results with previous meta-analyses on employees' age to show the uniqueness of entrepreneurs' careers and we offer suggestions for future studies.

Executive summary: The work population is aging, and entrepreneurship has become an attractive career option for both the young and the old. Age has often been included in empirical studies as a control variable to predict entrepreneurs' success, but with inconsistent empirical findings and inadequate attention to age's theoretical role, it is not clear whether older entrepreneurs are as successful as their younger counterparts.

The current study has two related components. First, we provided a much-needed review of the alternative theoretical perspectives on the effect of age on entrepreneurial success. These 12 perspectives focused on various age-related mechanisms, namely personal health, rigidity, risk propensity, time's value, discrimination, human capital, social capital, financial capital, emotion, life stages, family obligation, and gender stereotype. We found that explicit theoretical explanations are rare and fragmented for addressing entrepreneurs' age-success relationship. Most of the existing perspectives are simplistic, equivocal, and sometimes contradictory. Guided by the above review, we proposed several research questions about several contingency factors, such as the entrepreneur's life stage, gender, and tenure running the business, which would help us gain a more nuanced understanding of the age-success relationship.

Second, we empirically examined the research questions in an exploratory meta-analysis based on 102 independent samples. Indeed, we found more nuanced results than are typically apparent. The results show that age has a weak, positive linear relationship with overall entrepreneurial success ($\hat{\rho} = 0.02$), but it does exhibit signs of a U-shaped relationship, with the

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relationship being negative among younger samples but positive among older samples. The positive effect size becomes more pronounced when more females are included in the sample, suggesting female entrepreneurs' chance of success is higher at later life stages. The effect size of age does not differ by entrepreneurs' tenure running the firm, thus ruling out the possibility that the age-success effect is primarily driven by tenure effect or selection bias.

We performed some robustness checks for the meta-analytic results. We found age's effect is not affected by the study's publication year, but the effect differs across the world. In terms of the type of success measures, we found age has a negative effect on growth, but a positive effect on subjective success, firm size, and financial success, and no effect on firm survival. Older entrepreneurs tend to have larger businesses, so older entrepreneurs are "punished" for having a larger denominator in the calculation of growth, putting them in an unfair position if growth is the sole measure of success.

We compared our results with previous meta-analyses on employees' age, and one clear distinction is that previous meta-analyses reported an inverted U-shaped relationship between employees' age and overall performance, while our study shows the opposite, U-shaped relationship between entrepreneurs' age and success. This difference is probably due to the fact that entrepreneurial careers involve different resource commitments, job requirements, and success criteria compared to traditional careers, making people at a specific age more likely to succeed in one career but not in the other.

Our study shows that researchers need to rethink the theoretical role of age, account for potentially simultaneous operation of theoretical mechanisms, and identify new research directions. We call for more studies to address the unique promises and challenges entrepreneurs in each life stage will face, and we provided some suggestions to increase the rigor of future studies. It is imperative to study the intra-individual aging effect through tracking a large cohort of entrepreneurs over decades with repeated measures of their cognitive intelligence, motivations, role identities, and success. Because male entrepreneurs outnumber female entrepreneurs, it is necessary to oversample female entrepreneurs or seek a matched sample, so that any gender-related differential effects can be demonstrated fully. Because many entrepreneurs work in teams, future studies can compare founding teams of the same age (e.g., college classmates) and teams of different ages, and investigate how members of each type of team can collaborate to maximize their chance of success.

1. Introduction

Many entrepreneurial icons, including Steve Jobs of Apple, Michael Dell of Dell, and Mark Zuckerberg of Facebook, achieved great success in their twenties, leading to the stereotype that entrepreneurship is "a young person's game" (Lévesque and Minniti, 2006, p. 177). A typical script goes like this: "A super-bright college student, impatient with classwork, drops out to pursue his big idea. Venture-capital funders chase after him, and he gathers smart pals around him to launch his startup. Sensational growth soon follows for the company" (Schramm, 2018). Interestingly, however, the work population is aging. By 2035, older adults (age 65 and above) will outnumber children (age 18 and below) in the U.S. for the first time in history (Vesper, 2018). Given the evidence of age-related discrimination in the workplace (Posthuma and Campion, 2009) and the advantages of autonomy and flexibility that an entrepreneurial career provides, later-life entrepreneurship is an attractive option for older adults (Kautonen et al., 2017). For the important question of whether older people actually become entrepreneurs, Gielnik et al. (2018) found that although younger people are more likely to transition from opportunity identification to forming entrepreneurial intentions, older people are more likely to transition from forming entrepreneurial intentions to actually engaging in entrepreneurial activity, making older people equally likely to become entrepreneurs as younger people. These observations prompt the question: Are older entrepreneurs as successful as their younger counterparts?

Scholars have long acknowledged age as a potential factor influencing individuals' entrepreneurial success (e.g., Hisrich, 1990). In most research, however, age is included simply as a control variable, and the role of age and its theoretical contribution are rarely explicated (Gielnik et al., 2012). Yet age is an easy-to-measure proxy for a broad constellation of age-related factors (e.g., human capital, health, wealth, and discrimination), and these age-related factors may independently and simultaneously influence entrepreneurs' chance of success, possibly in different directions. The effect of age is thus more challenging than expected. The inadequate theoretical attention paid to entrepreneurs' age has resulted in inconsistent empirical findings and the complaint that "alternative and contradictory perspectives exist in the literature concerning the potential role of age in entrepreneurship" (DeTienne and Cardon, 2012, p. 360).

In this study, we examine the role of age in entrepreneurial success using a narrative review followed by a meta-analysis. We aim to contribute in the following ways. First, we provide a much-needed review of such alternative and contradictory theoretical perspectives on the effect of age, drawing from a broad set of literature. Our exhaustive summary will help researchers rethink the theoretical role of age, account for potentially simultaneous operation of theoretical mechanisms, and identify new research directions. Second, guided by the above review, we identify several contingency factors, and empirically examine them in the subsequent meta-analysis. We focus on the entrepreneur's life stage, gender, and tenure running the business, and indeed, find more nuanced

results than are typically apparent. Because age's effect does not easily lend itself to the testing of theoretical conjectures but is nevertheless important, we perform the meta-analysis as an exploratory quantitative study, which is “still useful for constructing new models to guide future empirical work” (Wennberg and Anderson, *in press*). Third, the target population of our review is entrepreneurs, complementing previous meta-analyses on the age-success relationship among employees (Ng and Feldman, 2008; Sturman, 2003; Waldman and Avolio, 1986). We compare our findings to these meta-analyses to highlight the uniqueness of entrepreneurial careers.

Before we start, we would like to clarify the boundaries of our study. We focus solely on entrepreneurs' career success, not individuals' intentions or actions taken to become entrepreneurs. Following previous research (e.g., Ng et al., 2005; Seibert et al., 2001), we define career success as the accumulated positive work and psychological outcomes resulting from one's work experiences. Due to data availability, we examine the inter-individual effects of age on success across different age groups and research contexts, instead of the intra-individual aging process itself. We define an entrepreneur as the founder, owner, and manager of a for-profit business (Zhao et al., 2010). Because this definition does not specify how “new” the business should be, it is possible that an entrepreneur had been running a business for decades at the time of study. We will address if an entrepreneur's tenure running the firm will affect the age-success effect later.

2. Literature review

Given the fragmented attention to the effect of age on entrepreneurial success in the literature, we performed a systematic search to identify relevant perspectives that can shed light on the relationship. We searched in databases for scholarly articles that presented theoretical arguments about the effect of entrepreneurs' age on their success. The initial search turned up very few articles even though we checked multiple sections of each paper (e.g., the introduction, theory, hypothesis development, and discussion of the results), so we broadened our scope to any article in a well-recognized management journal that included the terms “age” and “success” (and their variants) in the title, and followed up on references those authors cited of books, book chapters, monographs, and other works. After this “snowball sampling”, we organized the works we found by theoretical perspective on why and how age influences entrepreneurial success. Twelve distinct perspectives emerged. Most of the theories offer a simplistic view that focuses on either the negative or positive effect of age, but there are theoretic frameworks suggesting a complex relationship and associated contingency conditions. In Table 1, we present each perspective's central argument and empirical evidence. The works cited below and in Table 1 were not all included in our subsequent meta-analyses; some of the empirical studies failed to meet the more stringent inclusion requirements on the sample and reported statistics for meta-analyses as described in Section 3.1 and others are theoretical or computational models. However, they offer interesting ideas on the role of age on entrepreneurial success and influenced the development of our exploratory framework, so we incorporate them here.

2.1. Perspectives suggesting a negative linear relationship

2.1.1. Personal health

One drawback of being an older entrepreneur cited by some scholars is that of deteriorating health (Gielnik et al., 2012). Doctor visits, medication regimens and requirements to attend to exercise therapies take valuable time, mindshare, and energy away from the elder entrepreneur's work, potentially limiting their chances of business success. In a study comparing successful and unsuccessful entrepreneurs, Brockhaus (1980) found that successful entrepreneurs were, on average, 13 years younger than their unsuccessful counterparts. He speculated that “older... entrepreneurs may not have had sufficient energy to devote to their fledgling enterprise” (p. 371).

Although it is true that people's health gradually declines in later life, nowadays, many people are vigorous long beyond the traditional retirement age of 65. Even Brockhaus' results provoke questions, since the mean age of his ‘elderly’ entrepreneur group was 36 years, which is not old by today's standards. Furthermore, there is evidence that entrepreneurs are healthier than employees of the same age (Stephan and Roesler, 2010), so health seems unlikely to be a significant obstacle for the middle-aged or the “young-old”.

2.1.2. Rigidity

Psychological and cognitive characteristics of older entrepreneurs are the explanation offered by several scholars for a negative relationship between age and entrepreneurial success. Older adults tend to be slower in acquiring certain types of skills, including technical skills (Gist et al., 1988). Cognitively, older executives are not as facile at understanding new ideas or integrating new information and are more committed to the status quo (Hambrick and Mason, 1984). Supporting this view, Gielnik et al. (2012) found that older business owners tend to focus less on future opportunities, leading to slower firm growth.

Others offer contrasting evidence. Galenson (2009) describes two approaches to innovation: experimental innovators (e.g., 19th Century post-impressionist painter Paul Cezanne), who work by trial and error and arrive at their peak performance late in life; and conceptual innovators (e.g., Pablo Picasso, father of modern art) who make sudden breakthroughs, usually at an early age. Prasad et al. (2015) used this rationale to explain their finding of a negative relationship between entrepreneurs' age and performance for those developing innovative ventures but a lack of relationship for those developing imitative ventures. In other words, older entrepreneurs may be successful in running businesses that are not particularly innovative.

Table 1

Summary of major theoretical perspectives on the relationship between age and entrepreneurial success.

Perspective	Argument	Empirical evidence	Our critique
1. Negative relationship			
Personal health (Brockhaus, 1980)	Older people have worse health conditions than younger ones and are unlikely to have the time and energy to grow their businesses, resulting in poor performance.	Gielnik et al. (2012) found age is negatively related to business owners' physical health, although it is not related to mental health.	Entrepreneurs being studied are typically younger than 60, thus not likely to experience major health issues that would affect their performance.
Rigidity (Hambrick and Mason, 1984)	Older executives prefer the status quo, are more rigid, and less able to understand new ideas or to integrate new information, causing firms led by older executives to underperform those run by younger counterparts.	Gielnik et al. (2012) found older business owners have less focus on future opportunities, which is related to lower venture growth.	Older entrepreneurs may stick to existing competitive advantages and still succeed.
Time allocation (Becker, 1965)	Older people have a shorter remaining life expectancy, so the opportunity cost of devoting time to their ventures becomes higher. They may place a lower value on the discounted future cash flow, resulting in a higher likelihood of downsizing or withdrawing from the venture.	Wennberg et al. (2010) found older entrepreneurs are more likely to transfer their ownership even when the business is financially healthy, although age is not related to actual withdrawal.	Entrepreneurship offers non-monetary utilities and is essential to entrepreneurs' self-identity, which may motivate older entrepreneurs to continue.
Risk propensity (Stewart and Roth, 2001)	Risk propensity enhances one's motivation to persevere and likelihood of adopting higher performance goals. Older people are generally more risk-averse than younger people.	Josef et al. (2016) found that people's general, financial, and occupational risk propensity tends to decline with age.	Entrepreneurs' risk propensity seems unrelated to firm performance.
Discrimination (Kibler et al., 2015)	Older entrepreneurs will not fit into the dominant enterprise culture, which often praises a "youthful" image of the entrepreneur. This leads to discrimination, which negatively affects how they respond to business opportunities and mobilize resources, and hinders their chance of success.	Ainsworth and Hardy's (2008) case study demonstrates that many people see older unemployed workers as unattractive and incapable of entrepreneurially oriented jobs when compared with younger unemployed workers.	More objective evidence (e.g., loan rejection) is needed to show how age-related discrimination hurts older entrepreneurs' performance.
2. Positive relationship			
Human capital (Becker, 1962)	Older people have a greater amount of human capital, accumulated through professional and other life experiences, which can help them make wiser decisions and perform better at their jobs.	Forbes (2005) found older entrepreneurs are less overconfident than younger ones, probably because they have experienced more.	Younger people received more formal training, and thus may have the same level of overall human capital.
Social capital (Seibert et al., 2001)	Older people tend to have a greater amount of social capital. People's network positions and social resources (e.g., contacts in other functions and at higher levels) will help their access to information, additional resources, and career sponsorship, which facilitate their career success.	Davidsson and Honig (2003) found entrepreneurs' membership in a business network predicts their chance of making a sale and a profit, although other forms of social capital, such as parents and friends in business, do not have a similar effect.	Younger entrepreneurs may use alternative channels (e.g., social media, crowdfunding) to access essential resources, which will compromise older people's advantage in social capital.
Financial capital (Cooper et al., 1994)	Older entrepreneurs tend to have more disposable financial capital (e.g., savings) to use as a buffer against random shocks and the pursuit of more capital-intensive strategies, which are better protected from imitation.	Cooper et al. (1994) found entrepreneurs' initial financial capital size is positively related to firm survival and growth.	In countries without reliable retirement and medical benefits, older people may have problems paying bills, so this theory may have limited generalizability.
Emotion (Baron, 2008)	Emotion can influence entrepreneurs' cognition, business decisions, and tolerance of stress. Older people can regulate their emotions better than younger people under adverse conditions, so they are less likely to fail.	Bal et al.'s (2008) meta-analysis shows that when the psychological contract is breached, older workers respond with more subdued emotional reactions.	No studies to date have explicitly compared older and younger entrepreneurs' emotional regulation tactics and their relative influences on business outcomes.
3. Complex relationship			
Life span theory of adult development (Kanfer and Ackerman, 2004)	Adult development is a complex, lifelong process involving the loss, growth, reorganization, and exchange trajectories of psychological functioning across stages. The gain in one trajectory may compensate for the loss in another,	Horn and Cattell (1967) found younger adults have a higher level of fluid intelligence, while older people have a higher level of crystallized intelligence.	This theory integrates the negative perspectives (e.g., rigidity) and positive perspectives (e.g., human capital) reviewed above. It is unknown how each adult development trajectory affects

(continued on next page)

Table 1 (continued)

Perspective	Argument	Empirical evidence	Our critique
Family obligation (Parasuraman et al., 1996)	and adults' interests, needs, and strengths will shift across life stages. The relationship between individuals' age and performance may thus be non-linear. Entrepreneurs are obliged to take care of the family (e.g., children), which would reduce their time committed to work and their firm performance. Complementing the above life span theory, it shows the workload for family obligations will vary across life stages.	Parasuraman et al. (1996) found parental demands increase entrepreneurs' time commitment to family and work-family conflict. The effect is stronger for women.	entrepreneurs' success, or if there is indeed a non-linear relationship. Few studies have examined how family obligations impact entrepreneurs at different life ages.
Gender stereotype (Gupta et al., 2009)	Entrepreneurship is seen as a masculine profession, and females are expected to be submissive and caring. This gender stereotype puts female entrepreneurs at a disadvantage.	Sexton and Bowman-Upton (1990) found male and female entrepreneurs have few differences in traits, thus rejecting the stereotype that females lack essential psychological attributes to build a business successfully.	We still do not know how gender-related bias combines with age-related bias to affect entrepreneurs' performance.

2.1.3. Risk propensity

Older people's risk-averse tendencies may explain their lower chance of success. Entrepreneurs with higher risk propensity are more likely to set higher goals for their business and have a stronger motivation to become successful (Stewart and Roth, 2001). Vroom and Pahl (1971) found a significant negative relationship between managers' age and both risk-taking propensity and the value placed upon risk. Josef et al. (2016) found that people's general, financial, and occupational risk propensity tends to decline with age. There is even physiological evidence for older people's lower risk propensity: testosterone levels are positively related to risk propensity and bold business decisions (White et al., 2006). But testosterone levels peak during the teen and early adult years, and then gradually decline (Allan and McLachlan, 2004). Such changes in the body may influence entrepreneurs to gradually grow more risk-averse and hesitant when facing new opportunities in unknown territory.

Although age is negatively related to risk propensity (i.e., younger people are prone to take greater risks), it remains questionable whether risk propensity would indeed lead to higher chances of success. Entrepreneurs must be able to manage, minimize, and reduce risk (Miner, 1993). A previous meta-analysis shows that risk propensity is positively related to entrepreneurial intentions, but is not related to subsequent firm performance (Zhao et al., 2010). The authors theorize that entrepreneurs with high risk propensities may be more likely to gamble firm resources on unproven initiatives, when pursuing a known source of competitive advantage may be more effective. According to this logic, older entrepreneurs who are risk-averse and stick to their competitive advantage are likely to be successful too.

2.1.4. Time allocation

Time allocation theorists (e.g., Becker, 1965) suggest a negative age-success relationship. From an economics perspective, the present value of a stream of future payments decreases as people age, so older people prefer instant payoffs (e.g., weekly wages) over the delayed and uncertain gains from new ventures. Thus, older people are expected to be less willing to invest their time in a new venture compared to younger people (Lévesque and Minniti, 2006). Indeed, Wennberg et al. (2010) found older entrepreneurs are more likely to reduce their ownership when the business is still financially well (harvest sale).

This view is limited in that it focused on the value of money as the only motivation for entrepreneurs. In fact, entrepreneurship can be a lifestyle that provides non-financial utility and enhances entrepreneurs' quality of life (Marcketti, 2006). Closing a business may jeopardize entrepreneurs' self-identity. Interestingly, using the same sample that they found age is related to harvest sale, Wennberg et al. (2010) found entrepreneurs' age is unrelated to their choice to continue. Thus, entrepreneurs' reduction in ownership may simply represent a change in the financial arrangement (e.g., transfer of ownership to family members) rather than an actual withdrawal of involvement from the business. The other work (Lévesque and Minniti, 2006) is based on a mathematical model without empirical evidence, whose focus is on people's decision to become entrepreneurs rather than on entrepreneurs' motivation to grow their firms. So, age's negative impact on entrepreneurs' motivation to invest time in an existing firm is yet to be supported.

2.1.5. Discrimination

Some scholars believe ageism, or age-related stereotypes and discrimination from other people, is to be blamed for older entrepreneurs' relatively poor performance. Venture capital firms in Silicon Valley appear to emphasize youth as a critical criterion in investment decisions (Azoulay et al., 2018). Ainsworth and Hardy's (2008) case study in Australia offered quotes from public hearing

witnesses (such as government officials) that characterized older unemployed people as unattractive and incapable of understanding how to build a business from scratch. The witnesses in these hearings did not offer individual examples, but rather generalizations about this demographic category, which is the very definition of discrimination. Additionally, older entrepreneurs in the UK reported in interviews that they experienced discrimination because they do not fit the dominant enterprise culture which favors a “youthful” image of the entrepreneur, and that even family members would disapprove or socially exclude older entrepreneurs (Kibler et al., 2015).

This line of research is promising, except that existing evidence is mostly based on anecdotes, interviews, or public hearings. Quantitative studies with larger sample sizes, control groups, and more objective measures (e.g., loan rejection) are needed to gauge the scope and severity of the discriminatory bias. Additionally, insights are needed to understand the mechanisms through which the bias will subsequently hurt older entrepreneurs' abilities to succeed, as well as any contextual contingencies (e.g., national culture) that may be influencing the relationship between age-related bias and entrepreneurial success.

Taken together, the literature offers a number of possible explanations for the negative relationship between entrepreneurs' age and success. Declining health, cognitive slowdowns, psychological inflexibility, shortening time horizons, and the need for security are all characteristics of aging individuals that may inhibit their willingness and ability to drive toward entrepreneurial success. Additionally, other people's discriminatory biases toward the elderly may create or exaggerate perceptions of these characteristics, thereby preventing older entrepreneurs from obtaining adequate resources to achieve success. Yet, there is much to question in existing studies, and some of the proposed effects may work in the opposite direction. Many studies categorize entrepreneurs as young or old using their own standards. In one case we noted, the average age of “older” entrepreneurs is just 36 years, which is earlier than one would expect physical health or mental acuity to decline, the present value of future income to drop, or discriminatory biases to creep in. Thus, the negative view of older entrepreneurs' potential to succeed found in prior literature may be overly pessimistic.

2.2. Perspectives suggesting a positive linear relationship

2.2.1. Human capital

Human capital theory (Becker, 1962) is rather optimistic regarding the role of age. It assumes that age is a proxy for one's human capital that will help fuel the growth of new ventures. Older people are more likely to have a richer reservoir of life experience, industry experience, and entrepreneurial experience, and “people with greater experience outperform people with less experience” (Gielnik et al., 2018, p. 1071). Forbes (2005) found that older entrepreneurs are less likely to be overconfident, and he reasoned that older entrepreneurs have “experienced more failures, judgmental errors and other instances in which the inaccuracy of their own knowledge has been made apparent to them” (p. 628). Accurate assessments of their abilities will help older entrepreneurs to make sound decisions. In a similar vein, Baron et al. (2016) argued that entrepreneurs tend to understand their own strengths and weaknesses better with increasing age, which helps them avoid costly mistakes.

We caution that although human capital is a very widely used theoretical framework to support the positive effect of age, it takes many different forms, so a younger age does not necessarily equate to a lower level of human capital. For example, younger people are likely to have higher levels of knowledge and skills from systematic and up-to-date training in technology and business management at school, making their overall human capital sometimes similar to that of older entrepreneurs. Furthermore, a meta-analysis shows the correlation between human capital (including experience, education/training, and skills but excluding age) and entrepreneurial success is 0.098 (Unger et al., 2011), which is quite weak and cannot account for the more significant effect of age reported in some studies. It is necessary to identify additional theoretical mechanisms.

2.2.2. Social capital

Social capital theory also favors older entrepreneurs. The theory reasons that people's network structures (e.g., weak ties) and social resources (e.g., contacts in other functions and at higher levels) help them gain access to essential information, resources, and career sponsorship which, in turn, facilitate their career success (Seibert et al., 2001). A meta-analysis shows entrepreneurs' social capital is indeed related to small firm performance (Stam et al., 2014). Baucus and Human (1994) interviewed second-career entrepreneurs, who reported that a strong network helped them gain both financial and marketing support. Davidsson and Honig (2003) found entrepreneurs' membership in a business network predicts firm performance such as making the first sale and profit, although other forms of social capital, such as parents and close friends in business, do not have a similar effect.

Accumulation of social capital requires time, so older entrepreneurs tend to gather a more extensive network of business contacts than younger entrepreneurs who are new to the business. Nevertheless, the relationship between age and social capital may have changed in the last few decades, as non-traditional socialization channels, including social media, incubators, and crowdfunding, have become available to help younger entrepreneurs reach customers, investors, and other business contacts.

2.2.3. Financial capital

Financial capital is a precious resource for entrepreneurs because it can “create a buffer against random shocks and allow the pursuit of more capital-intensive strategies, which are better protected from imitation” (Cooper et al., 1994). Cooper et al. (1994) found that entrepreneurs' initial financial capital is positively related to firm survival and growth. On average, older entrepreneurs tend to have accumulated a greater amount of financial capital than their young counterparts, acquired over the course of their careers, to support venture formation and growth. Personal savings, retirement income, and homeownership may enable them to start new ventures more quickly, and if needed, such financial capital can be used as collateral to secure larger amounts of invested

capital. In contrast, younger entrepreneurs may rely on friends and family, angel investors and others who believe in their strengths. Recently, the growth in student loans has added another barrier to entry for young founders (Morelix, 2015). So, in general, we believe financial capital is a reasonable explanation for the positive relationship between entrepreneurial age and venture success. We caution, however, that this assumption may not apply to countries without a reliable social welfare system to offer the needed retirement and medical benefits to older people, so geographic contingencies may influence this relationship.

2.2.4. Emotion

Baron (2008) argued that entrepreneurs' emotions could influence their cognition, decision-making, and tolerance to stress. Research shows that negative emotion declines with age, but positive emotion remains relatively stable through late midlife (Charles et al., 2001). Bal et al.'s (2008) meta-analysis shows that when a psychological contract is breached, older workers respond with more subdued emotional reactions than younger ones. New ventures face financial, technical and market difficulties that place them in danger of failing. Due to emotional ties to the firm they created, entrepreneurs often make decisions that are not financially sound, such as refusing to close a failing business (Shepherd et al., 2009). With fewer negative emotions and better abilities to regulate their emotions, older entrepreneurs may be better able to balance the emotional and financial costs of business decisions than their younger counterparts. So far, however, we are not aware of any study comparing older and younger entrepreneurs' emotional regulation or examining whether emotional regulation mediates the age-success relationship.

In sum, the perspectives that provide reasons for a positive relationship among entrepreneurial age and career success incorporate the entrepreneurs' accumulations of wisdom, of a network of people, of financial capital, and of emotional regulation borne of having witnessed the outcomes of many actions and decisions. These perspectives are still simplistic, and empirical evidence is lacking regarding whether older entrepreneurs truly have more of those sources of capital and abilities. It is especially a concern when we consider the non-traditional resources that younger entrepreneurs can access. For example, younger entrepreneurs can reach potential customers through social media, which offers broad coverage at relatively low cost, and they can obtain financial capital through crowdfunding. It is also unknown whether the combined advantages for older entrepreneurs are adequate to outweigh the combined weaknesses and societal biases against the elderly. Given the above conflicting perspectives, we propose the following question:

Research Question 1. : In general, are older entrepreneurs as successful as younger ones?

2.3. Perspectives suggesting a complex relationship

Beyond a simple linear relationship, some theorists believe that the association between age and entrepreneurial success may vary depending on contingency factors. We review each suggested contingency below, identify the limitations, and propose research questions to be explored in the meta-analyses.

2.3.1. Life span stage

The life-span theory of adult development (Kanfer and Ackerman, 2004) provides a fine-grained explanation of the adult development processes. It posits that adult development "is not simply a matter of decline but...four distinct patterns of development—namely, loss, growth, reorganization, and exchange" (Kanfer and Ackerman, 2004, p. 442). Of the four trajectories, the first two have received the most attention. According to the *loss* pattern, younger adults' fluid intelligence (i.e., the intellectual abilities related to working memory, abstract reasoning, attention to and processing of new information) diminishes as they age. But fortunately, their crystallized intelligence (i.e., the intellectual abilities related to an extremely wide range of domain knowledge, much of it gathered through experience and focused attention in one area) grows and will "partially or fully offset" the loss of fluid intelligence (Kanfer and Ackerman, 2004, p. 444). To maintain their job performance at the optimal level, they need to move into work roles that place a higher demand on crystallized intelligence and a lower demand on fluid intelligence (e.g., by switching from an engineer's role to a manager's role). Testing this effect requires longitudinal data. To our knowledge, this theory has not been tested thoroughly, although early empirical studies supported some of its tenets. For example, Horn and Cattell (1967) found that younger adults have a higher level of fluid intelligence, whereas older people have a higher level of crystallized intelligence.

Although developed for the general population, this theory is highly relevant to entrepreneurs, because they are founders and have a large personal influence on firm performance regardless of their age. According to this theory, younger entrepreneurs, with better fluid intelligence and technical knowledge, will be more capable of developing new and innovative products and services themselves. In later life stages, entrepreneurs can take advantage of their growing crystallized intelligence through the role of a leader. This theory integrates the negative and positive perspectives we reviewed above. For example, the declining fluid intelligence partially corresponds to the rigidity perspective, while the growing crystallized intelligence partially corresponds to the human capital perspective. But more importantly, this theory suggests that the relationship between age and success can be non-linear, which is unique from the previous theories we reviewed. As an entrepreneur ages and transitions from primarily relying on fluid intelligence to crystallized intelligence, she will need to learn new managerial skills and get used to playing a different role in a venture setting, and poor performance may occur during this trial and error process. While it is challenging to study this intra-individual effect directly, if cross-sectional data are pooled from a larger body of literature examining the age-success relationship at many different life stages, we may be able to observe the synthesized non-linear relationship.

2.3.2. Family obligation

Entrepreneurs need to balance their work and life needs, so family obligations can also complicate the age-success effect. Entrepreneurial success “usually entails escalating business demands that can diminish the time available to fulfill family role responsibilities”, and family obligations would “limit the entrepreneur's ability to devote time and energy to the enterprise” (Parasuraman et al., 1996, p. 277). Unlike employees, entrepreneurs typically cannot request parental leave or expect coworkers to cover their job, so this factor needs to be accounted for when examining entrepreneurs' success. More importantly, family obligation is related to one's life stages. Younger entrepreneurs who recently graduated from college typically have few family obligations. Those who have started or are raising their families, however, are likely to find it challenging to balance their work and life. The work-family conflict may be eased or removed when the children reach school age, become mature and independent. So, older entrepreneurs may be able to free up more time to grow their businesses. Interestingly, this family obligation perspective thus complements the life-span theory to highlight the fact that entrepreneurs' family obligations will change across life stages. It thus reinforces the need to explore the following question:

Research Question 2. : How does the entrepreneur's life stage impact the age-success effect?

2.3.3. Gender stereotype

Another factor that can complicate the age-success effect is whether an entrepreneur is male or female. In addition to the bias toward older adults we discussed previously, people tend to have a discriminatory bias toward females because entrepreneurs are perceived to have predominantly masculine characteristics (Gupta et al., 2009). Many societies expect females to be submissive and caring, and emphasize their obligations in taking care of family needs. Even when females do not have a family, investors or business partners may still refuse to accept them as competent business leaders, due to their implicit gender stereotype. This stereotype places female entrepreneurs in a disadvantaged position when competing with male entrepreneurs. Sexton and Bowman-Upton (1990) found male and female entrepreneurs in fact score similarly in psychological traits with only a few exceptions. Although female entrepreneurs score lower on risk-propensity and energy levels, they score higher on autonomy and change. They concluded that “No evidence was found to support the perception that females may be lacking in the attributes necessary to initiate and manage a business”.

It remains unknown how the gender-related bias might combine with the age-related bias to affect entrepreneurs' success. It is possible that older females face dual types of discrimination bias—age and gender—and thus have the worst performance, or that older age may relieve some of the gender-related discrimination since family obligation expectations would be lessened and wisdom associated with accumulated experience may be more readily assumed. For the general population, females' motivational focus tends to shift “from nurturance to dominance” after mid-life (Rossi, 1980, p. 20), with their “androgen becoming more biologically active and influential as the estrogens drop” (p. 21). If this trend is applicable to female entrepreneurs, it will align them more closely with the masculine stereotype that our society tends to reward. It will thus be interesting to explore how entrepreneurs' gender will combine with age to affect their success.

Research Question 3. : How does gender affect the age-success effect?

2.3.4. Tenure running the firm

We did not find any studies addressing how entrepreneurs' tenure running the firm could affect age's effect, but we add this idea here because we believe it is worthy of further scrutiny given its theoretical importance. Adults enter entrepreneurship at different ages. “Older entrepreneurs” may refer to seasoned entrepreneurs who have run their firms for decades, making it their career, or nascent entrepreneurs who are older but new to entrepreneurship. Are “older entrepreneurs” who are running their businesses but have different tenures homogenous enough to be treated as the same in an empirical study? Some theoretical mechanisms we introduced above (e.g., declining health conditions and declining fluid intelligence) would apply universally to all old adults. But some presumed age-related effects may be tied to entrepreneurs' tenure running the firm. For example, our society's discrimination may be a bigger problem for older-and-nascent entrepreneurs than for older-and-seasoned entrepreneurs, because the latter are established and less dependent on external approval. Likewise, the diminishing motivation to operate the business tends to be applicable to seasoned entrepreneurs only, whereas nascent entrepreneurs' motivation would be relatively high, as implied by the intentional and recent entry.

A related and more challenging issue is selection bias due to small businesses' low survival rate (Cader and Leatherman, 2011) and the fact that only survivors can be studied. Older-and-seasoned entrepreneurs are survivors of business competition, thus are likely to achieve the same level of success as before. It is harder to predict older-and-nascent entrepreneurs' chance of success. Unfortunately, previous studies in this line of research never addressed the possibility that the age-success relationship can be confounded by the tenure effect or the selection effect, making answers to the following research questions long overdue.

Research Question 4. : How does an entrepreneur's tenure running the firm affect the age-success effect?

2.4. The need for a meta-analysis

Through undergoing a thorough literature review, we find that theoretical explanations are rare and fragmented for addressing entrepreneurs' age-success relationship. Most of the perspectives are simplistic, equivocal, and sometimes contradictory. Fortunately

(and also unfortunately), age has often been included as a control variable in empirical studies without theoretical guidance for decades, making it possible to conduct a meta-analysis to supplement the narrative literature review. A meta-analysis itself is theory-blind, so even with the calculated overall effect size, we cannot conclude which one mechanism caused the combined effect or conclude which theory is the “winner”. Nevertheless, a meta-analysis is still meaningful and important for the following reasons.

First, entrepreneurs' age will continue to be studied due to its intuitive appeal, and an overall effect size will help satisfy scholars' and practitioners' curiosity on whether, on average, older entrepreneurs are as successful as younger ones. Scholars can use the finding to decide whether to include age in their research model, or to design better studies to disentangle the composite effect. In addition, entrepreneurs, investors, educators, and others can use the overall effect size to re-calibrate their expectations and reduce potential biases toward entrepreneurs within a specific life stage. Second, a meta-analysis can correct research artifacts, such as small sample sizes and unreliable measures, to make the combined effect size more accurate than narrative reviews that report other studies' results individually, or relying on the empirical results of a single study. For example, [Brockhaus \(1980\)](#) reported a negative effect of age and doubted the success potential of older entrepreneurs. Although this influential study will be included in our meta-analysis as an informative data point, because it had a very small sample size, it is not likely to have a substantial weight when being analyzed with many other studies. Third, in a meta-analysis, we extract standardized statistics from empirical studies to make the results comparable and to avoid confusion over arbitrary labels. For instance, we use the samples' actual average age instead of relying on authors' labels of a sample being “old” or “young”. The standardized results can be compared to the age-success effect among employees or the general population, thus bridging adjacent research communities. Finally, we are able to explore the effects of several theoretical moderators, such as life stage, gender, and tenure running the firm, at the sample level. Understanding the contingency conditions can help reveal the boundaries of the effect and enable scholars to conduct inductive reasoning, thus helping new theory development.

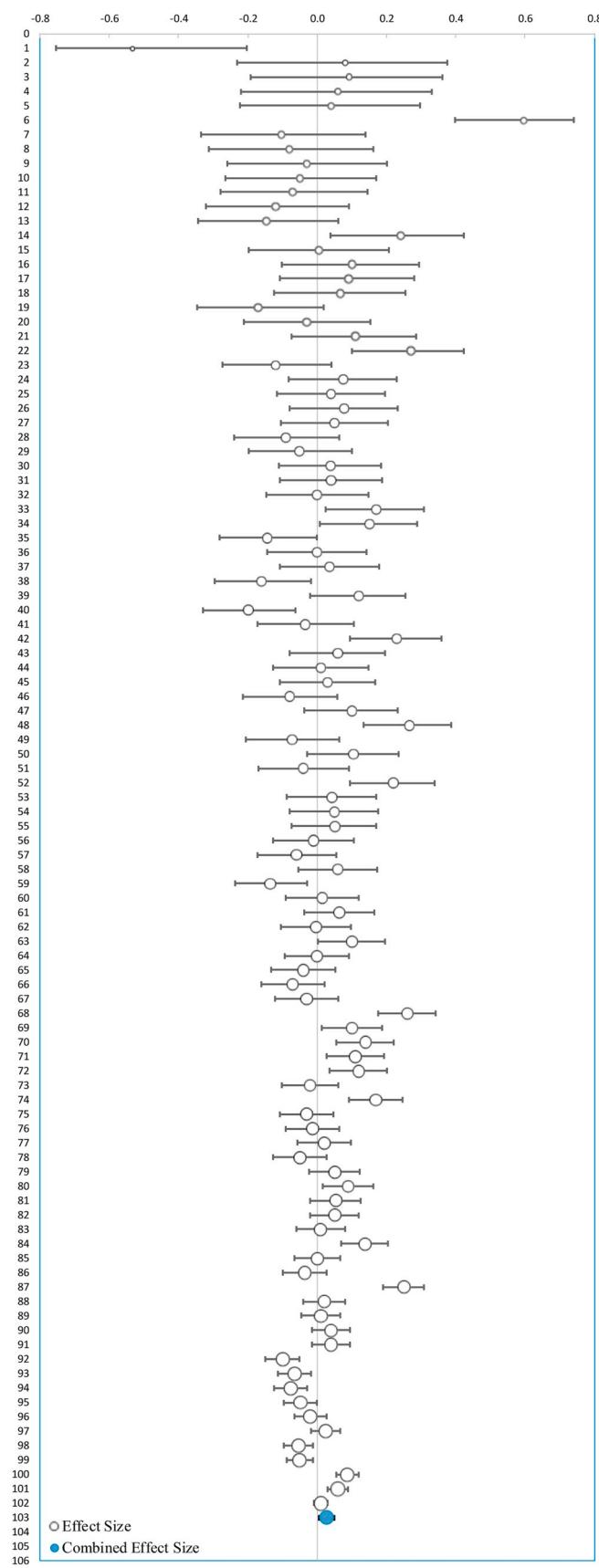
3. Method for the meta-analysis

3.1. Literature search

We used three different channels in January 2019 to perform a comprehensive search of primary studies. First, we searched numerous electronic databases including EBSCOHost (*Academic Search Premier*, *Business Source Premier*, *EconLit*, *PsycARTICLES*, *PsycINFO*) and ProQuest ABI/INFORM Global, using “entrepreneur*” as the subject term, combined with “age” and “success” (as well as eleven variant terms such as “performance”, “growth”, “survival”, and “satisfaction”) in the full text. We limited the search to articles written in English and published in scholarly, peer-reviewed outlets. Second, because the early issues of several entrepreneurship research outlets either do not have electronic copies available or the texts are not searchable, we browsed the physical copy of every article published in the following entrepreneurship journals until the journals became fully searchable: *Entrepreneurship & Regional Development*, *Entrepreneurship Theory and Practice*, *Journal of Business Venturing*, and *Journal of Small Business Management*. Third, we searched the primary studies listed in previous meta-analyses about entrepreneurs' success (e.g., [Unger et al., 2011](#); [Zhao et al., 2010](#)). Our search produced 1059 full-text articles, of which 752 contained empirical data for further screening.

We set several criteria to select primary studies for the meta-analysis. First, the primary study must include a dependent variable that can be classified as a measure of entrepreneurial success. We focus on the end states of success, including firm size, survival, growth, financial success (e.g., profit, income, and sales), and subjective success (e.g., career satisfaction). We excluded studies with only startup-related outcomes, such as entrepreneurial intention or status (i.e., entrepreneur group vs. non-entrepreneur group). Second, consistent with our definition of entrepreneurs, we excluded studies using students, employees, or managers without ownership. Third, the primary study must include a measurement of our independent variable: entrepreneurs' chronological age at the time of the survey. We excluded studies with dummy coded age (e.g., age below 25 coded as “1”) when testing the moderating effect of the sample's mean age, because we cannot calculate the mean age from dummy variables, but included them in other analyses. We excluded studies that contained data for “firm age” but no data for entrepreneurs' chronological age. Fourth, to be included, the study must include a Pearson correlation coefficient (or its equivalent, e.g., F value) for effect size. We transformed standardized regression coefficients into correlation coefficients using [Peterson and Brown's \(2005\)](#) formula. We excluded studies that reported unstandardized regression coefficients without sufficient statistics for us to transform them into correlation coefficients. Fifth, the primary study must report the sample size so that we can estimate the sampling error. Finally, for sample independence, if there are multiple studies based on the same data, we kept the one with more comprehensive statistics, or the most recent study if the same set of statistics was reported. If the same study design was carried out in multiple but independent subgroups (full replication, e.g., samples from different locations), we entered results from those subgroups into the meta-analysis as independent samples ([Schmidt and Hunter, 2015](#)). Following the above selection criteria, we included a total of 96 studies with 102 independent samples into the analyses, with a total sample size of 65,753 entrepreneurs.

To make scientific discoveries digestible, we presented various graphic displays to visualize the data and the meta-analytic findings vividly. It is a timely answer to the call for innovative data visualization for exploratory research ([Wennberg and Anderson, in press](#)). We used the Meta-Essentials tool (Version 1.5; [Suurmond et al., 2017](#)) to produce the forest plot of all effect sizes with their confidence intervals (CIs) in Fig. 1. More information about the primary studies, such as sample characteristics and success measures, are provided in the online supplement at <http://bit.ly/32AGESUP>.



(Caption on next page)

Fig. 1. Forest plot.

3.2. Meta-analytic approach

We use Schmidt and Hunter's (2015) approach to calculate the bivariate effect sizes. Because we anticipate the "true" correlation for a sample depends on the mean of age for the sample and there is no single "true" correlation being estimated, we use the random-effect model for estimation. If a study uses multiple measures of the same construct (e.g., different indicators of entrepreneurial performance) on the same pool of subjects, we averaged over those measures and used the single result as the effect size for the study, but we used separate measures for relevant subgroup comparisons (e.g., subjective success vs. objective success). We report the sample-weighted mean uncorrected correlation (\bar{r}). We then correct each primary correlation for attenuation due to measurement error, to calculate the sample-weighted means of these corrected correlations as the estimated population correlation ($\hat{\rho}$). When the reliability information for success was not reported, we used the mean of the reliabilities of the same measure reported in other studies included in the meta-analysis. We did not correct for the reliability of age.

In addition to the point estimates, we also report the 95% CI and 80% credibility interval (CV) around the estimated population correlations. The CI is based on the uncorrected standard error of the mean effect size and estimates the variability in the mean effect size, while the CV is based on the corrected standard deviation and provides an estimate of the variability of the individual effect sizes across studies (Whitener, 1990). A 95% CI around a point estimate excluding zero suggests that the point estimate would be larger (or smaller, as the case may be) than zero in 97.5% of the cases if we repeat the estimation procedures many times. If the CIs of different categories do not overlap, a moderation effect may exist. We note that this approach is being used as a "rule of thumb" instead of a formal significance test. An 80% CV that does not include zero indicates that 90% of the individual correlations in the population excluded zero (Judge et al., 2010). A relatively large CV suggests the existence of moderator variables. We also report a secondary statistic on the variability, I^2 , which is the percentage of the variance that is not due to statistical artifacts (Higgins et al., 2003). If I^2 is larger than 25%, it becomes necessary to search for moderators.

3.3. Publication Bias

Since entrepreneurs' age is usually used as a control variable instead of a variable of main interest, its statistical significance is not likely to affect a paper's chance of publication (i.e., publication bias). Nevertheless, we performed the following tests to detect any potential publication biases. First, we conducted a trim and fill analysis (Duval and Tweedie, 2000), which involves producing a funnel plot (i.e. a scatter plot showing the effect sizes on the x-axis and their standard errors on the y-axis), estimating the number of studies that should be removed to create a more symmetric funnel plot, and then filling these studies back with an imputed mirror

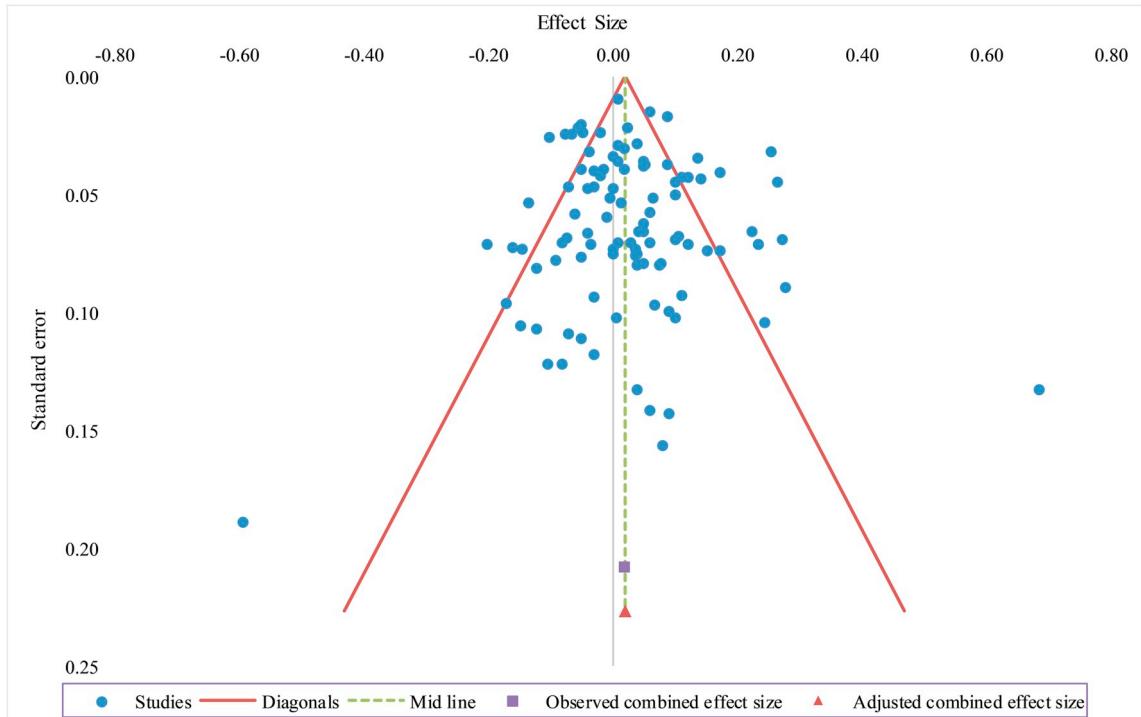
**Fig. 2.** Funnel Plot.

image for each such study to correct the variance. With a visual inspection of the funnel plot (see Fig. 2), we found the distribution of our effect sizes was rather symmetric, and the vast majority of effect sizes were within the funnel. Although two small sample-sized effect sizes (thus with a large standard error) were outside the funnel, they were symmetric to each other as well. The trim and fill procedure showed that no study needs to be trimmed or imputed. Begg and Mazumdar's rank correlation test indicated non-significant rank order correlations between the effect size and the standard error ($r = 0.02$, $z = 0.27$, $p > .05$). Similarly, Egger's intercept test revealed a non-significant intercept when the standardized effect size was regressed onto the inverse of the standard error ($intercept = 0.29$, $p > .05$), supporting a lack of publication bias.

Second, we conducted a subgroup analysis to compare effect sizes from journal versus non-journal sources. Publication bias exists if effect sizes from non-journal sources are weaker in magnitude than those from journals. In our database, eight primary studies were from non-journal sources such as dissertations, and the rest were from journals. The former subgroup had a combined effect size of 0.15 and a wide CI (-0.03 to 0.32), while the latter had a combined effect size of 0.02 and a narrow CI (0.00 to 0.04). Because the CIs overlap, effect sizes from non-journal sources are not different from effect sizes from journals, again supporting a lack of publication bias.

4. Results

4.1. Overall bivariate relationship

Research Question 1 asks whether and how entrepreneurs' age affects their chance of success. Table 2 shows the effect size of age on entrepreneurial success. Age has a weak, positive linear effect on entrepreneurial success ($\hat{\rho} = 0.02$), and the CI excludes zero. In general, and in contrast to popular belief, older entrepreneurs are slightly more successful than younger entrepreneurs. We caution that the magnitude of the effect size is very small and based on noisy observational data. The CV (-0.08, 0.12) is relatively wide and spans across zero, and the I^2 statistic is fairly high (77%), suggesting heterogeneity across samples and the necessity to explore moderators.

4.2. Moderating effects at the sample level

We used two approaches to conduct the meta-analytic regression: the inverse variance weighted OLS regression with a maximum likelihood estimation using Lipsey and Wilson's (2001) SPSS macros, and the "V-known" option of hierarchical linear modeling (Sturman, 2003) to account for variation at the subject level (the first level) and at the sample level (the second level). The results from these two approaches were very close, so we present the results from the former approach. We entered each of the four continuous moderators (namely, samples' mean age to examine the role of the entrepreneur's life span stage, female percentage to examine the role of gender, mean firm age to examine the influence of entrepreneur's tenure, and publication year to examine any differences accounted for due to socioeconomic and cultural changes over time) separately in the regression as independent variables. We did not enter them together because very few primary studies contained information on multiple moderator variables.

Research Question 2 asks about the moderating role of entrepreneurs' life stages, which we operationalize as the samples' mean age. Using this continuous variable is superior to assigning samples into discrete and arbitrarily set age groups. As shown in Table 3,

Table 2
Meta-analytic results of age-success relationship.

Sample	K	N	\bar{r}	$\hat{\rho}$	$SD_{\hat{\rho}}$	95% CI	80% CV	I^2
All	102	65,753	0.02	0.02	0.09	(0.01, 0.04)	(-0.08, 0.12)	76%
By country								
US	44	23,992	0.03	0.038	0.09	(0.01, 0.06)	(-0.08, 0.15)	79%
Bulgaria	3	1600	0.11	0.123	0.00	(0.11, 0.13)	(0.12, 0.12)	0%
Canada	6	2545	0.05	0.052	0.00	(0.02, 0.08)	(0.05, 0.05)	0%
China	8	4952	-0.03	-0.035	0.08	(-0.09, 0.02)	(-0.14, 0.07)	79%
Germany	3	1180	-0.03	-0.029	0.00	(-0.05, -0.01)	(-0.03, -0.03)	0%
Japan	3	1286	-0.00	-0.001	0.09	(-0.10, 0.10)	(-0.12, 0.11)	82%
Spain	6	2903	0.05	0.059	0.03	(0.02, 0.10)	(0.02, 0.10)	42%
Sweden	6	6010	-0.00	-0.003	0.04	(-0.04, 0.03)	(-0.05, 0.04)	59%
UK	3	11,704	0.01	0.012	0.02	(-0.02, 0.04)	(-0.02, 0.04)	75%
Other	19	9744	0.00	0.002	0.08	(-0.03, 0.04)	(-0.10, 0.10)	73%
By success type								
Subjective success	18	5830	0.08	0.09	0.06	(0.05, 0.12)	(0.01, 0.16)	50%
Firm size	32	30,427	0.07	0.07	0.06	(0.05, 0.09)	(-0.01, 0.15)	83%
Financial success	41	27,387	0.03	0.04	0.09	(0.01, 0.06)	(-0.08, 0.15)	83%
Firm survival	16	6872	-0.01	-0.01	0.09	(-0.05, 0.03)	(-0.10, 0.08)	68%
Growth	28	23,794	-0.05	-0.05	0.06	(-0.08, -0.03)	(-0.13, 0.02)	69%

Note. \bar{r} = sample weighted average observed effect size; $\hat{\rho}$ = estimated population effect size, after correcting for measurement error in the criterion; $SD_{\hat{\rho}}$ = the standard deviation of population effect size; K = number of studies; N = total sample size; CI = confidence interval; CV = credibility interval; I^2 = the percentage of the variance that is not due to statistical artifacts.

Table 3
Meta-analytic regression results.

Moderator	B	SE	p	R ²	k	N
(Constant)	-0.328	0.097	0.001			
Mean of age	0.008	0.002	0.000	0.141	70	41,724
(Constant)	-0.008	0.019	0.699			
Female percentage	0.127	0.055	0.021	0.081	64	39,646
(Constant)	0.051	0.026	0.048			
Firm age	-0.004	0.003	0.153	0.041	38	30,554
(Constant)	0.067	2.772	0.981			
Publication year	0.000	0.001	0.972	0.000	102	65,753

Note. B = raw beta weight; SE = standard error; R² = variance explained.

the sample's mean age has a significant effect on the effect size of age ($B_1 = 0.008, p = .000$), accounting for about 14% of the variance. Fig. 3 is the scatter plot of all effect sizes. The size of each bubble represents the sample size, and the dashed lines represent the estimated linear trend and the dotted lines represent the 95% CI. We note that the y-axis is effect size (a correlation between age and success), instead of success per se. When the mean age is 29 (the youngest mean age), the effect size is negative (-0.10), suggesting a negative slope for the age-success relationship. But as mean age increases, the negative slope becomes gradually flatter (i.e., closer to zero). For samples with a mean age of 41, which is 12 years (=0.10/0.008) after the youngest mean age of 29, the slope becomes completely flat. Then it turns slightly positive with each additional year in mean age. For samples with a mean age of 53 (12 years older than 41), the effect size is quite positive (0.10). Because the correlation slope begins negative, reaches zero, and then

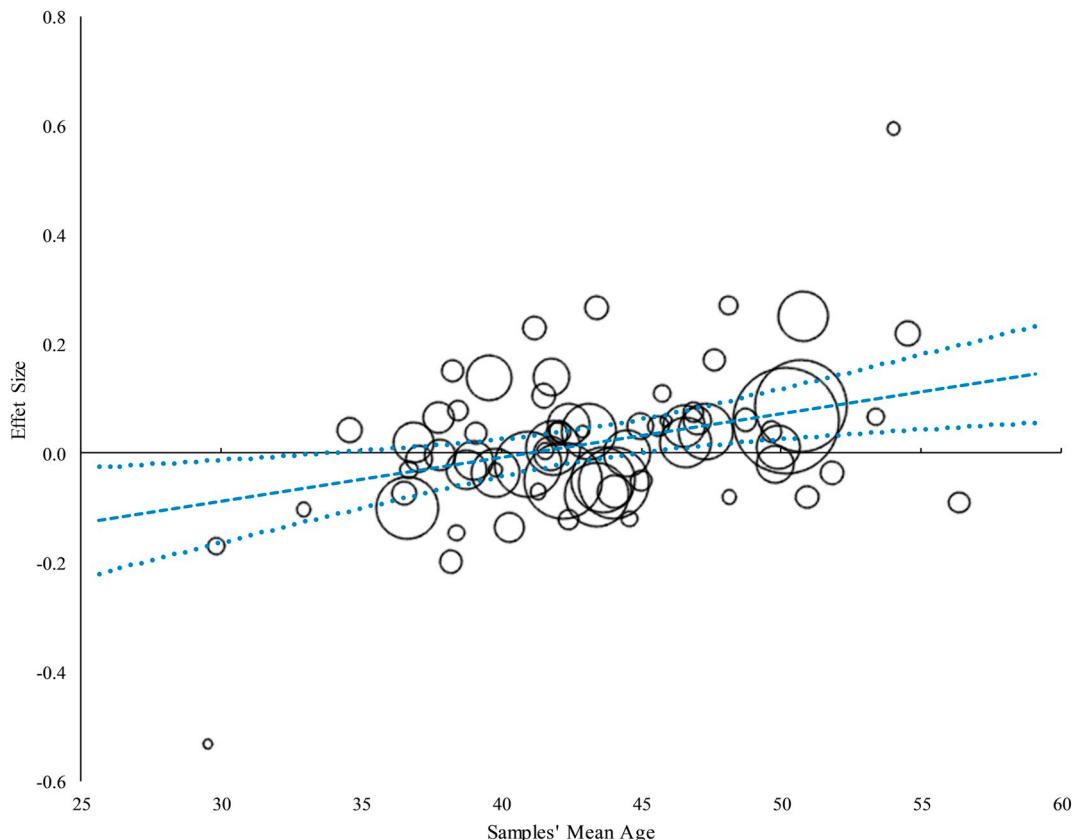


Fig. 3. Scatter plot showing the moderating effect of samples' mean age.

Note. k = 70. The y-axis is effect size (correlation between age and success) instead of success per se. Each circle represents one effect size, and the circle size reflects its sample size. The dashed line represents the estimated linear trend, and the two dotted lines represent the confidence interval for the linear trend.

becomes positive, it implies a possible U-shaped relationship between entrepreneurs' age and success at the subject level, with the assumption that the mean age is representative of most subjects' age in that sample.

An alternative way to establish a U-shaped relationship between entrepreneurs' age and entrepreneurial success is a positive effect of the age² term. Only two primary studies in our analyses, namely Gimeno et al. (1997) and Storey (2004), reported the effect size of age². We loosened our definition of entrepreneurs to include self-employed workers (e.g., independent investors, freelance writers, or farmers) to identify two additional studies with such data, namely Bruce (2002) and Dawson (2017). Then, we performed a post-hoc meta-analysis on the effect sizes from these four studies using the same techniques introduced above and found a positive average effect size for age² ($\hat{\rho} = 0.06$, and the CI does not include zero). Such evidence supports a U-shape relationship between entrepreneurs' age and entrepreneurial success at the subject-level. In other words, both younger and older entrepreneurs' success levels tend to be higher than that of the middle-aged. Nevertheless, this result should still be interpreted with caution because the number of primary studies was small, and the earlier definition of entrepreneurs was relaxed.

Research Question 3 examines the role of gender in the relationship between age and success. We operationalized gender as the female percentage of the sample. Table 3 shows that the female percentage is significantly related to the effect size of age ($B = 0.127$, $p = .021$), explaining about 8% of the variance in effect size. Fig. 4 shows the scatter plot of effect sizes by the samples' female percentage, with the size of each bubble weighted by sample size. Age has a nearly zero linear effect on success for male-only entrepreneurs (i.e., when female percentage = 0, $\hat{\rho} = -0.008$), which is similar to the nearly zero linear effect size for the overall entrepreneur population. Older male entrepreneurs are as successful as younger male entrepreneurs. As the female percentage of the sample increases, the effect size of age increases. For all-female samples (i.e., when female percentage = 1), $\hat{\rho}$ becomes 0.13, suggesting that older female entrepreneurs tend to be more successful than younger female entrepreneurs.

Research questions 4 asks about entrepreneurs' tenure running the current firm. Seasoned entrepreneurs may perform differently than nascent entrepreneurs of the same age. Entrepreneurs are founders, so their tenure running the firm can be captured by firm age. We test whether firm age is related to the effect size of age in a meta-regression using 38 studies that reported their sample's mean firm age. Results in Table 3 shows that samples' mean firm age does not affect the correlations between age and entrepreneurial success ($B = -0.004$, $p = .153$), suggesting that the correlation between entrepreneurs' age and success remains robust, regardless of the average tenure of the entrepreneurs at the time of the survey. It thus justifies the inclusion of mixed samples of nascent entrepreneurs and seasoned entrepreneurs for the meta-analysis, and it suggests the tenure effect and selection bias are not significant problems when we study entrepreneurs' age.

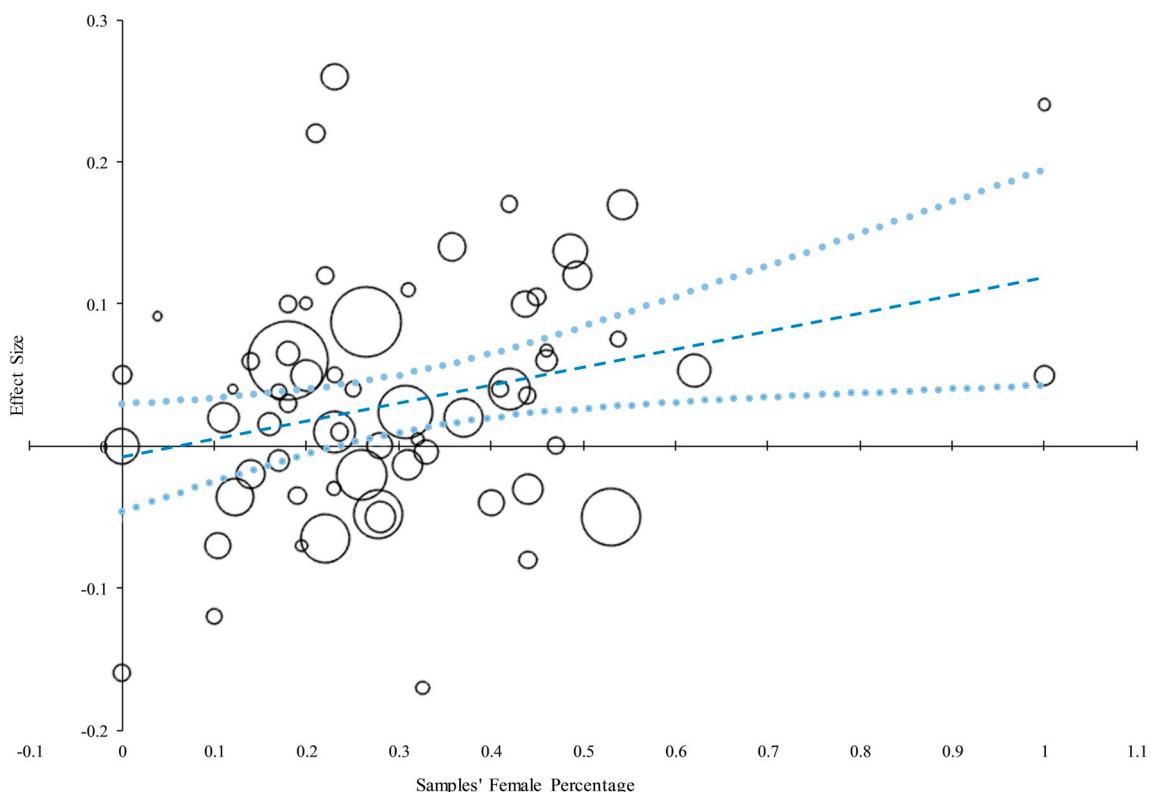


Fig. 4. Scatter plot showing the moderating effect of samples' female percentage.

Note. $k = 64$. The y-axis is effect size (correlation between age and success) instead of success per se. Each circle represents one effect size, and the circle size reflects its sample size. The dashed line represents the estimated linear trend, and the two dotted lines represent the confidence interval for the linear trend.

4.3. Robustness checks

We checked several contextual or methodological factors that can potentially influence the robustness of the age effect. First, we investigated the studies' publication years, because socioeconomic conditions and cultural norms evolve, making the effect sizes reported a few decades ago possibly different from those reported recently. We regressed the publication year on the effect size of age, and find that publication year, in general, does not affect age's effect ($B = 0.000, p = .972$; see [Table 3](#)).

Second, we examined samples' country of origin, which serves as a proxy for national culture and socio-economic conditions. People in different countries may have different levels of social support and encouragement toward older entrepreneurs, and the existence of a reliable welfare system will encourage older entrepreneurs to invest more in their firms. Samples included in this meta-analysis come from 27 countries. If a sample was drawn from multiple countries, it is excluded from the subsequent analyses. If there were two or more primary studies from the same country, we calculated a single effect size using the meta-analytic procedure. Samples were most frequently drawn from the United States ($k = 44$), followed by China ($k = 8$), Canada ($k = 6$), Spain ($k = 6$), and Sweden ($k = 6$). We color these countries in the world map in [Fig. 5](#), with the blue color representing the most negative effect size and the yellow representing the positive effect size. From the map, we can see that the US and Canada have similar colors, and China and Japan have similar colors, which makes sense, given that regional neighbors share relatively similar cultures. In contrast, countries in Africa show quite different colors, with some neighboring countries having opposite effects. Because these countries have only one or two primary studies, more studies are needed before conclusions can be drawn for Africa. Furthermore, we note the absence of data from many developing countries in the Middle East, Africa, and Latin America, and encourage scholars to explore the relationship between age and entrepreneurial success in these regions of the world.

Next, we compared the countries for which we have more than three studies and show these effect sizes and CIs in [Fig. 6](#). Age has a slightly positive effect in Bulgaria, Spain, Canada, and the US, a slightly negative effect in Germany, and a zero effect in China, Japan, Sweden, UK, and other countries. Thus, the effect size of age is not the same across all regions of the world. We note, however, that the effect size remains close to zero. The CVs are narrow and the I^2 statistics are close to zero (see [Table 2](#)) for Bulgaria, Canada, and Germany, suggesting a homogeneity in effect sizes from those countries. For all other countries, the CVs are wide, and the I^2 statistics are above the 25% threshold, suggesting heterogeneity and the need to search for other moderators.

Lastly, we checked the influence of the success measures used in primary studies. There are five commonly used success measures: financial success (e.g., income, profit, and sales), firm survival, firm size, growth, and subjective success (e.g., satisfaction). These measures do not necessarily converge at the time of measurement. For example, entrepreneurs may feel highly satisfied with a modest income, or they may achieve a high level of sales growth at the cost of a lower profit. For a better understanding, we need to parse out any differences associated with specific measures of success.

The subgroup comparison results are available in [Table 2](#), and we visualize the effect sizes and their confidence intervals in [Fig. 7](#). Age has a slightly positive effect on subjective success, firm size, and financial success, a slightly negative effect on growth, and zero effect on firm survival. So, the effect size of age indeed varies by the type of success measures. Older entrepreneurs tend to have higher or equivalent levels of success in most success measures, but they experience a slower growth rate. Thus, the effect size of age

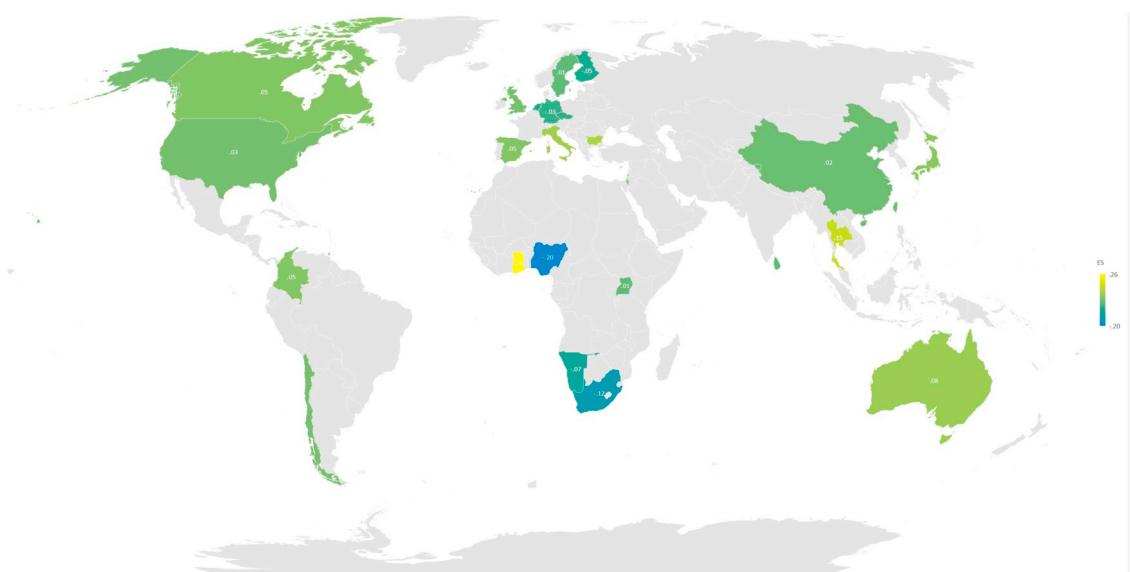
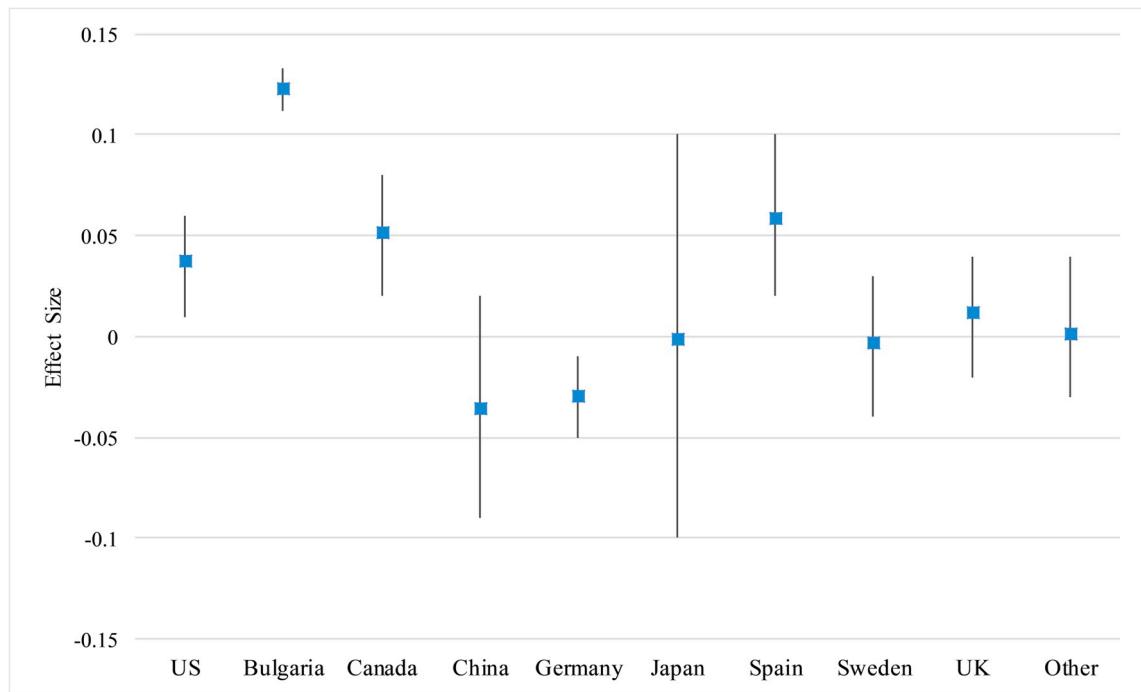
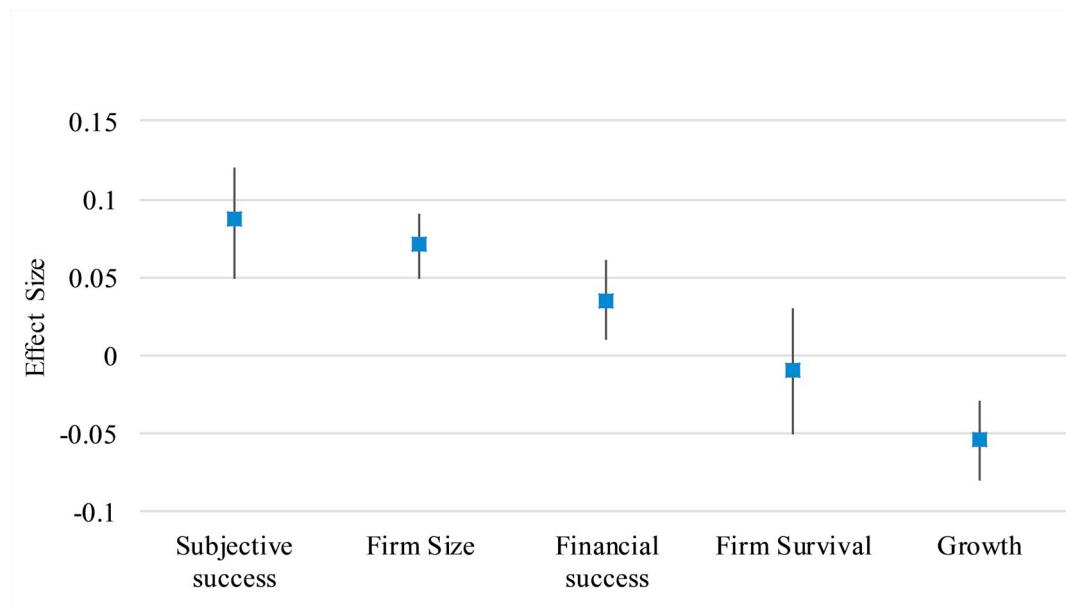


Fig. 5. Effect size across the world.

Note. Blue represents a more negative effect size, and yellow represents a more positive effect size. Only nine from these 27 countries contributed more than three primary studies each. A high-resolution color map is available at <http://bit.ly/MAP32AGE> (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

**Fig. 6.** Effect size comparison by the sample's location.

Note. The solid lines are 95% confidence intervals with the point estimates in the middle.

**Fig. 7.** Effect size comparison by success measure.

Note. The solid lines are 95% confidence intervals with the point estimates in the middle.

is not the same across all regions of the world. We note, however, that the effect size remains close to zero. The CVs are wide, and the I^2 statistics are above the 25% threshold for all types of success measure, suggesting the existence of other potential moderators.

5. Discussion

From our review and analyses, a simple answer to the question “is entrepreneurship a young person's game?” is “no”. Through the meta-analysis, we reject the stereotype that youth is a key trait of successful entrepreneurs. Furthermore, our results show that the

relationship between age and entrepreneurial success is complex and subject to influences of various contingency factors, such as entrepreneurs' life stage and gender, although it is not affected by entrepreneurs' tenure. So far, although entrepreneurs' age is sometimes included as a control variable in empirical studies, the theoretical rationale for such inclusion is often unclear, and reported effects are often neglected. Our results confirm the view that entrepreneurs' age deserves scholarly attention in its own right rather than being simply treated as a "control". We reviewed the literature to present diverse perspectives that can shed light on the effect of entrepreneurs' age on success, some of which stand in opposing directions. We do not intend to suggest a winning theory from among these competing perspectives, but rather to encourage more in-depth theorizing of age's effect and more rigorous designs in empirical studies based on our discoveries.

5.1. Comparison to employee-based meta-analyses

To highlight the theoretical contribution of our study in a broader context, we compare our findings to previous meta-analyses studying employees. Age is deemed such an important and intriguing variable that there have been a series of meta-analyses on employees' age and job performance or success (e.g., [McEvoy and Cascio, 1989](#); [Ng et al., 2005](#); [Ng and Feldman, 2008](#); [Sturman, 2003](#); [Waldman and Avolio, 1986](#)). But those analyses neglected entrepreneurs, and employees' career success (e.g., supervisors' performance ratings or promotion) are quite different from entrepreneurs' success (e.g., firm growth, survival, and profit). In this sense, current knowledge about the role of age in the workplace is not complete, and our study fills this gap.

When compared to other meta-analyses of age in the general management domain, our results show several similarities. For example, we find entrepreneurs' age only has a weak, positive relationship with their overall success ($\hat{\rho} = 0.02$, CI = 0.01 to 0.04), whereas [Ng and Feldman \(2008\)](#) reported that age has a similarly weak, positive relationship employees' overall job performance ($\hat{\rho} = 0.02$, CI = 0.02 to 0.03). We find age has positive effects on particular measures of success, but a negative or unrelated effect on other measures of success, with the effect sizes ranging from -0.05 to 0.09. Likewise, past meta-analyses based on employees (e.g., [McEvoy and Cascio, 1989](#); [Ng and Feldman, 2008](#); [Waldman and Avolio, 1986](#)) find that employees' age has positive effects on some types of performance, but negative or insignificant on other types of performance, with effect sizes in a similar range (e.g., between -0.02 to 0.08 in [Sturman, 2003](#)). So, the weak effect sizes and the inconsistent directions are not unique to the entrepreneurs' population.

There is one clear distinction between our results and previous employee-based meta-analytic findings. [Sturman's \(2003\)](#) and [Ng and Feldman's \(2008\)](#) meta-analyses reported an inverted U-shaped relationship between employees' age and overall performance, while our study shows the opposite, U-shaped relationship between entrepreneurs' age and success. The discrepancy in the shape of effect size distribution is probably due to the fact that entrepreneurial careers involve different resource commitments, job requirements, and success criteria compared to traditional careers, making people at a specific age more likely to succeed in one career but not in the other. For example, large organizations tend to be hierarchical ([Blau, 1972](#)). Young people at entry-level positions in large companies would not be deemed successful if judged by traditional success criteria such as salary, rank, or accomplishment. If young people start their own businesses, however, they are at the top of the firm's hierarchy, with the needed autonomy to decide and implement their own ideas and prove themselves. Busenitz and Barney (1997) argued that the job demands and resources for paid employment and entrepreneurship are so different that "entrepreneurs sometimes make bad managers" (p. 89). We concur, and believe the opposite direction is true as well: managers sometimes make bad entrepreneurs. Once people self-select into one career track and adjust to it over time, it may be difficult to switch to the other and continue to succeed. A middle-aged manager who is successful in a large company, if becoming an independent entrepreneur, may struggle due to a lack of resources and routines in the new venture. In this sense, our study is not a replication of previous meta-analyses. It confirms that entrepreneurs are not just top managers of smaller portfolios and that it is necessary to study entrepreneurs' careers separately.

5.2. Ideas for future research

It would be fruitful for scholars to build from the effects identified in our meta-analysis as a springboard for new research ideas. In fact, many of the theoretical perspectives we reviewed in [Table 1](#) have not been formally tested, leaving many opportunities for future research. Scholars should study the theoretical variable of interest directly instead of using age as a proxy of specific theoretical mechanisms. For example, the life span theory of adult development ([Kanfer and Ackerman, 2004](#)) proposes multiple development patterns that can potentially offset the effect of one another, which we believe are relevant for explaining entrepreneurs' overall maturity processes and success. Future research may test at which point entrepreneurs' growth of crystallized intelligence would completely compensate for the decline of their fluid intelligence, and whether a timely and planned role transition (e.g., from an engineer's role to a leader's role) will expedite the compensation. Based on organizational life cycle theory, [Ling, Zhao, and Baron \(2007, p. 691\)](#) argued that "small businesses will fail when owners or managers are reluctant to delegate to others as the firms grow and develop". The delegation they mentioned is one of the new skills demanded of the role transition recommended by the life span theory, even though each theory offers a unique focus (organization's life cycle vs. entrepreneur's life stage). Because both the organization and the entrepreneur are developing and evolving, scholars need to study whether entrepreneurs' success depends on the dynamic fit between the task requirements and entrepreneurs' age-related abilities, resources, and motivations.

A challenge to test about the intra-individual aging effect is that it must be studied through tracking a large cohort of entrepreneurs over decades with repeated measures of their cognitive intelligence, motivations, role identities, and success. Such a design would be expensive, but it would minimize selection bias that so often plagues studies of entrepreneurial success, because even those entrepreneurs who fail in the process are still accounted for. Panel studies like this, such as the Panel Study of Entrepreneurial

Dynamics (Reynolds, 2011), are ongoing but have not been designed to ask all of the questions necessary to test theories that may explain the age-success relationship. A more rigorous approach would be a cross-sequential design, which involves longitudinal tracking of different age cohorts (e.g., those born in the 1960s, 1970s, and 1980s, etc.) to further disentangle generational cohort differences from the effect of aging itself.

Gender's moderating effect is worthy of replication and expansion in future research. Our results show that age has almost no effect among male entrepreneurs but that a positive and significant effect among female entrepreneurs exists. Both age and gender are commonly used control variables. Compared to age, however, gender has received more scholarly attention, as scholars have attempted to explain why female-owned firms tend to underperform male-owned firms at the aggregated level (Rietz and Henrekson, 2000). For example, Robb and Watson (2012) argued that observed gender-related performance differences would disappear if key demographic variables, such as work experience and hours worked, are controlled. Our results are in line with Robb and Watson's view by showing that age, which is positively related to female entrepreneurs' work experience and hours available to their firms, plays a role in predicting female entrepreneurs' success.

There are inherent challenges for studies on the interaction between entrepreneurs' age and gender. For example, because male entrepreneurs outnumber female entrepreneurs, the majority of a random sample would be male, making the age effect negligible. Since entrepreneurship is a long and complicated business process, we cannot randomly assign people of certain ages and genders into entrepreneurial roles, or simulate such roles in a lab. Based on the results from our analysis, we encourage designers of future studies to over sample female entrepreneurs, or seek a matched sample, so that any differential age effects can be demonstrated fully. Traditional sampling channels tend to be biased and partial. For example, if the sample comes from professional organizations' directories, female entrepreneurs are likely to be underrepresented because females, especially stay-at-home moms, are likely to operate home-based businesses without much public information. If the sample comes from a university setting (e.g., through a university's incubator), the sample is likely to be mostly students or recent graduates, failing to represent older entrepreneurs. Researchers may try innovative channels, such as social media and snowball sampling techniques, to identify and access older entrepreneurs and female entrepreneurs.

Through the robustness checks, we found the type of success measure used as a dependent variable can help explain the variance in age's effects on entrepreneurial success. We find that older entrepreneurs have slightly higher satisfaction levels, larger firms, greater financial success, and the same chance of survival as younger entrepreneurs. Their only disadvantage is slightly lower growth rates, an artifact of their companies' larger sizes. Older entrepreneurs tend to have larger businesses, so older entrepreneurs are "punished" for having a larger denominator in the calculation of growth, putting them in an unfair position if growth is the sole measure of success. So, including multiple success measures can improve the content validity of the overall success measure.

Beyond individual entrepreneurs' age, we call for studies on the age structure of entrepreneurial teams, because many entrepreneurs work in teams. Given that older entrepreneurs exhibit different types of cognitive and social strengths and weaknesses than younger ones, the team's composition can work as a compensating mechanism for areas of vulnerability in the entrepreneur, and heavily influence entrepreneurial outcomes. Future studies can compare founding teams of the same age (e.g., college classmates) and teams of different ages, and investigate how members of each type of team can collaborate to maximize their chance of success.

5.3. Limitations

Our study has several limitations that need to be addressed in future research. First, we note that our discussion is limited to the "regular" age range covered by the primary studies, with the mean age ranging from 29 to 59. Our findings may not apply to entrepreneurs who did not reach adulthood (e.g., below 18), or who are beyond typical retirement age (e.g., above 70). These two groups are likely to experience unique problems related to their age. Very young entrepreneurs may face age-related restrictions when registering a business, applying for a loan, renting a car, or entering a bar to meet a client. At the same time, they may be viewed by partners and consumers as not credible for serious business. For entrepreneurs aged 70 or above, health problems may begin to prevail, and they are more likely to plan on successions. Researchers should take into consideration such special restrictions and motivations when studying entrepreneurs at very early and very late life stages.

Second, our meta-analyses are conducted at the sample level, based on the assumption that the sample level statistics (e.g., mean age) are representative of all subjects in the sample. This assumption is not always true, so it would be necessary for future studies to replicate our findings in an empirical study with a large sample size. A significant effect of age² from the raw data of an empirical study, for example, will be needed to confirm the U-shaped relationship between age and entrepreneurial success from our exploratory study.

5.4. Practical implications

Older entrepreneurs deserve attention from our society. We echo Schramm's (2018) observation that we should look beyond the "glamorous (and inevitably rare) tales of youthful success in Silicon Valley." Younger people, such as college students, often receive support in the form of entrepreneurship courses, incubator facilities, and sizable seed funds (Vanevenhoven and Liguori, 2013). To foster entrepreneurship at a larger scale, government agencies, banks, universities, and business incubators should identify channels to reach and help older adults as well.

Female entrepreneurs' better performance at an older age offers hope for younger female entrepreneurs who tend to face obstacles in their early careers. Our findings suggest they should not give up too readily, because their chance of success increases as they move to later life stages, and their perseverance tends to pay off ultimately. External stakeholders need to extend help to support them

through relatively unfavorable environments.

Our meta-analysis shows that early midlife entrepreneurs (e.g., those in their early-30s to early-40s) tend to experience a performance decline. According to life-span theory (Kanfer and Ackerman, 2004), midlife is a challenging span where the loss effect continues to happen while the growth effect has not accelerated, and reorganization and exchange processes may disrupt existing routines. Childcare and eldercare obligations also require valuable time and financial resources, and entrepreneurs do not have parental leave or daycare benefits. Thus, although it is generally commendable to pursue one's entrepreneurial aspiration, we suggest that early mid-life individuals carefully evaluate all of the resources at hand and take a realistic view of this career path before taking the leap.

5.5. Conclusion

Our society can enjoy significant benefits by helping a more diverse population of entrepreneurs to succeed. This study provides much-needed insight into how a very commonly used demographic variable, age, actually has complex relationships with entrepreneurial success. Multiple age-related theoretical mechanisms may intertwine and cancel out the effects of one another. Scholars can calculate the overall effect but cannot conclude which underlying mechanisms are influencing it and how. This exploratory study is an initial but necessary step to help inform entrepreneurship research about the theoretical need and practical value of including age in a multivariate model of new venture creation and growth, and to offer suggestions to increase the rigor of empirical studies. Studies that seek to develop richer theories by explaining the reasoning behind the age-entrepreneurial success relationship are desperately needed. We advocate additional research attention to address the unique promises and challenges that younger, mid-life, and older entrepreneurs face.

CRediT authorship contribution statement

Hao Zhao:Conceptualization, Methodology, Investigation, Formal analysis, Visualization, Writing - original draft, Data curation.**Gina O'Connor:**Writing - review & editing.**Jihong Wu:**Investigation.**G.T. Lumpkin:**Writing - review & editing.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jbusvent.2020.106007>.

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¹ Primary studies are listed separately in the online supplement.

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