

Boomer Entrepreneurs: Age and Type

Ting Zhang, University of Baltimore, tzhang@ubalt.edu

Zoltan Acs, George Mason University, zacs@gmu.edu

ABSTRACT

This study extends the occupational choice model to explore age effects for eight different types of boomer entrepreneurs. The empirical study relies on monthly Current Population Survey data across 11 years (2006-2016). Multilevel mixed-effects logistic regression models are estimated to incorporate individual- and metropolitan-level effects. Among boomer entrepreneurs, we find that *novice*, *opportunity novice*, *part-time*, and *unincorporated* entrepreneur rates rise at higher ages (55 and above), with a slightly n-shaped age effect for *non-novice/switcher* (versus *novice/switcher*), *necessity novice* (versus *opportunity*), *full-time* (versus *part-time*), and *incorporated* (versus *unincorporated*) boomer entrepreneurs. We also identify determinants such as race, health, marital status, education, and work history, with opposite effects for each pair of entrepreneur types, and end by comparing the driving forces for boomer and non-boomer entrepreneurs.

KEYWORDS: Boomer entrepreneurs, *novice* entrepreneurs, *necessity* entrepreneurs, *opportunity* entrepreneurs, *full-time* entrepreneurs, *part-time* entrepreneurs, *incorporated* entrepreneurs, *unincorporated* entrepreneurs

JEL CODES: J24, L26

ACKNOWLEDGMENTS

The authors acknowledge the Ewing Marion Kauffman Foundation for its generous grant support for this study. The content of this study is solely the responsibility of the authors and does not

necessarily reflect the views of the Kauffman Foundation. The authors thank Simon Parker and Enrico Santarelli for their valuable comments.

Boomer Entrepreneurs: Age and Type

I. INTRODUCTION

Baby boomers are the large, unique post-World War II demographic cohort that followed the “silent generation” and rose with the knowledge economy. Skillful, educated, innovative, and transformational, boomer entrepreneurs have literally transformed society. Without boomer entrepreneurs like Steve Jobs, Bill Gates, Jeff Bezos, and Jack Ma, our society would not be what it is today. One company, Apple Inc., changed the world with one transformative product: the iPhone. As Nobel Laureate Ronald Coase points out, “As economists, we are interested in entrepreneurship not for the heroic personalities of entrepreneurs, [...] but [for] their lasting impact on the economy, such as novel products, [...] new firms and new markets” (Terjesen & Wang, 2013, p. 180). As the boomer generation has aged, it is interesting to observe what has happened to its entrepreneurial prowess. Unlike prior generations, boomers’ human capital (education and health), physical capital, and social capital (Lee & Vouchilas, 2016) enable them to continue to pursue outstanding entrepreneurial opportunities beyond the usual age of retirement.

Conventional wisdom maintains that older entrepreneurs are predominantly unproductive *necessity* or *part-time* entrepreneurs. However, boomers’ age trajectory and entrepreneur types likely differ from prior generations, for three main reasons: (1) the knowledge economy equips aging boomers with better human, social, and physical capital, and that capital is particularly valuable for certain entrepreneur types; (2) growing up in America’s Golden Age of Capitalism—the post-World War II economic expansion—and leading America’s Golden Age of Innovation—the late 20th and early 21st centuries (Akcigit, Grigsby, & Nicholas, 2017),

boomers)—are particularly transformational;¹ and (3) while evidence that older people are more entrepreneurial is not necessarily conclusive, the importance of the age effect could lie in the fact that certain types of entrepreneurs are more common at an older age.

The baby boomer generation had the glory of shifting the technological frontier through the innovations of Schumpeterian entrepreneurs. As this cohort ages, however, it may become less likely to be at the cutting edge of new technologies. Boomer entrepreneurs may instead have the skill set to engage in Kirznerian entrepreneurship by identifying opportunities for enhanced market efficiency.² When boomers age, their entrepreneurial willingness and intention may decrease (Le´vesque & Minniti, 2006) and they may have fewer novel ideas, but they may have increasing entrepreneurial opportunities (Blanchflower, Oswald, & Stutzer, 2001). This means they are more likely to become pro-Kirznerian entrepreneurs.

What specific entrepreneur types are boomers likely to be and what factors are driving them? While boomer entrepreneurs could have a positive effect on the economy on several fronts, including increasing tax revenue, creating jobs, and relieving fiscal pressure, our understanding of the entrepreneurial prowess of the aging boomer generation is limited. Exploring the age trajectory and the different types of boomer entrepreneurs is critical to our understanding of who these older entrepreneurs are, why they continue to be entrepreneurial, and what leads them to become a particular type of entrepreneur.

The purpose of this paper is to gain a better understanding of the effects age and other factors have on various types of boomer entrepreneurs. It first explores the age-trajectory tension

¹ This transformational attribute is socioeconomically constructed. This especially transformational cohort could be more involved into certain entrepreneurial types, such as novice and opportunity entrepreneurs that are not typically associated with other adults.

² “Kirzner’s entrepreneur is a person who discovers previously unnoticed profit opportunities. The entrepreneur’s discovery initiates a process in which these newly discovered profit opportunities are then acted on in the marketplace until market competition eliminates the profit opportunity” (www.econlib.org/library/Enc/Entrepreneurship.html).

between declining entrepreneurial intention (Levesque & Minniti, 2006) and increasing entrepreneurial opportunities (Blanchflower et al., 2001) and activities (Fairlie, Morelix, Reedy, & Russell, 2015) among eight different entrepreneur types (four pairs). Second, for the first time it extends the occupational choice model to different types of boomer entrepreneurs and identifies their different age effects and other driving factors.

While *non-novice/switcher*, *necessity*, *full-time*, and *incorporated* entrepreneur rates decrease with older age (55 and above), *novice/switcher*, *opportunity*, *part-time*, and *unincorporated* entrepreneur rates rise as people age. Driving factors such as race, health, marital status, education, and work history are identified with opposite effects on *non-novice/switcher*, *opportunity*, *full-time*, and *incorporated* as compared to *novice/switcher*, *necessity*, *part-time*, *unincorporated* entrepreneurial propensities³. Finally, three sets of multilevel mixed-effects logistic regression models are empirically tested using monthly individual- and metropolitan-level Current Population Survey (CPS) data for the years 2006-2016. The first set estimates the determinants for workers' entrepreneurial propensities. The second and third sets estimate the determinants for the four contrasting pairs of entrepreneur types, the former only among boomer entrepreneurs and the latter only among non-boomer entrepreneurs. Different driving forces for boomer versus non-boomer entrepreneurs are also identified across models.

The rest of this paper extends the occupational choice model to include boomers' entrepreneurial propensities and examines eight types (four pairs) of boomer entrepreneurs.

Section II reviews the literature, section III develops the hypotheses to be tested, and section IV

³ *Novice* entrepreneurs are those who become entrepreneurs for the first time. *Opportunity* entrepreneurs start a new venture to realize a business opportunity, whereas *necessity* entrepreneurs are pushed to start a business with no better career alternatives. *Full-time* boomer entrepreneurs work more hours than *part-time* boomer entrepreneurs. *Incorporated* and *unincorporated* entrepreneurs are respectively incorporated and unincorporated self-employed workers.

examines the data and presents summary statistics. Section V presents the empirical model and the variables, section VI provides the results, and the final section presents the summary and limitations of the study.

II. LITERATURE REVIEW

The baby boomers, as a heterogeneous and particularly transformational cohort born between 1946 and 1964, differ from other generations. Boomers have been leading U.S. society into industrial glory with the creation of the knowledge-based economy and previously unimaginable experiences of the digital age. Boomers are less ethnically and racially diverse than younger generations, have higher marriage rates between ages 18 and 33 (Pew Research Center, 2011), and have better physical, social, and human capital. Compared to previous generations, boomers are more likely to be college graduates, be healthier, and have higher incomes (Lee & Vouchilas, 2016). This section documents the literature on boomers' propensity for entrepreneurship as an occupational choice, on age and entrepreneurship, on aging boomers ranging from Schumpeterian to Kirznerian entrepreneurs, and on different types of boomer entrepreneurs.

Occupational Choice

Previous entrepreneurship research has identified many interesting factors related to entrepreneurial propensity, which include human capital such as education (Berkovec & Stern, 1991; Parker, 2009; Velilla & Ortega, 2017) and health (Zhang & Carr, 2014); unemployment rates (Blanchflower & Oswald, 1998; Fairlie & Fossen, 2017; Zhang, 2008); prior (quasi-)entrepreneurial experience (Fuchs, 1982; Hsu, Shinnat, Powell, & Betty, 2017); wealth (Evans & Leighton, 1989; Parker & Rougier, 2007; Schmalz, Sraer, & Thesmar, 2017); gender

(Blanchflower, 2000; Hörisch, Kollat, & Brieger, 2017); race (Friedline & West, 2016); and urban residence (Glaeser, 2007). Responsibility for family care (Walker, Grant, Meadows, & Cook, 2007) and support (Zhang & Carr, 2014) are also factors that determine entrepreneurial pursuits.

Utility theory has been used to characterize boomers' decisions regarding tradeoff between work retirement and leisure, e.g., Blanchflower, 2000; Lévesque & Minniti, 2006). This theory assumes that boomers attempt to maximize utility:

$$\text{Max } U(\text{work, leisure}).$$

Budget constraints also come into play. Choices regarding consumption (C) are subject to income (Y), the amount of which is typically based on total hours a person works (H) and other income (O). Boomers choose their hours of work (H) to maximize their utility, which is subject to the income constraint (Y), that is:

$$U(C_i, H_i), \text{ where } C_i = Y_i.$$

There are some tradeoffs that are important to consider. On the one hand, working more can generate more income, which can allow for more consumption. On the other hand, boomers may maintain a limited number of hours of work (possibly less than full-time) after retirement to improve their life quality (Kautonen, Kiblera, & Minniti, 2017). A transformational cohort, boomers' work and leisure preferences could differ from those of other generations; more importantly, their preferences could differ according to their entrepreneurial type.

To maximize their utility, which is subject to the income constraints, people choose their total hours of work (H) and allocate hours (h) for occupational choices, such as entrepreneurship versus wage-and-salary work or various types of entrepreneurship:

$$U(C_i, H_i, h_i), C_i = Y_i.$$

If retired, the entrepreneur's business income and wage-and-salary income would both be 0; if a person is only a wage-and-salary employee, their business income would be 0; if a person is only an entrepreneur, their wage-and-salary income would be 0; if a person is both an entrepreneur and a wage-and-salary employee of another employer, they would have both business income and wage-and-salary income. Wage-and-salary income refers to income from working for someone else, while the entrepreneur's business income refers to income from working for oneself. Model (1) characterizes a person's income as follows:

$$Y_i = \underbrace{G(\cdot) * f(K_i) * h_i}_{\text{Entrepreneur's Business Income}} + \underbrace{W_i * (H_i - h_i)}_{\text{Wage-and-Salary Income}} + O_i \quad \text{Model (1)}$$

This utility model explains workers' participation in entrepreneurship. In the model, a worker's total income (Y) depends on an entrepreneur's business income, wage-and-salary income, and other income (O). An entrepreneur's business income depends on an individual worker's entrepreneurial ability ($G(\cdot)$), physical capital (K), and hours worked as an entrepreneur (h). A worker's wage-and-salary income depends on the worker's wage rate (W) and hours worked for the wage-and-salary job ($H-h$). $G(\cdot)$ is a function for individual entrepreneurial ability; $f(\cdot)$ is a production function that depends on the capital (K) invested in the business.

Age and Entrepreneurship

The occupational choice model explains factors for entrepreneurial propensity but does not explain the age effect. Although previous literature has addressed the effects of age on entrepreneurship, its effect on the propensities of different entrepreneur types has not been

gender, race, and marital status, and the local business cycle, represented by local unemployment rate (U). The age effect (Age) results from different stages of the life course.

The reason educational attainment (Edu), health ($Health$), and prior working experience (Exp) become particularly important is that human capital (Edu and $Health$) and social capital (Exp) become key driving forces in providing opportunities to become entrepreneurs (Berkovec & Stern, 1991; Blanchflower et al., 2001; Parker, 2009; Velilla & Ortega, 2017). In the knowledge economy, which is driven by knowledge and innovation rather than by physical capital and labor alone, human capital is the leading economic engine. Entrepreneurship facilitates knowledge spillover, from the source creating that knowledge to its commercialization (Acs, Audretsch, Braunerhjelm, & Carlsson, 2010).

Aging Boomers' Entrepreneurship: From Schumpeterian to Kirznerian Entrepreneurs

Model (2) incorporates age into the occupational choice model via the effect it has on both entrepreneurial ability and choice of entrepreneur types. Baumol (1990) contributed to the body of entrepreneurship literature by differentiating between three types of entrepreneurship: productive, unproductive, and destructive. Productive entrepreneurship is comprised of activities that create wealth; unproductive entrepreneurship merely redistributes existing rents (wealth); and destructive entrepreneurship destroys economic rents. Productive entrepreneurship can be divided further into two types: Schumpeterian entrepreneurship (Schumpeter, 1934) and Kirznerian entrepreneurship (Kirzner, 1973). The former, which is about innovation and technological changes, shifts out the technological frontier. The latter, which is about identifying inefficiency and exploiting existing business opportunities, moves the economy toward the technological frontier.

The baby boomer generation has been about shifting the technological frontier through innovation and by introducing new products into the economy; many boomers were Schumpeterian entrepreneurs. As this cohort has aged, it may be gradually shifting away from the technological frontier and becoming less likely to be on the cutting edge of new technologies. That said, it also may now have developed the skill set needed to engage in Kirznarian entrepreneurship by identifying opportunities and moving the economy toward the frontier. This shift from Schumpeterian to Kirznerian entrepreneurship might not be the result of age alone but also of economic change. Acs, Lafuente, Sanders, and Szerb (2017) note that the positive effect Kirznerian entrepreneurship has on improving efficiency holds only in periods of sustained economic growth, while the positive effect Schumpeterian entrepreneurship has on technical change is consistent over the long run, regardless of economic cycles. The boomers' uniqueness comes not only from their greater human, social, and physical capital but from the unique economic background they have experienced.

Biologically, older individuals may have more difficulty producing novel ideas than younger ones, but this does not necessarily mean they are less productive. People have both crystallized intelligence and fluid intelligence. Crystallized intelligence is a form of acquired knowledge and is usually stable until late in life; fluid intelligence is the ability to solve novel problems quickly and it begins to decline in the 20s or 30s (Schulz & Salthouse, 1999). Although older workers may have a disadvantage in terms of fluid intelligence and become less likely to be Schumpeterian entrepreneurs, they may have an advantage in terms of crystallized intelligence and thus be able to rise in Kirznerian entrepreneurship. This stable and accumulative crystallized intelligence enables older boomers to identify existing market inefficiencies and see opportunities that will enhance economic productivity. Therefore, they may continue to be

productive, for example, pro-Kirznerian *opportunity* entrepreneurs; moreover, this trend does not necessarily decline with age.

The evolutionary and revolutionary nature of Schumpeterian entrepreneurship normally takes some time to develop and it could take much longer to redeem the utility wage. The aforementioned decline in entrepreneurial willingness and intention as one ages could occur more among Schumpeterian entrepreneurs, due to the future higher discount rate of wage utility with high opportunity cost of time at an older age. In contrast, the aforementioned increasing entrepreneurial opportunity could be related more to Kirznerian entrepreneurship, because it has a strong path dependency on the current market equilibrium. To further explore whether the nature of aging boomers' entrepreneurship is productive entrepreneurship and whether it is Schumpeterian or Kirznerian—we further investigate eight types (four pairs) of entrepreneurs.

Types of Entrepreneurs

The current literature on boomer entrepreneurship is thin, particularly on the different types of boomer entrepreneurs, who clearly are not a homogeneous group. Anokhin, Grichnik, and Hisrich (2008) argue that *non-novice* and *novice entrepreneurs*, for example, have significantly different skills, competencies, and information. *Novice* entrepreneurs are those who become entrepreneurs for the first time, tend to have limited information and networks, and to be located in urban centers, as they might not have as much mature network that *non-novice* boomer entrepreneurs can go free off.

One of the most prominent differences between *opportunity* and *necessity* entrepreneurs is their motivation for starting a business (Block & Wagner, 2010; Reynolds et al., 2005; Van der Zwan, Thurik, Verheul, & Hessels, 2016). *Opportunity* entrepreneurs start a new venture to

realize a business opportunity, whereas *necessity* entrepreneurs are pushed to start a business because they consider all other alternatives unsatisfactory (Bergmann & Sternberg, 2007; Kautonen & Palmroos, 2010; Reynolds et al., 2005). The terms *opportunity* and *necessity* entrepreneur emerged in 2001 to refer respectively to entrepreneurship “reflecting the voluntary pursuit of *opportunity*” and “reflecting a necessity to engage in entrepreneurship when there is an absence of employment opportunities” (Reynolds et al., 2005, p. xv); they are driven by “pull” and “push” factors, respectively (Van der Zwan et al., 2016). Block and Wagner (2010), who suggest that the two groups vary in terms of age, gender, region, and perceived risks, argue that policies for entrepreneurship should be based on the types of entrepreneurs they pertain to. *Opportunity* entrepreneurs, for example, are expected to be more closely connected to the labor market than *necessity* entrepreneurs and to provide more job opportunities; this suggests that *opportunity* boomer entrepreneurs have an advantage in terms of productivity and socioeconomic status.

Previous literature states that many older *necessity* entrepreneurs were pushed into entrepreneurship because they were unemployed or dissatisfied with their wages (De Kok et al., 2010; Weber & Schaper, 2004). Kautonen (2008) writes that older workers are less likely to find alternative career opportunities in the labor market, which drives many to become *necessity* entrepreneurs. However, older *opportunity* entrepreneurs start businesses because of their interest in financial success (Weber & Schaper, 2004) or in self-realization (Kautonen et al., 2017), and in the personal ambition, success, and lifestyle they cherish (Zhang, 2008).

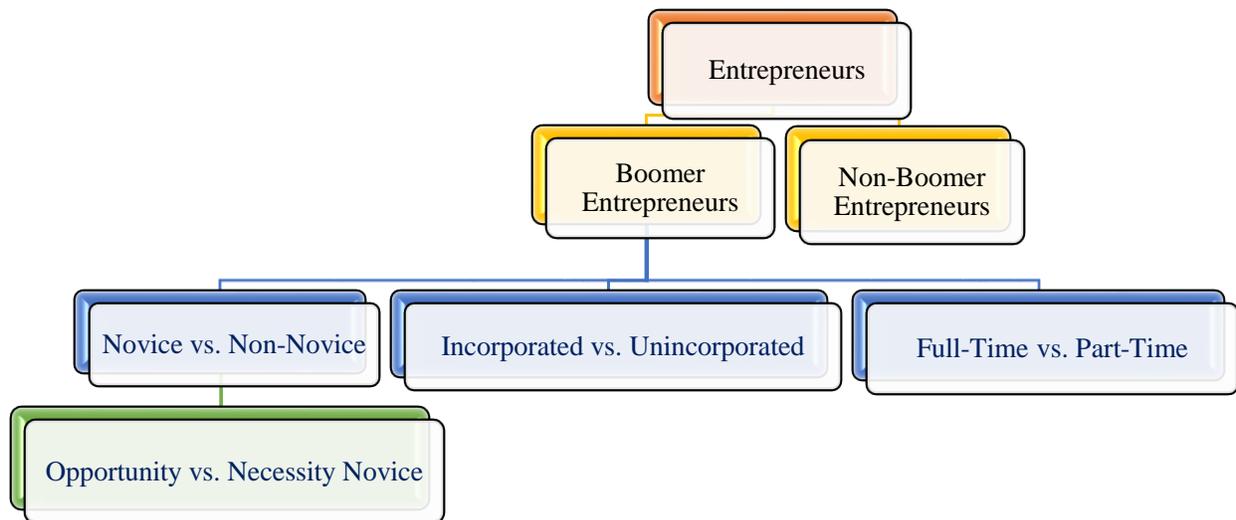
Levine and Rubinstein (2013) write that there are in general more *unincorporated* than *incorporated* entrepreneurs because of the relative ease of becoming the latter; these general findings could apply to boomers as well. *Incorporated* entrepreneurs earn more and work more

than the *unincorporated*, and they have more of a certain type of health care coverage through their company than the *unincorporated* self-employed. With their higher incomes (Levine & Rubinstein, 2013), larger businesses (Glover & Short, 2009), and likelihood of having paid employees (Hipple & Hammond, 2016), *incorporated* entrepreneurs tend to prefer non-urban locations where they can find affordable space to operate a larger business (Glover & Short, 2009). The smaller scale businesses *unincorporated* entrepreneurs tend to operate in the smaller space they need in an urban setting (Glover and Short, 2009). . Furthermore, Light and Munk (2015) find that *incorporated* entrepreneurs have a higher level of education and experience and more resources than *unincorporated* entrepreneurs. Based on 2000 census data, Scott Shane (2014) notes that *incorporated* entrepreneurs are more likely to be White and Asian men who are married.

By definition, *full-time* boomer entrepreneurs work more hours than *part-time* boomer entrepreneurs. Some seniors run their own business only as a “bridge job” (Bruce, Holtz-Eakin, & Quinn, 2000; Zhang, 2008), to earn extra income or have a phased retirement, or for tax purposes, and thus tend to be *part-time* entrepreneurs. *Full-time* boomer entrepreneurs have a stronger commitment and bear more risks than their *part-time* counterparts. *Full-time* entrepreneurs are expected to have higher earnings and be healthier, whereas *part-time* entrepreneurs have more flexibility and time for family commitments or to further their education (Block & Landgraf, 2013). Wennberg, Folta, and Delmar (2006) explain that *part-time* entrepreneurs usually test a business opportunity without making an irrevocable investment and thus need fewer physical and financial resources for less marginal cost (Folta, Delmar and Wennberg, 2010) than *full-timers*, who have a higher risk of uncertainty with their investments.

Figure 1 exhibits the eight different types (four pairs) of boomer entrepreneurs and the associated hypotheses.

Figure 1. Four Pairs of Boomer Entrepreneur Types



While previous literature has explored senior entrepreneurs, boomer entrepreneurs as a special cohort have not been much addressed. This study, in addition to identifying the various age effects on the different entrepreneur types, identifies the driving factors for each boomer entrepreneur type and compares them to non-boomer entrepreneurs.

III. RESEARCH HYPOTHESES

Based on prior literature, we test two hypotheses. Hypothesis 1 is for the different age effects on the eight boomer entrepreneur types. Hypothesis 2 compares the driving factors behind the different boomer entrepreneur types.

As mentioned earlier, many people have more disposable income when they are older. They also have fewer family responsibilities, such as caring for young children. This increased physical, human, and social capital also increases entrepreneurial opportunity. Therefore, many

boomers around retirement age can become *novice* entrepreneurs and begin to work for themselves. We therefore expect a rising rate of *novice* entrepreneurs rather than *non-novice* entrepreneurs among older people.

Among the *novice* entrepreneurs, we expect more *opportunity* than *necessity* entrepreneurs as people age, due to increasing entrepreneurial opportunity driven by human, physical, and social capital. Moreover, as people age they may need to care for a spouse, face their own health issues, or just want a more relaxed lifestyle, thus we expect a rising rate of *part-time* entrepreneurship and a decreasing *full-time* rate.

Kautonen, Down, and Minniti (2014) empirically demonstrate that entrepreneurial activity increases almost linearly with age for sole proprietors but decreases after the late 40s for people who aspire to hire workers (owner-managers). Since *incorporated* entrepreneurs typically operate larger businesses (Glover & Short, 2009), sole proprietors are more likely to be *unincorporated* entrepreneurs, whereas owner-managers are more likely to be *incorporated* entrepreneurs. Consistent with Kautonen et al. (2014), we therefore expect that the rate of *unincorporated* entrepreneur/sole proprietors rises with an older age, while the rate of *incorporated* entrepreneur/owner-managers decreases.

For the four pairs of entrepreneur types presented above, we therefore test the following:

Hypothesis 1. *The age trajectory differs among different types of boomer entrepreneurs.*

While *non-novice*, *necessity*, *full-time*, and *incorporated* boomer entrepreneur rates tend to decrease with older age (55 and above), *novice*, *opportunity*, *part-time*, and *unincorporated* entrepreneur rates tend to rise.

As mentioned earlier, previous literature has illustrated differences between *novice* and *non-novice*, *opportunity* and *necessity*, *full-time* and *part-time*, and *incorporated* and *unincorporated* entrepreneurs. We too expect that the driving factors for each boomer entrepreneur type differ.

Boomer entrepreneurs are well-positioned to continue working well beyond their retirement years in the knowledge economy. The knowledge economy, along with boomers' rising human, physical, and social capital, also enables boomers to become *opportunity* and *full-time* entrepreneurs. Moreover, *opportunity*, *incorporated*, and *non-novice* entrepreneurs often emerge from people with better human and social capital—more knowledge, experience, and social ties—than their counterparts.

Other personal attributes (*P*), such as race, gender, and marital status, affect entrepreneurial ability and a propensity to become a certain entrepreneur type. *Non-novice*, *opportunity*, and *incorporated* entrepreneurs are often well established and well prepared; these types of entrepreneur tend to be male, married, non-African Americans.

Because of the importance of knowledge spillover, local economic conditions as represented by the local unemployment rate (*U*) are relevant in determining entrepreneurial ability and a propensity to be specific types of entrepreneurs. This leads us to:

Hypothesis 2. *The determinants for novice, necessity, incorporated, and full-time boomer entrepreneurs differ from those for non-novice, opportunity, unincorporated, and part-time boomer entrepreneurs. Entrepreneurs who are better off socioeconomically are more likely to be non-novice, opportunity, and incorporated rather than novice, necessity, and unincorporated entrepreneurs.*

IV. DATA

Self-employment is a measure often used for entrepreneurship (Bailey, 2017; Blanchflower et al., 2001; Evans & Leighton, 1989; Fairlie & Fossen, 2017; Kahn, Martina, & MacGarvie, 2017; Kautonen et al., 2014; Zissimopoulos & Karoly, 2007), and Florida's (2004) "creative class" is defined as those employed in the knowledge-based occupations.⁴ In this study, we define boomer entrepreneurs as unincorporated and incorporated non-agricultural self-employed workers in the knowledge-based sectors. Alternative measures include R&D expenditures and number of startups; however, the former tends to underestimate small-business entrepreneurship (Acs & Audretsch, 1990) and the latter (Audretsch & Keilbach, 2004) does not fully capture sustainability issues. To avoid the drawbacks of using self-employment to measure entrepreneurship, this study uses knowledge-based self-employment. To address perspectives of new technology and innovation (see Schumpeter, 1950) and knowledge spillover (Acs et al., 2010), the study includes *incorporated* and *unincorporated* entrepreneurs (see Evans & Leighton, 1989; Kahn et al., 2017) and distinguishes non-agricultural self-employment from agricultural sole-proprietorship.

Data Sources

To measure the nuanced entrepreneur types, we needed a well-represented dataset to measure month-to-month employment transitions that covered multiple years and individual-level employment, demographic, and other socioeconomic details. Thus this study relies heavily on the longitudinally linked U.S. Census CPS data for the years 2006-2016, as compiled by

⁴ This follows Zhang (2008) and Florida's (2004) "creative class" occupations, which include sectors of management, business and financial operations, computer and mathematical, architecture and engineering, science, law, education, arts and media, health-care practitioners, and high-level sales management.

Flood, King, Ruggles, and Warren (2015) in the Integrated Public Use Microdata Series. There are multiple reasons for using CPS data:

1. The CPS is a national survey of the noninstitutionalized U.S. civilian population age 16 and above. It includes extensive employment, demographic, and socioeconomic information that can be used as a longitudinal dataset that covers years before and after the Great Recession.
2. The month-to-month employment information helps us compose and define the four pairs of boomer entrepreneurs. CPS data also address changes in monthly employment status between no employment, wage-and-salary employment, and self-employment, which is critical to our study. The data also offer reasons for the changes, which allows us to define whether they are voluntary or involuntary.
3. The CPS is a nationally well-represented survey conducted by the U.S. Census Bureau, and it has one of the highest response rates (90%) among government household surveys (U.S. Bureau of Labor Statistics & U.S. Census Bureau, 2006). It has been used as a reliable measure of national employment for many years. Considering the fact that specific boomer entrepreneur types often end up with limited observations, a large and reliable national sample is important.
4. The CPS is the best source for self-employment information, as it reports on self-employed individuals not covered in the Current Employment Statistics and is the source of official statistics on self-employment in the United States (Karoly & Zissimopoulos, 2004). Individuals who report being employed during the referenced week are asked whether the employment class for their main job is

self-employed; if the reply is yes, respondents are asked whether the business is incorporated.

5. The CPS provides microdata at the individual level, with flexible geographic identification that can be more readily integrated with other data sources. The CPS data provide reliable estimates at the state level and for the largest metropolitan statistical areas (U.S. Bureau of Labor Statistics & U.S. Census Bureau, 2006).

Households in the CPS are interviewed according to a 4-8-4 rotation pattern: that is, households from all states and the District of Columbia are interviewed for four consecutive months, dropped out of the sample for the next eight months, and interviewed again in the next four months, after which they leave the sample permanently.⁵ The 4-8-4 rotation has the added benefit of allowing the sample to be constantly replenished, with continuity and without an excessive burden on respondents (U.S. Bureau of Labor Statistics & U.S. Census Bureau, 2006); however, it only offers the ability to track a person for eight months and cannot track a person for more than 16 months total. This limited trackability constrains our measurement of *novice* versus *non-novice* boomer entrepreneurs, for if a boomer started a business more than 16 months earlier, then stopped, and 16 months later started a new business, this person would only count as a *novice* boomer entrepreneur.

Although the CPS data contain self-identified information that can cause common method bias (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003), we argue that this is not a major concern. The data cover 132 monthly data points with eight monthly measures for each worker; they therefore avoid the problem of using a single response at a single point in time. In addition,

⁵ Thus, individuals who are interviewed in January, February, March, and April of one year are interviewed again in the next January, February, March, and April.

using the well-represented, large-scale, multipurpose national survey data reduces the effects of social desirability bias typically seen in small, single-purpose surveys (Binder & Coad, 2013).

In addition to the CPS microdata, we used the Bureau of Labor Statistics unemployment rate for metropolitan areas to control local economic conditions. Linked via the metropolitan area Federal Information Processing Standards code, the metropolitan unemployment rates are added. Not all metropolitan areas are covered in our observations.

Measure of *Novice* versus *Non-Novice* Boomer Entrepreneurs

Breaking down the aforementioned definition of boomer entrepreneurs, this study identifies four pairs of boomer entrepreneur types, as presented in Figure 1. In this study, *novice* boomer entrepreneurs refers to those who reported being an entrepreneur in the reference month but not in any of the previous seven sampling months. Considering that the data we use track individuals' monthly employment for eight total sample months—the 4-8-4 rotation pattern—*novice* boomer entrepreneur refers to those who reported being entrepreneurs in the reference month but not previous three months or the previous 12-15 months.

Please note that these data do not necessarily mean that this was the first time a person became an entrepreneur; we do not have data to verify that. They could have been an entrepreneur during the eight months they were not surveyed or more than fifteen months earlier, but not during the previous fifteen months. In such cases, our measure of a *novice* entrepreneur would be more that of a *switcher* entrepreneur—someone who went from another occupational status to entrepreneurship. We therefore hereafter refer to this group as *novice/switcher* versus *non-novice/switcher* entrepreneurs. This measure expands on Fairlie et al. (2017) by using all rather than only two sampling months per person with more employment history in the CPS.

This definition differs from what Wagner (2004) has defined, in that it does not consider whether the entrepreneurs have been actively trying to start a new firm in the previous year or use a positive monthly cash flow measure.

This definition of *novice/switcher* entrepreneur is contingent on the availability of data; it does distinguish boomers who are new entrepreneurs from those who have been entrepreneurs since a younger age. In contrast, *non-novice/switcher* boomer entrepreneur refers to those who were entrepreneurs in the reference month and at any time in the previous three months or the previous 12-15 months. This study focuses more on the *novice/switcher* boomer entrepreneurs to dispute the belief that older entrepreneurs are only *non-novice/switcher* entrepreneurs who grew older after becoming an entrepreneur at a young age. Classifying this further could enhance our understanding of boomer entrepreneurs.

Measures of *Opportunity* versus *Necessity Novice/Switcher* Boomer Entrepreneurs

Among *novice/switcher* boomer entrepreneurs, *necessity* boomer entrepreneurs' motivations differ from those of *opportunity* boomer entrepreneurs. Our measure uses a combination of information on employment status and reasons for unemployment. In this study, *necessity novice/switcher* boomer entrepreneurs refers to *novice/switcher* boomer entrepreneurs who were unemployed workers or workers who left the labor force because they were unable to work, retired, or for other involuntary reasons in the previous calendar month. Correspondingly, *opportunity novice/switcher* entrepreneurs refers to *novice/switcher* entrepreneurs who were in the armed forces, had a job, or left a job voluntarily in the previous calendar month. Note that not all *novice/switcher* entrepreneurs are classified as either *necessity* or *opportunity*. Although our measure of *necessity* entrepreneurs is not perfect, it is the best one available that uses large, well-

represented national survey data to capture its comprehensive meaning. This measure of *necessity* versus *opportunity* coincides somewhat with Fairlie et al. (2017), but adds more nuance in terms of whether a job loss was voluntary or not.

Measure of *Incorporated* versus *Unincorporated* Boomer Entrepreneurs

Incorporated versus *unincorporated* boomer entrepreneurs are another contrasting pair. These categories are particularly necessary when using self-employment data instead of firm-creation data to measure entrepreneurship. In this study, *incorporated* boomer entrepreneurs refers to boomers who had incorporated self-employment, while *unincorporated* boomer entrepreneurs refers to those who had unincorporated self-employment. Our measures of *unincorporated* and *incorporated* entrepreneurs are largely consistent with Kautonen et al.'s (2014) self-employment/sole proprietor and *incorporated/owner-manager* concepts.

Measure of *Full-Time* versus *Part-Time* Boomer Entrepreneurs

This study also distinguishes *part-time* from *full-time* boomer entrepreneurs. We define *full-time* boomer entrepreneurs as those who reported having worked *full-time* (35+ hours) during the reference month, whether or not they previously were usually *full-time* or *part-time* workers. We define *part-time* boomer entrepreneurs as those who worked *part-time* hours, whether or not they previously usually worked *full-time* or *part-time*.

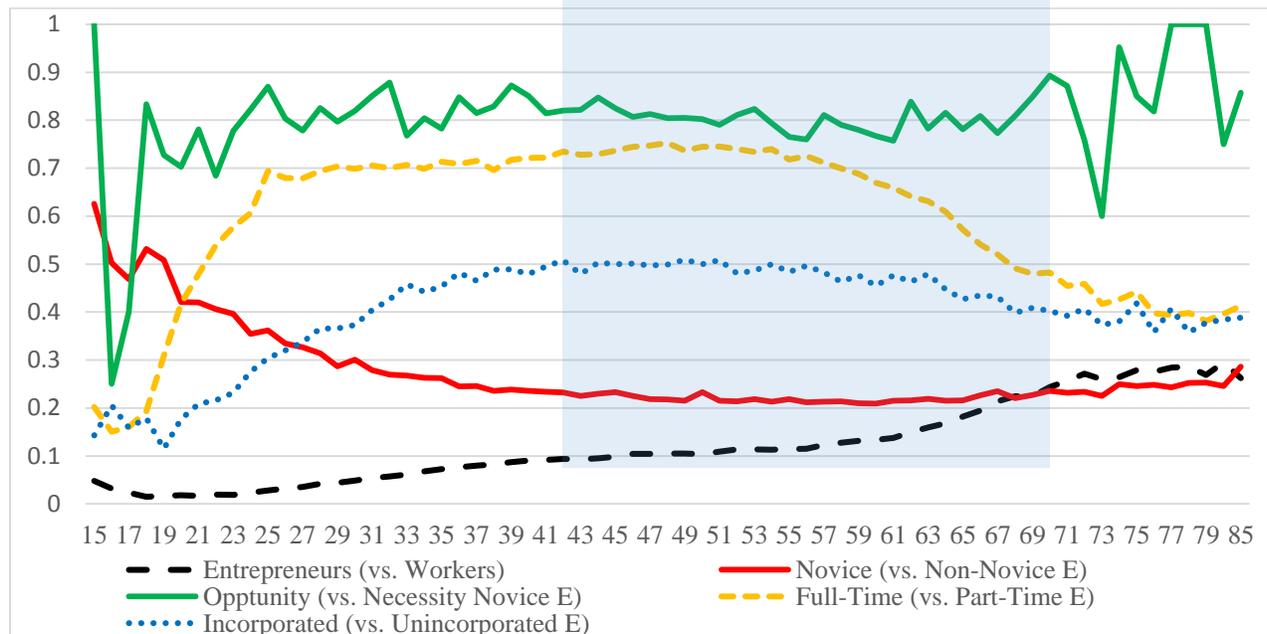
Age Trend of Various Boomer Entrepreneurs

Figure 2 illustrates the rates of entrepreneurs and of each entrepreneur type by age.⁶ The different rates include the (1) rate among non-agricultural knowledge-based working individuals (hereafter called “workers”); (2) rate of *novice/switcher* (versus *non-novice/switcher*) entrepreneurs; (3) rate of *opportunity* (versus *necessity novice/switcher*) entrepreneurs among all *novice/switcher* entrepreneurs; (4) rate of *full-time* (versus *part-time*) entrepreneurs; and (5) rate of *incorporated* (versus *unincorporated*) entrepreneurs. Because our data cover the years 2006-2016, the age span for boomers is 42-70, as shown in the grey-shaded area.

Overall, the entrepreneur rate among workers rises with age, which implies that their wage-and-salary employment rate declines with age. As they age, a worker becomes more interested in working for themselves rather than for others. *Full-time* and *incorporated* entrepreneur rates among all entrepreneurs have an n-shaped trend with age that peaks in the 40s, which is consistent with previous literature. This implies that the number of *part-time* or *unincorporated* entrepreneurs increases among older workers. The *novice/switcher* versus *non-novice/switcher* entrepreneur rate has a u-shaped age trend, with a slightly rising trend at higher ages. The proportion of *opportunity novice/switcher* entrepreneurs is higher than for *necessity novice/switcher* entrepreneurs; the former has an overall n-shaped age trend among all ages, though a mild u-shaped trend among boomers, with a slight increase at higher ages.

⁶ We started graphing the age trends with self-employment rates in our preliminary analysis and identified a faster-rising age trend in the self-employment rate than in the entrepreneur rate. We therefore only focus on entrepreneur rates in this study.

Figure 2. Entrepreneur Rates by Age and Entrepreneur Type from CPS Data of 2006-2016



Boomer versus Non-Boomer Entrepreneurs

Table 1 reveals more statistical details. Among the 1,856,272 workers in our study, 36% (or 671,147) are boomer workers and 9% (or 167,206) are entrepreneurs (both boomers and non-boomers). Entrepreneurs are defined in this study as those engaged in non-agricultural knowledge-based self-employment, thus this figure is not inconsistent with a roughly 9.4% non-agricultural self-employment rate among the 2004 labor force using the CPS data in Karoly and Zissimopoulos (2004); with a 10% non-agricultural self-employment rate using the 2010 CPS data in Hipple (2010); and a 10.1% total self-employment rate using the 2015 CPS data in Hipple and Hammond (2016). Of the 671,147 boomer workers, 12% are entrepreneurs, which is consistent with findings from prior studies that the probability of being self-employed is higher for older workers than for younger workers (Blanchflower & Oswald, 1998; Blanchflower et al., 2001; Evans & Leighton, 1989; Fuchs, 1982).

Comparing boomer entrepreneur types to non-boomer entrepreneur types, there is a similar but slightly higher share of *full-time* and *incorporated* entrepreneurs among the boomers. On the one hand, as Figure 2 demonstrates, there is a u-shaped age effect on the *novice/switcher* entrepreneur rate across all ages and across boomer ages; the rate rises with age (55 and above). On the other hand, the 21% share of *novice/switcher* entrepreneurs among boomer entrepreneurs is slightly lower than the 23% among entrepreneurs of all ages; *opportunity* (versus *necessity novice/switcher*) entrepreneurs have a clearly higher share among boomers (60%) than among non-age-specific entrepreneurs (52%).⁷

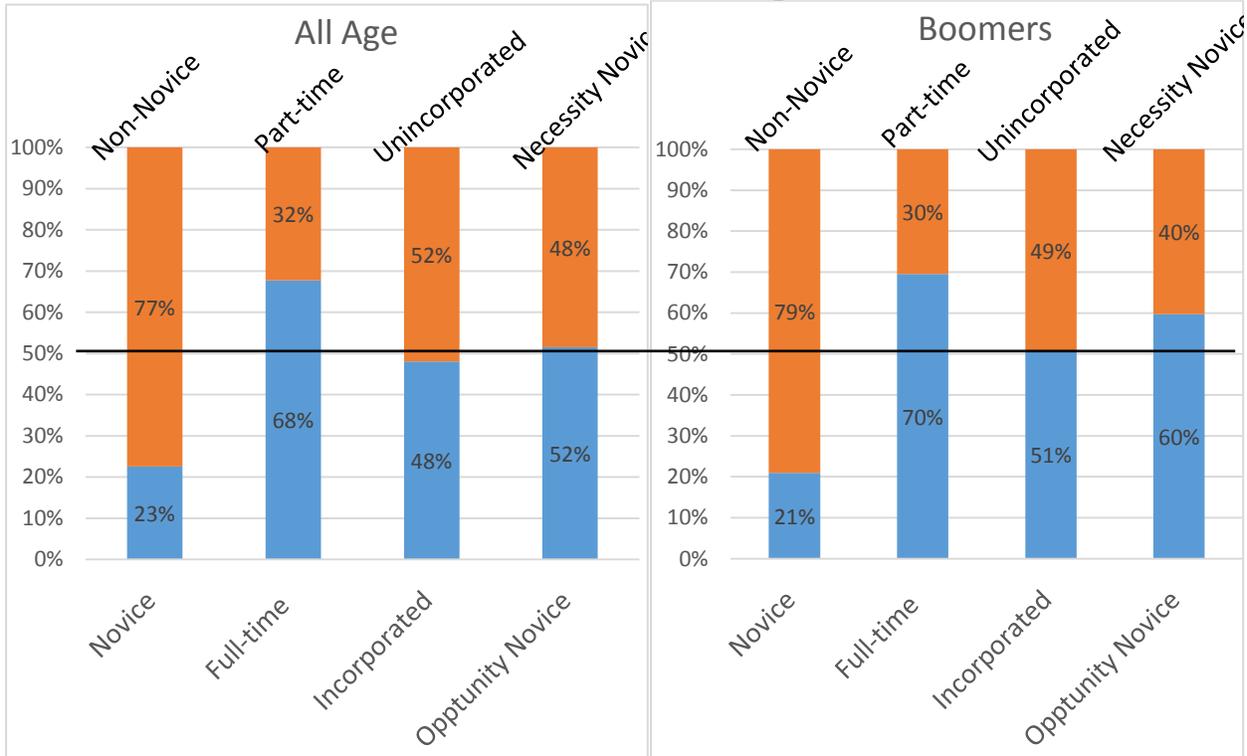
Table 1. Comparing Probability among Four Pairs of Boomer Entrepreneur Types

Variable	Among All-Age Knowledge-Based Non-Agricultural Workers			Among Boomer Knowledge-Based Non-Agricultural Workers		
	Obs.	Mean	Std. Dev.	Obs.	Mean	Std. Dev.
Boomer Entrepreneurs	1,856,272	36%	48%	671,147	12%	33%
	Among All-Age Entrepreneurs			Among Boomer Entrepreneurs		
<i>Novice/Switcher</i> Entrepreneurs	167,206	23%	42%	81,055	21%	41%
<i>Full-Time</i> Entrepreneurs	152,089	68%	47%	73,904	70%	46%
<i>Incorporated</i> Entrepreneurs	167,206	48%	50%	81,055	51%	50%
	Among All-Age <i>Novice/Switcher</i> Entrepreneurs			Among Boomer <i>Novice/Switcher</i> Entrepreneurs		
<i>Opportunity Novice</i> Entrepreneurs	4,856	52%	50%	2,066	60%	49%

⁷ Please note that (1) about 91% of entrepreneurs are either *full-time* or *part-time* entrepreneurs, according to the reported data; (2) only 13.6% of *novice* entrepreneurs are classified as either *necessity* or *opportunity* entrepreneurs, according to our definition.

Figure 3 contrasts the shares for all eight types (four pairs) of entrepreneurs between all-age and boomer entrepreneurs. Boomer entrepreneurs have a higher share in *non-novice/switcher*, *full-time*, *incorporated*, and *opportunity novice/switcher* entrepreneurs than non-age-specific (or all age) entrepreneurs. Although older, boomer entrepreneurs are more likely than non-boomer entrepreneurs to be productive types, such as *opportunity novice/switcher* and *full-time* entrepreneurs. The boomers' 70% full-time rate is consistent with prior literature on older workers' full-time self-employment rate in New Zealand, as suggested in Boyd and Dixon (2009). Interestingly, against conventional wisdom but consistent with the above findings, there clearly is a lower percentage of *necessity novice/switcher* entrepreneurs and, evidently, a higher percentage of *opportunity novice/switcher* entrepreneurs among boomer entrepreneurs than among non-boomers. Please note that, although boomer entrepreneurs overall are slightly more likely than non-boomer entrepreneurs to be *non-novice/switchers*, the *novice/switcher* entrepreneur rate rises at higher ages.

Figure 3. Shares of Novice/Switcher vs. Non-Novice/Switcher, Full-Time vs. Part-Time, Incorporated vs. Unincorporated, and Opportunity Novice/Switcher vs. Necessity Novice/ Switcher Boomer Entrepreneurs



V. EMPIRICAL MODELS AND VARIABLES

This section explains our empirical models and describes the variables used in the models. We also present summary statistics of independent variables in the models.

Empirical Models

The study adopts a series of binomial multilevel mixed-effects logistic regressions. Our independent variables follow prior literature on entrepreneurship and occupational choice, which we explain later. Relying on the aforementioned utility maximization theory, logistic regressions are expected to be estimated to test the various factors affecting the probability of being an entrepreneur. In addition, when data were hierarchical or clustered, as in Hörisch et al. (2017), we adopted multilevel modeling. After examining the goal of the study and our data structure,

we adopted multilevel mixed-effects logistic regressions instead of simple logistic regression, fixed-effect logistic regression, and logistic regression with clustered standard errors, even though the latter three require much less computational time and complexity.

Our outcome variables are binary: a worker is either an entrepreneur or not (coded 1 or 0, respectively), a *novice/switcher* or *non-novice/switcher* entrepreneur (coded 1 or 0, respectively), an *opportunity* or *necessity* entrepreneur (coded 1 or 0, respectively), a *full-time* or *part-time* entrepreneur (coded 1 or 0, respectively), or an *incorporated* or *unincorporated* entrepreneur (coded 1 or 0, respectively). In this case, an appropriate model would be a logistic regression, with the dependent variable capturing the log odds of the binary outcomes modeled as a linear combination of the independent variables.

We have the luxury and necessity of using the longitudinal and panel data. Therefore, a fixed-effects logistic regression would be needed to model the temporal changes fixed onto a specific individual, rather than just using simple logistic regression.

However, entrepreneurial behavior is an employment behavior subject to local market conditions and the labor pool. Therefore, workers are interdependent in an area where knowledge, information, labor, and social networks flow easily and affect individual workers. In this case, fixed-effect logistic regression is limited, not only because it assumes independence between individuals, but also because it does not allow for necessary random effects across different local areas. Although we want to observe the longitudinal effects across each fixed individual, these individuals could move between different local areas; therefore, we do not want to fix local areas. We instead want to observe the random effects across the variations in different local areas. When we model across different local areas, treating each as a unit of analysis or treating the whole area as an observation, we want our models to be random units.

In addition, if we want to adjust our logistic regression for non-independence, we can choose logistic regression with clustered standard errors. However, the cluster standard errors address the independence issue across each individual record but do not allow for random effects across different local areas. Therefore, logistic regression with clustered standard errors cannot fully capture what we want to observe.

Considering the fact that our base unit of analysis is individual workers or entrepreneurs and our higher level unit of analysis is local economic areas, our hierarchical data structure allows us to adopt multilevel modeling. Fortunately, our data provides information at both the metropolitan-area level and the individual level. A metropolitan area typically includes one or more urban centers that form an employment based commuting circle. For our models, it serves well as our economic and socioeconomic area control. We want to observe not only variations across specific individuals (fixed individual effects) but also variations across random local economic areas, such as metropolitan areas (random metropolitan area effects). We also want to observe both fixed and random effects on the binomial entrepreneurial propensity across individuals who are living in different metropolitan areas—thus our choice of multilevel mixed-effects logistic regressions.

Multilevel mixed-effects logistic regressions have been used extensively in various social science studies, such as Ng, Carpenter, Goldstein, and Rasbash (2006), which analyzes a Bangladeshi fertility survey, and Rabe-Hesketh and Skrondal (2012), which analyzes school data from Scotland. Rabe-Hesketh, Skrondal, and Pickles (2005) provide an excellent econometric survey on multilevel models with binary outcomes. As StataCorp (2015) notes, log-likelihood calculations for fitting any generalized mixed-effects model require integrating out the random effects. A widely used method is to directly estimate the integral required to calculate the log

likelihood by Gauss–Hermite quadrature or some variation thereof. The estimation method we use is a multi-coefficient and multilevel extension of one of these quadrature types, an adaptive Gaussian quadrature based on conditional modes using Stata (StataCorp 2015), with a multi-coefficient extension from Pinheiro and Bates (1995) and a multilevel extension from Pinheiro and Chao (2006).

Mixed-effects logistic regression contains both fixed effects and random effects. In longitudinal data and panel data, random effects are useful for modeling intra-metropolitan area correlation; that is, workers or entrepreneurs in the same metropolitan area are correlated because they share common metropolitan area-level random effects.

Since our mixed-effects model is first a logistic regression, Model (3) is the logistic cumulative distribution function with the linear predictor to the probability of $Y = 1$, that is, for workers to be entrepreneurs or for entrepreneurs to be a certain type of reference entrepreneur for a contrasting pair of entrepreneur types. The output Y_{itj} is a binary-valued variable, with value 1 for referenced categories of entrepreneur and 0 for alternative categories

$$P(Y_{ij} = 1 | u_{ij}) = \frac{\exp(\alpha_0 + \sum \beta_k X_{kitj} + Z_{ij}u_{ij})}{1 + \exp(\alpha_0 + \sum \beta_k X_{kitj} + Z_{ij}u_{ij})}, \quad \text{Model (3)}$$

In our two-level mixed-effects logistic regression model, a series of m metropolitan areas are conditional on a set of random effects u_{ij} , for $j = 1, \dots, m$ metropolitan areas, with metropolitan area j consisting of $I = 1, \dots, n_j$ observations in metropolitan area j across time periods (months) t . $\sum X_{kitj}$ measures k factors identified above, such as demographics, marital status, education, health, child-care responsibility, prior job history, local economic condition, etc. Each vector X_{itj} is a covariate for the fixed effects, analogous to the covariates in a standard logistic regression model, with regression coefficients (fixed effects) β . Vector Z_{itj} is the covariate corresponding to

the random effects. The random effects u_{ij} are m realizations from a multivariate normal distribution, with mean 0 and variance δ . The random effects are not directly estimated as model parameters, but are instead summarized according to the unique elements of variance.

Although we did not present other models in our analysis, we used the same model for three series of tests; each had multiple regression models with different specifications. Our results across the descriptive analyses, graphs, and all 11 regression models help us check robustness and consistency of our findings. All 11 models share the same independent variables.

We started with the first set of three models that estimates the determinants to becoming an entrepreneur among all workers, boomer workers, and non-boomer workers. The three are our base models and not specific to individual entrepreneur types. $Y = 1$ is, respectively, for entrepreneurs, non-boomer entrepreneurs, and boomer entrepreneurs, and $Y = 0$ is, respectively, for wage-and-salary workers, wage-and-salary boomer workers, and wage-and-salary non-boomer workers. The latter two sets of models (eight total models) both test determinants for individual entrepreneur types. For those latter eight models, $Y = 1$ is, respectively, for *novice/switcher*, *opportunity novice/switcher*, *full-time*, and *incorporated* entrepreneurs, and $Y = 0$ is, respectively, for *non-novice/switcher*, *necessity novice/switcher*, *part-time*, and *unincorporated* entrepreneurs.

To test the first hypothesis, all three sets of models include an independent variable, age, to estimate the age effect for entrepreneurial propensities and for choice of entrepreneur type. To test the second hypothesis, the latter two sets of eight models contrast the determinants for *novice/switcher*, *opportunity novice/switcher*, *full-time*, and *incorporated* entrepreneurs,

respectively, to that for *non-novice/switcher*, *necessity novice/switcher*, *part-time*, and *unincorporated* entrepreneurs.⁸

Independent and Control Variables

The independent variables used to characterize each individual include human capital (health and educational attainment), social capital (such as job experience), demographic, and socioeconomic factors. The basic demographic and socioeconomic variables include age and age squared for the nonlinear age effect, gender (using the dummy variable male), race (using the dummy variables White, African American, and other races⁹), and marital status (using dummy variables married, never married, widowed, divorced, separated¹⁰). Considering the importance of aforementioned knowledge spillover, we include the variable central city to measure whether the individual is residing in the central city or in more rural/suburban areas.

Health, as a part of human capital, is mentioned in previous literature and also hypothesized in this study to be an important determinant of a senior's employment choice; therefore, the dummy

⁸ Considering the fact the local economic condition might have spatial influence or autocorrelation from contiguous local areas' economic conditions, as addressed in Santarelli, Carree, and Verheul (2009), spatial modeling was initially considered. However, for three reasons we did not think it necessary to integrate the spatial modeling in this study: (1) our second-level (or cluster-level) unit is in metropolitan areas, which are not contiguous geographically. Without contiguity, the spatial interdependence is limited. (2) A metropolitan area is a commuting circle in which residents and commuters share the urban centers and socioeconomic atmosphere, rather than sharing those in another metropolitan area some distance away. This differs from other geographic units that are arbitrarily determined by political (such as state or county) or population size boundaries (such as census blocks or census block groups). (3) When facing a noncontiguous geographic unit, one needs to use a distance matrix to measure spatial associations that typically assume a Euclidian centroid as the geographic code for the metropolitan area and measure the distance between this centroid to another metropolitan area's assumed centroid. This hypothetical centroid approximation is not a good representation of the urban core, and the distance-based measure of influence from another metropolitan area is further compromised by size of the metropolitan areas. (4) Our basic unit of analysis is fixed at individual workers' level and the majority of variation across our observations is at the individual level, not at a geographic area level, thus spatial interdependence is less of a concern. Even if there is influence across different second-level continuous geographic areas, when nuanced down to each individual level analysis, this spatial effect is greatly discounted.

⁹ Other race is the item omitted for comparisons with the above race variables.

¹⁰ Being married is the item omitted for comparisons with the marital status dummy variables.

variable any difficulty is used as a proxy for an individual's health status and indicates whether an individual has any physical or cognitive difficulties during the observing month.¹¹

The educational attainment variables are used to measure another important dimension of human capital and are expected to have a positive impact on a senior's choice of employment. We included dummy variables for high school graduate, some college, bachelor's degree, and advanced degree; those who did not report their educational attainment information or attained less than a high school degree were omitted.

For younger non-boomers, dependent children are particularly important; some boomers might still have responsibility for their children and some need to care for grandchildren. This could affect their motivation to participate into the labor force. Therefore, the model this paper builds on includes the variable children under 16 to test whether this is a factor related to entrepreneurial propensity and, if so, how strong a factor it is.

Due to the rich monthly employment information CPS offers, we are able to track work experience, which includes two continuous variables: (1) the continued weeks unemployed by the end of the previous month, and (2) the hours worked on the main job in the previous month. Work history shows how attached an individual is to the labor market, which contributes to their motivation, social capital, and choice of entrepreneurship as an occupation.

We also included the local business cycle indicator, as measured by metropolitan unemployment rates, as a control for macroeconomic conditions. Previous literature offered controversial evidence on the relationship between the unemployment rate and entrepreneurial propensity, which we felt was worth adding to the control. More importantly, the unemployment

¹¹ CPS does not offer detailed information on an individual's health status. Although Health and Retirement Studies offer detailed information on seniors' health, this dataset lacks information on monthly employment that is key to this study. Therefore, the study ends up using CPS information on physical or cognitive difficulty as a proxy for seniors' health status.

rate is directly associated with our definition of *necessity* entrepreneurship and contributes to our hypothesis on the importance of this factor.

In addition, since previous literature does not provide consistent evidence of an unemployment rate effect, we included year dummy variables to help control for business cycle effects. The year dummy variables can help control for different economic years, including pre-, in-, and post-recession years and post-recovery years. Of course, year dummies also help to control for unobserved time variant effects. We omitted the better economic years for our base, including the pre-recession years 2006 and 2007, and the most recent year of economic growth, 2016.

Previous literature indicated the role liquidity constraints play in entrepreneurial propensity. However, the CPS data contain no good measure for cumulative family wealth, thus the earnings information has many missing values for our hierarchical modeling and we had to drop them.

Summary Statistics for Entrepreneurship Determinants

Our study focuses on four pairs (eight types) of boomer entrepreneurs. The mean age of our observed entrepreneurs, as presented in Table 2, is about 50. This is older than Devine's (1994) findings using CPS data for 1976-1991, which were 44.4 for men and 43.4 for women; note that the definitions of entrepreneurs are not exactly the same for the two datasets. As Hipple and Hammond (2016) suggest, based on the CPS data for 2015, the U.S. self-employment rate continues to be higher for older workers than for younger workers.

To have a better sense of the mechanism that leads boomers to become different types of entrepreneurs, we examined the different attributes in Table 2 across those eight types of

entrepreneurs throughout our study period, 2006-2016. There are low correlations between the variables and there is no concern about multi-collinearity.¹² Two-sample t tests with unequal variances were conducted between each of the four pairs of entrepreneur types. Almost all attributes are significantly different (at $p < 0.05$) between each pair, except between *novice/switcher* and *non-novice/switcher* entrepreneurs for having young children, and for a real unemployment rate between *full-time* and *part-time* entrepreneurs.

Across different types of entrepreneurs, we observe some differences. *Necessity novice/switcher* entrepreneurs are more likely than their opportunity novice/switcher counterparts to be younger, female, less educated, not married, not employed for longer, to have worked for more hours at their current main job, to have reported having more physical or cognitive difficulties, and to live in a metro area with a higher unemployment rate. The *opportunity novice/switcher* entrepreneurs tend to report fewer physical or cognitive difficulties and tend to live in metropolitan areas with lower unemployment rates than the *necessity novice/switcher* entrepreneurs. This is consistent with our definition and expectations. In terms of residential location, *incorporated* entrepreneurs are less likely than unincorporated entrepreneurs to reside in city centers. This could be related to *incorporated* businesses' need for more space, which tends to be less costly away from major business centers. In contrast, being close to a major business center or market often makes it easier for the nimble *novice/switcher* and *unincorporated* entrepreneurs to start up a business.

While *part-time* entrepreneurs tend to be female, *full-time* entrepreneurs are male dominant. Our data also show that *full-time* entrepreneurs tend to report fewer physical or

¹² We conducted preliminary correlation analysis. Based on the correlations, most of the between variable correlation coefficients are very small. This reflects the heterogeneity among individuals. There are no very strong associations between the explanatory variables, therefore, multi-collinearity becomes less of a concern.

cognitive difficulties and, interestingly, to report working fewer hours on their main job. Having fewer physical or cognitive difficulties could be a reason for their *full-time* entrepreneur status. Working fewer hours could be because (1) *full-time* entrepreneurs are more likely to be well established and stable but to work fewer hours; (2) *part-time* entrepreneurs' main job may also be demanding; (3) the number of hours reported is perceived hours and might differ from actual working hours.

Table 2. Variable Summary Statistics across the Eight Non-Age-Specific Entrepreneur Types, 2006-2016

	E	Novice /swit-cher E	Oppprt. Nov. E	Necc. Nov. E	Non-Nov. E	FT E	PT E	Inc. E	Uninc. E		
Obs	167206	38088	2810	2369	129118	10298	49104	80282	86924		
Variable	Mean (sd.)	Mean (sd.)	Mean (sd.)	Mean (sd.)	Mean (sd.)	Mean (sd.)	Mean (sd.)	Mean (sd.)	Mean (sd.)	Min	Max
Central City	0.36 (0.48)	0.39 (0.49)	0.41 (0.49)	0.42 (0.49)	0.36 (0.48)	0.36 (0.48)	0.37 (0.48)	0.33 (0.47)	0.39 (0.49)	0	1
Age	50 (12.91)	49 (13.80)	46 (13.32)	43 (14.55)	51 (12.60)	50 (11.90)	52 (14.29)	51 (11.94)	50 (13.74)	15	85
Male	0.63 (0.48)	0.61 (0.49)	0.59 (0.49)	0.45 (0.50)	0.63 (0.48)	0.72 (0.45)	0.47 (0.50)	0.69 (0.46)	0.57 (0.49)	0	1
African Amer	0.06 (0.23)	0.07 (0.25)	0.09 (0.28)	0.10 (0.30)	0.05 (0.22)	0.06 (0.23)	0.05 (0.21)	0.05 (0.22)	0.06 (0.24)	0	1
White	0.87 (0.33)	0.85 (0.36)	0.82 (0.38)	0.81 (0.39)	0.88 (0.33)	0.87 (0.34)	0.89 (0.31)	0.88 (0.33)	0.87 (0.34)	0	1
HS	0.14 (0.34)	0.14 (0.35)	0.14 (0.35)	0.17 (0.38)	0.13 (0.34)	0.14 (0.35)	0.12 (0.33)	0.14 (0.35)	0.13 (0.34)	0	1
Some College	0.21 (0.41)	0.22 (0.41)	0.21 (0.41)	0.26 (0.44)	0.21 (0.41)	0.21 (0.40)	0.22 (0.41)	0.20 (0.40)	0.22 (0.41)	0	1
Bachelors	0.32 (0.47)	0.32 (0.47)	0.34 (0.47)	0.31 (0.46)	0.32 (0.47)	0.32 (0.47)	0.32 (0.47)	0.32 (0.47)	0.32 (0.47)	0	1
Advanced	0.30 (0.46)	0.29 (0.45)	0.27 (0.45)	0.19 (0.39)	0.31 (0.46)	0.31 (0.46)	0.31 (0.46)	0.31 (0.46)	0.29 (0.46)	0	1
Sep Div Wid	0.14 (0.35)	0.15 (0.36)	0.14 (0.34)	0.15 (0.35)	0.14 (0.35)	0.14 (0.34)	0.15 (0.36)	0.12 (0.33)	0.16 (0.37)	0	1
Never Married	0.14 (0.34)	0.17 (0.38)	0.22 (0.42)	0.30 (0.46)	0.13 (0.33)	0.13 (0.34)	0.14 (0.34)	0.10 (0.30)	0.17 (0.38)	0	1
Married	0.72 (0.45)	0.68 (0.47)	0.64 (0.48)	0.55 (0.50)	0.73 (0.44)	0.73 (0.44)	0.71 (0.45)	0.78 (0.41)	0.66 (0.47)	0	1

ChildUnder16	0.31 (0.46)	0.30 (0.46)	0.31 (0.46)	0.33 (0.47)	0.32 (0.47)	0.33 (0.47)	0.29 (0.45)	0.34 (0.47)	0.29 (0.45)	0	1
Cont Wks UnEm	975 (150)	967 (173)	979 (138)	864 (335)	977 (143)	999 0	999 0	987 (105)	963 (182)	0	999
Hrs Wrk Mn Job	229 (382)	239 (390)	225 (380)	441 (482)	227 (380)	162 (310)	263 (420)	187 (342)	269 (412)	0	999
Any Diff	0.04 (0.21)	0.05 (0.22)	0.03 (0.18)	0.09 (0.28)	0.04 (0.20)	0.03 (0.17)	0.06 (0.24)	0.04 (0.19)	0.05 (0.22)	0	1
Unemploy Rt	7.23 (2.29)	7.19 (2.29)	7.12 (2.24)	7.36 (2.30)	7.24 (2.29)	7.21 (2.26)	7.22 (2.31)	7.24 (2.29)	7.22 (2.28)	2.4	19.5

Notes: 1. Not all *novice* entrepreneurs are classified as either *necessity* or *opportunity* entrepreneurs. In fact, only 13.6% of *novice* entrepreneurs modeled can be classified as either an *opportunity novice* or *necessity novice* entrepreneur, according to our definition. 2. Not all entrepreneurs reported either *full-time* or *part-time* status. In fact, about 91% of entrepreneurs are either *full-time* or *part-time* entrepreneurs, according to the reported data.

VI. EMPIRICAL FINDINGS

We adopted multilevel mixed-effects logistic regression models to empirically estimate factors associated with various entrepreneurial propensities. Table 3 presents the estimates for our base models that demonstrate workers' determinants for entrepreneurial propensity.

As shown in Table 3, most factors for boomer and non-boomer entrepreneurial propensity have consistent effects. Workers who live in a central city, are White, non-African American, married, have children under the age of 16, have had a longer unemployment, work more hours on their main jobs, have more physical or mental difficulties, and have advanced academic degrees have higher odds of being an entrepreneur than other workers.

Living in a central city close to customers, markets, and knowledge hubs enhances workers' odds of being an entrepreneur. Consistent with prior literature, African Americans often have fewer resources and thus are less likely to be entrepreneurs. Being married often means having a well-established family and financial situation, and therefore indicates a higher entrepreneurial propensity. Having child-care responsibilities or physical or cognitive difficulties often requires the kind of flexibility that can be better accommodated by being an entrepreneur. Being unemployed for longer pushes workers who have had a hard time finding a wage-and-

salary job into entrepreneurship. For those who have a wage-and-salary job and spend more hours on their wage-and-salary job tend to have fewer hours to spend on becoming an entrepreneur. Those with advanced academic degrees have more human capital and are more likely to be entrepreneurs.

Some determinants have different effects for boomers than non-boomers. , including age and unemployment rate effects. Consistent with previous literature, our data show an overall n-shaped age effect on entrepreneurial propensity among non-age-specific workers and among non-boomer workers; however, a u-shaped age effect is observed for boomer workers, who were ages 42-70 during our data observation period (2006-2016). Boomers in their 40s to late 50s are typically close to the peak entrepreneurial age. The rate of entrepreneurship gradually declines in the years before retirement, but the entrepreneurial propensity starts to increase again around retirement age. This is consistent with empirical findings from Blanchflower et al. (2001), Zhang (2008), Zissimopoulos and Karoly (2007), and Fairlie et al. (2015).

Table 3. Multilevel Mixed-Effects Logistic Regression Estimates on Entrepreneurial Propensities among All Workers, Non-Boomer Workers, and Boomer Workers

	E			Non-Boomer E			Boomer E		
	Coef.	SE	P	Coef.	SE	P	Coef.	SE	P
Residence Location									
Central City	0.07	0.01	***	0.09	0.01	***	0.05	0.01	***
Demographics									
Age	0.06	0.00	***	0.09	0.00	***	-0.13	0.01	***
Age2	-0.00	0.00	***	-0.00	0.00	***	0.00	0.00	***
Male	0.81	0.01	***	0.74	0.01	***	0.88	0.01	***
Race (base: other minority and mixed races)									
African Amer	-0.38	0.02	***	-0.31	0.02	***	-0.52	0.02	***
White	0.24	0.01	***	0.26	0.01	***	0.19	0.02	***
Socioeconomic Status									
Educational Attainment (base: less than high school or unreported)									
HS	-0.45	0.02	***	-0.40	0.02	***	-0.52	0.03	***

Some College	-0.54	0.02	***	-0.50	0.02	***	-0.59	0.03	***
Bachelors	-0.48	0.02	***	-0.50	0.02	***	-0.47	0.03	***
Advanced	-0.37	0.02	***	-0.47	0.02	***	-0.29	0.03	***
Marital Status (base: married)									
Never Married	-0.24	0.01	***	-0.24	0.01	***	-0.25	0.01	***
Sep Div Wid	-0.13	0.01	***	-0.17	0.01	***	-0.12	0.01	***
Family Responsibility									
Child Under 16	0.19	0.01	***	0.11	0.01	***	0.12	0.01	***
Work Experience									
Cont Weeks UnEmp	0.00	0.00	***	0.00	0.00	***	0.00	0.00	***
Hrs Work Main Job	0.00	0.00	***	0.00	0.00	***	0.00	0.00	***
Health									
Any Diff	0.10	0.01	***	0.13	0.02	***	0.08	0.02	***
Metro Business Cycle									
Unemploy Rt	0.01	0.00	**	0.02	0.00	***	-0.00	0.00	
Year Dummy Variables	Yes			Yes			Yes		
Constant	-7.05	0.05	***	-7.60	0.07	***	-1.46	0.38	***
Random-Effects Parameters: Metropolitan Areas; Identity									
sd(_cons)	0.3	0.0	**	0.3	0.0	**	0.4	0.0	**
LR test vs. logistic model: chibar2(01)	6536		***	3896		***	2978		***
Number of obs	1856272			1185125			671147		
Number of groups	144			144			144		
Obs per group:									
min	478			348			120		
avg	12891			8230			4661		
max	139139			95877			49833		
Log likelihood	-504335			-275016			-228176		
Wald chi2(25)	96883		***	59349		***	32707		***

Note: * indicates statistical significance at 0.1 level, ** indicates statistical significance at 0.05 level, and *** indicates statistical significance at 0.01 level.

Table 4 directly tests both hypotheses with boomer entrepreneurs. It compares the driving factors of *novice/switcher* and *non-novice/switcher*, *opportunity novice/switcher* and *necessity novice/switcher*, *full-time* and *part-time*, and *incorporated* and *unincorporated* boomer entrepreneurs.

The age effect in our models tests and supports Hypothesis 1. Among boomer entrepreneurs, we observe a slightly u-shaped age effect for being *novice/switcher*, *opportunity*

novice/switcher, *part-time*, and *unincorporated* entrepreneur types, which implies a slightly n-shaped age effect for being *non-novice/switcher*, *necessity novice/switcher*, *full-time*, and *incorporated* types; this is consistent with the findings for boomers seen in Figure 2. Boomers ranged in age from 42 to 70 during our study period, which means that the rate of *novice/switcher*, *opportunity novice/switcher*, *part-time*, and *unincorporated* boomer entrepreneurs rises at higher ages (55 and above). This means that the number of productive Kirznerian boomer entrepreneurs, such as *opportunity novice/switcher* types, increases with age. This is consistent with the aforementioned rising entrepreneurial opportunity and supports Hypothesis 1.

Our findings also support Hypothesis 2. Compared to *non-novice/switcher* entrepreneurs, *novice/switcher* entrepreneurs are less established and less experienced, have relatively limited information and networks, and often require more time to start a business. These boomer entrepreneurs are therefore more likely to have fewer resources, such as people living in a central city, females, African Americans, those not married, and those with more physical or mental difficulties. They are less likely to be White, to have advanced academic degrees, and have child-care responsibilities.

Unlike *necessity* entrepreneurs, who have no work alternatives but to be an entrepreneur, *opportunity* entrepreneurs recognize a new business opportunity and take time to explore it. Consistent with our expectations, our model shows that boomers who are male, unemployed for longer with more time to prepare for the business, work fewer hours at another main job, and have fewer physical or mental difficulties are more likely to be *opportunity* entrepreneurs.

Full-time entrepreneurs require more time and more commitment for their entrepreneurial businesses than *part-time* entrepreneurs. They are usually boomers who are male, educated,

separated, divorced, or widowed, have no child-care responsibilities, and no physical or mental difficulties. In contrast, because less time is required, *part-time* entrepreneurship is more likely to attract those never married who work at another job for more hours. Higher unemployment rates and fewer employment opportunities also push more seniors to become *part-time* entrepreneurs.

Incorporated boomer entrepreneurs tend to be more experienced and established and to operate larger businesses than *unincorporated* boomer entrepreneurs. They are more likely to reside in suburban areas where there is adequate space for a larger business, to be male, educated, and married. As incorporated businesses are often larger and take more time to develop, *incorporated* boomer entrepreneurs are more likely to be those who work fewer hours at another job or have been unemployed long enough to develop their business, or those without physical or mental difficulties.

Table 4. Multilevel Mixed-Effects Logistic Regression Estimate for Boomer Entrepreneurs

	Novice E			Opportunity Novice E			Full-Time E			Incorporated E		
	Coef.	SE	P	Coef.	SE	P	Coef.	SE	P	Coef.	SE	P
Residence Location												
Central City	0.05	0.02	***	-0.09	0.10		-0.02	0.02		-0.19	0.02	***
Demographics												
Age	-0.19	0.03	***	-0.80	0.16	***	0.31	0.03	***	0.08	0.02	***
Age2	0.00	0.00	***	0.01	0.00	***	-0.00	0.00	***	-0.00	0.00	***
Male	-0.10	0.02	***	0.55	0.10	***	1.05	0.02	***	0.45	0.02	***
Race (base: other minority and mixed races)												
African Amer	0.16	0.05	***	-0.06	0.24		-0.29	0.05	***	-0.34	0.05	***
White	-0.11	0.04	***	-0.00	0.18		-0.27	0.04	***	-0.13	0.03	***
Socioeconomic Status												
Educational Attainment (base: less than high school or unreported)												
HS	-0.04	0.06		-0.01	0.32		0.25	0.06	***	0.55	0.06	***
Some College	-0.07	0.06		-0.10	0.31		0.16	0.06	**	0.46	0.05	***
Bachelors	-0.09	0.06		0.24	0.31		0.17	0.06	***	0.48	0.05	***
Advanced	-0.14	0.06	**	0.46	0.31		0.23	0.06	***	0.49	0.05	***
Marital Status (base: married)												
Never Married	0.13	0.03	***	-0.11	0.16		-0.21	0.03	***	-0.62	0.03	***

Sep Div Wid	0.10	0.02	***	-0.04	0.13		0.05	0.02	**	-0.38	0.02	***
Family Responsibility												
Child Under 16	-0.05	0.03	*	-0.04	0.14		-0.09	0.03	***	0.01	0.02	
Work Experience												
Cont Weeks UnEmp	-0.00	0.00	***	0.00	0.00	***				0.00	0.00	***
Hrs Work Main Job	-0.00	0.00		-0.00	0.00	***	-0.00	0.00	***	-0.00	0.00	***
Health												
Any Diff	0.15	0.04	***	-1.10	0.18	***	-0.48	0.04	***	-0.30	0.04	***
Metro Business Cycle												
Unemployment Rt	0.01	0.01		0.02	0.03		-0.02	0.01	*	0.00	0.01	
Year Dummy Variables		Yes		Yes			Yes			Yes		
Constant	4.55	0.82	***	21.53	4.45	***	-6.81	0.80	***	-2.76	0.71	***
Random-Effects Parameters: Metropolitan Areas; Identity												
sd(_cons)	0.1	0.0	**	0.0	0.1		0.3	0.0	**	0.5	0.0	**
LR test vs. logistic model: chibar2(01)				0			397		***	2417		***
Number of obs	81055			2066			73904			81055		
Number of groups	144			135			144			144		
Obs per group:												
min	11			1			5			11		
avg	563			15			513			563		
max	5872			190			5425			5872		
Log likelihood	-41497			-1236			-41988			-53101		
Wald chi2(25)	302			235			5844			3387		

Note: * indicates statistical significance at 0.1 level, ** indicates statistical significance at 0.05 level, and *** indicates statistical significance at 0.01 level.

In contrast to Table 4 findings, Table 5 compares the factors involved in non-boomers' choice of entrepreneur types from among the four pairs (eight types). The factors across different types of non-boomer entrepreneurs are largely similar to those of the boomer entrepreneurs, including the effects from living in a city center, gender, race (particularly for Whites), marital status, duration of unemployment, hours worked at the main job, and physical and cognitive difficulties. Limited factor effect differences are observed.

For the age effect, there is a u-shaped age trend for *opportunity* versus *necessity novice/switcher* boomer entrepreneurs and an n-shaped age trend among the same types of non-boomers. Considering the fact that boomers were ages 42-70 and non-boomers ages 16-51 during

our observation period (2006-2016), the older non-boomers could have shared the age span with the younger boomers. Therefore there is a downward age trend around ages 42-51, which is not inconsistent with the aforementioned findings. The age effects on the other three pairs of entrepreneur types are consistent across boomer and non-boomer entrepreneurs.

There is a slight difference in race effect between boomer and non-boomer entrepreneurs. While African American boomers are more likely to be *part-time* versus *full-time* entrepreneurs, this is not the case for African American non-boomer entrepreneurs. With our increasingly diverse society, younger African Americans now tend to have more business opportunities. This could well include *full-time* entrepreneurship.

The educational attainment effect and child-care responsibility effect are more evident for non-boomer entrepreneurs than boomer entrepreneurs. Having more years of working experience, the role of educational attainment might not be as evident for boomer entrepreneurs. Moreover, the strong educational effect for non-boomers could be related to an education system that is now more oriented toward careers and entrepreneurship. Non-boomer entrepreneurs are also more likely to have young children than boomer entrepreneurs.

The unemployment rate shows a strong positive effect for *incorporated* versus *unincorporated* non-boomer entrepreneurship, but not for boomer entrepreneurship. While the recession pushed workers' wage lower, *incorporated* non-boomer entrepreneurs benefited more from the lower labor costs than *unincorporated* non-boomer entrepreneurs. *Incorporated* boomer entrepreneurship is not as cyclical as their non-boomer counterparts.

Table 5. Multilevel Mixed-Effects Logistic Regression Estimate for Non-Boomer Entrepreneurs

	Novice E	Opportunity Novice E	Full-Time E	Incorporated E
--	----------	----------------------	-------------	----------------

	Coef.	SE	P	Coef.	SE	P	Coef.	SE	P	Coef.	SE	P
Residence Location												
Central City	0.03	0.02	*	0.03	0.08		0.03	0.02	*	-0.14	0.02	***
Demographics												
Age	-0.07	0.00	***	0.07	0.02	***	0.13	0.00	***	0.09	0.00	***
Age2	0.00	0.00	***	-0.00	0.00	***	-0.00	0.00	***	-0.00	0.00	***
Male	-0.12	0.02	***	0.73	0.08	***	1.23	0.02	***	0.59	0.02	***
Race (base: other minority and mixed races)												
African Amer	0.14	0.04	***	0.03	0.18		0.01	0.05		-0.11	0.04	***
White	-0.10	0.03	***	0.07	0.13		-0.28	0.03	***	-0.13	0.03	***
Socioeconomic Status												
Educational Attainment (base: less than high school or unreported)												
HS	-0.13	0.05	***	0.63	0.20	***	0.39	0.05	***	0.26	0.05	***
Some College	-0.23	0.05	***	0.68	0.19	***	0.21	0.05	***	0.25	0.05	***
Bachelors	-0.21	0.05	***	0.90	0.19	***	0.29	0.05	***	0.40	0.05	***
Advanced	-0.23	0.05	***	1.09	0.20	***	0.26	0.05	***	0.43	0.05	***
Marital Status (base: married)												
Never Married	0.10	0.03	***	-0.43	0.12	***	-0.09	0.03	***	-0.44	0.02	***
Sep Div Wid	0.13	0.03	***	-0.24	0.14	*	0.17	0.03	***	-0.25	0.02	***
Family Responsibility												
Child Under 16	-0.14	0.02	***	-0.43	0.10	***	-0.18	0.02	***	0.20	0.02	***
Work Experience												
Cont Weeks UnEmp	-0.00	0.00	***	0.00	0.00	***				0.00	0.00	***
Hrs Work Main Job	0.00	0.00	***	-0.00	0.00	***	-0.00	0.00	***	-0.00	0.00	***
Health												
Any Diff	0.18	0.04	***	-1.06	0.21	***	-0.41	0.04	***	-0.12	0.04	***
Metro Business Cycle												
Unemployment Rt	-0.00			-0.02			-0.01	0.01		0.03	0.01	***
Year Dummy Variables		Yes			Yes			Yes			Yes	
Constant	1.35	0.12	***	-3.07	0.49	***	-2.15	0.12	***	-3.65	0.13	***
Random-effects Parameters: Metropolitan Areas; Identity												
sd(_cons)	0.1	0.0	**	0.2	0.1	**	0.3	0.0	**	0.5	0.0	**
LR test vs. logistic model: chibar2(01)	1			1			505		***	2308		***
Number of obs	86151			3113			78185			86151		
Number of groups	143			138			143			143		
Obs per group:												
min	14			1			14			14		
avg	603			23			547			603		
max	6973			291			6392			6973		
Log likelihood	-47238			-1919			-44622			-55441		
Wald chi2(25)	1356		***	368		***	8791		***	4854		***

Note: * indicates statistical significance at 0.1 level, ** indicates statistical significance at 0.05 level, and *** indicates statistical significance at 0.01 level.

Our findings are mostly consistent across all 11 models in the three tables and consistent with our intuition and observations from the data. This demonstrates the robustness of our model. Our Wald chi-square statistics are all statistically highly significant ($p = 0.000$), which indicates overall that the independent variables, taken together, have significant effects on the dependent variables of all the models. The statistically significant ($p = 0.01$) random-effect parameters indicate the advantage of using mixed-effect multilevel or hierarchical modeling instead of one-level analysis. The statistically highly significant log likelihood ratio test statistics versus logistic regressions reflect the advantage of using cross-sectional time-series panel data model rather than a simple logistic regression that does not consider the cross-sectional time series longitudinal data structure and correlations. These statistics demonstrates the advantage of our multilevel mixed-effects logistic regression models.

VII. SUMMARY OF FINDINGS AND LIMITATIONS OF THE STUDY

This study extends the occupational choice literature to include age effect and different entrepreneur types. It measures eight different types of boomer entrepreneurs (four pairs): *novice/switcher* versus *non-novice/switcher*, *incorporated* versus *unincorporated*, *full-time* versus *part-time*, and *opportunity* versus *necessity novice/switcher*. The study continues the discussion on age and entrepreneurship and offers new nuances on the different types of entrepreneurs. This is the first study to compare eight entrepreneurship types, to compare boomer and non-boomer entrepreneur types, and to identify the contributing factors for different types of entrepreneurial propensity. It not only models across individuals for the fixed effects, it also incorporates random effects across metropolitan areas with the multilevel mixed-effects logistic

regression models. Moreover, it uses the most current nationally representative data, which cover 132 months of information (11 years).

Our findings based on 11 multilevel mixed-effects logistic regression models support our hypotheses. The age effect supports Hypothesis 1—that different boomer entrepreneur types have different age effects. Among boomer entrepreneurs, we observe that *novice/switcher*, *opportunity novice/switcher*, *part-time*, and *unincorporated* entrepreneur rates rise at higher ages (55 and above), with a slightly u-shaped age effect for *novice/switcher* (versus *non-novice/switcher*), *opportunity* (versus *necessity*) *novice/switcher*, *part-time* (versus *full-time*), and *unincorporated* (versus *incorporated*) boomer entrepreneurship. Although boomers are overall more likely than non-boomers to be *non-novice/switcher* or *full-time* entrepreneurs (see Figure 3), the *novice/switcher* and *part-time* entrepreneur rates rise at higher ages (see Figure 2). There is a u-shaped age effect across all ages (see Figure 2 and Tables 3-5) on the *novice/switcher* entrepreneur rate. We also observed an overall u-shaped age effect on entrepreneurial propensity among boomer workers, but the opposite among non-boomer workers. Boomer entrepreneurs' dominance in *opportunity* entrepreneurship, with a rising trend at higher ages, supports our understanding that boomer entrepreneurs continue to be productive, particularly Kirznerian entrepreneurs.

Our findings also support Hypothesis 2—that the driving factors differ across different boomer entrepreneur types. Among boomer entrepreneurs, the better-off entrepreneur types—*non-novice/switcher* (versus *novice/switcher*), *opportunity* (versus *necessity*) *novice/switcher*, and *incorporated* (versus *unincorporated*)—tend to be suburban male boomers with no physical or mental difficulties. Boomers who were unemployed for longer are also more likely to be the better-off entrepreneur types, probably because they spent a good amount of time preparing to

start a new business. Male, non-African American minorities, separated, divorced, and widowed boomers from areas with lower unemployment rates, those with no young children, and those with no physical or mental difficulties are more likely to be *full-time* than *part-time* entrepreneurs, as they tend to have more time to make the commitment.

For both boomers and non-boomers, living in a central city, being White, married, and having young children, being unemployed for longer, working more hours at a main job, and having more physical or mental difficulties are associated with higher odds of being an entrepreneur. For non-boomer entrepreneur types, the effects of educational attainment, having responsibility for young children, and unemployment rates are more evident than for boomer entrepreneur types. While African American boomer entrepreneurs are more likely to be *part-time* than *full-time* entrepreneurs, this is not the case for non-boomer entrepreneurs.

As the first study to identify and address eight types of boomer entrepreneurs, we acknowledge that there is much more to be explored. This paper has touched on the differences between the cohort effects and the age effects; further study of these differences is clearly worthwhile. Our next study will compare the cohort differences and continue the discussion on Schumpeterian versus Kirznerian productive entrepreneur types. Further nuanced research could also include analysis of industry, occupation, location, and subpopulation, and adopt alternative model specifications and data.

REFERENCES

Acs, Z. J., & Audretsch, D. B. (1990). *Innovation and small firms*. Cambridge, MA: MIT Press.

- Acs, Z., Audretsch, D., Braunerhjelm, P., & Carlsson, B. (2010). The missing link: Knowledge diffusion and entrepreneurship in endogenous growth. *Small Business Economics*, 34, 105-125.
- Acs, Z., Lafuente, E., Sanders, M., & Szerb, L. (2017). *The global technology frontier: Productivity growth and the relevance of the national system of entrepreneurship* [working paper]. Arlington, VA: George Mason University.
- Akcigit, U., Grigsby, J., & Nicholas, T. (2017). When America was most innovative, and why. *Harvard Business Review*. Retrieved from <https://hbr.org/2017/03/when-america-was-most-innovative-and-why?referral=00060>
- Anokhin, S., Grichnik, D., & Hisrich, R. D. (2008). The journey from novice to serial entrepreneurship in China and Germany: Are the drivers the same? *Managing Global Transitions*, 6, 117-142.
- Audretsch, D. B., & Keilbach, M. (2004). Entrepreneurial capital and economic performance. *Regional Studies*, 38, 949-959.
- Bailey, J. (2017). Health insurance and the supply of entrepreneurs: New evidence from the Affordable Care Act. *Small Business Economics*, 49, 627-646.
- Baumol, W. J. (1990). Entrepreneurship: Productive, unproductive, and destructive. *Journal of Political Economy*, 98, 893-921.
- Bergmann, H., & Sternberg, R. (2007). The changing face of entrepreneurship in Germany. *Small Business Economics*, 28, 205-221.
- Berkovec, J., & Stern, S. (1991). Job exit behavior of older men. *Econometrica*, 59(1), 189-210.
- Binder, M., & Coad, A. (2013). Life satisfaction and self-employment: A matching approach. *Small Business Economics*, 40, 1009-1033.

- Blanchflower, D. G. (2000). Self-employment in OECD Countries. *Labour Economics*, 7, 471-505.
- Blanchflower, D. G., & Oswald, A. J. (1998). What makes an entrepreneur? *Journal of Labor Economics*, 16(1), 26-60.
- Blanchflower, D. G., Oswald, A. J., & Stutzer, A. (2001). Latent entrepreneurship across nations. *European Economic Review*, 45, 680-691.
- Block, J. H., & Landgraf, A. (2013). The intention of part-time entrepreneurs to become full-time entrepreneurs: The role of financial and non-financial motives. Retrieved from <https://ssrn.com/abstract=2340046>, <http://dx.doi.org/10.2139/ssrn.2340046>
- Block, J. H., & Wagner, M. (2010). Necessity and opportunity entrepreneurs in Germany: Characteristics and earnings differentials. *Schmalenbach Business Review*, 62, 154-174.
- Boyd, S., & Dixon, S. (2009). *The working patterns of older workers*. Wellington, New Zealand: New Zealand Department of Labour. Retrieved from www.dol.govt.nz/publications/research/working-patterns/working-patterns-full.pdf
- Bruce, D., Holtz-Eakin, D., & Quinn, J. (2000). *Self-employment and labor market transitions at older ages* [working paper]. Chestnut Hill, MA: Center for Retirement Research at Boston College.
- De Kok, J. M. P., Verheul, I., & Ichou, A. (2010). *New firm performance: Does the age of founders affect employment creation*. Zoetermeer, Netherlands: Scales Research Reports from EIM Research Reports, no. H201015.
- Devine, T. (1994). Characteristics of self-employed women in the United States. *Monthly Labor Review*, March 1994, 20-34.

- Evans, D. S., & Leighton, L. S. (1989). Some empirical aspects of entrepreneurship. *American Economic Review*, 79, 519-535.
- Fairlie, R. W., Morelix, A., Reedy, E. J., & Russell, J. (2015). *Kauffman Index 2015: The startup activity*. *National Trends*. Kansas City, MO: The Ewing Marion Kauffman Foundation.
- Fairlie, R. W., & Fossen, F. M. (2017). *Opportunity versus necessity entrepreneurship: Two components of business creation* [discussion paper no. 17-014]. Stanford, CA: Stanford Institute for Economic Policy Research. Retrieved from <http://siepr.stanford.edu/sites/default/files/publications/17-014.pdf>.
- Flood, S., King, M., Ruggles, S., & Warren, J. R. (2015). *Integrated public use microdata series, current population survey: Version 4.0*. [Machine-readable database]. Minneapolis: University of Minnesota.
- Florida, R. (2004). *The rise of the creative class and how it's transforming work, leisure, community and everyday life*. New York: Basic Books.
- Folta, T. B., Delmar, F., & Wennberg, K. (2010). Hybrid entrepreneurship. *Management Science*, 56, 253-269.
- Friedline, T., & West, S. (2016). Young adults' race, wealth, and entrepreneurship. *Race and Social Problems*, 8(1), 42-63
- Fuchs, V. (1982). Self-employment and labor force participation on older males. *Journal of Human Resources*, 17, 339-357.
- Glaeser, E. (2007). *Entrepreneurship and the city*. Cambridge, MA: NBER working paper, no. 13551.

- Glover, A., & Short, J. (2009). *Incorporated entrepreneurs: The first step from the basement to the boardroom* [working paper]. Retrieved from <http://www.econ.upf.edu/docs/seminars/short.pdf>
- Hipple, S. (2010). Self-employment in the United States. *Monthly Labor Review*, *September 2010*, 17-32.
- Hipple, S. F., & Hammond, L. A. (2016). *BLS spotlight on statistics: Self-employment in the United States*. Washington, DC: U.S. Department of Labor, Bureau of Labor Statistics.
- Hörisch, J., Kollat, J., & Brieger, S. A. (2017). What influences environmental entrepreneurship? A multilevel analysis of the determinants of entrepreneurs' environmental orientation. *Small Business Economics*, *48*(1), 47-69.
- Hsu, D., Shinnat, R. S., Powell, B. C., & Betty, C. S. (2017). Intentions to reenter venture creation: The effect of entrepreneurial experience and organizational climate. *International Small Business Journal*. DOI: <https://doi.org/10.1177/0266242616686646>
- Kahn, S., Martina, G. L., & MacGarvie, M. J. (2017). "Misfits," "stars," and immigrant entrepreneurship. *Small Business Economics*, *49*, 533-557.
- Karoly, L. A., & Zissimopoulos, J. (2004). Self-employment among older U.S. workers. *Monthly Labor Review*, *July 2004*, 24-47.
- Kautonen, T. (2008). Understanding the older entrepreneur: Comparing third age and prime age entrepreneurs in Finland. *International Journal of Business Science and Applied Management*, *3*(3), 3-13.
- Kautonen, T., Down, S., & Minniti, M. (2014). Ageing and entrepreneurial preferences. *Small Business Economics*, *42*, 579-594.

- Kautonen, T., Kiblera, E., & Minniti, M. (2017). Late-career entrepreneurship, income and quality of life. *Journal of Business Venturing*, 32, 318-333.
- Kautonen, T., & Palmroos, J. (2010). The impact of a necessity-based start-up on subsequent entrepreneurial satisfaction. *International Entrepreneurship and Management Journal*, 6, 285-300.
- Kirzner, I. M. (1973). *Competition and entrepreneurship*. Chicago: University of Chicago Press.
- Lee, M. O., & Vouchilas, G. (2016). Preparing to age in place: Attitudes, approaches, and actions. *Housing and Society*, 43(6), 69-81.
- Lévesque, M., & Minniti, M. (2006). The effect of aging on entrepreneurial behavior. *Journal of Business Venturing*, 21, 177-194.
- Levine, R., & Rubinstein, Y. (2013). *Smart and illicit: Who becomes an entrepreneur and does it pay?* Cambridge, MA: NBER working paper, no. 19276.
- Light, A., & Munk, R. (2015). *Business ownership vs. self-employment*. Retrieved from <https://ssrn.com/abstract=3044070>
- Ng, E. S.-W., Carpenter, J. R., Goldstein, H., & Rasbash, J. (2006). Estimation in generalized linear mixed models with binary outcomes by simulated maximum likelihood. *Statistical Modelling*, 6, 23-42.
- Parker, S. C., & Rougier, J. (2007). The retirement behaviour of the self-employed in Britain. *Applied Economics*, 39, 697-713.
- Parker, S. C. (2009). *The economics of entrepreneurship*. Cambridge, UK: Cambridge University Press.
- Pew Research Center. (2011). *The generation gap and the 2012 elections*. Retrieved from [http://www.people-press.org/files/legacy-pdf/11-3-11Generations Release.pdf](http://www.people-press.org/files/legacy-pdf/11-3-11Generations%20Release.pdf)

- Pinheiro, J. C., & Bates, D. M. (1995). Approximations to the log-likelihood function in the nonlinear mixed-effects model. *Journal of Computational and Graphical Statistics*, 4, 12-35.
- Pinheiro, J. C., & Chao, E. C. (2006). Efficient Laplacian and adaptive Gaussian quadrature algorithms for multilevel generalized linear mixed models. *Journal of Computational and Graphical Statistics*, 15, 58-81.
- Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method bias in behavioral research: a critical review of the literature and recommended remedies. *Journal of Applied Psychology*, 88, 879-903.
- Rabe-Hesketh, S., Skrondal, A., & Pickles, A. (2005). Maximum likelihood estimation of limited and discrete dependent variable models with nested random effects. *Journal of Econometrics*, 128, 301-323.
- Rabe-Hesketh, S., & Skrondal, A. (2012). *Multilevel and longitudinal modeling using stata* (3rd ed.). College Station, TX: Stata Press.
- Reynolds, P. D., Bosma, N., Autio, E., Hunt, S, de Bono, N., Servais, I. ... Chin, N. (2005). Global Entrepreneurship Monitor: Data collection design and implementation 1998-2003. *Small Business Economics*, 24, 205-231.
- Santarelli, E., Carree, M., & Verheul, I. (2009). Unemployment and firm entry and exit: An update on a controversial relationship. *Regional Studies*, 43, 1061-1073.
- Schmalz, M. C., Sraer, D. A., & Thesmar, D. (2017). Housing collateral and entrepreneurship. *The Journal of Finance*, 72(1), 99-132.

- Schott, T., Rogoff, E., Herrington, M. and Kew, P. (2017), Senior entrepreneurship: special topic report 2016-2017, *Global Entrepreneurship Monitor*, Babson College & Universidad del Desarrollo, Wellesley, MA and Santiago.
- Schulz, R., & Salthouse, T. A. (1999). *Adult development and aging: Myths and emerging realities* (3rd ed.). Upper Saddle River, NJ: Prentice Hall.
- Schumpeter, J. A. (1934). *The theory of economic development: An inquiry into profits, capital, credit, interest, and the business cycle*. Cambridge, MA: Harvard University Press.
- Schumpeter, J. (1950). *Capitalism, socialism, and democracy* (3rd ed.). New York: Harper and Row.
- Shane, S. (2014). *Incorporated Versus Unincorporated Self Employment*. Retrieved from <https://smallbiztrends.com/2013/11/incorporated-versus-unincorporated-self-employment.html>.
- Singh, G., & DeNoble, A. (2003). Early retirees as the next generation of entrepreneurs. *Entrepreneurship, Theory and Practice*, 23, 207-226.
- StataCorp. (2015). *Stata: Release 14* [statistical software]. College Station, TX: Author.
- Terjesen, S., & Wang, N. (2013). Coase on entrepreneurship. *Small Business Economics*, 40, 173-184
- U.S. Bureau of Labor Statistics & U.S. Census Bureau. (2006). *Design and methodology: Current Population Survey. Technical paper 66*. Retrieved from <https://www.nber.org/cps/tp-66.pdf>
- Van der Zwan, P., Thurik, R., Verheul, I., & Hessels, J. (2016). Factors influencing the entrepreneurial engagement of opportunity and necessity entrepreneurs. *Eurasian Business Review*, 6, 273-295.

- Van Praag, C. M., & Van Ophem, H. (1995). Determinants of willingness and opportunity to start as an entrepreneur, *KYKLOS*, 48, 513-540.
- Velilla, J., & Ortega, R. (2017). Determinants of entrepreneurship using fuzzy set methods: Europe vs. non-Europe. *Applied Economics Letters*, 24, 1320-1326.
- Wagner, J. (2004). *Are young and small firms hothouses for novice entrepreneurs? Evidence from German micro data* [working paper no. 301]. [location?]: University of Lüneburg.
- Walker, H., Grant, D., Meadows, M., & Cook, I. (2007) Women's experiences and perceptions of age discrimination in employment: Implications for research. *Social Policy and Society*, 6(1), 37-48.
- Weber, P., & Schaper, M. (2004). Understanding the grey entrepreneur. *Journal of Enterprising Culture*, 12, 147-164.
- Wennberg, K., Folta, T. B., & Delmar, F. (2006). A real options model of stepwise entry into self-employment. In *Babson College Entrepreneurship Research Conference (BCERC)*, Bloomington, IN, 2006.
- Zhang, T., (2008). *Elderly entrepreneurship for an aging U.S. economy: It's never too late*. London: World Scientific.
- Zhang, T., & Carr, D. (2014). Does working for oneself, not others, improve older adults' health? An investigation on health impact of self-employment. *American Journal of Entrepreneurship*, 7(1), 142-180.
- Zissimopoulos, J., & Karoly, L. (2007). Transitions to self-employment at older ages: The role of wealth, health, health insurance and other factors. *Labour Economics*, 14, 269-295.