Financial literacy and self employment – The moderating effect of gender and race

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ABSTRACT

Within the next decade, the number of self-employed workers, now 40% of the workforce, is predicted to surpass that of traditional employees. Managing finances (financial literacy) is an important skill set for self-employment. We bring attention to the growing prevalence of self-employment at a time when financial literacy is in decline in the United States. Using a sample of 15,069 participants in the 2015 and 2018 National Financial Capability Study, we find support for a positive association between financial literacy and self-employment in a U.S. context and extend prior research by focusing on two widely studied and important U.S. demographic segments in self-employment and entrepreneurship literature – gender and race. Contrary to other U.S.-based studies, we find that women with higher financial literacy scores are more likely to be self-employed than men; yet surprisingly, there is no significant difference in the association between higher financial literacy scores and self-employment between non-white and white U.S. respondents. We discuss the implications of the findings for researchers, policymakers, educators, and those considering self-employment.

1. Introduction

Small businesses, touted as the backbone of the American economy (Greenspan & Wooldridge, 2018; Struckell, 2019), have been the driver of U.S. job creation and GDP expansion for years (Bureau of Labor Statistics, 2017; Dearie & Geduldig, 2013). The majority of small business owners fall under the category of self-employed (Murray, 2019). Since the 2008 recession, there has been a marked and steady decline in new business entry (Kenan Institute, 2020), while there has been a significant increase in self-employment. According to federal U.S. employment statistics, between 2017 and 2020, 27 million Americans, representing 21% of the workforce, shifted from full-time jobs to self-employment, bringing the number of self-employed Americans to approximately 42 million people, representing roughly one-third of the U.S. workforce (Everlance, 2018).

This seismic shift in the workforce from employment to self-employment was first fueled by massive layoffs and associated high unemployment levels during the 2008 recession (Struckell, 2018). The recession disrupted the traditional employee-employer relationship (Gallup, 2018). The digital economy has also been a catalyst for self-employment through what is commonly known today as the gig economy (Istrate & Harris, 2017). Rapid growth in the number of freelancers and gig workers is expected to push traditional employment to the workforce minority by 2027 (Pew, 2019). Demand for gig workers is increasing 20% a year, especially in technology, graphic design, and writing (Kassi & Lehdonvirta, 2018). One source suggests freelance and independent workers will number over 90 million by 2028 (Statista, 2021). No doubt the growth in self-employment has been facilitated by technology. Internet applications provide sourcing and access for those seeking to buy or sell goods and services. The internet also provides support networks and other resources (i.e., access to insurance, marketing, benefits, and training) that can facilitate the success of those choosing self-employment (Ashford et al., 2018; Klarin & Suseno, 2021; Rashid, 2016; Tan et al., 2021).

Recently, the growth away from traditional employment is also being driven by the 46% of Generation Z members choosing independent work

over traditional employment (Upwork, 2020). At the other older end of the generational spectrum, baby boomers are also increasingly turning to self-employment as a transition to and means of funding retirement (Gallup, 2018; Pew, 2019).

In this paper, we focus on this fast-growing and important segment of the U.S. workforce, the self-employed, and investigate the relationship between self-employment and an important skill for the self-employed – financial literacy. Represented among the self-employed are businesses providing both services and products. Some studies consider an entrepreneur and a self-employed person as the same (Christnacht et al., 2018; Szaban & Skrzek-Lubasińska, 2018). Other studies parse self-employment into different categories, suggesting that the incorporated self-employed (25% of those self-employed) might be more entrepreneurial than the unincorporated self-employed – assuming the legal entity is informative (Levine & Rubinstein, 2018). Yet other studies differentiate the entrepreneur through innate attributes and suggest that entrepreneurs can be found in all types of employment situations, including corporate environments (McKeown, 2015). Other means of segmenting the self-employed in the literature include those that are self-employed by choice (more entrepreneurial) versus necessity (less entrepreneurial) (McKinsey, 2016). A recent Gallup report (2018) segments gig workers by distinguishing between true independent contractors (freelancers and online platform workers) and contingent workers (temporary and on-call) and by suggesting they are primarily differentiated by their level of autonomy and control over their work.

Looking beyond the definitions and characterizations of self-employment used in literature are distinctions as to race and gender. Nearly 79% of self-employed workers are white; 60% are men; and almost 20% are immigrants, making up the majority (75%) of non-white self-employed (Headd, 2021). It is generally accepted that workforce diversity at all levels produces more creativity and innovation and, ultimately, better business results (Kenan Institute, 2020). While women now make up the majority of the workforce and represent more college graduates than men, only 40% of women are self-employed (SBA, 2020). Women and non-white entrepreneurs account for less than 5% of venture capital funding (Kenan Institute, 2020). Women and non-whites are underrepresented in self-employment.

Regardless of the type of self-employment, and the race or gender of the self-employed, in this study, we focus on financial literacy as an important skill for all self-employed and self-employment types. The study recognizes the failing cited by Huston (2010) in a meta-analysis – that the majority of studies on financial literacy (72%) do not provide a clear definition of the term. We borrow the definition proposed by Huston (2010) for its simplicity: financial literacy is "how well an individual can understand and use personal finance-related information" (page 306). While financial literacy has become a focus of public policy (Huston, 2010), the United States has seen a decline in its level of financial literacy, and the overall level of financial literacy in the United States is low when compared to other developed and developing countries. The United States ranks 14th, with a reported 57% financial literacy rate. The data is supported by the 2015 National Financial Capabilities Study, which included nearly 30,000 respondents and found the overall level of financial literacy in the United States is 61%; higher for those that received formal financial literacy education (71%) and lower for women and minorities (Al-Bahrani et al., 2019). A study conducted by the FINRA Investor Education Foundation found that during the past decade, between 2009 and 2018, there was an 8% decline in financial literacy levels in the United States (Keshner, 2019). Every age group has seen a decline in financial literacy, but the greatest decline is registering with the millennial generation, which now represents the majority generation of the U.S. population and workforce. Financial literacy among millennials dropped from 30% to 17% in the past decade (Keshner, 2019).

We build on a recent study published in the Journal of Consumer Affairs (Ćumurović & Hyll, 2019). Using a German sample from the 2009 SAVE panel database of household asset accumulation and saving

behavior, the authors provide evidence of a strong directional link between financial literacy and self-employment propensity. Specifically, self-employed German respondents were found to have a higher level of financial literacy than employed respondents. Self-employed German respondents were also more likely to be male, and men were found to have a higher level of financial literacy than women. Germany, like many European countries, is ethnically homogenous; as such, ethnic diversity was not part of the study.

Given the growing importance of self-employment in the United States, where as much as 33% of the workforce identifies as self-employed (Everlance, 2018), the historic importance of immigrant business start-ups and small business to the U.S. economy, and the unique diversity of the U.S. population, we were motivated to investigate the relationship between financial literacy (FL) and self-employment (SE) using a U.S. sample and to delve deeper into the demographic implications, including gender and ethnicity. We use a sample of 15,069 participants from the 2015 and 2018 National Financial Capability Study to attempt to investigate an overall relationship between financial literacy and self-employment. The study contributes to the body of literature focused on the growing segment of self-employment, which has received less attention than the related area of entrepreneurship. We contribute to prior findings using a much larger and U.S.-based sample, and we extend the findings by determining if the relationship between financial literacy and self-employment holds for women and non-white Americans. Finally, we provide theoretical support to the study by drawing on the human capital theory that has its foundation in the resource-based view.

What follows is a theoretical review, the development of three hypotheses, the research methods and findings, and a discussion of results. We focus on the implications of the findings to researchers, policymakers, educators, and those considering self-employment.

2. Theoretical underpinnings

2.1. Theoretical background: Self-employment

After decades of declining self-employment driven by a significant decrease in agricultural work (farming), self-employment in the United States began a steady increase in the 1980s (Blau, 1987). Increases have been driven in part by growth in fields most noted for self-employment and are due to technology enablement (computers/internet) and tax motivations, especially for higher income brackets motivated to shield income through self-employment entities (Blau, 1987). The fastest growing occupations for the self-employed are overwhelmingly found in the fields of healthcare support, social and community service, computer and digital occupations, and personal care (Newsome, 2019; Vilorio, 2014). According to federal self-employment statistics, 42 million Americans, representing 33% of the workforce, were projected to be self-employed in the United States as of 2020 (Everlance, 2018). A 2019 Pew Research study suggests the number is higher, bringing the percentage of Americans participating in independent work closer to 40% (Pew, 2019), with sources noting that by 2027 traditionally employed workers will become the minority in the United States (Pew, 2019; Statista, 2021).

The earnings of the self-employed, including independent contractors and those in alternative work arrangements, accounted for about one-eighth of total U.S. personal income in 2010 (Eisenach, 2010) and can be estimated to be close to 20% today based on the increase in the number of workers in the category and their average earned annual income (Pofeldt, 2021). The self-employed work in fields including agriculture, construction, and professional services as well as in other specific occupations such as cab driver, financial advisor, truck driver, hairstylist, and construction worker (Eisenach, 2010). Historically, the rate of self-employment is higher for older versus younger workers, higher for men than women (60% versus 40%, respectively), significantly higher for white Americans (79%) versus Black Americans (11%),

and higher for immigrants than native-born Americans (Hipple & Hammond, 2016; Bureau of Labor, 2017; Headd, 2021). Besides, the self-employed are disproportionately less likely to be Hispanic than are employed workers (Christnacht et al., 2018). The majority of self-employed are classified as independent contractors, consultants, or freelancers (Newsome, 2019) and predominantly work in five industries: professional services, repair and personal services, construction, retail, and administrative services (Pofeldt, 2021). The majority (87%) prefer self-employment to traditional employment and note the primary benefits of self-employment as flexibility in schedule and location and autonomy (Eisenach, 2010; Gallup/Quickbooks, 2019; Pofeldt, 2021; Upwork, 2020).

One study suggests the increase in self-employment is the result of increasing life span, the shift from manufacturing to a service-oriented economy, and employer use of technology to eliminate full-time employees (Eisenach, 2010). Increasing longevity supports the greater level of self-employment for older age groups (Eisenach, 2010). Baby boomers see self-employment as a transition into retirement (Gallup/Quickbooks, 2019; Pew, 2019; Upwork, 2020). The service industry is better motivated to match staffing to demand through contract labor (Eisenach, 2010). Corporations seeking efficiency use technology and outsourcing to strategically limit and target the number of full-time employees. Technology has enabled self-employment by making possible remote and independent work and providing ease of access to both work (for the contractor-supply) and worker for the consumer and/or employer (Brussevich et al., 2018). Internet applications provide sourcing and access for seeking to buy or sell goods and services. The internet also provides support networks and other resources (i.e., access to insurance, marketing, benefits, and training) that can facilitate the success of those choosing self-employment (Ashford et al., 2018; Klarin & Suseno, 2021; Rashid, 2016; Tan et al., 2021).

Other reasons for the growth in self-employment include the establishment of the legitimacy of self-employment resulting from the 2008 recession and subsequent growth of the gig economy (Struckell, 2018). Recently, the youngest generation, Generation Z, is selecting independent work versus traditional work, a shift further motivated by the COVID-19 pandemic (Upwork, 2020).

2.2. Theoretical background: Self-employment and financial literacy

Self-employment comes with significant challenges. The *self* is responsible for everything in the business (Murray, 2019). The Federal Labor Standards Act (FLSA) only covers direct employer-employee relationships, so freelancers are forced to pay for their own healthcare insurance (or forgo it), pay higher taxes (both the employee and employer portion of Medicare and Social Security), and receive no other benefits such as paid vacation, sick days, or maternity leave (Halpin & Cook, 2010). In general, freelancers are paid less (as much as 40% less than they earned in traditional work and less than the median U.S. wage earner), and they work longer hours, sometimes across a mix of jobs (Hesmondhalgh & Baker, 2010). Earlier discussion supports this fact: 33% of the workforce claims to be self-employed, yet only one-eighth of U.S. personal income is reported from the self-employed.

A European study conducted on the skills needed for self-employment included those required for any successful worker–soft skills such as oral and written communication–and highlighted unique financial skills required, such as those related to financial literacy. For example, self-employment requires an ongoing risk versus benefit assessment, functional business skills across finance, human resource, and marketing, at a minimum, and specialized business knowledge in taxes, finances, and legal matters (IES, n.d.).

A recent study of Uber driver economics illustrates the need for financial literacy for the self-employed. The study revealed that the average Uber driver makes less than $4/hour before taxes, and 30% were found to lose money when considering vehicle expenses; yet the drivers were unaware that they were losing money or being paid at such

a low rate (Zoepf et al., 2018). It makes sense that the self-employed require a higher level of financial skills to prepare plans and business budgets, for tax purposes, to assess insurance needs, and to make decisions about healthcare. Most businesses fail due to financial issues; this is no different for a sole proprietor (Ćumurović & Hyll, 2019; Nitani et al., 2019). As such, financial literacy is an important skill for the self-employed.

In the Standard and Poor's Global Financial Literacy Survey, the United States is ranked only 14th, with a 57% financial literacy level (Iacurci, 2019). The issue of financial literacy has been named an "epic failure" in both the home and classroom (FEC, n.d.). The importance of financial literacy to career success has been a theme in entrepreneurship and self-employment literature. Higher levels of education have been linked to higher earnings (Marvel et al., 2016), and education has been linked to both entrepreneurial activity and performance (Block et al., 2011; Lofstrom et al., 2014; Struckell, 2019). Studies have supported the association between higher education and the selection of self-employment (Lange et al., 2014). On a global basis, financial literacy appears to increase with educational attainment, math skills, age, and income (Klapper et al., 2017). In the United States, we have achieved the highest level of educational attainment in history as measured by high school diploma attainment at 92% and bachelor's degree attainment at 36% (NCES, 2018). Given these high levels of educational attainment, it is shocking that the level of financial literacy in the United States is plummeting.

It is also surprising to find this decline in financial literacy in the decade following the great recession of 2008. Sixteen percent of the workforce lost their jobs, and nearly every household was financially impacted. Some lost their homes, home equity, and wealth (Christelis et al., 2015; Leubsdorf, 2016). Financial hardship should motivate demand for financial literacy. At the same time, other structural changes should be a catalyst for refined financial acumen. Calculation of retirement income required is more difficult because people are living longer (Iacurci, 2019), and the solvency of the social security system is uncertain (Pascarella, 2018). Americans are forced to take on substantial debt at much younger ages. Many high school students have credit cards and credit card debt (Keshner, 2019), forcing younger adults to be more capable of managing their finances. Student debt has risen to $1.7 trillion, impacting 71% of recent graduates (2016), with an average debt burden of $37, 000 and a monthly payment of $351 (Zetlin, 2017). Based on these conditions, financial literacy is important for all U.S. adults and imperative for those self-employed.

Symptoms of financial illiteracy are abundant. Household debt increased by 25% between 2011 and 2018. Nearly 40% of households have credit card debt close to $20,000 with an APR of 17% or more (Pascarella, 2018). Median retirement savings for people 55–64 years old would amount to a retirement income of only $310 a month (Iacurci, 2019). One-third of adults have zero retirement savings and 56% have saved less than $10,000, while projections suggest the average U.S. adult will need about $1 million in retirement savings if they retire at age 65, and millennials will need 50%-100% more than that (Pascarella, 2018). Not only do U.S. adults lack retirement savings, they also do not have emergency funds. If met with an unexpected medical bill or job interruption, 44% of Americans would not be able to cover $400 in unexpected expenses. Finally, Americans with student loans are not paying them back; 43% of all borrowers are not making scheduled payments (Pascarella, 2018). The only plausible reason for this apparent financial literacy crisis is a reduction in K-12 post-recessionary funding, which has impacted reading and math skills. Math skills have been associated with the capacity for financial literacy (Keshner, 2019).

Motivation for the study is to bring attention to this phenomenon. The growing prevalence of self-employment does not reflect the diversity of the U.S. population. Further, we have a financial literacy crisis at a time when the country is experiencing a structural shift from traditional employment to self-employment.

2.3. RBV and human capital theory

Resources (i.e., labor, capital, and land) have been an integral part of economic growth theory since the 18th century (e.g., Malthus – 1798, Adam Smith – 1776, and Ricardo – 1817) (Sirmon et al., 2007; Wernerfelt, 1984). Early strategic management scholars suggested that resources were homogeneous within an industry and environmental forces were most important in determining firm performance (Porter, 1980; Rumelt, 1982). Resource-based view (RBV) gained momentum during a period in the early 1990s when a significant shift was taking place in the competitive environment and suggested that resources are idiosyncratic and heterogeneous within industries across firms and within firms (Pereira & Bamel, 2021; Porter, 1994; Prahalad & Hamel, 1990). Barney (1991) explained that not all resources are created equal – the ones that are rare and difficult to imitate, acquire, or substitute yield the greatest competitive advantage. Scholars were able to demonstrate that when firms can manage resources strategically, a remarkably strong resource-firm performance link exists (Barney, 1991; Combs et al., 2005; Crook et al., 2008; Prahalad & Hamel, 1990). Edith Penrose first noted that firms can improve productivity by bundling physical, human, and organizational resources in unique ways based on the knowledge and experience possessed and applied by managers (Barney, 1991; Kor & Mahoney, 2004; Penrose, 1959). The Oxford Handbook of Human Capital lists human capital as a key resource type considered in RBV that contributes to competitive advantage (Kraaijenbrink, 2011). Other resource types discussed as part of RBV encompass physical resources (i.e., plant and equipment) and organizational resources (i.e., brands and processes) (Pereira & Bamel, 2021). Resource-based view theory has evolved to encourage additional theory and streams of related research including knowledge-based view and the concept of dynamic capabilities – each based on human capital as a generator of knowledge and decisions and related to individuals and groups within the firm (Pereira & Bamel, 2021; Teece & Pisano, 1994).

Alongside the development of RBV, the human capital theory had specialized research focus given its recognition as "the most important source of economic wealth and engine of economic growth over time" (Blair, 2011). Human capital theory moved beyond labor as an input to suggest that workers' and managers' heterogeneous investments in skills and knowledge, including formal education and training, were positively related to earnings (Becker, 2011; Marvel et al., 2016).

Expressly relevant to the study, scholars have developed a robust stream of research linking human capital theory to entrepreneurial success (Gruber et al., 2012; Martin et al., 2013; Shane & Cable, 2002). Human capital can include education, experience, knowledge, and skills – with the potential to enhance each (Gruber et al., 2012; Unger et al., 2011). A 2016 review of human capital and entrepreneurship research based on over 100 articles from leading journals found that human capital theory drives overall entrepreneurial success because it influences abilities to recognize opportunities, access critical financial resources, and launch ventures (Marvel et al., 2016). Research has focused on human capital as an alternative to innate entrepreneurial attributes because human capital (e.g., skills, experience, and education) is a resource that can be acquired and cultivated (Ćumurović & Hyll, 2019). Authors of a review of self-employment literature, including 100 studies, find education has a significant influence on entrepreneurship selection, making the case for investment in education at all levels (Arnold, 2014). Levine & Rubinstein (2018) account for human capital and earnings as a proxy for certain types of self-employed – those that are more entrepreneurial.

As shared in the introduction, entrepreneurship literature has shown a strong link between education and entrepreneurial activity and performance (Block et al., 2011; Lofstrom et al., 2014). Studies have supported the association between higher education and the selection of self-employment (Lange et al., 2014). On a global basis, financial literacy appears to increase with educational attainment, math skills, age, and income (Klapper et al., 2017). In a second global study of financial literacy, education was found to be related but not a "perfect proxy" (Lusardi & Mitchell, 2011).

The resource-based view and human capital theory are appropriate to support the link between education and self-employment. Financial literacy can be cultivated through both education and experience (Ćumurović & Hyll, 2019). Skills noted in research as important for self-employment include general skills required for any successful worker– soft skills such as oral and written communication. Research also highlights unique skills needed for successful self-employment, like those related to financial literacy. For example, studies have shown that self-employment requires an ongoing risk versus benefit assessment, functional business skills across finance, human resource and marketing, at a minimum, and specialized business knowledge in taxes, finances, and legal matters (IES, n.d.; Vilorio, 2014).

We draw on RBV broadly as well as human capital theory to support the association between self-employment selection and financial literacy.

3. Hypothesis development

We build on a recent study (Ćumurović & Hyll, 2019). Using a German sample from the 2009 SAVE panel database of household asset accumulation and saving behavior, evidence of a strong directional link between financial literacy and self-employment propensity is supported. Specifically, German self-employed respondents were found to have a higher level of financial literacy than traditionally employed respondents. German self-employed respondents were more likely to be male, and men were found to have a higher level of financial literacy than women. Germany, like many European countries, is ethnically homogenous; as such, ethnic diversity was not part of the study.

Given the growing importance of self-employment in the United States, where as many as 33% of the workforce is self-employed (Everlance, 2018), the historic importance of immigrant business start-ups and small businesses to the U.S. economy, and the unique diversity of the population, we were motivated to attempt to investigate the relationship between financial literacy (FL) and self-employment (SE) using a U.S. sample and to delve deeper into the demographic implications including gender and ethnicity.

3.1. Financial skills and propensity for self-employment

The skillset needed for self-employment is certainly broader than that of the traditional employee. The traditional employment model eases tax administration and income reporting for the employee (Vilorio, 2014). The employer takes care of at least part of an employee's retirement planning, for example through a pension or 401(k) plan, as well as healthcare, salary, withholding for state and federal taxes, vacation, and sick pay. On the other hand, those that are self-employed bear the sole responsibility for each of those items discussed, in addition to the development of individual business planning and financial assessments. One of the most challenging differences between self-employment and traditional employment is income security and financial and administrative burdens (McKeown, 2015).

Literature suggests that a segment of those self-employed, those that are self-employed by choice, might be better equipped to deal with these additional complexities than those who are forced into self-employment. Taken together the two conditions drive an overall increase in the level of financial literacy for those self-employed; considered separately, we might see that those who select into self-employment are more financially literate, earn more, and enjoy a greater level of wellbeing than traditional employees (Levine & Rubinstein, 2018).

Expressly relevant to the study, scholars have developed a robust stream of research linking human capital theory to entrepreneurial success (Gruber et al., 2012; Martin et al., 2013; Shane & Cable, 2002). Human capital can include education, experience, knowledge, and skills – with the potential to enhance each (Gruber et al., 2012; Unger et al.,

2011). Experience is one factor that has been shown to improve financial literacy. Managerial experience, entrepreneurial experiences, and experience diversity have each been shown to increase performance (Arnold, 2014). Those that are self-employed are generally older – half are age 50 or older (Christnacht et al., 2018) – and therefore have years of experience in business that should be supportive of a higher level of financial literacy. Both experience and education are measures of human capital that have been correlated with selection and success in both entrepreneurship and self-employment (Gruber et al., 2012; Marvel et al., 2016).

Studies have shown that education improves an entrepreneur's ability to recognize and analyze business opportunities, organize, and solve problems, as well as increases self-confidence (Marvel et al., 2016; Verheul et al., 2012). According to the 2015 National Financial Capabilities Study, which included nearly 30,000 respondents, the overall level of financial literacy in the United States is 61%, and ten points higher for those who received formal financial literacy education (Al-Bahrani et al., 2019).

We follow the findings of the German study comparing the financial literacy of self-employed versus traditional employees (Ćumurović & Hyll, 2019) to support the hypothesis:

Hypothesis 1. Financial literacy is more positively associated with self-employment than traditional employment.

3.2. Financial skills and propensity for self-employment in women

Literature looks at differences in self-employment by gender. Studies find that men are more likely to be self-employed than are women (Christnacht et al., 2018; Peters et al., 2019; Pew, 2015), yet 40% of self-employed Americans are women. This compares to traditional employment, which is split nearly equally between men and women (51% and 49%, respectively). Self-employed women are disproportionately concentrated in education, health service, and retail trade occupations (Christnacht et al., 2018; Pew, 2015). Further, we find self-employed women are more likely to be married than single, which lowers the risk level of self-employment for women (Peters et al., 2019). Studies have shown that self-employed women earn less but select self-employment for flexibility and other non-pecuniary benefits (Budig, 2006; Christnacht et al., 2018; Justo et al., 2021).

A strong motivation for women to become self-employed is to take advantage of the inherent flexibility in self-employment to help manage work and family roles (Budig 2006; Christnacht et al., 2018). Yet, Hughes (2003) found that most women, about 75% of those studied, were more likely to become voluntarily self-employed for the challenge, autonomy, and flexibility (Hughes, 2003). Those that were pushed into self-employment because of necessity, while being of lower-income levels, still had a high overall job satisfaction, which is different from studies reflecting general self-employment trends (Hughes, 2003; Levine & Rubinstein, 2018). This is consistent with another study that found self-employed women to be more satisfied with their jobs than their employed counterparts (Anderson & Hughes, 2010).

But these studies provide no evidence to suggest an association between self-employment and financial literacy for women. In fact, in a study using a Bank of Italy dataset, results did not find support between financial literacy and the probability of being an entrepreneur for women – only for men (Oggero et al., 2020). In an earlier study, women from the UK were found to be much less likely to borrow money from external sources (i.e., banks) for self-employment, which was found to impede women's selection into self-employment – unlike their male counterparts (Sena et al., 2012). One recent study of women and self-employment found that women are more risk-averse than men, especially when it comes to financial decisions, and self-employed women are more highly motivated to seek financial knowledge than their employed peers (Nitani et al., 2019). In a global study of financial literacy, women were found to be both less financially literate than men

and more aware of this deficit (Lusardi & Mitchell, 2011).

In support of our hypothesis, we draw on literature focused on self-efficacy and risk aversion. Literature provides evidence that women are more risk-averse and less likely to say they are qualified for a job unless they have the experience and skills required for the job; women avoid placing themselves in situations where they might feel like "imposters" (Morrison & Owler, 2018). The term "imposter syndrome" was introduced in 1978 by two female psychologists to describe the feeling that many women share that "you're not good enough, that you don't belong, that you don't deserve the job, the promotion, the book deal, the seat at the table" (Bennett, 2020, n.p.). Generally, women judge their performance as worse than it actually is, while men judge their performance as better. Often, when women receive a promotion or recognition, they associate it with good luck or timing rather than merit (Mullangi & Jagsi, 2017). While stretch jobs are more exciting for men, women are less comfortable with stretch jobs, considering them riskier and fraught with anxiety and the fear of failure. As such, women are less likely to apply for a job if they are not certain they can do it (Mohr, 2014). Women, in general, appear less optimistic and confident about their abilities. This may explain the overall lower prevalence for women to select self-employment (Verheul et al., 2012). One study showed that women often feel they lack the appropriate skills for self-employment and have less directly related experience (Verheul et al., 2012).

Another study found that women were more likely than men to find work opportunities that use their education and abilities because they feel they will be more successful and have more confidence and less anxiety taking work they are directly qualified to perform (Morrison & Owler, 2018). For example, healthcare workers represent a large and growing segment of self-employment workers, and women are disproportionately represented in healthcare work. These jobs require degrees and certifications that enable women to feel very qualified for positions; given the abundance of the opportunities, the decision to move into self-employment with a certification or degree limits the risk or increases the self-efficacy level, supporting the education to self-employment link. Women in health care are comfortable selecting self-employment. This was supported empirically in studies of healthcare workers and teachers where self-efficacy was highly associated with job satisfaction (Morrison & Owler, 2018). This supports the finding that women's job satisfaction was associated with their feeling of having expertise and competence to perform their jobs well (Morrison & Owler, 2018).

As in the general population, education and job skills have been found to have a positive effect on entering self-employment for women (Budig, 2006). Women have made up the majority of the college-educated (any college) adult population for several decades. In 2019, for the first time, working women with college degrees outnumbered working men with college degrees (Matias, 2019). Yet, in general, financial literacy for working women is lower than for working men – 29% versus 47%, respectively (Lusardi, 2017). Women report lower financial literacy both in objective testing and when asked to self-report (Bucher-Koenen et al., 2017). While we might expect men to have a higher perception of financial literacy than women, given imposter syndrome, the objective gap in financial literacy is significant.

Financial literacy is associated with self-employment. More men are self-employed than women. In general, men have a higher level of financial literacy than women. While men have a much higher self-reported level of financial literacy than women, which should be reflected in self-employed men as well, the research above might suggest that women who select self-employment would only do so if they were over-qualified, possessing a higher level of skills, financial and otherwise, than their male self-employed counterparts, supporting our hypothesis:

Hypothesis 2. As financial literacy increases, women are more likely to be self-employed than men.

3.3. Financial skills and propensity for self-employment in non-whites

Overall, 29% of self-employed workers in the United States are non-white, representing a smaller percentage than in the employed work-force in general (37%). Nonetheless, the non-white self-employed represent a significant segment of the overall self-employed population, and are therefore worthy of investigation (Christnacht et al., 2018). Breaking down the self-employed by ethnicity, Asians are more likely to be self-employed than the overall and white population, while Black and Hispanic Americans are less likely to be self-employed than the overall and white population. Further, Hispanic men and white men with higher levels of education are less likely to be self-employed, and non-white women are less likely to be self-employed than non-white men (Peters et al., 2019). Christnacht et al. (2018) found that immigrants (a segment of the non-white population) have higher self-employment rates than native-born American workers and represent 25% of entrepreneurs (Kenan Institute, 2020). This data is consistent with an earlier Gallup study (Ryan, 2014) suggesting that immigrants account for 74% of the non-white self-employed.

The literature on entrepreneurs and self-employment often parses those that are self-employed into two groups – those that are incorporated and those that are unincorporated (Levine & Rubinstein, 2013). The unincorporated self-employed represent the vast majority (~75%) of self-employed (Vilorio, 2014). Incorporated self-employed are those that have formed a legal entity for their business, suggesting a higher level of sophistication than those that are sole proprietors. While the delineation is related to legal entity formation, the difference in types of jobs and demographic characteristics of the two groups provides further significance to the groupings (Levine & Rubinstein, 2013). Incorporated self-employed are more likely to be in management and financial operations (Hipple & Hammond, 2016). Most studies of self-employment do not count incorporated businesses in their measures of self-employment because they are technically employees of their businesses (Hipple, 2010). The work of the unincorporated self-employed tends to include routine tasks requiring less cognition and less education than those that are incorporated and those in salaried positions. As such, it is not surprising the unincorporated self-employed tend to score lower on aptitude tests. Occupations that reflect high levels of unincorporated self-employed include retail sales workers, childcare workers, carpenters, construction managers, hairstylists, landscapers, housekeepers, real estate agents, and financial analysts (Vilorio, 2014).

Educational attainment is lower for minority groups than the general population. While minority degree completion rates are improving, 56% of Hispanic workers attained only a high school education or less, compared to 36% of the workforce in general and 39% for Black workers (McKinsey, 2019). Likewise, financial literacy levels are lower for the non-white population by 10–15% (Al-Bahrani et al., 2019), and the financial capability gap between low-income earners/minorities and higher income earners is reported to be widening (Keshner, 2019).

Formal financial literacy education nearly eliminates this gap, but it is more beneficial for whites than for minorities. Formal financial literacy provided at the high school level can add about 7% to financial literacy scores that are comparable to employer education, while college-level education adds only 4.5% to the scores. This is one reason that 17 states now mandate financial literacy education at the high school level. Using National Financial Capabilities Data, white respondents scored 12% higher than minorities on financial literacy questions, even though minorities are more likely to have access to financial literacy education. The data showed that while 41% of minorities are offered financial literacy education, only 27% took advantage of the offer (Al-Bahrani et al., 2019).

Conversely, 70% of the self-employed are white, the majority of them men (Headd, 2021). White men, and the white population in general, have a higher level of educational attainment (Klapper et al., 2017; McKinsey, 2019; NCES, 2018). Further, whites have more access to financial literacy training and are more likely to take advantage of it

than non-whites (Al-Bahrani & Weathers, 2019). Whites represent a greater percentage of the incorporated self-employed, who are more likely to be professionals with greater levels of formal education, including financial skills training (Hipple & Hammond, 2016).

Based on the support provided we present the following hypothesis:

Hypothesis 3. As financial literacy increases, non-whites are less likely to be self-employed than whites.

4. Methods

4.1. Data

To test the proposed hypotheses, we use the 2015 and 2018 National Financial Capability Study. The National Financial Capability Study (NFCS) is commissioned by the Financial Industry Regulatory Authority (FINRA) Investor Education Foundation and conducted by Applied Research and Consulting LLC. The survey includes roughly 500 participants per state and the District of Columbia. The NFCS is a triennial survey, started in 2009, that has been widely used and validated as a representative sample of the American population by researchers in economics and social sciences (e.g., Robb et al., 2015). After the case-wise deletion, our final sample includes 15,069 participants.

4.2. Measures

4.2.1. Dependent variable
Our outcome measure is self-employed, measured through a dummy variable for employment (1 – Self-employed; 0 – Employed full-time; 0 – Employed part-time). The sample has 1606, 11,753, and 1710 self-employed, full-time employees, and part-time employees, respectively. Dropping the part-time employees did not affect our inferences.

4.2.2. Independent variable
To measure financial literacy, we use a Financial Skills Score based on the sum of correct answers on the U.S. Financial Capability Survey. The first question is: "Suppose you had $100 in a savings account and the interest rate was 2% per year. After 5 years, how much do you think you would have in the account if you left the money to grow?" (i) More than $102; (ii) Exactly $102; (iii) Less than $102; (iv) Don't know; and (v) Prefer not to say.

The second question was "Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, how much would you be able to buy with the money in this account?" (i) More than today; (ii) Exactly the same; (iii) Less than today; (iv) Don't know; and (v) Prefer not to say.

The third question was: "If interest rates rise, what will typically happen to bond prices?" (i) They will rise; (ii) They will fall; (iii) They will stay the same; (iv) Don't know; and (v) Prefer not to say.

The fourth question was "A 15-year mortgage typically requires higher monthly payments than a 30-year mortgage, but the total interest paid over the life of the loan will be less" (i) True; (ii) False; (iv) Don't know; and (v) Prefer not to say.

The fifth question was "Buying a single company's stock usually provides a safer return than a stock mutual fund" (i) True; (ii) False; (iv) Don't know; and (v) Prefer not to say.

Based on the U.S. Financial Capability test approach we assigned a value of 1 for a correct answer, while incorrect answers as well as 'don't know' or 'prefer not to say' responses were coded as zero. The score ranges from 0 to 5.

4.2.3. Moderators
The moderators are sex (1 – Male; 2 – Female) and race (1 – White; 2 – Non-white). The survey does not provide a detailed breakdown of race.

Table 1
Descriptives.

	Variable	Coding	N	mean	sd	min	p25	p50	p75	max
1	Self-employed	(0 = employed; 1 = self-employed)	15,069	0.1066	0.3086	0	0	0	0	1
2	Financial Score (without bonus)	Sum of the five financial ability questions	15,069	3.1725	1.3715	0	2	3	4	5
3	Gender	1 = male; 2 = female	15,069	1.4626	0.4986	1	1	1	2	2
4	White	1 = white; 2 = Non-white	15,069	1.2486	0.4322	1	1	1	1	2
5	Difficulty covering monthly expenses	1-very difficult; 2-somewhat difficult; 3-not at all difficult	15,069	2.4786	0.6409	1	2	3	3	3
6	Financial Ability	Mean of two items of financial ability	15,069	5.9423	1.1542	1	5.5	6	7	7
7	Overall Financial knowledge	1-very low to 7 - very high	15,069	5.4192	1.0969	1	5	5	6	7
8	Age group	1:18–24; 2:25–34; 3: 35–44; 4: 45–54; 5: 55–64	15,069	3.2817	1.1764	1	2	3	4	5
9	Education	1: Did not complete high school; 2: High school graduate - regular high school; 3: High school graduate - GED or alternative; 4: Some college, no degree; 5: Associate's degree; 6: Bachelor's degree; 7: Post graduate	15,069	4.9441	1.6231	1	4	5	6	7
10	Marital status	1: Married; 2: Single; 3: Separated; 4: Divorced; 5: Widowed/Widower	15,069	1.1942	0.5764	1	1	1	1	5
11	Children	1; 2; 3; 4 or more; No financially dependent children; Do not have any children)	15,069	3.3952	1.9468	1	2	3	5	6
12	Household annual income	Less than $15,000; At least $15,000 but less than $25,000; At least $25,000 but less than $35,000; At least $35,000 but less than $50,000; At least $50,000 but less than $75,000; At least $75,000 but less than $100,000; At least $100,000 but less than $150,000; and $150,000 or more	15,069	5.6322	1.6282	1	5	6	7	8
13	Armed service	1: Currently a member of the U.S. Armed Services; 2: Previously a member of the U.S. Armed Services; 3: Never a member of the U.S. Armed Services	15,069	2.8172	0.4771	1	3	3	3	3
14	Satisfaction with assets, debts and savings	1-Not at all satisfied to 10-Extremely satisfied	15,069	6.0971	2.5694	1	4	7	8	10
15	Financial risk in financial investments	1-Not at all willing to 10-Very willing	15,069	5.8700	2.4655	1	4	6	8	10
16	Large drop in income in past 12 months	1-Yes and 2-No	15,069	1.7897	0.4075	1	2	2	2	2
17	Current Credit Score Rating	1-Very bad to 5-Very good	15,069	4.0803	1.1428	1	3	5	5	5
18	Health insurance coverage	1-Yes; 2-No	15,069	1.0709	0.2567	1	1	1	1	2
19	Do you or your partner currently own home	1-Yes; 2-No	15,069	1.2548	0.4358	1	1	1	2	2
20	States		15,069	26.7312	14.8625	1	14	27	40	51
21	Year of interview		15,069	2016.4510	1.4992	2015	2015	2015	2018	2018

4.2.4. Controls

To lower the effects of alternate explanations we include a variety of controls. To control for financial hardships, we include this measure: "In a typical month, how difficult is it for you to cover your expenses and pay all your bills?" (1 – Very difficult; 2 – Somewhat difficult; 3 – Not at all difficult). The financial hardships control allows for control for the general ability to manage finances. Personal characteristics such as frugality could proxy for financial skills in managing monthly bills. In addition, financial hardships also proxy for monthly stock and flow of financial resources.

We next include self-rated financial ability based on two items: (i) I am good at dealing with day-to-day financial matters, such as checking accounts, credit and debit cards, and tracking expenses; and (ii) I am pretty good at math (1 – Strongly disagree to 7 – Strongly agree). The self-rated financial ability allows for control for social desirability in reporting financial skills and also for confidence in financial ability. We also include self-reported financial knowledge: "On a scale from 1 to 7, where 1 means very low and 7 means very high, how would you assess your overall financial knowledge?" (1 – Very low to 7 – Very high). Consistent with self-reported financial ability, self-reported financial knowledge allows control for the general exposure to financial news and knowledge about managing finances.

We also include age groups (1 – 18–24; 2 – 25–34; 3 – 35–44; 4 – 45–54; 5 – 55–64 years) and education (1 – Did not complete high school; 2 – High school graduate - regular high school; 3 – High school

graduate – GED or alternative; 4 – Some college, no degree; 5 – Associate's degree; 6 – Bachelor's degree; 7 – Post graduate). As human capital accumulates with age and older individuals are likelier to have a more stable income and careers, age allows control for the general accumulation of financial resources and skills. Similarly, education is strongly correlated with income levels and general cognitive ability, thereby partially explaining financial skills, income, and career outcomes.

Next, we control for marital status (1 – Married; 2 – Single; 3 – Separated; 4 – Divorced; 5 – Widowed/Widower) and children (1; 2; 3; 4 or more; No financially dependent children; Do not have any children). Households with partners could have more stable financial income streams, and the presence of children could further add to the financial commitments of a household. To control for the financial condition we include household annual income (Less than $15,000; At least $15,000 but less than $25,000; At least $25,000 but less than $35,000; At least $35,000 but less than $50,000; At least $50,000 but less than $75,000; At least $75,000 but less than $100,000; At least $100,000 but less than $150,000; and $150,000 or more). Income allows control for the overall financial stocks of a household. To control for veteran status we include whether the participant is currently a member of the U.S. Armed Services; Previously a member of the U.S. Armed Services; or Never a member of the U.S. Armed Services. The veteran status could influence job stability and also the available government benefits (e.g., insurance) that could influence self-employment.

Table 2
Correlations.

		1	2	3	4	5	6	7	8
1	Self-employed	1							
2	Financial Score (without bonus)	0.0205*	1						
3	Gender	0.0194*	−0.2010*	1					
4	White	−0.0126	−0.1300*	0.0151	1				
5	Difficulty covering monthly expenses	−0.0365*	0.2317*	−0.0877*	−0.0517*	1			
6	Financial Ability	0.0127	0.2514*	−0.1083*	−0.0426*	0.2201*	1		
7	Overall Financial knowledge	0.0266*	0.1314*	−0.1492*	0.0089	0.1607*	0.4445*	1	
8	Age group	0.0771*	0.2810*	−0.1114*	−0.1409*	0.1633*	0.1436*	0.0635*	1
9	Education	−0.0411*	0.2531*	−0.0489*	0.0272*	0.1492*	0.1393*	0.1328*	−0.0174*
10	Marital status	0.0101	−0.0675*	0.0778*	0.0443*	−0.0717*	−0.0474*	−0.0673*	−0.0998*
11	Children	0.0333*	0.0759*	0.0437*	−0.0559*	0.1085*	0.0224*	−0.0362*	0.1158*
12	Household annual income	−0.0806*	0.3332*	−0.1471*	−0.0833*	0.3409*	0.2037*	0.2009*	0.2365*
13	Armed service	−0.0029	0.0847*	0.2016*	−0.0622*	0.1089*	−0.0552*	−0.1552*	0.0570*
14	Satisfaction with assets, debts and savings	−0.0220*	0.0277*	−0.1601*	0.0162*	0.4082*	0.2689*	0.4526*	0.0379*
15	Financial risk in financial investments	0.0118	0.0717*	−0.2464*	0.0660*	0.0775*	0.1650*	0.3540*	−0.0747*
16	Large drop in income in past 12 months	−0.0619*	0.1840*	−0.0555*	−0.0800*	0.3813*	0.0802*	0.0075	0.1311*
17	Current Credit Score Rating	−0.0310*	0.2512*	−0.1177*	−0.1088*	0.4470*	0.2761*	0.2718*	0.1763*
18	Health insurance coverage	0.0914*	−0.1381*	0.0194*	0.0301*	−0.1269*	−0.0976*	−0.0556*	−0.0967*
19	Do you or your partner currently own home	−0.0021	−0.1811*	0.0964*	0.1305*	−0.1905*	−0.1559*	−0.1932*	−0.2914*
20	States	−0.0148	−0.0049	0.0102	−0.0935*	−0.0068	−0.0148	−0.0261*	−0.0139
21	Year of interview	−0.0033	−0.0570*	0.0101	−0.01	0.0082	−0.0535*	−0.0529*	0.0219*

		9	10	11	12	13	14	15	16	17	18	19	20
9	Education	1											
10	Marital status	−0.0939*	1										
11	Children	−0.0258	0.0902*	1									
12	Household annual income	0.3700*	−0.1750*	−0.0382*	1								
13	Armed service	−0.0107	0.0379*	0.0967*	−0.0338*	1							
14	Satisfaction with assets, debts and savings	0.1665*	−0.1187*	−0.0171*	0.2878*	−0.1762*	1						
15	Financial risk in financial investments	0.1591*	−0.0579*	−0.0981*	0.2118*	−0.1918	0.4165*	1					
16	Large drop in income in past 12 months	0.0980*	−0.0547*	0.0738*	0.2103*	0.1723*	0.1357*	−0.0506*	1				
17	Current Credit Score Rating	0.2431*	−0.1525*	0.0651*	0.3798*	0.0004	0.4508*	0.1562*	0.2298*	1			
18	Health insurance coverage	−0.1244*	0.0867*	0.0131	−0.2145*	−0.0025	−0.0920*	−0.0319*	−0.1035*	−0.1793*	1		
19	Do you or your partner currently own home	−0.1450*	0.1940*	0.1125*	−0.3683*	0.0616*	−0.2502*	−0.1325*	−0.0992*	−0.3469	0.1605*	1	
20	States	−0.0427*	−0.0029	0.0013	−0.0507*	0.0127	−0.0374*	−0.0314*	0.0108	−0.0092	0.006	−0.0013	1
21	Year of interview	−0.0409*	0.0282*	0.0292*	0.0186*	−0.0219	−0.0265*	−0.0639*	0.007	−0.0334	0.0083	0.0214*	0.0416*

* $p < 0.05$ (two-tailed).

Next, satisfaction with and willingness to take risks with financial capital could influence the need to seek financial skills and managing finances. Because self-perceptions of financial conditions could impact financial demeanor, we include: "Overall, thinking of your assets, debts, and savings, how satisfied are you with your current personal financial condition?" (1 – Not at all satisfied to 10 – Extremely satisfied). We also include willingness to take risks on finances: "When thinking of your financial investments, how willing are you to take risks?" (1 – Not at all willing to 10 – Very willing). Recent income changes could influence current household financial conditions. To control for recent change in income, we include: "Has your household experienced a large drop in income which you did not expect?" (1-Yes and 2-No). Ability to get credit may influence the ability to manage monthly finances. Therefore, we also include a self-rated credit score: "How would you rate your current credit record?" (1 – Very bad to 5 – Very good). Finally, because medical expenditures could significantly add to financial strain, we also control whether the participants have health coverage and whether the

participant or the partner owns their home. Finally, we control for state dummies and the year of the interview.

To test our hypotheses we used logistical regression, which is the appropriate method when there is more than one independent variable and the response variable is dichotomous (Sperandei, 2014). Logistical regression allows us to test the odds that financial literacy will increase the possibility of self-employment.

4.3. Results

Table 1 and Table 2 present the sample descriptives. In the sample, about 11% are self-employed, and about 46% of the participants are females. Of the 15,069 participants, about 25% are not white, and a portion of participants finds it difficult to meet their monthly expenses. The self-rated financial ability is high (mean = 5.94, on a scale of 1–7), and so is the self-reported financial knowledge (mean = 5.42, on a scale of 1–7). The average age of the respondent is between 35 and 44 years,
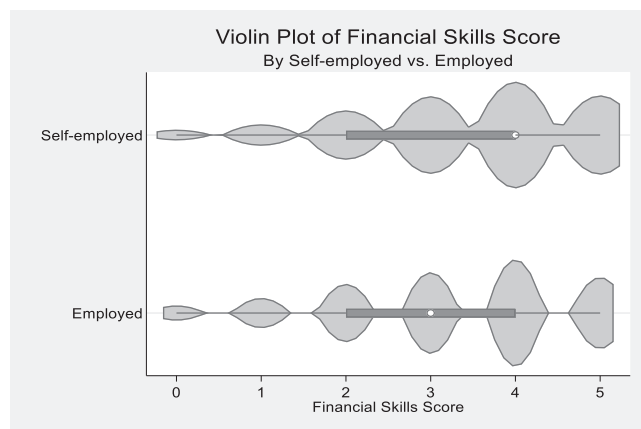
Fig. 1. Violin plot. *Note.* The white dot represents the median of the data, the box represents the interquartile range, and overlaid is the density plot for financial skills score.

and an average participant has an associate's degree. Most of the participants are married and had a household income between $75,000 and $100,000 a year. Participants reported an average level of risk-taking, and most participants had not reported a sudden decline in income in the past 12 months. Surprisingly, participants reported their credit to be high, and most of them reported home ownership. These results reinforce the need for the use of robust objective measures for financial literacy to supplement subjective (self-reported) measures.

Table 3 shows the results of the logistical regression results presenting 15 models with and without controls – model 15 is the fully loaded model. Hypothesis 1, which states that as financial literacy increases people are more likely to be self-employed than traditionally employed, was supported ($\beta = 1.057$, $p \leq 0.05$). A unit increase in financial skills score increases the log of odds of being self-employed by 1.057 units. Despite the large sample size, the effect size is meaningful. Fig. 1 provides additional evidence as the violin plot shows that the self-employed, on average, had a higher median financial skills score (the white dot more at the right) than the employed. Furthermore, the density area for higher financial skills score is higher for self-employed for levels 3, 4, and 5. Overall, the evidence points to higher levels of financial skills score associated with self-employment (see Table 3).

Hypothesis 2, which proposes that, as financial literacy increases, women are more likely to be self-employed than men, was also supported ($\beta = 1.094$, $p \leq 0.001$) – unit increase in financial skills score increases the log of odds of a female being self-employed by 1.094 units. Further, the odds that higher financial skills will increase female self-employment at a higher rate than for males is illustrated in Fig. 2.

Finally, Hypothesis 3 states that as financial literacy increases, non-whites are less likely to be self-employed than whites. Hypothesis 3 is not supported ($\beta = 1.015$, $p =$ not significant). Overall, hypotheses 1 and 2 are supported. The odds that higher financial skills will increase the odds of self-employment are consistent for the entire sample (dominated by white men), for men, women, and non-whites, but the relationship appears strongest for women.

4.4. Robustness checks

4.4.1. Inclusion of bonus questions for financial skills
The financial skills score also has a bonus question. Because of the choice to answer the bonus question, we do not include this question in our score of financial skills. The question is: "Suppose you owe $1000 on a loan and the interest rate you are charged is 20% per year compounded annually. If you didn't pay anything off, at this interest rate, how many years would it take for the amount you owe to double?" (i) Less than 2 years; (ii) At least 2 years but less than 5 years; (iii) At least 5 years but less than 10 years; (iv) At least 10 years; (v) Don't know; (vi) Prefer not

to say. Consistent with the earlier operationalization, the correct answer was coded as 1, and all others were coded as zero. In model 1 Table 4, we include this additional question in scoring financial capability and find our results consistent with the main results.

4.4.2. Low prevalence of self-employment
Using the *scobit* routine in Stata for the skewed distribution of the outcome of self-employment, the estimates in model 2 of Table 4 are consistent with the main inferences.

4.4.3. Matched pair analysis
In Table 5, using the controls as the matching covariates for self-employed, we assess the difference in financial skills score. We use four alternate propensity score matching methods: (i) with replacement; (ii) without replacement; (iii) nearest five neighbors, caliper (0.1); and (iv) local linear regression matching. We find that self-employed scored higher on financial skills scores across the four matching methods.

4.5. Discussion

Self-employment levels are increasing rapidly in the United States, in part due to the emergence of the gig economy. According to federal U.S. employment statistics, in the period between 2017 and 2020, 27 million Americans, representing 21% of the workforce, shifted from full-time jobs to self-employment, bringing the number of self-employed Americans to 42 million people, representing roughly one-third of the U.S. workforce (Everlance, 2018). Those growth rates are expected to continue in the future. A McKinsey & Company study (2016), suggests that 15% of employees in traditional jobs, those not reporting independent work, indicated the pursuit of independent work in the future. The McKinsey study also points out that many of the occupations represented by women and minorities are in job classifications likely to be impacted by automation and that automation-related job displacement will likely accelerate future increases in self-employment. The current rise in the numbers of self-employed and the forecasted acceleration in self-employment represented as an outcome of automation create a priority of the need for financial literacy.

Among the elements of human capital enabling successful self-employment is financial literacy. A popular adage for small firms is "cash flow is king." Clearly, the ability to manage finances is an important skill for small business owners and those that are self-employed. Most small businesses fail because of financial issues (Ćumurović & Hyll, 2019). In our empirical investigation, we relied on a large U.S. dataset and identified a positive association between financial literacy and self-employment. A significant body of work in entrepreneurship has identified challenges that females and minorities face in pursuing entrepreneurship and managing businesses. As such, for the self-employed from these underrepresented groups, financial literacy would be even more critical.

We find support for Hypothesis 1 as our results replicate those presented in a German context, through an earlier study, finding a strong correlation between self-employment and financial literacy and a higher level of financial literacy for self-employed than those in a traditional employment relationship. Next, we extend those findings by investigating gender and race, which are relevant to the U.S. context given the population diversity.

Our results show that female self-employed have a higher financial literacy score than male self-employed and those in traditional employment, in support of Hypothesis 2. We explain these findings based on the need for women to feel highly qualified and skilled for positions they take and suggesting that the need for over-qualification would be consistent with the higher level of financial literacy among women selecting self-employment. These findings contribute to entrepreneurship literature seeking to understand the female gender gap in entrepreneurship (Verheul et al., 2012).

Understanding that self-employed women seek more financial

Table 3
Logit estimates.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Financial Score	1.050** (0.0205)	1.052*** (0.0208)	1.021 (0.0280)	1.048** (0.0240)	1.023 (0.0284)	1.052** (0.0243)	1.024 (0.0310)	1.097*** (0.0256)	1.097*** (0.0256)	1.096*** (0.0258)	1.064** (0.0329)	1.085*** (0.0284)	1.063* (0.0332)	1.088*** (0.0288)	1.057* (0.0353)
Sex			0.894 (0.125)		0.890 (0.125)		0.889 (0.125)				0.930 (0.135)		0.924 (0.135)		0.924 (0.135)
Financial Score × Sex			1.088** (0.0434)		1.087** (0.0437)		1.088** (0.0437)				1.096** (0.0447)		1.093** (0.0450)		1.094** (0.0450)
White				0.935 (0.140)		0.933 (0.142)	0.943 (0.144)					0.852 (0.132)		0.858 (0.135)	0.865 (0.136)
Financial Score × White				0.997 (0.0447)		0.986 (0.0446)	0.982 (0.0447)					1.034 (0.0474)		1.019 (0.0471)	1.015 (0.0472)
Difficulty covering monthly expenses								0.995 (0.0528)	0.995 (0.0528)	0.997 (0.0533)	1.000 (0.0531)	0.997 (0.0529)	1.002 (0.0537)	1.000 (0.0535)	1.004 (0.0539)
Financial Ability								1.013 (0.0275)	1.013 (0.0275)	1.009 (0.0276)	1.011 (0.0275)	1.013 (0.0275)	1.007 (0.0275)	1.009 (0.0276)	1.007 (0.0275)
Overall Financial knowledge								1.099*** (0.0333)	1.099*** (0.0333)	1.104*** (0.0337)	1.101*** (0.0334)	1.100*** (0.0334)	1.106*** (0.0337)	1.106*** (0.0337)	1.108*** (0.0338)
Age group								1.299*** (0.0379)	1.299*** (0.0379)	1.291*** (0.0380)	1.312*** (0.0384)	1.299*** (0.0379)	1.303*** (0.0385)	1.289*** (0.0380)	1.300*** (0.0384)
High school graduate - regular high school (ref. did not complete high school)								0.578** (0.142)	0.578** (0.142)	0.573** (0.142)	0.564** (0.139)	0.578** (0.142)	0.560** (0.139)	0.572** (0.142)	0.559** (0.139)
High school graduate - GED or alternative								0.753 (0.195)	0.753 (0.195)	0.748 (0.194)	0.738 (0.191)	0.754 (0.195)	0.733 (0.191)	0.747 (0.194)	0.733 (0.191)
Some college, no degree								0.650* (0.156)	0.650* (0.156)	0.629* (0.152)	0.636* (0.154)	0.653* (0.157)	0.617** (0.150)	0.633* (0.153)	0.620** (0.151)
Associate's degree								0.595** (0.148)	0.595** (0.148)	0.581** (0.145)	0.575** (0.143)	0.599** (0.149)	0.563** (0.141)	0.586** (0.147)	0.568** (0.142)
Bachelor's degree								0.580** (0.141)	0.580** (0.141)	0.558** (0.137)	0.558** (0.136)	0.584** (0.142)	0.538** (0.132)	0.563** (0.138)	0.542** (0.133)
Postgraduate								0.611** (0.152)	0.611** (0.152)	0.588** (0.147)	0.592** (0.147)	0.615* (0.153)	0.571** (0.143)	0.592** (0.148)	0.574** (0.144)
Single (ref. Married)								0.975 (0.0951)	0.975 (0.0951)	0.972 (0.0955)	0.978 (0.0954)	0.981 (0.0958)	0.976 (0.0959)	0.978 (0.0962)	0.982 (0.0967)
Separated								0.406* (0.216)	0.406* (0.216)	0.406* (0.217)	0.398* (0.212)	0.412* (0.219)	0.399* (0.214)	0.414* (0.221)	0.406* (0.217)
Divorced								1.011 (0.162)	1.011 (0.162)	1.004 (0.162)	0.985 (0.159)	1.006 (0.162)	0.979 (0.158)	1.000 (0.161)	0.975 (0.158)
Widowed/Widower								0.678 (0.376)	0.678 (0.376)	0.657 (0.365)	0.671 (0.372)	0.681 (0.378)	0.651 (0.361)	0.660 (0.367)	0.654 (0.364)
2 children (ref. 1 child)								0.896 (0.0755)	0.896 (0.0755)	0.900 (0.0761)	0.903 (0.0762)	0.897 (0.0756)	0.906 (0.0767)	0.900 (0.0762)	0.906 (0.0768)
3 children								1.045 (0.115)	1.045 (0.115)	1.057 (0.116)	1.050 (0.115)	1.049 (0.115)	1.062 (0.117)	1.063 (0.117)	1.068 (0.118)
4 or more children								1.101 (0.152)	1.101 (0.152)	1.100 (0.153)	1.111 (0.154)	1.106 (0.153)	1.110 (0.155)	1.108 (0.154)	1.119 (0.156)
No financially dependent children								1.143 (0.0994)	1.143 (0.0994)	1.138 (0.0996)	1.127 (0.0982)	1.142 (0.0995)	1.125 (0.0986)	1.136 (0.0995)	1.123 (0.0985)
Do not have any children								1.118 (0.0933)	1.118 (0.0933)	1.103 (0.0926)	1.112 (0.0928)	1.116 (0.0931)	1.098 (0.0922)	1.100 (0.0924)	1.095 (0.0920)
At least $15,000 but less than $25,000 (ref. Less than $15,000)								1.094 (0.238)	1.094 (0.238)	1.055 (0.231)	1.091 (0.237)	1.089 (0.237)	1.050 (0.230)	1.049 (0.230)	1.045 (0.229)
At least $25,000 but less than $35,000								0.673* (0.144)	0.673* (0.144)	0.658* (0.142)	0.667* (0.143)	0.670* (0.143)	0.651** (0.140)	0.654** (0.141)	0.648** (0.140)

Table 3 (*continued*)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
At least $35,000 but less than $50,000								0.581***	0.581***	0.562***	0.571***	0.578***	0.553***	0.558***	0.549***
								(0.119)	(0.119)	(0.116)	(0.117)	(0.119)	(0.114)	(0.116)	(0.114)
At least $50,000 but less than $75,000								0.382***	0.382***	0.371***	0.374***	0.379***	0.365***	0.368***	0.361***
								(0.0779)	(0.0779)	(0.0764)	(0.0765)	(0.0773)	(0.0751)	(0.0757)	(0.0744)
At least $75,000 but less than $100,000								0.343***	0.343***	0.332***	0.337***	0.340***	0.327***	0.328***	0.323***
								(0.0713)	(0.0713)	(0.0696)	(0.0702)	(0.0707)	(0.0686)	(0.0688)	(0.0679)
At least $100,000 but less than $150,000								0.280***	0.280***	0.272***	0.278***	0.277***	0.271***	0.268***	0.267***
								(0.0592)	(0.0592)	(0.0581)	(0.0589)	(0.0587)	(0.0578)	(0.0574)	(0.0571)
$150,000 or more								0.373***	0.373***	0.362***	0.374***	0.369***	0.364***	0.357***	0.358***
								(0.0819)	(0.0819)	(0.0804)	(0.0822)	(0.0812)	(0.0808)	(0.0793)	(0.0797)
Previously a member of the U.S. Armed Services (ref. Currently a member of the U.S. Armed Services)								0.751*	0.751*	0.773	0.776	0.750*	0.797	0.773	0.797
								(0.127)	(0.127)	(0.131)	(0.131)	(0.127)	(0.136)	(0.131)	(0.136)
Never a member of the U.S. Armed Services								0.850	0.850	0.885	0.820	0.848	0.854	0.883	0.852
								(0.127)	(0.127)	(0.134)	(0.124)	(0.127)	(0.130)	(0.134)	(0.130)
Satisfaction with assets, debts and savings								0.980	0.980	0.979	0.980	0.981	0.978	0.980	0.979
								(0.0137)	(0.0137)	(0.0138)	(0.0137)	(0.0137)	(0.0138)	(0.0138)	(0.0138)
Financial risk in financial investments								1.045***	1.045***	1.047***	1.054***	1.046***	1.055***	1.048***	1.056***
								(0.0130)	(0.0130)	(0.0131)	(0.0134)	(0.0131)	(0.0135)	(0.0132)	(0.0135)
Large drop in income in past 12 months								0.702***	0.702***	0.708***	0.711***	0.700***	0.717***	0.705***	0.715***
								(0.0482)	(0.0482)	(0.0490)	(0.0490)	(0.0482)	(0.0498)	(0.0489)	(0.0496)
Current credit score rating Bad (ref. very bad)								0.737*	0.737*	0.734*	0.740*	0.736*	0.738*	0.733*	0.737*
								(0.118)	(0.118)	(0.118)	(0.119)	(0.118)	(0.119)	(0.118)	(0.119)
About average								0.784	0.784	0.779	0.783	0.783	0.778	0.779	0.778
								(0.122)	(0.122)	(0.122)	(0.122)	(0.122)	(0.122)	(0.122)	(0.122)
Good								0.715**	0.715**	0.709**	0.721**	0.714**	0.714**	0.707**	0.713**
								(0.113)	(0.113)	(0.112)	(0.114)	(0.113)	(0.113)	(0.112)	(0.113)
Very good								0.747*	0.747*	0.744*	0.752*	0.744*	0.749*	0.739*	0.745*
								(0.117)	(0.117)	(0.118)	(0.118)	(0.117)	(0.119)	(0.117)	(0.118)
Health insurance coverage								2.102***	2.102***	2.108***	2.109***	2.100***	2.114***	2.104***	2.109***
								(0.185)	(0.185)	(0.188)	(0.186)	(0.185)	(0.189)	(0.187)	(0.188)
Do you or your partner currently own home								0.829**	0.829**	0.816***	0.837**	0.835**	0.823***	0.822***	0.830**
								(0.0611)	(0.0611)	(0.0608)	(0.0618)	(0.0617)	(0.0615)	(0.0615)	(0.0621)
State dummies		Included			Included	Included	Included			Included			Included	Included	Included
Year dummies		Included			Included	Included	Included			Included			Included	Included	Included
Constant	0.102***	0.139***	0.105***	0.105***	0.143***	0.143***	0.147***	0.111***	0.111***	0.147***	0.105***	0.116***	0.141***	0.153***	0.147***
	(0.00699)	(0.0281)	(0.0107)	(0.00858)	(0.0312)	(0.0296)	(0.0326)	(0.0468)	(0.0468)	(0.0681)	(0.0451)	(0.0487)	(0.0666)	(0.0711)	(0.0695)
Observations	15,069	15,069	15,069	15,069	15,069	15,069	15,069	15,069	15,069	15,069	15,069	15,069	15,069	15,069	15,069

Standard errors in parentheses; odds ratios are reported.
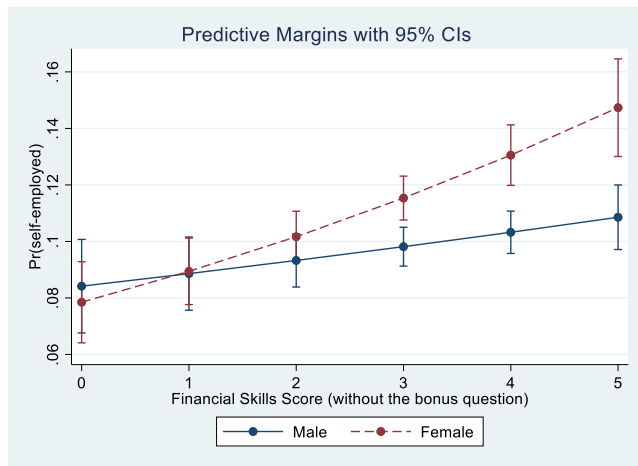
*** p < 0.01.

** p < 0.05.

* p < 0.1.

Fig. 2. Moderation effects for females.

Table 4
Robustness checks.

Variables	(1) Financial Capability Score (with the bonus question)	(2) *scobit* estimate in Stata 16.1
Financial Score (with bonus)	1.058**	
	(0.0305)	
Sex	0.975	0.943
	(0.141)	(0.128)
White	0.895	0.867
	(0.140)	(0.127)
Financial Score (with bonus) × Sex	1.069*	
	(0.0387)	
Financial Score (with bonus) × White	1.003	
	(0.0413)	
Financial Score (without bonus from main analysis)		1.059*
		(0.0328)
Financial Score (with bonus from main analysis) × Sex		1.083**
		(0.0413)
Financial Score (with bonus from main analysis) × White		1.014
		(0.0439)
Controls	Included	Included
State dummies	Included	Included
Year dummies	Included	Included
Constant	0.140***	1.85e−06
	(0.0664)	(0.000830)
Observations	15,069	15,069
Number of groups		
Chi-2		

Standard errors in parentheses; odds ratios are reported.
*** $p < 0.01$.
** $p < 0.05$.
* $p < 0.1$.

knowledge (Nitani et al., 2019) and generally tend to be risk-averse and more comfortable feeling fully qualified for a position (as an employee or self-employed) suggests that to inspire more women to become entrepreneurs, government groups should consider programming focused on building women's confidence in financial and business skills. In addition, women need financial literacy because they are living much longer than men and are often widowed, making retirement planning more challenging (Bucher-Koenen et al., 2017).

Finally, we expected to find that higher financial literacy for non-whites would be lower than those for the white self-employed, thus we did not find support for Hypothesis 3. There is no difference in the effect of higher financial literacy scores on self-employment between white and non-white self-employed. The assumption that lower levels of education might diminish the positive relationship between higher financial literacy scores on self-employment was misguided. One plausible explanation for these findings is that the majority of the self-employed, including non-white self-employed, are unincorporated self-employed who, while generally less educated and in lower-income occupations, may develop financial skills through experience. This is consistent with the literature linking human capital to entrepreneurship, in which human capital may include formal education as well as experience. Another plausible explanation is that the majority of non-white self-employed in the study are immigrants, as represented in the U.S. self-employment statistics (Kochhar et al., 2015). As such, they may not have access to formal financial literacy education, nor do they have the luxury of selection between employment and self-employment; they, therefore, are self-employed with or without financial literacy.

All in all, the higher the financial literacy score, the higher the odds of self-employment regardless of the demographic cluster. Financial literacy is important to self-employment.

4.6. Pandemic impact

More recently, the COVID-19 pandemic has and will continue to contribute to growth in self-employment. Fewer independent workers were impacted by the COVID-19 lockdown because many self-employed were already working from home, and the nature of self-employment (i. e., need for agility and flexibility) better prepared them to weather the effects of the pandemic. According to a study commissioned by Upwork (2020) during summer 2020, 12% of the working population were found to have started some sort of independent work during the pandemic and were found to feel positive about it and likely to continue in the future. A remarkable finding from the study is that half of the members of Generation Z have freelanced in the past year; nearly 40% of those started during the pandemic, and 90% plan to continue their independent work post-COVID. Even for those workers who have not participated in independent work, working from home during the pandemic has interested them in more flexible work arrangements, including self-employment, after the pandemic (Upwork, 2020). Males represented an even larger percentage (72%) of these freelance workers than the overall self-employed population as discussed prior.

Another study conducted during 2020 by McKinsey and Company suggests that women, particularly Black women, have been more negatively affected by COVID-19, as seen in a much higher percentage considering leaving the workforce or downshifting than in prior years and versus their male counterparts during the same period, especially those that have children (Jablonska, 2020). In addition, people of color were five times more likely to be hospitalized or die of COVID-19 than white people, exposing an inequity in access to healthcare (Mcneil, 2021).

Related to the study, the temporary or permanent loss of jobs was significant. Most Americans say it will take at least three years to recover financially; 10% suggest they will never recover (Horowitz et al., 2021). The unforeseen financial setback was especially severe for lower income, Asian, Black and less-educated workers. Lower income workers, the majority of Black and Hispanic families, and those workers with a high school diploma or less education report they are in poor financial condition (Horowitz et al., 2021). On the other hand, upper income and college-educated workers, those able to take advantage of the stock market and less vulnerable to job loss or furlough, report their finances are in excellent shape a year into the pandemic.

Behavior changes adopted due to the pandemic, some of which were already underway and were accelerated, are unlikely to reverse and have long-term implications on the workforce. According to a McKinsey and Company study, remote work, e-commerce and other contactless transactions, and teleconferencing (rather than business travel) are examples of behavior shifts with far-reaching, long-term consequences

Table 5
Matched pair sampling estimates.

	Variable	Treated	Controls	Difference	S.E.	T-stat
With replacement	Unmatched	3.254047	3.162817	0.091231	0.0362	2.52
	ATT	3.254047	3.144458	0.109589	0.051893	2.11
Without replacement	Unmatched	3.254047	3.162817	0.091231	0.0362	2.52
	ATT	3.254047	3.119552	0.134496	0.049176	2.73
Nearest neighbor (5)	Unmatched	3.254047	3.162817	0.091231	0.0362	2.52
	ATT	3.254047	3.096721	0.157327	0.040432	3.89
Local linear regression matching:	Unmatched	3.254047	3.162817	0.091231	0.0362	2.52
	ATT	3.254047	3.0648	0.189247	0.051893	3.65
Untreated 13,463; Treated = 1,606; Total 15,609						

that will yield permanent loss of jobs in lower skilled positions in certain industries (Lund et al., 2021).

The pandemic points to more self-employed workers, accelerating an already rapid shift, and exposes the inequity of the impact by gender, race, and education levels.

4.7. Practical implications

The prevalence-based inferences are important to a variety of stakeholders. Those seeking or finding themselves in self-employment by default should invest in greater financial literacy. Financial literacy can be cultivated through experience or formal education. It was noted that the non-white population has access to formal financial literacy education, yet many do not take advantage of it. Further, we noted a significant drop in financial literacy in the United States especially among the 18–34 age group, while nearly every American (92%) earns a high school diploma and 36% earn a college degree (NCES, 2018). It appears that there may be both a drop in the quality of formal financial education (educator and public policy issue) as well as an issue with stakeholder motivation to take advantage of it.

Creditors, government agencies, and educators must make financial literacy an important consideration. A variety of government agencies provide material and consulting support to the self-employed. In improving the odds of success in self-employment, financial literacy could be an important "checkbox" for such stakeholders. In entrepreneurship education, though entrepreneurial finance is widely taught, day-to-day financial management in a small business is seldom the focus. Though financial literacy literature may not focus upon these aspects, it could be an important consideration in future pedagogical considerations for educators and policymakers to target financial training and motivational literature for self-employed.

A shift in the workforce toward self-employment comes at a time when financial literacy levels are declining. The blame has been placed on post-recession funding issues for K-12 education that have negatively impacted both math and reading skills (Iacurci, 2019). Studies support the need for mandatory financial education, especially at the high school level. We have learned from research that simply offering financial education is not enough. It must be mandated – this is an issue for public policy and educators. Today, <34% of states require mandatory financial literacy education at the high school level (Iacurci, 2019). A few studies are investigating beginning financial education at a much earlier age – with 5th and 6th graders – via a Cash Quiz (Kalwij et al., 2019).

4.8. Study limitations

Our effects are robust across different specifications. Though we cannot address endogeneity concerns, our findings are robust to matched-pair analysis. It is difficult to identify instrumental variables that meet the exclusion criteria. Parental socioeconomic factors, including parental education, also affect career choices, thereby limiting the exclusion criteria of the early life experiences in parsing causality from the association. We acknowledge that our inferences are associational and should not be interpreted as causal effects. We also highlight

that the interpretations of our results are to be assessed as prevalence rates instead of individuals becoming entrepreneurs due to financial literacy. Given that financial literacy data was only collected recently in cross-sectional nationally representative surveys, we cannot infer financial literacy as a driver for self-employment as an occupational choice.

The findings should be interpreted considering limitations. First, like most studies on financial literacy, though measurement error is not plausible due to the availability of correct or incorrect answers, by design the tests are short and may not capture the gamut of additional financial literacy components. Fluid and crystallized intelligence could impact financial literacy, and there could be much underlying heterogeneity in the measurement of financial literacy. However, consistent with nationally representative surveys, shorter questionnaires are the norm due to higher costs and lower response rates from longer questionnaires. Second, the mechanics of the association between financial literacy and self-employment remains a black box. Financial literacy, like other human capital factors in entrepreneurship such as education and personality, among others, is influenced by dynamics that affect how it translates to self-employment activities that remain unknown. Such dynamics are difficult to understand in quantitative data; however, qualitative data could be critical to understanding how the self-employed leverage financial literacy. Third, the cross-sectional nature of the data does not allow controls for self-selection into self-employment, nor can we control for the fixed effects of the individual.

4.9. Future research

The emerging dynamics of self-employment types are equally interesting for future research. With much of the U.S. workforce also engaging in the gig economy and contract work, higher financial literacy is equally desirable; however, the extent of financial literacy is less understood for gig workers. In a survey conducted by Gallup, 36% of the U.S. workforce, or 57 million American workers, were identified as having some sort of gig or alternate work arrangement, and 29% of all U. S. workers reported alternative work as their primary job (McFeely & Pendell, 2018; McKinsey, 2016). Further, these independent workers represent a diverse workforce in terms of age, income levels, educational attainment, and gender (McKinsey, 2016). Future studies parsing financial skills, well-being, and income across different types of gig workers should be useful.

The long-term impact of the pandemic on self-employment offers a robust area for future research. As noted, the short-term effects were more adverse for women, people of color, and less educated. Research could specifically focus on financial literacy as a study variable linked to outcomes including well-being, financial impact, and self-employment.

Given the availability of financial education, lower takedown rates for minorities is worth investigating; the research could focus on identifying reasons and making recommendations for ways to encourage voluntary participation in training directed at improving financial literacy.

In conclusion, our analysis indicates that financial literacy is more prevalent among the self-employed, and female self-employed tend to

have higher financial literacy relative to females who are traditionally employed. Counter to our hypothesis, there was no difference in financial literacy between white and non-white self-employed. Facing greater challenges in managing finances than the employed, the self-employed may understand the need for additional skills and acquire stronger financial literacy skills either through formal financial education, education in general, or business experience. Our results replicate prior work in the U.S. context and extend prior work by uncovering the heterogeneity in self-employment and financial literacy association.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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