

Pension planning for entrepreneurs: an actuarial perspective

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67

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Abstract

Purpose – Having adequate pension coverage for the working people is an aim for achieving the welfare of societies. The labour landscape is experiencing changes, of interest in this paper, is the rise in self-employment and entrepreneurship. Moreover, the world population is ageing, with increased life expectancy. Therefore, there is an expectation of more people transitioning to retirement and living longer, with a growing proportion of those transitioning directly from self-employment or entrepreneurship. A limited volume of studies addresses entrepreneur's pension planning or take-up. This study examines the potential pension gap and considers it from the point of view of the self-employed, governments and policy makers and actuaries. Our work outlines findings from original data analysis to understand factors that affect the level of pension-related preparedness of entrepreneurs. The paper also considers personality traits that are most associated with entrepreneurs and what they mean in terms of pension planning, design and take-up. Having made several observations from the extracted insight and consider that the pension gap is a significant problem, where the financial impacts to society may materialise within the next decade, if action is not taken by Governments, supported by Actuaries (in public and private space). Given the evolving labour market, we consider that government financial security objectives should be strongly linked to financial inclusion strategies. This paper, therefore, provides a collection of factors that actuaries and Governments may want to consider in arriving at appropriate strategies, designing flexible products and widening distribution and reach to the self-employed population.

Design/methodology/approach – Our work outlines findings from the analysis of original data (UKHLS – UK) to understand factors that affect the level of pension-related preparedness of entrepreneurs, such as the relationships between entrepreneurship and having pension plans and the size of the business. These relationships are explored by setting four linear probability models and test for two types of pension plans: employer and personal pensions. The paper also considers personality traits that are most associated with entrepreneurs and what they mean in terms of pension planning, design and take-up.

Findings – The main findings include: an upward trend towards self-employment with a growingly diverse workforce in terms of gender, age and profession. There is a material of pension coverage gap amongst the self-employed where approximately 20% only of that population have pension plans compared to approximately 80% of the employed population. A positive relationship is detected between personal pension and entrepreneurship where as it is negative with the employer pension. The larger the size of the business the more likely that an employer pension scheme is used. Personality traits affect the behaviour of entrepreneurs towards having pension plans.

Research limitations/implications – Considering the UK pension environment as an example in understanding the pension gap for the self-employed. Thus, the results obtained are according to the data used from the British database (UKHLS – UK). Other variables may affect the relationships under study, such as the age, gender, the education and financial assessment. Future research may wish to consider in greater detail the impact of these variables.

Practical implications – Government financial security objectives should be strongly linked to financial inclusivity to ensure appropriate pension coverage in old age and reduce the likelihood of financial strain to the state of retirement poverty. Financial inclusivity measures may require improved financial literacy initiatives. Actuaries can play a vital role in raising awareness and financial literacy by articulating the risks of income uncertainty in retirement. Actuaries can also be involved in designing and modelling products for better reach

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considering the factors and personality traits of entrepreneurs mentioned in this research and formulating the appropriate risk-based messages to increase the likelihood of pension take-up.

Originality/value – Coverage for the self-employed in social insurance systems and access to private pension arrangements varies across countries. Also, there isn't a sufficient volume of research on pension take-up or retirement financial resources amongst the self-employed or entrepreneurial population. As it has been depicted in the literature that entrepreneurs are poor pension planners, this paper consolidates several literary, market and analysis insights into this matter to address the identified pension gap from different angles: self-employed or entrepreneurs – Governments and decision-makers – actuaries. Taking into consideration the analysis of important factors and personality traits that affect the pension planning.

Keywords Entrepreneurship, Self-employed, Pension planning, Pension actuary, Life actuary, Financial inclusion

Paper type Research paper

1. Introduction

The world's population is ageing, and the elderly population is projected to surpass two billion in the next 50 years. A review of global demographic forecasts shows that by 2050, more than 20% of the US population will be at or above 65, up from about 13% in 2010. Similar scenarios are expected to take place in many other countries such as Britain, France and China ([Honarvar et al., 2022](#)). Therefore, we should expect a significant increase in the transition from employment to retirement and a surge in the number of retired individuals.

An enhanced interest in economic well-being in retirement is observed worldwide. For example, a paper issued by the Ugandan Ministry of Gender, Labour and Social Development about social pensions and their contributions to economic growth in Uganda, indicates that there is compelling evidence of pensions having positive impacts on the well-being of older persons and that investments made by pension funds have a positive impact on economic growth ([Kidd and Tran, 2018](#)).

The labour landscape is also changing with a rise in skill-driven self-employment or innovation-driven entrepreneurship and start-up activity. The self-employed and entrepreneurs, by virtue of operational scale, financial literacy as well as attitudes towards wealth utilisation will likely have different pension arrangements to those in standard employment. They may also be less likely to be members of an existing pension scheme, depending on how early in their career lifecycle they made the transition from standard employment and whether pension planning is the responsibility of the state, employers or individuals in the jurisdiction in which they live. We should, therefore, expect that a larger proportion of those transitioning into retirement will be doing so from self-employment. For ease of reference, throughout this paper, the terms entrepreneurs and self-employed are used interchangeably.

The social goals of financial security for older individuals, the economic growth impact of pension scheme investments, coupled with an ageing population and a change in the labour market with an increase in self-employment means that policymakers need to continuously evaluate and possibly reform the present retirement institutions, both: public and private. Given the changing makeup of the labour market and the demographic trends, there is a need for the financial security objective to be strongly linked to financial inclusivity goals. This will include a better understanding of the current and projected trends in self-employment, their financial and societal impacts and considering how best to design profitable pension products or retirement-related policies that are suitable for the circumstances and traits of the self-employed as well as having reach strategies that can enhance take up and consequently secure better pension coverage.

In general, having an income (usually in the form of pensions) provided by the state social insurance systems would allow older people to enjoy a greater sense of well-being. Employer and personal pension plans are considered other alternatives that offer a better well-being at retirement as well ([Bender and Jivan, 2005](#)). In pension schemes, the increasing life expectancy is a challenge to decision-makers in terms of maintaining financial well-being in retirement as well as funding the pension liabilities. This includes retirement income

adequacy; and the need to have the financial resources be above minimal levels. Thus, solutions are needed. For example: the solutions offered in the British context include:

(1) Increasing the pensionable retirement age along with the removal of ageist legislation and the implementation of 2010 Equality Act, (2) the transfer of retirement planning from state to employers and individuals to secure their retirement plans and reduce burdens on the state, (3) the promotion of entrepreneurship at older ages where almost 42% of men over the age of 65 that have remained in the labour force are self-employed (Sapleton and Lourenco, 2015). The second and third solutions represent useful movements towards the improvement of pension coverage for working people, hence, achieving a decent standard of living at retirement. Thus, both solutions are considered of main interest in our study where we focus on pension planning for entrepreneurs with an emphasis on employer and personal plans.

For the purpose of this paper, pension actuaries are actuaries working in the defined benefit and defined contribution space. This will include Life actuaries working with unit-linked and annuity businesses that are offered as a retirement solution.

The increasing trend towards self-employment – at young and older ages – indicates the need to actively consider the pension coverage available to entrepreneurs. However, it is noted that self-employed individuals have a different behaviour towards saving for pensions. Limited actuarial studies draw attention to the pension coverage of self-employed and the expectations of a pension gap in the future. In a working paper issued by IFoA in 2017, the pension problem facing the UK and many other western countries is addressed to increase participation in pension schemes. The paper highlights the reasons behind the pension problem, which are: the decline in the level of saving in pensions, increased longevity and ageing population. Auto-enrolment system was initiated in the UK to increase member participation in workplace pensions. The US and New Zealand introduced auto-enrolment systems as well for wider availability of pension coverage. However, the paper indicates the self-employed fall outside the auto-enrolment requirement. In addition, the compulsory pension contributions approach adopted by the Australian retirement system also does not provide coverage to the self-employed. Furthermore, Sir Steve Webb (former UK pensions' Minister) explained in an article in FT Advisor published in 2017 that almost 85% of self-employed people did not contribute to pensions in 2016. He added "*In the past you might have said, well, self-employed are just different. Perhaps their business is their pension. They'll sell up their business and live off that. Or maybe they've got property*", but the newly self-employed are different with having a lower income than the average employed person.

Thus, it is important that pension actuaries have a deeper understanding of the behaviour of existing and prospective entrepreneurs towards pension planning to create and/or promote pension plans that appeal to them. Hence, our work may provide a good ground for actuaries to focus more on the coverage provided to this category and work on attracting more self-employed to buy pensions. This consideration gives rise to a few questions, for example: Is there a relationship between being an entrepreneur and having a pension plan? Does the type of pension plan held by an entrepreneurial individual, who is currently in full-time employment, affect their entrepreneurial entry? Is the type of pension plan held by existing entrepreneurs affected by the size of their business? Moreover, do the personal traits affect the type of pension plans chosen by individuals who are expected to become entrepreneurs?

In this research, we are exploring these questions while taking into consideration the role of pension actuaries. Understanding the relationships between entrepreneurship and having pension plans and the size of their business will be explored by setting four linear probability models (LPM) to test the following: (1) the relationship between entrepreneurship and pension plans and (2) the relationship between the size of the entrepreneur's business and pension plans. In these models, we will focus on two types of pension plans: employer and personal pensions. State schemes are excluded as they are governed by laws, and they are usually compulsory. The LPM models are commonly used in various areas of social sciences and medical research to estimate and interpret categorical variables. These qualitative regression models are easier to estimate by using OLS, faster with large data, and most importantly, they

are more suitable to interpret the results of our analysis compared to other models such as logits and probits. Furthermore, the relationship between the personal traits of individuals and the choice of a pension plan will be illustrated from the entrepreneurs' perspective. The analysis of these relationships will be based on a database from the UK: The Household Longitudinal Study (UKHLS, 2014). To aid in contextualising and connecting the qualitative and quantitative analysis, a high-level summary of pension offerings that are available in the UK market and of the pension readiness of the self-employed population will be covered. The reasons for choosing the UK market are:

(1) The developed techniques in designing pension products and the advanced actuarial modelling by pension actuaries. (2) The growing interest in entrepreneurship and (3) the availability of relevant data.

Section 1 of this paper gives a background to pension plans and the importance of the role of pension actuaries. An introduction to entrepreneurship as a concept and its different classifications will be mentioned in Section 2, followed by a description of entrepreneurs' behaviour towards having pension plans in Section 3. A clear example linking pension plans and entrepreneurs in practice is considered where the pension landscape of the self-employed in the UK market is illustrated in Section 4. The data and models used in our analysis will be covered in Section 5. Three dimensions of pension planning are studied in Sections 6 and 7 to describe the relationships between entrepreneurship and having an employer or a personal pension plan, the size of entrepreneurs' business and also, their personal traits. Finally, we will conclude our remarks and recommendations in Section 8.

2. Background

Realising the significant impact of entrepreneurship in promoting innovation and economic development emphasises the importance of endorsing the culture of entrepreneurship to help in the advancement of human resources. Hence, there has been continuous support by the governments to set rules and regulations to encourage the involvement of entrepreneurs in the workforce. This extends to include old-age entrepreneurs as well. Thus, the governments have had to organise the labour systems to allow for a better work environment for the entrepreneurs. This includes special loan programs, tax deductions, attractive pensions and insurance schemes.

In general, pension plans should be able to provide the level of satisfaction and financial security that the retirees reasonably anticipate. It is expected that the reduction in income at retirement causes a decrease in the level of satisfaction of the retirees. This is explained by Honarvar *et al.* (2022), where they also indicate that physical and mental conditions along with economic status affect retirement satisfaction.

The entrepreneurs who constitute part of the working force should also be offered pension plans that are attractive and can meet their financial needs in old age.

Here, it is important to highlight the role of pension actuaries in designing different pension plans that fulfil the needs of entrepreneurs at retirement. Pension plans are commonly offered by three main pillars: the state, employer and private personal pension schemes. Each of these schemes has its own characteristics. In many countries, the state pension scheme is considered the main provider of basic benefits to the elderly. However, governments have faced difficulties in maintaining this role and satisfying the escalating needs of the working people. Financial burdens in the economies, rising inflation and the cost-of-living crisis it introduces, and the increased ceiling of demands and needs of working people are among the main reasons behind the diminished role of the state pension scheme as a sole provider of pensions. Due to these challenges, the role of pension actuaries should increasingly draw attention to the possible alternatives to increase the population pension coverage. This would relate to employer pensions that entrepreneurs set up for their businesses and private personal pensions. Moreover, actuaries should consider designing plans that can be distributed in a way that increases financial inclusivity by contributing to financial literacy initiatives, for wider reach

that leads to pension plans taken up by the target audience. This would enable the main objective of maintaining the level of financial satisfaction in old age to be achieved.

Participating in raising financial literacy is a vital role that actuaries can play. It has been depicted in the literature that entrepreneurs are poor pension planners. Hence, pension actuaries can contribute effectively to raising the awareness of pension plans available in the market and how they can meet entrepreneurs' needs and maintain their living standards in old age. Actuaries also raise financial literacy by clearly articulating the risks and possible gains that plan holders are exposed to at the different stages pre and post-retirement. This would also extend to material and support that is provided by pension providers to financial advisors. On the other hand, pension actuaries should also consider the transition of already retired individuals back into the workforce through, self-employment, by designing flexible, innovative and transparent products that can be adjusted to fit with the circumstances of the market re-entrant. Generally, the expansion of old age coverage to protect more of the entrepreneurs as working people would lead to the welfare of societies.

It has been observed that little research has focused on the pension protection provided to the entrepreneurs in old age. Thus, understanding the importance of getting pension coverage at retirement by the entrepreneurs, and their behaviour towards having pension plans that are provided in the market is a main investigation to be explored in this research. In the following section, we will introduce entrepreneurship as a concept and its classification. Then, in [Section 3](#), entrepreneurs, and their behaviour towards attaining pension plans will be explained.

3. Entrepreneurship: definition and classification

Entrepreneurship is a term that has been used for over 7 decades. It has been defined by many authors in different areas that are mainly focusing on business and economics. Back in 1952, Lamb, R.K. defines entrepreneurship as “a form of social decision making performed by economic innovators”. [Cole \(1959\)](#) states that: “Entrepreneurship is the purposeful activity of an individual or group of associated individuals, undertaken to initiate, maintain or aggrandise profit by production or distribution of economic goods and services”. In 1984, entrepreneurship was defined by [Ronstadt \(1985\)](#) as the dynamic process of creating incremental wealth. An interesting definition is stated by [Hisrich and Peters \(1998\)](#): “Entrepreneurship is the process of creating something new and value by devoting the necessary time and effort, assuming the accompanying financial, psychic, and social risks and receiving the resulting awards of monetary and personal satisfaction and independence”.

Recently, the definition of entrepreneurship has been elaborated with increasing the impact of entrepreneurship on economies. It is altered between aiming at a successful business or building creative minds and skills. [Chang and Wyszomirski \(2015\)](#) see entrepreneurship as an art, and [Barot \(2015\)](#) describes entrepreneurship as a key to success and states that: “practice begins with action and creation of new organisation”. According to them employment of technical and skilled labour and managerial talents is essential in entrepreneurship. Moreover, [Crocì \(2016\)](#) indicates that entrepreneurship can operate independently and interdisciplinary. [Hessels and Naudé \(2019\)](#) agreed with [Barot \(2015\)](#) that the final destination of entrepreneurship is to create job opportunities and lead to the development of economies. Also, the latter research indicates that entrepreneurship is closely related to opportunity recognition and explains that entrepreneurial ability should bring innovation through process and learning leading, to economic development.

Furthermore, the European Union Labour Force Survey ([EULFS, 2023](#)) defines the self-employed person as working in their own business, farm or professional practice and who meets one of the following criteria: works for the purpose of earning profit; spends time on the operation of a business; or is currently establishing a business.

The classification of entrepreneurship has been covered from different perspectives. It is known that the self-employed are not homogeneous groups, thus, different categorisations of entrepreneurship are listed below:

- (1) The size: this classification divides the enterprises into small/medium businesses and large businesses. The difference in size would affect the ability of competitiveness and access to the global markets (Aulet and Murray, 2013).
- (2) Opportunity and necessity base: according to Barot (2015) entrepreneurship can be classified into opportunity-based and necessity-based. The former stands for initiating new ideas and developing a business as a career choice. This might also include innovation-driven which is focused on pursuing global opportunities and technology-enabled allowing to create many jobs worldwide (Aulet and Murray, 2013; Welter et al., 2016), and the latter means that entrepreneurship is not a choice but a compulsion for earning a living.
- (3) Independence and dependence self-employment: Williams and Lapeyre in The Employment Working Paper No. 228 issued by the International Labour Organisation (ILO) in 2017 elucidate an important classification between independent and dependent self-employed. The independent self-employed persons need to meet three criteria: (1) have more than one client; (2) have the authority to hire staff and/or (3) have the authority to make important strategic decisions about how to run the business. Thus, the term “dependent self-employment” emerged to refer to those who do not meet one or more of the three criteria mentioned above.
- (4) With or without employees: the most basic distinction between types of self-employment is whether they have employees or not. The European Working Conditions Survey in 2015 finds that 53% of the self-employed without employees are thus “genuine” independent self-employed, while 47% are dependent self-employed. Self-employment (either independent or dependent) is considered a Non-Standard Employment relationship (NSE). Unlike the Standard Employment Relationship (SER), the NSE has a higher degree of decent work deficits. This is regarding lower security in the labour market, less social security coverage (social benefits), fewer prospects for personal development and less rights (ILO, 2018). Therefore, it can be said that the self-employed are generally less protected by social security systems, where the social security protection varies from one country to another leading to what is termed a “social gap” (Williams and Lapeyre, 2017).

Moreover, we can conclude from the above that there is no specific classification or limitations related to the age of the entrepreneurs. Thus, they can be individuals who are working age or retirees. Some entrepreneurs (particularly younger individuals) may perceive a new business (start-up) to start a career based on innovative and new ideas along with high capabilities and motivation. Other working-age individuals or retirees seek to increase their income and benefit from their accumulated expertise by establishing their own businesses. This may be encouraged by governments to reduce the pension liabilities that the governments/pension schemes are responsible for especially in the ageing countries. According to Sappleton and Lourenco (2015), the main motives behind getting people to be re-employed in old age could be:

- (1) Self-employed tend to work longer over their careers than waged workers.
- (2) Policies aimed at boosting entrepreneurship can encourage waged workers to migrate to self-employment.

4. Entrepreneurs and pension plans

Recently, the importance of entrepreneurship and its financial impact on economies has become more apparent. It is expected that the number of self-employed would increase to

constitute a larger proportion of the workforce around the world. This could be attributed to many reasons, such as:

- (1) The increase in world population the limited resources.
- (2) Economic challenges with the deterioration in poverty levels.
- (3) Severe competitiveness and the need for innovation; and
- (4) The expansion of the use of AI with possible loss of jobs and re-skilling in other work areas.

Accordingly, the importance of pension planning to secure the old age of the self-employed should be asserted. Although entrepreneurs are considered poor pension planners, their needs at retirement should be given fair and proportionate consideration; and financial systems in general, should be more inclusive (while financial inclusivity should be achieved for all segments of the population, this paper is written with entrepreneurs in mind). The fact that entrepreneurs own their own businesses may lead to a lack of planning for income in retirement ([Detianne, 2008](#)). Hence, they need the business to be sustained long enough in old age to provide the coverage needed.

[Sapleton and Lourenco \(2015\)](#) provided detailed studies that covered various aspects of self-employment, pre and post-retirement, in some countries. This includes studying older entrepreneurs (aged 50+) in the context of pending retirement. They indicate that self-employment can play a particularly interesting role as a vehicle for gradual retirement or bridge employment. In this case, they are offered the flexibility needed to meet the requirements of a workforce that at older ages is very heterogeneous in terms of preferences and health. Also, they explain whether the transition to self-employment post-retirement is driven by opportunity (pull) or necessity (push) dynamics. For example: knowledge-based economies (which focused on enhanced education and skills obtained from experience) play a key role as a pull factor for post-retirement self-employment.

Another crucial point to be addressed is that the average income and wealth of the self-employed are likely to be higher than employees. Thus, savings ratios are expected to be higher as well. [Fehr and Hofbauer \(2016\)](#) introduce a numerical general equilibrium model with occupational choice to analyse the interplay between pension policy and entrepreneurial choice in Germany. They indicate that self-employed households who are not covered by the public, have to rely fully on private savings during retirement, and hence, need to save more than ordinary employees in Germany. However, lower income self-employed or those with lower entrepreneurial skills save less, on average, than employees.

Furthermore, [Ketkaew et al. \(2019\)](#) highlight the relationship between entrepreneurial financial attainment capacity and expected retirement income in Thailand. Applying a structural Equation Model (SEM), it is found that the entrepreneurial financial attainment capacity is positively affecting expected retirement income. The results demonstrated that entrepreneurial financial attainment capacity was positively determined by an entrepreneur's investment in financial assets, employment income, business net worth, business income and negatively determined by personal annual expenses and business expenses.

In the UK, an important note is issued by [D'Arcy \(2015\)](#) focusing on the expected income upon retirement and the low pension coverage for the self-employed. The note reveals that ordinary employees have a greater average pension and more financial wealth to fall back on in all ages apart from among 16- to 24-year-old and over-65s, where the self-employed have a higher income or wealth than employees. This could be linked to the self-employed choosing to work longer and delaying taking their pension or high-income employees moving into self-employed semi-retirement. Most importantly, the study raises three main issues to explore evidence of the pension gap for self-employed, they are:

- (1) Prefer more accessible savings products, such as investment savings accounts: it is found that 10% of the self-employed without employees prefer savings and investments overpaying for pensions, whereas 14% of self-employed who employ have the same preference.
- (2) Can sell their businesses outright or its assets and stock upon retirement: the self-employed may not save in pensions simply because they own a business. The study refers to WAS analysis which indicates that 6% of self-employed intend to sell to fund their retirement, 48% think that the business will be closed down and 32% have not decided yet.
- (3) Are satisfied with their preparation for retirement: the question about whether the self-employed feel prepared for retirement reveals that 40% of self-employed without employees and 28% with employees are not confident their retirement income will provide them with the living standard they hope for.

To further illustrate the behaviour of the self-employed towards pensions, the study explores the reasons behind not contributing to pensions, the results reveal that the major reasons for self-employed without employees not buying pensions (85%) are: having a low income or being in education (44%) and being unable to afford to contribute (41%). There is a difference detected in the responses of the self-employed with employees who have various reasons for not contributing to pensions: 28% can't afford to, 24% have a low income or are in education, 20% have too many expenses, bills or debts, 14% preferring other forms of savings, 12% do not trust companies/schemes and 12% not interested or not thought of.

Another recent study in the UK ascertains that there are eminent concerns about the pension savings of the self-employed. It indicates that one of the key reasons for this is that they are not covered by automatic enrolment (Cribb *et al.*, 2024). In this context, we totally agree that the optional approach for the self-employed to contribute to pensions could be a fundamental cause for the occurrence of the pension gap in this group.

On the other hand, Wagener (2000) finds that there is no general rule as to what extent entrepreneurs need more or less insurance, in old age, than employees. However, Ziegelmeier (2010) claims that even though the majority of the self-employed have the funds required to support old-age provision, there is a considerable number of former entrepreneurs who have to rely on social assistance in retirement.

At the state level, coverage for the self-employed in social insurance systems exists in most European countries. They are either integrated into the national systems like Scandinavian countries, or they have separate insurance systems for the self-employed. If the national social insurance system is not characterised as being compulsory for the self-employed, this means they should seek coverage from employer or personal pension plans. For example, in the UK, national social insurance contributions are only compulsory for salaried individuals whose salaries exceed a certain threshold. Therefore, non-salaried or low-incomed self-employed individuals would not be entitled to the state pension, as will be summarised in the next section. Individual Pension Plans (IPP) and Insured Retirement Plans (IRP) are examples of retirement plans that could provide pension coverage to the self-employed from age 60 to 85 in western countries (Leroy *et al.*, 2008). Other contingencies, such as unemployment and sickness benefits, are only provided in some countries while it is voluntary in other countries (Williams and Lapeyre, 2017).

Therefore, the pension coverage provided to the self-employed at old age is different from one country to another. Also, the behaviour of the self-employed towards planning for pensions to secure themselves financially at old age is varied. Hence, studying the relationship between entrepreneurship and pension plans is needed from different perspectives. A case study of the pension coverage for the self-employed in the UK market could be a good example to understand the level of protection that the self-employed could have at old age and its adequacy to cover their needs.

5. Country spotlight: the UK self-employed pension landscape

This section outlines UK-specific observations and summary information regarding the self-employed population, with the aim of providing real-life examples of a pension gap for the self-employed. The UK market was chosen due to the maturity of the market and the availability of data relevant to the self-employed population as mentioned before.

The observations cover the self-employed population in terms of numbers, composition (demographics and occupational classification) and trends. We then provide a summary of the available pension offerings in the market, the extent of accessibility for the self-employed and government measures to encourage pension savings (e.g. tax incentives).

With this information in mind, we outline the pension preparedness and saving status of the self-employed population and illustrate the gap in pension savings by the self-employed.

5.1 UK self-employed population at a glance

In 2022 there were approximately 4.1 million solo self-employed individuals in the UK with an estimated contribution of £278 billion to the UK economy and accounting for approximately 13% [1] of the total UK workforce.

In 2008, there were approximately three million self-employed individuals, as opposed to 4.1 million in 2022 [2]. The number of self-employed reduced during the COVID-19 pandemic. It is currently observed to rise again but remains at a lower level than pre-pandemic figures. Figure 1 shows the trend in self-employment since 2011 only, and as such does not show a significant increase from the year 2008.

The following summary information is sourced from the annual IPSE Self-Employed Landscape Report for the year 2022 [3] and gives an overview of the makeup of the self-employed population. The IPSE report defines the solo self-employed as “people who are running their own business, operating as a sole trader or in a partnership and do not have any employees”.

Therefore, the information set out below should be considered with care, in not assuming a similar make up for the self-employed population that employs others.

(1) Demographics

The average age of the self-employed population is 48 years of age. The following chart shows the age distribution of the self-employed population in the second quarter of 2022.

The current largest age group is 50–59 years of age, making up 27% of the self-employed population as shown in Figure 2. This is followed by the age group 40–49 with 23% and the over 60s at 21% of the self-employed population. In fact, only 30% of the self-employed population is younger than 40 years of age, i.e. 70% of the current self-employed population may be gradually transitioning to retirement in the next 5–20 years. Therefore, it should be

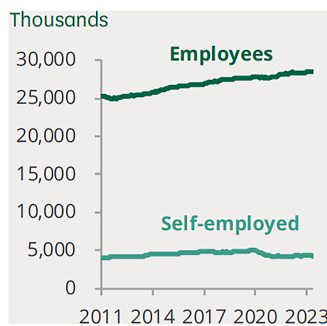


Figure 1. Trend in UK self-employment (2011 to 2023). **Source:** UK Labor Market Statistics, 2023 (house of commons library)



Figure 2. UK age distribution of the self-employed population Q2-2022. **Source:** Association of Independent Professionals and Self-Employed (IPSE)

reasonable to expect that a sizeable proportion of the self-employed population have started pension planning or have accumulated sufficient funds in their pension plans, in preparation for retirement. Commentary on the pension savings accumulated by the self-employed is summarised later in this section.

The gender split of the self-employed population is majority male, at 62%, with females making up 38%. This split is stable from the prior year; however, the long-term trend has been less so. For example, since 2008, the number of women in self-employment has increased by 57%, while the number of men increased by 11%. Over the same time period, the number of working mothers in self-employment has increased by 55%.

There has also been a surge of numbers of disabled self-employed individuals, year-on-year (42% between 2013 and 2022), with the highest increase being amongst the over 60s age group.

The demographic changes, summarised above, indicate the clear diversity within the self-employed pool. These changes are both qualitative (segments of society) and quantitative (upward trend in self-employment and rapid upward trends that change the demographic makeup of the self-employed population).

(2) Occupational classification

The following chart shows the split of the solo self-employed population by Standard Occupational Classifications (SOCs). The SOC is the system used by the UK Office for National Statistics (ONS, 2022a, b). It categorises jobs according to the required skill level, qualification and specialisation needed to perform a job, with 1 representing higher levels of technical skill, qualification and specialisation.

Figure 3 shows that the largest single occupational group of self-employed is SOC5 (Skilled Trades occupations). This group accounts for 24% of the solo self-employed population. Example sectors include construction, agriculture and food preparation.

The largest collection of occupational groups are highly skilled freelancers. This sub-set of the solo self-employed is made up of the top three skilled SOC groups (SOC1-3). Together they make up about 46% of the solo self-employed population.

The above shows the wide spectrum of areas in which the self-employed operate. It is reasonable to assume that the members of the distinct groups, and indeed within the same group, will have varying levels of financial literacy and a wide range of annual income. This occupational diversity can be an indication of the complexity of disseminating relevant information that can encourage pension take-up.

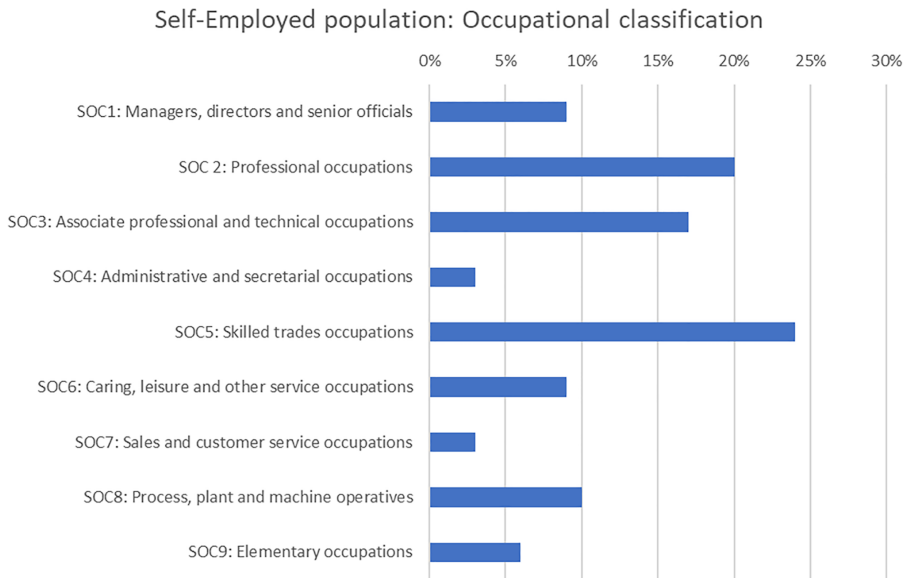


Figure 3. UK occupational classification of the self-employed population. **Source:** The UK Office for National Statistics (ONS, 2022b)

5.2 Retirement savings offerings

This section outlines the available retirement-specific provisions and saving products that are available in the UK market (regardless of employment arrangement). This includes public and private provisions that are open to new entrants. These options are available to the solo self-employed as well as those who employ others.

To set the scene, Table 1 illustrates current levels of expected annual expenditure, required for three different retirement living standards. These Retirement Living Standards estimates were developed by the Pension and Lifetime Savings Association (PLSA) and are based on research conducted by Loughborough University.

(1) State pension

In the UK, a government State pension can be claimed at the state retirement age, provided a working individual made social security (National Insurance) contributions for 10 years,

Table 1. Expected annual expenditure for different retirement living standards

	Minimum (Covers essential needs and small residual amount for non-essentials)	Moderate (More financial security and flexibility)	Comfortable (More financial freedom and some luxuries)
Single	£12,800 £14,300 (London)	£23,300 £28,300 (London)	£37,300 £40,900 (London)
Couple	£19,900 £22,400 (London)	£34,000 £41,400 (London)	£54,500 £56,500 (London)

Source(s): The PLSA

with the full state pension amount payable if 35 years of contributions were made. The qualifying years of contributions do not need to be consecutive. The current state retirement age is 66, rising to 67 between 2026 and 2028. The state retirement age is reviewed, regularly, by the government and considers matters such as life expectancy and the expected affordability of the state pension. A self-employed individual would have accumulated qualifying years if they made contributions during prior standard employment or if a proportion of their income in self-employment is in the form of a salary (e.g. salary from their own business).

The current full State Pension is £203.85 per week (i.e. £10,600 per year). It is unlikely that the state pension on its own will be sufficient to support a comfortable living standard. In fact, it is lower than the minimum expected annual expenditure, as per the above table. The state pension will require supplemental income, for example from pensions or other wealth.

For the self-employed, planning for retirement in later life is their responsibility and would require deliberate consideration and action.

(2) Private defined contribution plans

Private pensions enable individuals to save for retirement in a flexible and tax-efficient way. Personal pension savings can be accessed from age 55 (increasing to 56 from 2028), whereas State Pension can only be claimed from the state retirement age. Tax efficiency is summarised later in this section.

The standard defined contribution pension plan (Personal Pension) involves making regular or lump sum contributions into the pension plan which is then invested by the pension provider. The accumulated fund can be used to purchase an annuity or other flexible income plans (such as taxed and untaxed drawdowns). The size of the pension fund at retirement will depend on a number of factors, such as the amount of contributions made, the types of investments selected, the length of investment, the performance of the investments and the charges deducted by the pension provider. As such, market risk is assumed by the plan holder and the value of the fund may fall as well as rise. There are three main variations of the private defined contribution pension plans:

- **Personal Pension Plan:** This is the standard defined contribution pension, with a range of investment options and lifestyle investment strategies. Lifestyle investment strategies include strategies, such as investing in high-risk/high-return assets at younger ages (e.g. equities) and transitioning the investments into lower-risk assets closer to retirement (e.g. cash and government bonds).
- **Stakeholder Pension Plan:** This is a personal pension plan that must meet certain government criteria such as capped charges and lower minimum contributions. This product was introduced to enhance financial inclusivity, by encouraging moderate and lower income individuals to save into pensions.
- **Self-Invested Personal Pensions (SIPPs):** This is a personal pension plan that offers a wider range and, possibly, more sophisticated investments and allows the plan holder to manage the investments in their pension fund, either personally or by acquiring the services of a financial advisor to manage the investments on their behalf.

(3) State-sponsored workplace pension scheme (NEST)

The UK government set up a workplace-defined contribution pension scheme. This scheme is run on a not-for-profit basis by the National Employment Savings Trust (NEST) Corporation, which acts as the pension provider. The pension arrangement is commonly referred to as NEST auto-enrolment. NEST was introduced in 2010 and a phased implementation started in 2012.

- The scheme is accessible, on a voluntary basis, to all employers that do not have a company pension scheme but wish to offer pension arrangements to their employees. This is relevant to the self-employed who employ others through their business.
- There is also a compulsory requirement for employers to enrol their employees into a pension scheme if they earn more than £10,000 per year, are over 22 years of age and younger than the state retirement age. These employees can choose to opt out of the scheme if they wish, but they will be re-enrolled into the scheme every three years, if they are still eligible, with the option to opt-out again. This takes into account that individual circumstances can change.

This is relevant to the dependent self-employed who would be enrolled by their employer if they meet the criteria. And will also apply to the independent self-employed if they or their employees meet the criteria.

- A solo self-employed individual who does not employ anyone else can also enrol themselves into the scheme.

Commercial multi-employer pension schemes (Master Trusts) can be used as an alternative to NEST in the above circumstances as well.

(4) Non-pension financial products

- **Lifetime Individual Savings Account (ISA):** An ISA is a tax-free saving account where a resident of the UK aged 16 and over can save up to an annual allowance per tax year, in cash or invest in stocks and shares (from age 18). The interest on cash savings and income or capital gains on share investments is tax-free.

There are four types of ISAs, and of interest to pension provision is the Lifetime ISA. The Lifetime ISA is available to individuals between the ages of 18 and 39 and savings in this ISA are specifically made for the purposes of purchasing a first home or for retirement.

Contributions can continue until the age of 50. The current maximum allowable saving in a lifetime ISA is £4,000 per tax year. And the UK government will make an additional contribution of 25% of the savings, up to a maximum of £1,000 per tax year (tax relief).

Money accumulated in the Lifetime ISA can be withdrawn for purchasing a first home, once the holder of the ISA turns 60 (retirement) or becomes terminally ill with less than 12 months to live. Any withdrawals other than these specific reasons will be charged a 25% withdrawal charge, which recovers the government's tax relief.

5.3 Tax efficiency of saving in pension products

Pensions are a tax-efficient way to save for retirement as there are tax advantages over saving the same amounts in other saving vessels. The following is a high-level summary of the tax advantages available:

- (1) Individual Pension contributions invested in a personal pension receive tax relief from the government – effectively increasing the monetary amount of the contributions. The tax relief is subject to an Annual Allowance.

Whilst an individual can save as much as they wish in a personal pension, the Annual Allowance represents the maximum that can be saved in a person's pension(s) each tax year on a tax-free basis. Contributions above the allowance are subject to tax.

The current annual allowance is the smaller of 100% of annual earnings and £60,000 in any tax year and unused allowances from the prior three tax years can be carried forward and used to increase the tax-free contributions.

- (2) Pension contributions invested in a pension fund grow tax-free, subject to a Lifetime Allowance on the size of the accumulated fund. The current Lifetime Allowance is £1,073,100, after which tax is charged.
- (3) Upon retirement, the pension holder has an option to withdraw 25% of the accumulated pension fund as a tax-free lump sum. This is currently subject to a maximum of £268,275 tax-free lump sum withdrawal.
- (4) Employer Pension contributions made from pre-tax company profits are treated as an allowable business expense, therefore, reducing the tax liability of the business. These contributions may not be subject to the same tax relief made by the individual.

These advantages apply to everyone. Therefore, a self-employed individual benefits from tax relief on contributions made from their own taxed income or accumulated wealth and can also benefit when making any employer pension contributions through their company as they benefit from a reduced tax bill.

Tax rules are complex and tax allowances can change from one tax year to the next and from one government to another. For example, the Lifetime Allowance has changed over time. It was £1.5 m when it was first introduced in 2006, later increased to £1.8 m then gradually decreased to its current level of £1.07 m. It is now set to be abolished from April 2024. This will incentivise senior and experienced individuals to work for longer, as the tax charge applicable when their pensions exceed the Lifetime Allowance is removed.

However, the key message of summarising the tax advantages, at a high level, is to illustrate the efficiency of choosing to save in a pension as opposed to other alternatives and to highlight measures put in place by the UK government to encourage saving for retirement.

5.4 *The self-employed and their saving for retirement*

The following graphics are extracts from the “Saving for retirement in Great Britain: April 2018 to March 2020” report as issued by the ONS and using the seventh round of the Wealth and Assets Survey.

The following graphic illustrates the percentage of people aged 16 years to State Retirement age contributing to different pension types by employment arrangement between July 2006 to March 2020.

We note that the above graphic summarises data up to the year 2020, while the self-employment figures we quote in Section 4.1 are based on 2022 data. However, self-employment figures have been relatively stable in the period 2020 to 2022 due to the slowdown of economic activity during the COVID-19 pandemic (Figure 1), therefore we do not consider the date difference to be a material limitation to our comparison, for the purpose of this paper.

With this in mind, Figure 4 shows that the self-employed have consistently held less pensions than the employed population. The gap is widening over time with an increasing trend of the proportion of the employed population saving in pensions, and a decreasing trend of the proportion of the self-employed population saving in pensions.

Based on the summary information of the UK self-employed pension landscape outlined in Section 4.1, approximately 48% of the solo self-employed population are approaching or are close to retirement age (age 50+) and 70% are over 50 years of age. We’d consider it reasonable that a sizeable proportion should, in theory, be in the advanced stages of financial retirement planning. By 2020, approximately 20% of the self-employed were saving into a personal pension, compared to the 48% who are approaching or close to retirement. Meanwhile, 80% of the employed population were saving into a pension. It should be noted that employee savings into pensions have increased in part due to the introduction of NEST auto-enrolment. Moreover, the self-employed pension savings were in personal pensions only, while the employed population held a mixture of personal pensions, employer-defined

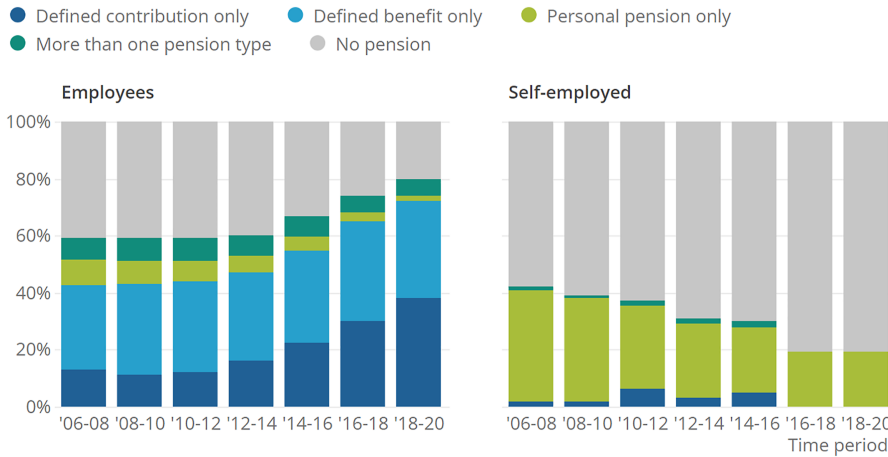


Figure 4. Distribution of types of pension plans for the employed and self-employed (2006–2020). **Source:** Saving for retirement in Great Britain: April 2018 to March 2020 – issued by the ONS

contribution and defined benefit pensions. Defined benefit pensions provide more income certainty than defined contribution pensions.

Therefore, there is a significant mismatch between the proportion of self-employed approaching retirement and the proportion with current investments in pension vehicles. It also highlights the disparity in this mismatch between the employed and the self-employed populations as well as the level of financial security offered by the type of pension held.

The next graphic explores the expected source of income in retirement for the employed and self-employed.

Figure 5 shows that more than twice as much self-employed individuals, compared to the employed, are expecting to finance their retirement from accumulated wealth in property, investments and earning from their business. Conversely, more than twice as many employees expect to finance their retirement from occupational or personal pensions, compared to the self-employed. This also indicates that the employed population may have less volatile income in retirement due to a higher concentration of pensions (including from the state) which is more secure.

5.5 UK self-employed pension preparedness: observations

Having understood the increasingly diverse pool of the growing self-employed population in the UK, the landscape of the pension arrangements available to them, and the state of their preparedness towards securing themselves in retirement, a gap in pension coverage is detected.

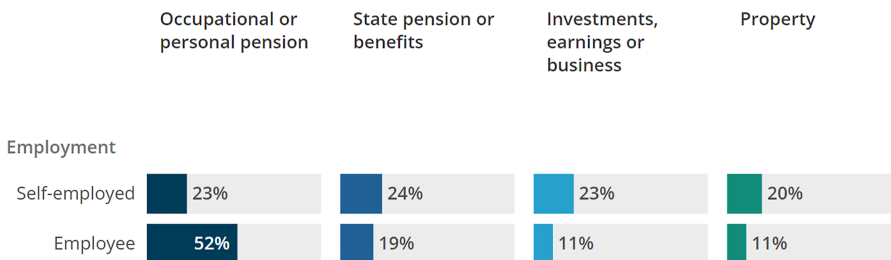


Figure 5. Expected source of income in retirement for the employed and self-employed. **Source:** Saving for retirement in Great Britain: April 2018 to March 2020 – issued by the ONS

The make-up of the self-employed population is changing in terms of gender, age and disability. Self-employment is also present in professions at various levels of skill, qualification, and income. Narrowing the pension gap for the self-employed has a wide-reaching impact on achieving financial inclusivity and security in society.

Self-employed individuals prefer more accessible investments and would be comfortable relying on or selling their business to finance retirement, reducing the risk of financial insecurity in retirement. However, there remains the risk that the performance of the business, economic conditions or market changes (for example, the business becoming obsolete) may lead to a much lower business value at retirement. This would expose these individuals to retirement poverty, expose the government to increased social expenditure strain, and can have a second-order effect on future self-employment rates if individuals considering self-employment are discouraged by the poor outcomes in old age. Retirement financial literacy is crucial in highlighting the importance of income certainty in retirement, compared to during an individual's working life. Owning a successful business, whilst indicating business acumen, does not necessarily equate to financial literacy in terms of risk-based thinking for retirement and does not counter an individual's bias in considering the continued sound operation of their business post-retirement. Thus, specific actions need to be taken to clearly communicate the risks of different retirement options, including non-pension arrangements, compared to a pension plan.

It is clear that there are pension products available in the market that are also available to the self-employed. There are also government actions in terms of the introduction of the NEST defined contribution scheme, as well as tax incentives when making contributions to a pension or saving plan. However, there is still a significant gap in pension coverage for the self-employed.

Over and above financial literacy, there are also challenges in terms of access to financial advice. This could be because of a lack of reach or affordability of seeking the services of financial advisors. However, this could also indicate that more innovative communication and/or distribution channels may be needed for better reach this includes trade and professional bodies, social media, automated advice and utilisation of Artificial Intelligence (AI).

A challenge that these observations indicate is that policymakers may need to take informed and sustainable action, in terms of designing policies that can achieve financial inclusivity in general. They may also consider an accelerated action plan to mitigate the impact of the self-employed retiring in the next 20 years, especially as a significant proportion of those retiring may not have the financial security they expected. Actuarial projections and sensitivities that incorporate life expectancy as well as the make-up of the self-employed population and assumptions regarding pension preparedness should be used to understand the range of possible financial impacts that the government may be exposed to if more people than expected slip into retirement poverty, under different economic conditions. This understanding can also inform the adequacy of proposed policies or strategies.

Actuarial projections can also be used in assessing the financial cost of certain proposed policies, strategies and tactics against the general societal benefit. For example, the impact of raising the maximum age for purchasing a Lifetime ISA from 39 to say 45, under scenarios with and without financial literacy and financial inclusivity policies, against the projected retirement poverty levels under each scenario.

Another challenge is for actuaries working for pension providers, and that is to design profitable and flexible products that can reach the self-employed population and be attractive enough to encourage more take-up. Personality traits of entrepreneurs are discussed in [Section 7](#), and they provide further matters that may be of interest to actuaries in terms of product design and product reach.

6. Data and model

In this section, the data and the models that are used in our research will be described. This analysis will focus on studying the existence of a relationship that could affect entry into

entrepreneurship, in the context of existing pension arrangements. In other words, we will explore the relationships between having a pension plan and being an entrepreneur and also the size of the entrepreneur's business and their pension provision. Another relationship which is equally important – represents the personal traits of individuals (who could be entrepreneurs) and how these can impact take-up of pension plans. From our perspective, studying these relationships will provide three different dimensions to have a better understanding of the attitude of the self-employed towards pension plans. Furthermore, analysing the results will draw a broader picture of how the choice of pension plans could affect entrepreneurship.

Thus, four models are set according to the availability of data and their relevance to entrepreneurship. These models test the relationships between personal/employer pension plans and entrepreneurship and the size of the entrepreneur's business and pension provision, respectively. The first dimension is represented in two models that examine the relationships between entrepreneurship and the acquisition of either personal or employer pension plans. The two models of the second dimension deal with the relationship between the size of the entrepreneur's business and having a personal or employer pension plan. The third dimension of personal traits and its relationship with pension plans was covered by [Balasuriya and Yang \(2019\)](#) using the same methodology and database. Hence, it will be interesting to explain this relationship from the entrepreneurs' perspective with a focus on the role of pension actuaries in [Section 7](#).

The analysis of these models is based on the data from the UK Household Longitudinal Study ([UKHLS, 2014](#)). The UKHLS is a multi-purpose longitudinal study operated by the Institute for Social and Economic Research at the University of Essex. In this database, over 45,000 individuals were interviewed each year between 2009 and 2014. We will focus on two different pension plans, these are: personal pensions and employer pensions.

The total number of observations from the UKHLS that is used in our analysis is: 6,968 and 6,663 in entrepreneurship models and the models of the size of the entrepreneur's business, respectively. These models correspond to different assumptions regarding the existence and effects of unobserved variables ([Wilson, 2015](#)) with specifications for ordinary least squares (OLS) models estimated. These models are employed to explore the relationships between the type of pension plans and entrepreneurship and the size of the entrepreneur's business and pension provision. The models are *linear probability models (LPM)*, a special case of OLS. LPM can be defined as a regression model where the *outcome* variable is a binary variable, and one or more explanatory variables are used to predict the outcome. Explanatory variables can themselves be binary or continuous. Furthermore, using LPM models are considered simple to estimate and interpret the results of the analysis especially when the outcome variable is dichotomous. In addition, the major advantage of using LPM models as a qualitative response regression model compared to other models is its interpretability ([Von Hippel, 2015](#)). Since our analysis is based on qualitative type of data and our main focus is measuring the effect and the direction of the relationships that interpret the behaviour of the self-employed, we can say that LPM could be appropriate among other regression models such as; logit and probit as being easier to interpret. Another advantage of using the LPM models is that it is faster when dealing with large datasets compared to the logits which could be frustratingly slow.

The formulae of OLS and LPM are indicated below ([Gujarati, 1995](#)):

$$Y_i = \beta_1 + \beta_2 X_i + u_i \quad (1)$$

$$E(Y_i | X_i) = \beta_1 + \beta_2 X_i \quad (2)$$

The model, the conditional expectation of Y_i given X_i , $E(Y_i | X_i)$, can be interpreted as the conditional probability that the event will occur given X_i , that is,

$Pr(Y_i = 1 | X_i)$. If P_i = probability then $Y_i = 1$ (that is, the event occurs) and $(1 - P_i)$ = probability that $Y_i = 0$ (that is, that the event does not occur), then the expectation of variable Y_i is:

$$E(Y_i) = 0(1 - P_i) + 1(P_i) = P_i$$

Thus,

$$E(Y_i | X_i) = \beta_1 + \beta_2 X_i = P_i \quad (3)$$

Other basic explanatory variables are included in the analysis, and they are measured at the individual level, they are: nationality (here, it means either British or not), gender, age, marital status, health assessment, education and the degrees attained, financial status including income and home value, and finally, the family background, such as education and father's occupation.

The results obtained regarding the relationships of personal/employer pensions with entrepreneurship and the size of the entrepreneur's business are shown in [Tables A1 and A2](#) in [Appendix](#). The results are obtained by applying the LPM models using both employer and personal pension as dependent variables and running the software Stata 16. Here, it is important to state that the study's findings are subject to several limitations that should be acknowledged. First, the study only considers the association between employer/personal pensions and entrepreneurship but does not consider other potential factors that may influence an individual's decision to start a business. Second, the study does not consider the potential impact of pension plans on the success of entrepreneurial ventures. Future research may wish to consider these limitations and explore these issues in greater detail. The main findings can be explained thoroughly in the next section.

7. Results

7.1 Personal pensions and entrepreneurship

The finding of the first model reveals a positive relationship between personal pension and entrepreneurship. This means that entrepreneurs are likely to get personal pensions. Thus, increasing the number of entrepreneurs will lead to an increase in the probability of having personal pensions. This result is sensible as the entrepreneurs are usually individuals who start their own businesses based on innovative ideas and/or new applications, and hence, they are responsible for having their own financial security in old age. In addition to the fact that personal pensions provide individuals with financial security, personal pensions offer a stable source of income during retirement which may provide individuals with a safety net during their working life. Moreover, personal pensions may provide a source of start-up capital in some countries, as individuals can borrow against their pension funds to finance their business ventures (although this is not the case in the UK, where these data are from). Our model also reveals a significant impact on personal pension with other control variables, they are nationality, gender and social class.

This positive relationship has an important impact on both the pension actuaries and entrepreneurs. Pension actuaries may need to explore ways to design personal pension plans that are attractive to entrepreneurs, but importantly designing products that would be fit for various distribution channels that can achieve a diverse reach to entrepreneurs. Actuaries can also play a role in advising policymakers by providing financial impacts and scenario analysis of potential outcomes should the entrepreneur/self-employed pension gap persist. This in turn can lead to more financially inclusive policies. This may increase the numbers of self-employed who get these plans, hence, reduce the pension coverage gaps that are expected for the self-employed. In other words, the benefits, contribution pattern and accessibility should be designed to be more attractive and satisfying to the needs of entrepreneurs for security and protection in old age. In addition, policymakers, such as the government may provide more tax incentives to personal pension plans provided to the self-employed. On the other hand, entrepreneurs who do not have personal pension coverage should be aware of their need to be creative in their financial strategies and explore alternative sources of capital beyond their

personal savings (Shane, 2003). This could include seeking funding from investors, crowdfunding or taking advantage of government programs designed to support small businesses.

Thus, highlighting the impact of pension planning outcomes and the pension gap, by different policymakers including pension actuaries, would help in increasing old age protection to entrepreneurs over time. We are aware that this finding would demote the idea that the entrepreneurs are poor pension planners as mentioned earlier, which is also mentioned in previous research that has found a positive relationship between financial insecurity and entrepreneurship (Dencker *et al.*, 2021). We are not concluding that the assertion is false, rather, this is additional information, based on a particular sample.

7.2 Employer pensions and entrepreneurship

The study finds a negative association between employer pension and entrepreneurship. This means that entrepreneurs are less likely to get employer pensions. This can be interpreted as the entrepreneurs, in most cases, starting a new business which is usually classified as small or medium businesses. Thus, these enterprises could be run by a sole self-employed or a small number of employees. Hence, the need to buy employer pensions may not be financially viable.

On the other hand, this indicates that individuals who have access to a pension plan through their employer are less likely to start their own business compared to those who do not have access to a pension plan. Moreover, another possible explanation for this negative relationship is that employer pensions provide individuals with a sense of financial security, which may discourage them from taking risks and starting a business. This finding is consistent with previous research that has identified various barriers to entrepreneurship, such as access to finance, regulation and labour market conditions (Guzman and Kacperczyk, 2019). Also, other control variables are found significant in employer plan, such as gender, financial assessment, education and social class.

Here, it is worth mentioning that the relationship between employer pension and entrepreneurship is particularly important in the current economic climate, where entrepreneurship is increasingly seen as a means to create jobs and foster innovation (Wiklund *et al.*, 2003). The policymakers, regulators and pension actuaries should encourage strategies to have employer pensions among potential entrepreneurs (a good example is the NEST arrangement in the UK, as described in Section 4). The pension actuaries should emphasize the importance of the pension coverage needed for the self-employed and their employees. Moreover, tax incentives or loan guarantees could be of great motivation to those who participate in pension plans while starting a business.

7.3 Implications

The contrasting findings of these models highlight the importance of distinguishing between types of pension plans when studying the relationship between pension plans and entrepreneurship. The results reveal that personal pension plans may act as a facilitator of entrepreneurship, whereas the employer pension plans may restrain entrepreneurship.

Moreover, these findings have significant implications for the policymakers who are interested in promoting entrepreneurship and advancing innovation in their economies, for example, the relationship between having pensions and reluctance to enter innovation-driven entrepreneurship. Having active choices for the self-employed to boost pension participation, Cribb *et al.* (2024) suggest three options to policy makers within the UK market, they are: (1) Filling out a self-assessment tax return. (2) Automatic enrolment. (3) Providing a range of options for increasing contributions continuously each year (perhaps in line with CPI).

On the other hand, pension actuaries – as a key player–may need to:

- (1) participate in designing flexible pension products;

- (2) work in the actuarial modelling of different personal pension plans that comply with the needs of diverse the self-employed population;
- (3) help the financial advisors in raising awareness of the importance of pension coverage to entrepreneurs.

Thus, designing flexible and profitable products (features, benefits and charges) that can be suitable for distribution through various and non-traditional channels is quite important to increase reach into the entrepreneurial and self-employed population. This could raise the involvement of the entrepreneurs in such plans, especially with the movement of transitioning from permanent employment to self-employment. Furthermore, policymakers and employers who are interested in promoting entrepreneurship may seek the opinion of pension actuaries to consider the potential impact of distinct types of pension plans on entrepreneurial activity.

Other variables are found to be significant in our models in relation to the type of pension plans with entrepreneurship and the business size, such as nationality, gender, financial assessment, education and social class. Here, it is also clear that age, education, marital status and health are considered important factors that affect the decision to go into retirement. This is explained by [Sappleton and Lourenco \(2015\)](#). For example: age correlates negatively with wishing to retire as early as possible, indicating how important the retirement horizon is in the face of mostly actuarially unfair retirement systems. Work characteristics (such as work hours) are important driving force of desire to go into retirement, but also movement into entrepreneurship. Also, future pension claim expectations are included, and the results show that those that are eligible to retire early also say they wish to retire early. In addition, [Fehr and Hofbauer \(2016\)](#) indicate that the occupational choice in pension is made according to: entrepreneurial skills or risk preferences. Here, it might be interesting to study further the impact of these variables in relation to pension plans and entrepreneurship in future work.

7.4 Personal/employer pensions and the size of business

The number of employees is considered one of the main elements that classify the size of a business. The classification can vary from small enterprises starting with a sole person to large enterprises that may have hundreds of employees. OECD Data classifies enterprises by size, as follows:

- (1) Micro starting with 1 up to 9 employees
- (2) Small 10 to 49 employees
- (3) Medium 50 to 249 employees
- (4) Large 250+ employees

Workers in EU 28 are almost equally distributed between micro, SM and large companies. Substantial differences between countries in terms of the size of each group can be detected ([Eurofound, 2017a, b](#)). In each business class, the employees need to be provided with social benefits in older age. The preference between the personal pension and employer pension according to the size of the business is considered an essential factor when studying the behaviour of the self-employed. For pension actuaries, it is important to understand the effect of the size of the business on the choice of the pension plan to design the appropriate pension plan for entrepreneurs.

It is noted that there are scarce studies that cover the behaviour of self-employed in buying specific pension plans taking into consideration the size of their business. The note of [D’Arcy \(2015\)](#) pointed out that the self-employed with employees are more likely to be more prepared for pension plans than the self-employed without employees. Moreover, the study indicates that ordinary employees are much more likely than the self-employed to say an occupational or personal pension will provide the largest part of their retirement income with close to half

(48%) pointing to this as their main source of post-retirement funding. In contrast, just one in four (23%) of the self-employed without employees say they will rely primarily on occupational or personal pensions, with the same share instead saying the state pension will form the largest part. Recently, the dependence on the state has changed allowing for more reliance on occupational or personal pensions.

In our study, the analysis of our models reveals a negative relationship between the personal pension and the size of the business. In contrast, there is a positive relationship detected between the employer pension and the size of the business. This means that the larger the size of the business the less likely for personal pensions to be used, whereas the more likely that employer pension is used. This can be interpreted as the self-employed with a larger number of employees are more likely to set up an employer pension. At the same time, the self-employed without employees will probably tend to get personal pensions. This ascertains that the self-employed with employees are more likely to be more prepared for pension arrangements than the self-employed without employees. Thus, we can say that these results are consistent with our analysis explained in Sections 6.1 and 6.2 and also with the findings of [D'Arcy \(2015\)](#) as indicated above.

These results can be explained as the large businesses have the financial stability and the ability to afford providing their employees with pensions and other benefits for remuneration. Also, large businesses are keen to hire and keep highly skilled employees to achieve success and sustainability in competitive markets. Hence, they usually offer better job packages to the employees including pensions. There may also be a state compulsion to provide pension offerings to employees. In contrast, the self-employed with small businesses have limited resources and usually depend on their personal skills to perform the job, or they may rely on a few people to carry on the work – if needed-. This could be considered one of the main reasons why they are expecting to rely on their savings or personal pension for retirement.

Finally, classifying the entrepreneurs according to the size of their business would enable the pension actuaries to have a better understanding of the needs of the targeted self-employed and the pension plans that match these needs in the market.

8. Personality traits and pension plans

In this section, we are going to illustrate the relationship between personality traits and having personal/employer pension plans. This will be explained from the entrepreneurs' and pension actuaries' perspectives. A detailed interesting study by [Balasuriya and Yang \(2019\)](#) investigates how the personality traits of individuals can be related to pension plans and precisely the acquisition of personal and employer pensions.

It is interesting that this study is conducted based on the same database we used in our analysis. The study focuses on the five-factor personality model that is the most comprehensive, systematic and widely accepted taxonomy of personality traits to date ([John et al., 2008](#); [John and Srivastava, 1999](#); [Rustichini et al., 2016](#); [Balasuriya and Yang, 2019](#)). These personality traits are: extraversion – agreeableness – conscientiousness – neuroticism – Openness to experience. The findings of this research, which reveal the effect of the personality traits of individuals on the acquisition of pension plans, are closely related to our work.

The personality traits mentioned above can be seen as affecting the behaviour of the entrepreneurs as well. Illustrating the basic features of each trait which indicates the type of personality for those who could become an entrepreneur and their preference for the type of pension plan will be covered in this section. This would help in providing the pension actuaries with insight into the behaviour and attitude of different characters of entrepreneurs towards having a pension plan, leading to product and distribution models that are appropriate, can reach the target market, and importantly incentivize take up. This is explained below.

- (1) Extraversion is positively associated with personal pensions. Extraverted individuals tend to be more outgoing and social, which could make them more likely to engage in

financial planning discussions (Shane *et al.*, 2010a) and seek advice on pension plans. They are also more likely to take risks and to have a larger social network. This could help them gain knowledge and information about pension plans. Therefore, extraversion is a personal characteristic that would encourage an entrepreneur to have a pension plan and acquire personal pensions specifically.

- (2) Agreeableness is negatively associated with both personal and employer pensions. Agreeable individuals tend to be more trusting and cooperative, which could make them vulnerable to being taken advantage of in financial matters. They may not negotiate the best pension plans or seek out the best financial advice. Moreover, they may prioritize the needs of others over their own, leading them to neglect their retirement planning. Therefore, an agreeable individual may not be an entrepreneur who is prepared to acquire a pension plan. Hence, the agreeable entrepreneur needs more effort to be incentivised to have either a personal or employer pension plan.
- (3) Conscientiousness is positively associated with both personal and employer pensions. This means that people with high conscientiousness are more likely to acquire personal pensions or sign up for their employer pension arrangement. Conscientious individuals tend to be more organized and responsible, which could lead them to engage in financial planning and seek out the best pension plans. Moreover, they are likely to be diligent and persistent, which could help them contribute consistently to their pension plans over time. Therefore, conscientiousness as a characteristic of entrepreneurs could act effectively as a facilitator to the acquisition of pension plans.
- (4) Neuroticism is negatively associated with both. The findings show that people with high neuroticism are less likely to acquire a personal or sign up for their employer pension arrangement. Neurotic individuals tend to be more anxious and insecure, which could lead them to avoid financial planning and take less risk (Shane *et al.*, 2010b). They may prioritize short-term needs over long-term financial planning. Additionally, they may struggle with financial decision-making, leading them to delay or avoid pension planning. Therefore, neuroticism is not considered a strong trait in regard to driving entrepreneurs in planning for their retirement.
- (5) Openness to experience is positively associated with both personal and employer pensions. Individuals who are open to experience tend to be curious and open-minded, which could make them more willing to seek out information and knowledge about pension plans. They are likely to have a broad range of interests, which could make them more interested in financial planning and investment opportunities. Moreover, they may be more willing to take risks, which could lead them to invest in pension plans. Therefore, entrepreneurs who are open to experience could be regarded as good potential clients for acquiring either personal or employer pension plans.

Therefore, we can conclude that personality traits can play a significant role in planning for retirement, and hence, the likelihood of obtaining personal or employer pensions. Extraversion is positively associated with personal pensions. Conscientiousness and openness to experience are positively associated with personal and employer pensions whereas agreeableness and neuroticism are negatively associated with both pension plans.

These findings can be helpful to pension actuaries, employers and decision-makers in understanding and modelling the behaviour of entrepreneurs that influence pension planning and the design of pension plans. Since the personality traits of entrepreneurs can be easily examined through regular questionnaires and tests, pension actuaries can then use these results for:

- (1) Product design and distribution channel partnerships: Providing analysis and viable solutions to increase reach and reduce the pension and financial planning gap for the self-employed in old age, taking into consideration the different personality traits.

- (2) Communication: Raising awareness, producing easy-to-understand product literature that includes the benefits and the risks of not having pension arrangements, thus encouraging agreeable and neurotic entrepreneurs to plan for retirement and understand the importance of acquiring the appropriate pension plan.
- (3) Business take-up tactics: Motivating and incentivising the self-employed who are characterised as extraverted, conscientious and open to experience to secure their old age by attaining either personal or employer pension plans.

9. Conclusions and recommendations

9.1 Conclusions

With increasing life expectancy and an ageing worldwide population, there is an expected increase in the transition from employment to retirement. It is noted that there isn't a sufficient volume of research on pension take-up or retirement financial resources amongst the self-employed or entrepreneurial population. This has significant implications in relation to future retirement poverty in this category. This paper consolidates several literary, market and analysis insights into this matter to address the identified pension gap from different angles.

The UK pension environment is selected as an example of a developed pension market and the availability of data to illustrate the pension gap for the self-employed. Studying the UK self-employed pension landscape, the observations reveal that there are state initiatives to encourage pension savings into pensions, such as tax incentives. In addition, the UK market includes products and state-sponsored schemes that are designed to increase financial inclusivity and accessibility of pension savings, including to the self-employed. However, approximately 20% of the self-employed population have pension plans, compared to approximately 80% of the employed population.

Another perspective related to the behaviour of the self-employed towards saving into pensions is studied by conducting a statistical analysis using the UK database: the [UKHLS \(2014\)](#), to explore whether there was a relationship between pension plans and entrepreneurship and entrepreneurial pension planning and the size of the entrepreneur's business. Taking into consideration two cases of personal pension and employer pension, the results reveal that entrepreneurs are likely to get personal pensions where as they are less likely to set up an employer pension. Since the size of the business reflects the number of employees enrolled, it is found that self-employed with employees are more likely to be more prepared with pension plans/employee schemes than the self-employed without employees. A final area of consideration in relation to pension planning was the personality traits of entrepreneurs by utilising prior published research that was conducted using the same UK database as that used in our analysis ([UKHLS, 2014](#)). Personality traits affect the behaviour of entrepreneurs towards having pension plans and the type of pension plans they are likely to save in. The recommendations and the practical actions that policymakers and actuaries can adopt and implement to deal with the pension gap are illustrated in detail below.

9.2 Recommendations

The policymakers may use the findings of the research to improve and develop the following points:

- (1) Highlight the importance of pension planning for the self-employed that requires their deliberate actions, as they do not have access to employer pension schemes, guidance or expertise.
- (2) Link the Government's financial security objectives strongly to financial inclusivity to ensure appropriate pension coverage for the self-employed in old age and reduce the likelihood of financial strain to the state. For example, state-sponsored pension

schemes that are administered by insurance companies, as is the case in the UK, these schemes are open to self-employed individuals.

- (3) Improve the financial literacy initiatives since the financial inclusivity measures may not be sufficient, in isolation.
- (4) Consider the availability and affordability of independent financial advice to self-employed.

The actuaries, on the other hand, can play a vital role in raising awareness and financial literacy of entrepreneurs towards pension planning by:

- (1) Articulating and illustrating the risks of income uncertainty in retirement, possibly under different retirement arrangement scenarios by the use of digital illustration platforms that project retirement income based on an individual's current wealth and based on pension alternatives. These can then be compared to projected living expenses for different living standards.
- (2) Designing and modelling products that can be promoted through new and innovative communication channels for better reach, this includes trade and professional bodies, social media, automated advice, utilisation of AI.
- (3) Utilising the available research regarding personality traits of entrepreneurs both in relation to designing profitable products and formulating the appropriate risk-based messages that can increase the likelihood of pension take up.

Furthermore, actuaries can work with decision-makers in governments and other bodies to help inform and shape government action. Areas that actuaries can add value include:

- (1) Defining the attributes of labour market data needed to analyse the self-employed pension gap.
- (2) Analysing the collected data and performing projections that consider the self-employed population composition and trends, as their lifetime expectation. These projections should be based on different pension take-up assumptions and scenarios and should aim to provide a range of expected levels of retirement poverty and expected levels of government expenditure to address the retirement poverty levels.
 - Comparing, contrasting and testing the retirement security initiatives introduced by different counties.
 - Re-performing the projections and scenario analysis to understand their suitability should they be implemented to their population.
 - Participate in the financial modelling of the initial and continued costs of implementing the new initiatives.

Finally, while this paper uses the UK market to illustrate a real-life self-employed pension gap, there is a need to have a better understanding of the scale and complexity of this issue in other markets in future work.

Notes

1. [Office for National Statistics \(2022a\)](#): Understanding changes in self-employment in the UK.
2. The self-employed figures as of July 2023 are 4.24 million. However, the 2022 figures are used to maintain consistency with the self-employed population statistics outlined at the start of this sub-section.
3. [IPSE: Association of Independent Professionals and Self-Employed \(2022\)](#).

References

- Aulet, W. and Murray, F.E. (2013), "A tale of two entrepreneurs: understanding differences in the types of entrepreneurship in the economy," available at: <https://ssrn.com/abstract=2259740/http://dx.doi.org/10.2139/ssrn.2259740>
- Balasuriya, J. and Yang, Y. (2019), "The role of personality traits in pension decisions: findings and policy recommendations", *Applied Economics*, Vol. 51 No. 27, pp. 2901-2920, doi: [10.1080/00036846.2018.1563670](https://doi.org/10.1080/00036846.2018.1563670).
- Barot, H. (2015), "Entrepreneurship – a key to success", *The International Journal of Business and Management*, Vol. 3 No. 1, pp. 163-165.
- Bender, K.A. and Jivan, N.A. (2005), *What Makes Retirees Happy?*, Center for Retirement Research at Boston College, Massachusetts, Vol. 28.
- Chang, W.J. and Wyszomirski, M. (2015), "What is arts entrepreneurship? Tracking the development of its definition in scholarly journals", *Journal of Entrepreneurship in the Arts*, Vol. 4 No. 2, pp. 11-31, doi: [10.1353/artv.2015.0010](https://doi.org/10.1353/artv.2015.0010).
- Cole, A.H. (1959), *Business Enterprise in its Social Setting*, Harvard University Press, First Edition. ISBN-10: 0674087518 ISBN-13: 978-0674087514.
- Cribb, J., Emmerson, C., O'Brien, L. and Sturrock, D. (2024), *Private Pensions for the Self-Employed: Challenges and Options for Reform*, The Pensions Review, The Institute for Fiscal Studies, London, ISBN 978-1-80103-199-8.
- Croci, C.L. (2016), "Is entrepreneurship a discipline?", Honors Theses and Capstones. 296, University of New Hampshire Scholar's Repository, available at: <https://scholars.unh.edu/honors/296>
- D'Arcy, C. (2015), *The Self-Employed and Pensions*, Resolution Foundation (RF) Briefing.
- Dencker, J.C., Bacq, S., Gruber, M. and Haas, M. (2021), "Reconceptualizing necessity entrepreneurship: a contextualized framework of entrepreneurial processes under the condition of basic needs", *Academy of Management Review*, Vol. 46 No. 1, pp. 60-79, doi: [10.5465/amr.2017.0471](https://doi.org/10.5465/amr.2017.0471).
- Detianne, D.R. (2008), "Entrepreneurial exit as an critical component of revising the definition of old age to reflect future changes in life table probabilities", *Canadian Journal of Aging*, Vol. 21 No. 3, pp. 349-356.
- Eurofound (2017a), *Exploring Self-Employment in the European Union*, Publications Office of the European Union, Luxembourg, ISBN: 978-92-897-1598-0, doi: [10.2806/651917](https://doi.org/10.2806/651917).
- Eurofound (2017b), *Sixth European Working Conditions Survey – Overview Report (2017 Update)*, Publications Office of the European Union, Luxembourg, ISBN 978-92-897-1597-3, doi: [10.2806/422172](https://doi.org/10.2806/422172).
- European Union Labour Force Survey (2023), "Labour force survey microdata 1983-2022", Release 2023, Eurostat, doi: [10.2907/LFS1983-2022](https://doi.org/10.2907/LFS1983-2022), available at: <https://ec.europa.eu/eurostat/documents/203647/15476179/EU+LFS+DOI+2022.pdf>
- Fehr, H. and Hofbauer, F. (2016), "Pension reform with entrepreneurial choice", *VfS Annual Conference 2016 (Augsburg): Demographic Change 145714*, Verein für Socialpolitik/German Economic Association.
- Gujarati, D. (1995), *Basic Econometrics*, 4th ed., McGraw Hill, New York.
- Guzman, J. and Kacperczyk, A.O. (2019), "Gender gap in entrepreneurship", *Research Policy*, Vol. 48 No. 7, pp. 1666-1680, doi: [10.1016/j.respol.2019.03.012](https://doi.org/10.1016/j.respol.2019.03.012).
- Hessels, J. and Naudé, W. (2019), "The intersection of the fields of entrepreneurship and development economics: a review towards a new view", *Journal of Economic Surveys*, Vol. 33 No. 2, pp. 389-403, doi: [10.1111/joes.12286](https://doi.org/10.1111/joes.12286).
- Hisrich, R.D. and Peters, M.P. (1998), *Entrepreneurship*, Irwin/McGraw-Hill; Pennsylvania State University, (2011), ISBN 0071153233, 9780071153232.
- Honarvar, M., Rasouli, J. and Amirzadeh-Iranagh, J. (2022), "Predictors of retirement satisfaction in the older adults of Urmia: a cross-sectional study", *BMC Geriatrics*, Vol. 22 No. 1, p. 557, doi: [10.1186/s12877-022-03259-1](https://doi.org/10.1186/s12877-022-03259-1).

- John, O.P., Naumann, L.P. and Soto, C.J. (2008), "Paradigm shift to the integrative big five trait taxonomy: history, measurement, and conceptual issues", in John, O.P., Robins, R.W. and Pervin, L.A. (Eds), *Handbook of Personality: Theory and Research*, Guilford Press, New York, pp. 114-158.
- John, O.P. and Srivastava, S. (1999), "The big five trait taxonomy: history, measurement, and theoretical perspectives", in Pervin, L.A. and John, O.P. (Eds), *Handbook of Personality: Theory and Research*, Guilford Press, New York, pp. 102-138.
- Ketkaew, C., Van Wouwe, M. and Vichitthamaros, P. (2019), "Exploring how an entrepreneur financially plans for retirement income: evidence from Thailand", *Cogent Business and Management*, Vol. 6, 1668676, doi: [10.1080/23311975.2019.1668676](https://doi.org/10.1080/23311975.2019.1668676).
- Kidd, S. and Tran, A. (2018), *Social Pensions and their Contributions to Economic Growth*, Ministry of Gender, Labour and Social Development, The Republic of Uganda.
- Leroy, H., Manigart, S. and Manleman, M. (2008), "The planned decision to transfer and entrepreneurial company", *Paper Presented at the 2008 Academy of Management Conference*, USA.
- Ronstadt, R. (1985), "The educated entrepreneurs: a new era of entrepreneurial education is beginning", *American Journal of Small Business*, Vol. 10 No. 1, pp. 7-23, doi: [10.1177/104225878501000102](https://doi.org/10.1177/104225878501000102).
- Rustichini, A., DeYoung, C.G., Anderson, J.E. and Burks, S.V. (2016), "Toward the integration of personality theory and decision theory in explaining economic behavior: an experimental investigation", *Journal of Behavioral and Experimental Economics*, Vol. 64, pp. 122-137.
- Sapleton, N. and Lourenco, F. (2015), *Entrepreneurship, Self-Employment and Retirement*, Palgrave Macmillan, ISBN 978-1-349-48532-1 ISBN 978-1-137-39839-0 (eBook), doi: [10.1057/9781137398390](https://doi.org/10.1057/9781137398390).
- Shane, S. (2003), *A General Theory of Entrepreneurship: The Individual-Opportunity Nexus*, Edward Elgar, Cheltenham.
- Shane, S., Nicolaou, N., Cherkas, L. and Spector, T.D. (2010a), "Genetics, the Big Five, and the tendency to be self-employed", *Journal of Applied Psychology*, Vol. 95 No. 6, pp. 1154-1162, doi: [10.1037/a0020294](https://doi.org/10.1037/a0020294).
- Shane, S., Nicolaou, N., Cherkas, L. and Spector, T.D. (2010b), "Do openness to experience and recognizing opportunities have the same genetic source?", *Human Resource Management*, Vol. 49 No. 2, pp. 291-303, doi: [10.1002/hrm.20343](https://doi.org/10.1002/hrm.20343).
- Social Protection for Older Persons: Policy Trends and Statistics 2017-19 (2018), "Paper 17", *The Social Protection Department*, International Labour Organisation (ILO).
- The Annual IPSE Self-Employed Landscape Report (2022), "*IPSE: association of independent professionals and self-employed*".
- The Office for National Statistics (2022a), "The report of saving for retirement in Great Britain: April 2018 to March 2020".
- The Office for National Statistics (2022b), "Understanding changes in self-employment in the UK".
- The UK Household Longitudinal Study (UKHLS) Database (2014), "The institute for social and economic research at the University of Essex".
- UK House of Commons (2023), "UK labour market statistics (updated monthly)", available at: <https://commonslibrary.parliament.uk/research-briefings/cbp-9366/>
- Von Hippel, P. (2015), "Linear vs logistic probability models: which is better, and when", *Statistical Horizons*, July 2015, available at: <https://statisticalhorizons.com/linear-vs-logistic/>
- Wagener, A. (2000), "Entrepreneurship and social security", *Finanz Archiv*, Vol. 57 No. 3, pp. 284-315, doi: [10.1628/0015221012904904](https://doi.org/10.1628/0015221012904904).
- Welter, F., Baker, T., Audretsch, D.B. and Gartner, W.B. (2016), "Everyday entrepreneurship-a call for entrepreneurship research to embrace entrepreneurial diversity", *Entrepreneurship Theory and Practice*, Vol. 41 No. 3, pp. 311-321, doi: [10.1111/etap.12258](https://doi.org/10.1111/etap.12258).

- Wiklund, J., Davidsson, P. and Delmar, F. (2003), "What do they think and feel about growth? An expectancy-value approach to small business managers' attitudes toward growth", *Entrepreneurship Theory and Practice*, Vol. 27 No. 3, pp. 247-270, doi: [10.1111/1540-8520.t011-00003](https://doi.org/10.1111/1540-8520.t011-00003).
- Williams, C.C. and Lapeyre, F. (2017), "Dependent self-employment: trends, challenges and policy responses in the EU", The Employment Working Paper No. 228, The International Labour Organization, ISSN: 1999-2939; 1999-2947.
- Wilson, N.E. (2015), "Vertical separation increases gasoline prices", *Economic Inquiry*, Vol. 53 No. 2, pp. 1380-1391, doi: [10.1111/ecin.12203](https://doi.org/10.1111/ecin.12203).
- Ziegelmeyer, M. (2010), "Das Altersvorsorge-Verhalten von Selbständigen – eine Analyse auf Basis der SAVE-Daten", *Schmollers Jahrbuch: Journal of Applied Social Science Studies / Zeitschrift für Wirtschafts – und Sozialwissenschaften, Duncker & Humblot*, Vol. 130 No. 2, pp. 195-240.

Further reading

- Alaili, A. (2015), "What is an entrepreneur ?", [Entrepreneur Post], available at: <http://www.entrepreneurpost.com/2015/03/04/what-is-anentrepreneur/>
- Aldrich, J.H. and Nelson, F.D. (1984), *Linear Probability, Logit, and Probit Models*, Sage Publications.
- Clark, R.L., d'Ambrosio, M.B., McDermed, A.A. and Sawant, K. (2006), "Retirement plans and saving decisions: the role of information and education", *Journal of Pension Economics and Finance*, Vol. 5 No. 1, pp. 45-67, doi: [10.1017/S1474747205002271](https://doi.org/10.1017/S1474747205002271).
- DeTienne, D.R. and Wennberg, K. (2015), "Research handbook of entrepreneurial exit", Edward Elgar Publishing, Cheltenham, UK, available at: <http://www.elgaronline.com/view/9781782546962.xml>
- Diandra, D. and Azmy, A. (2020), "Understanding definition of entrepreneurship", *International Journal of Management, Accounting and Economics*, Vol. 7 No. 5, pp. 235-241, ISSN 2383-2126 (Online).
- Eurofound (2024), *Self-employment in the EU: Job Quality and Developments in Social Protection*, Publications Office of the European Union, Luxembourg, ISBN 978-92-897-2371-8, doi: [10.2806/350964](https://doi.org/10.2806/350964).
- Hamilton, B.H. (2000), "Does entrepreneurship pay? An empirical analysis of the returns to self-employment", *Journal of Political Economy*, Vol. 108 No. 3, pp. 604-631, doi: [10.1086/262131](https://doi.org/10.1086/262131).
- Hyams, S., Woodruff, M., Warren, G., Smith, A., Atherton, J., Pickett, E. and Willetts, P. (2017), *Pension Participation Market Research Review of UK and Worldwide, Markets Defined Contributions Participation, Accumulation and Decumulation Working Party*, Institute and Faculty of Actuaries.
- Kim, S. and Feldman, D.C. (2000), "Working in retirement: the antecedents of bridge employment and its consequences for quality of life in retirement", *Academy of Management Journal*, Vol. 43 No. 6, pp. 1195-1210, doi: [10.2307/1556345](https://doi.org/10.2307/1556345).
- Kim, J., Kwon, J. and Anderson, E.A. (2005), "Factors related to retirement confidence: retirement preparation and workplace financial education", *Financial Counseling and Planning*, Vol. 16 No. 2, pp. 77-89.
- Ntalianis, M. and Wise, V. (2011), "The role of financial education in retirement planning", *Australasian Accounting, Business and Finance Journal*, Vol. 5 No. 2, available at: <https://data.oecd.org/entrepreneur/enterprises-by-business-size.htm>
- Panis, C.W.A. (2004), "Annuities and retirement wellbeing", in *Pension Design and Structure: New Lessons from Behavioral Finance*, Oxford University Press, New York, NY, pp. 259-274.
- Patharkar, N. and Kishnani, N. (2021), *Entrepreneurship*, The Bhopal School of Social Sciences, Bhopal, ISBN: 978-93-91410-27-8.
- Pensions and Lifetime Savings Association: <https://www.retirementlivingstandards.org.uk/>
- Pradhan, K.C., Course Note: "Quantitative techniques for economics", Department of Economics, Mahatma Gandhi Central University.

- Singh, G. and DeNoble, A. (2003), "Early retirees as the next generation of entrepreneurs", *Entrepreneurship Theory and Practice*, Vol. 27 No. 3, pp. 207-226, doi: [10.1111/1540-8520.t01-1-00001](https://doi.org/10.1111/1540-8520.t01-1-00001).
- Sundali, J., Westerman, J.W. and Stedham, Y. (2008), "The importance of stable income sources in retirement: an exploratory study", *Journal of Behavioral and Applied Management*, Vol. 10 No. 1, p. 18, doi: [10.21818/001c.17168](https://doi.org/10.21818/001c.17168).
- Webb, S. (2017), "Webb unveils trick to get self-employed into pensions", FT Advisor Article. Pensions, Feb 2017.

Appendix

Table A1. Results of LPM analysis of personal pension

Personal pension	Model 1	Model 2
Business size		-0.29*** (0.02)
Entrepreneurship	0.50*** (0.14)	
Nationality	-0.49*** (0.18)	-0.53*** (0.19)
Sex	-0.95*** (0.06)	-1.06*** (0.06)
Parental education	-0.15 (0.11)	-0.11 (0.12)
Father occupation	0.06 (0.08)	0.09 (0.08)
Birth order	-0.07 (0.07)	-0.09 (0.07)
Marital status	0.03 (0.09)	0.03 (0.09)
Health assessment	-0.04 (0.04)	-0.03 (0.04)
Financial assessment	-0.01 (0.03)	-0.02 (0.04)
Education	0.13 (0.10)	0.06 (0.10)
Social class	-0.26*** (0.06)	-0.27*** (0.07)
Constant	0.15 (0.26)	1.12*** (0.28)
Observations	6,968	6,663
Multilevel estimator – region	Applied	Applied

Note(s): Standard errors in parentheses
 *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table A2. Results of LPM analysis of employer pension

Employer pension	Model 1	Model 2
Business size		0.42*** (0.02)
Entrepreneurship	-0.60*** (0.14)	
Nationality	0.20 (0.17)	0.11 (0.18)
Sex	-0.40*** (0.05)	-0.28*** (0.05)
Parental education	0.14 (0.10)	0.14 (0.10)
Father occupation	-0.04 (0.07)	-0.09 (0.07)
Birth order	-0.05 (0.06)	-0.04 (0.06)
Marital status	-0.14* (0.08)	-0.15* (0.08)
Health assessment	-0.04 (0.03)	-0.04 (0.04)
Financial assessment	-0.11*** (0.03)	-0.11*** (0.03)
Education	-0.64*** (0.09)	-0.59*** (0.09)
Social class	-0.17*** (0.06)	-0.18*** (0.06)
Constant	1.08*** (0.24)	-0.11 (0.26)
Observations	6,968	6,663
Multilevel estimator – region	Applied	Applied

Note(s): Standard errors in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

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