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Financial Literacy and Retirement Preparation in Portugal

Miguel Coelho Antas Rebocho

Dissertation presented as partial requirement for obtaining the Master's degree in Statistics and Information Management

NOVA Information Management School
Instituto Superior de Estatística e Gestão de Informação

Universidade Nova de Lisboa

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NOVA Information Management School

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FINANCIAL LITERACY AND RETIREMENT PREPARATION IN PORTUGAL

by

Miguel Coelho Antas Rebocho

Dissertation report presented as partial requirement for obtaining the Master's degree in Statistics and Information Management, with a specialization in Risk Analysis and Management

Advisor: Prof. Dr. Jorge Miguel Ventura Bravo

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ABSTRACT

The responsibilities of individuals concerning retirement decisions have been increasing through time, and financial literacy has been rising as an important instrument to help individuals reach this stage of life with acceptable possessions.

This master's dissertation intends to look further on the impacts that financial literacy may have on retirement preparation, in Portugal, and what more variables may have implications on it. It aims also to better define these concepts and to give an overview of the retirement preparation environment in Portugal.

Using a survey with international comparability, the basic financial literacy level in Portugal was assessed. This includes a descriptive statistics segment and the usage of logistic regression models to verify possible relationships between retirement readiness, financial literacy, and other tested variables.

The main results reveal a good hit rate in the basic financial questions. The corrected responses are at least equal or better compared to the existing literature. A positive and significant impact of financial literacy on retirement preparation is found. The gender of an individual is also statistically significant, with men being considered more prepared for retirement than women.

This may mean that developing financial literacy in the country may lead to better prepared for retirement citizens.

KEYWORDS

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LIST OF ABBREVIATIONS AND ACRONYMS

AML   Área Metropolitana de Lisboa – Lisbon Metropolitan Area

AMP   Área Metropolitana do Porto – Porto Metropolitan Area

NASD   National Association of Securities Dealers

IMF   International Monetary Fund

GDP   Gross Domestic Product

AICPA   The American Institute of Certified Public Accountants

SGF   Sociedade Gestora de Fundos de Pensões, SA.

RGSS   General social security scheme

FEFSS   Social Security Trust Fund

OECD   Organization for Economic Co-operation and Development

1. INTRODUCTION

"An investment in knowledge pays the best interest."

Benjamin Franklin

"The question isn't at what age I want to retire, it's at what income."

George Foreman

1.1. BACKGROUND AND PROBLEM IDENTIFICATION

The retirement planning systems all over the world have become more complex. The increase in life expectancy and the decrease in number of births has led to inverted demographic pyramids, putting the sustainability of retirement systems in check, and even raising questions regarding its structure. This situation is very denoted in developed economies, where Portugal is included (Figure 1)
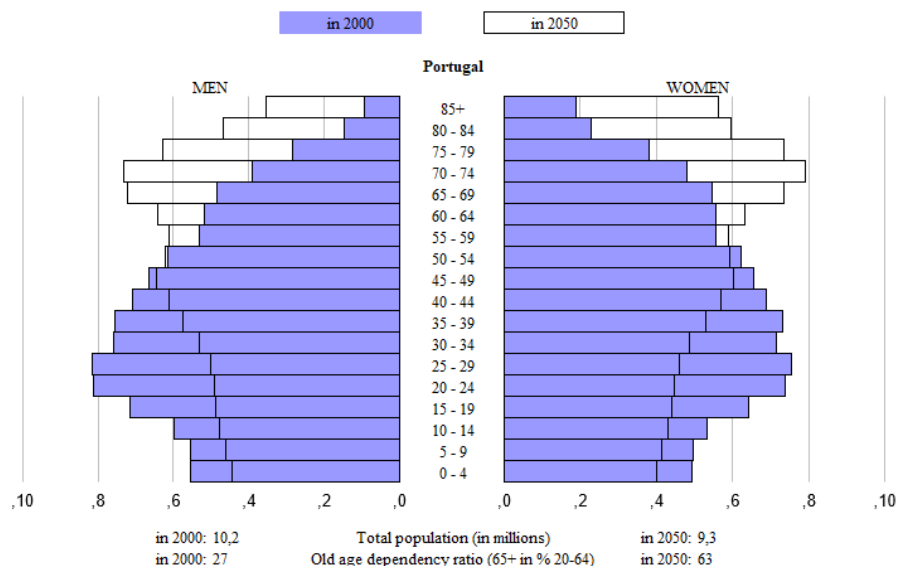
Figure 1 – **Portuguese demographic pyramid, from 2000 until 2050.** In 2050, it is expected that the age pyramid of Portugal becomes inverted, with a higher percentage of dependent population. Source: OECD

Many countries acted with this trend as basis (amongst other factors), changing their traditional defined benefit pensions to individual-account defined contributions. A big part of the responsibility of financing retirement moved from the institutions – such as governments and firms – to the individuals. One can point positive and negative outcomes of this change, nevertheless, the responsibility of an individual in preparing for retirement, and making the right decisions, increased significantly (Lusardi and Mitchell ,2011).

Considering the traditional economic hypothesis, it holds that forward-thinking individuals optimize predicted lifetime value by using economic knowledge. This is done with the objective to accumulate

retirement assets over the course of their working lifetimes (Behrman, Mitchell, Soo, and Bravo, 2012). This holds the question, how can one assess a person's financial knowledge and verify it influences its future economic decisions? With the goal to assess financial literacy around the world, The FLAT World – Financial Literacy around the World – Project was created. It has the "Big Three" questions as a starting point, with several adjustments and additional perspectives to address a country-specific characteristics. These three questions are related with the understanding of interest rate compounding, inflation, and risk diversification. They were created with the assumptions of simplicity, relevance, and brevity (FLAT, 2021). The project had the participation of fifteen countries, and many more used this project as basis to develop their work in this field of research. For instance, Alessie et al. (2011) found a positive relationship between financial knowledge and retirement preparation, in the Netherlands. On other hand, Crossan et. al (2011), in New Zealand, have not found sufficient evidence in the relationship between financial literacy and retirement readiness, despite the incremented level of financial knowledge found. Different authors around the world have studied the different levels of the financial understanding complexity and retirement plans, as well as the relationship between them (additionally to the fifteen previously mentioned). One of the main conclusions stated by many is that there is a positive and significant relationship between financial literacy and retirement preparation. In the works performed by Moure (2016), in Chile, Sekita (2011), in Japan, Bucher-Koenen and Lusardi (2011), in Germany and Arrondel et al (2013) in France, this same relationship is found. Some of the few exceptions regarding the significant relationship between the preparation of retirement and financial knowledge are the findings registered in Finland (Kalmi and Ruuskanen, 2018), Kenya (Aluodi et al, 2017) and Israel (Meir et al, 2016).

This indicates that citizens with a higher financial knowledge have a higher probability of being prepared for retirement than one with less understanding of the topic. Other result is that a big part of individuals lacks understanding of financial basic concepts, with some countries having worse results than others, but the generality presenting this trend. In this study, the overall findings and conclusions of a great part of these are presented.

There are other valuable elements connected with financial literacy, and potentially as consequence, with retirement readiness. An individual attitudes and preferences influence the way people perceive their savings for the future. If a person prioritizes long term security rather than short term, it will most likely have some sort of emergency funds or a long tenure plan for its earnings. And vice-versa. The attitude connects with the individual's financial behavior. This reflects more on a person's actions on financial matters. As example, over-using of credit, paying the bills on time, creating a "safety net", are behaviors that can improve or diminish the financial health of an individual (Atkinson and Messy ,2012).

1.2. STUDY RELEVANCE AND IMPORTANCE

In the highly dynamic and changing world we live in, financial literacy and retirement preparation have risen in importance in the last couple of years. As OECD/INFE (OECD/INFE, 2016, p.15) states: "financial literacy has gained a prominent position in the policy agenda of many countries and the importance of collecting informative, reliable data on the levels of financial literacy across the adult population has been widely recognized."

The findings of studies regarding these topics can be a useful tool to many agents of society. From a very basic and general point of view, an ordinary person can benefit from the information provided by it and take decisions accordingly. This aspect is reinforced with the responsibility regarding personal financial wellbeing, which has been growing (Barbić, Palić and Bahovec, 2016). Regarding entities and individuals who are more concerned about the topic, findings can provide valuable information to many, like governments, policy advisors, pension funds, international organizations, among others. Deeper into this point, the outcomes can influence countries financial education policies, giving information to possible actions (Behrman et al.2012). Linked to the same entities, this knowledge is also important due to the sustainability of pension systems. With the projected significant increase in expenditure, in the next years, combined with factors like economic crisis, political cycles – making promises for votes and compromising the pension system, and the general demographic evolution (older population, lower fertility rates), among others, the sustainability of the system may be compromised (Kadhim, 2009). The assessing of the people's financial literacy level can also help entities to pass protective legislation to protect consumers of financial scams and complex financial products that can take advantage of a consumer's low-level knowledge on the topic (Lusardi and Mitchell, 2014).

1.3. STUDY STRUCTURE

The present study intends to look further in these matters, when looking at the Portuguese reality. Some organizations and institutions (such as Banco de Portugal) have already looked at the subject, but there isn't yet a study with the methodology used in this work. The research introduces the many definitions given to financial literacy. The relationship between financial literacy and retirement preparation is explored, with many examples of the numerous studies conducted all over the world. Next, the Portuguese Retirement system is delved into, with its main historic changes and its composition nowadays. Afterwards, the underlying data will be explained, and the result of the logistic regression models shown. The study ends with the main conclusions, constraints found and possible actions to make.

1.4. STUDY OBJECTIVES

This master's dissertation intends to look further on the impacts that financial literacy may have on retirement preparation, in Portugal, and what more variables may have implications on it. It aims also to better define these concepts and to give an overview of the retirement preparation environment in Portugal.

One can form some questions whose answers can be used to reach the proposed goals:

- What is the financial literacy level in Portugal?

- Do exist variables influencing the level of the Portuguese people financial literacy? If so, which one(s)? Which is/are more impactful?

- Is there a relationship between financial literacy and retirement preparation in Portugal? If so, is it a positive or negative relationship?

- How is the Portuguese Pension System?

- In Portugal, what are the existing mechanisms regarding retirement preparation?

- How can this work's results/research impact the actual thoughts and perceptions on the topic?

These goals were achieved. There is a good accuracy in the answers given regarding financial literacy. Through the logistic regression models, a positive and significant relationship between financial literacy and retirement preparation is found. The other significant variable is gender, with men being more ready for retirement than women. Nowadays, the Portuguese Pension System is considered to have a mature level, with the capability to reach almost all population and granting pensions rights adjusted to the contributions of new pensioners. The findings of this work will generate new knowledge regarding the topic, as it was not yet studied in this perspective. The interested individuals and organizations in the subject can make use of the information as a starting point and make decisions accordingly.

2. LITERATURE REVIEW

2.1.1. Financial Literacy Definition

The definition of Financial Literacy has different interpretations and there are diverse dimensions that can be added to define more broadly this concept. Its many conceptions have grown as complex as the economy. In its most basic form and definition, financial literacy is associated with the capability of an individual in managing money (Remund, 2010). The same author also refers to the lack of coherent criteria between researchers when defining and measuring financial literacy. For the past decades, other authors and organizations have surged with many other definitions. Due to the many definitions existing regarding the topic, the ones enumerated in this thesis will try to give an overview of different lines of thought and interpretations, all aligned with the field of this study.

Taking the Cambridge Dictionary as a starting point, it defines financial literacy as "the ability to understand basic principles of business and finance". According to the Banco de Portugal (2010), at an international level, the more quoted definition for Financial Literacy is the one presented by Shagen (1997) – "…the ability to make informed judgements and to take effective decisions regarding the use and management of money". This definition can be important in the context of this thesis, due to the Banco de Portugal being one of the most important financial institutions in the country where this research is being done, Portugal (it is the central bank of the Portuguese republic).

Another institution, NASD – National Association of Securities Dealers (2003), refers to financial literacy as the comprehension regular investors have of market principles, tools, organizations, and regulations. According to the American Institute of Certified Public Accountants (AICPA, 2008), the concept of financial literacy regards the capability of an individual to assess and manage their finances in an effective way to produce prudent choices to reach life goals and monetary comfort. This definition is criticized by Wilson et al. (2014) due to the limitations of focusing specifically on households, emphasizing prudence, and not generalizing the concept of information.

The Organization for Economic Cooperation and Development (OECD) defines financial literacy as "a combination of awareness, knowledge, skill, attitude and behavior necessary to make sound financial decisions and ultimately achieve individual financial wellbeing.' (OECD, 2016, 2020). This definition is comparable with the concept provided by Friebel & Kaminski (2012) of financial competence, which refers to the ability to self-guide in the financial markets. This concept incorporates the capability of an individual to discern from the risk-return of financial instruments. This institution also points out the difference between financial education and literacy. The first is the mean to achieve a higher level of the second.

Clark et al. (2012) refer to the comprehension and familiarity of retirement preparation and financial mathematics as a definition for financial literacy. Vitt (2000) considers personal financial literacy as the capacity to read, scrutinize, manage, and communicate concerning the personal financial settings that impact material well-being. Atkinson and Messy (2012) define Financial Literacy as a mix of knowledge, ability, and consciousness with the end goal of establishing financial welfare.

A point referred to by Wilson et al. (2014) is that we must look at literacy as synonymous with comprehending or meaning-making, and that this conception is a precondition to reach our goals. In this theme (financial literacy), the end game has financial purposes. The authors also point that financial knowledge should be conceptualized as a complex phenomenon whereby individuals use a sense of information to assess the financial outcomes of their decisions. So, the main point in this line of thought is that individuals make use of information, combining technologies and skills, other tools, and understanding of context to be in a sufficient position to make a decision that requires awareness of their financial outcomes.

Another perspective arises from Mason and Wilson (2014). The authors defend that financial literacy is an individual's capability to attain, comprehend and evaluate the information that is relevant and needed to make decisions with the consciousness of the most probable final financial results. This definition connects information literacy with financial literacy, being the difference in the perceived outcome, in this case, financial outcomes. An individual uses the information, which may not be integrally financial knowledge, to make decisions with financial implications.

Lusardi (2019) refers to financial literacy not only as the concept related to knowledge and comprehension on the topic, but also as the aptitudes, motivation, and confidence to apply it and make decisions. This definition can also be important in the context of the study because the author is one of the main researchers in the area and has produced a big part of the existing literature.

2.1.2. Relationship between Financial Literacy and Retirement Preparation

Regarding the relationship between retirement preparation and financial literacy, there is already a wide variety of international literature documenting the influence of financial literacy on an individual's propensity to start preparing for retirement. A trend verified in the conducted studies is the positive effect of financial literacy on retirement planning. With the support of empirical evidence, these findings were achieved through studies directed in many countries. The main methodology consists of an identical and standard survey with questions regarding financial literacy and retirement

planning. The data collected from these is posteriorly analyzed using, most commonly, a logistic regression analysis.

In Table 1 one can see a summary of some of the existing literature regarding the topic, throughout the world:

Table 1 - Summary of some of the existing literature, regarding financial literacy and retirement preparation, throughout the World

Country	Title	Authors	Summary of findings
Italy	Financial literacy and pension plan participation in Italy.	Fornero, E., & Monticone, C. (2011)	Generalized lack of basic financial knowledge. Men are more well-informed than women regarding the topic. Regional discrepancy, between the more knowledgeable Centre-North and the less informed South. Substantial and positive impact of financial literacy on the probability of participation in a pension plan.
Switzerland	Financial literacy and retirement planning in Switzerland.	Brown, M., & Graf, R. (2013)	1500 households survey serves as the basis for the findings. High financial literacy level, considering international standards. A particularly interesting finding was that age doesn't affect at a significant level the financial knowledge value. Strong positive relationship between financial literacy and voluntary retirement savings.
Chile	Financial literacy and retirement planning in Chile.	Moure, N. G. (2016)	Considerable low level of financial knowledge in the country, and a small predisposition to plan for retirement. Despite these aspects, a positive and significant relationship between financial literacy and retirement planning.
China	Financial literacy and retirement preparation in China.	Niu, G., Zhou, Y., & Gan, H. (2020)	Survey conducted to more than 13,900 households and across 29 provinces of the country. Low level of financial literacy in the country. Strong link between financial literacy and retirement preparation. Suggest the need for tangible measures to improve financial literacy in the country
USA	Financial literacy and retirement planning in the United States	Lusardi, A., & Mitchell, O. S. (2011)	There is a lack of basic financial knowledge. The most vulnerable group is the lower-paid and least-educated people. People with higher knowledge regarding the subject are much more predisposed to plan for retirement.
Croatia	Logistic regression analysis of financial literacy implications for retirement planning in Croatia.	Barbić, D., Palić, I., & Bahovec, V.(2016)	This study shows that people with higher financial knowledge levels are more likely to have a positive attitude regarding preparing and saving for retirement. There is also a low level of financial literacy in the Croatian population.
Canada	Financial literacy and retirement planning in Canada	Boisclair, D., Lusardi, A., & Michaud, P. C. (2014)	Low level of financial literacy in the country, with only 42% of the correspondents answering correctly to the basic questions. The lowest financial literacy groups are in line with other countries (younger and elder, women, minorities, and low educated). Financial literacy level increases with the educational level of

the person and is sturdily associated with retirement planning as well.

Country	Title	Authors	Findings
Finland	Financial literacy and retirement planning in Finland.	Kalmi, P., & Ruuskanen, O. P. (2018)	No association between financial literacy and retirement planning when using an estimation through regression in the basic three questions. Nevertheless, in a wider range of questions, this linking proved to be positive. This association is also evidenced to be sturdier for women than for men.
Japan	Financial literacy and retirement planning in Japan.	Sekita, S. (2011)	The level of financial literacy in Japan is not high. Women, younger individuals, and the ones with lower income and lower education have the worse financial literacy. It also verified a positive relationship between financial literacy and retirement planning.
Sweden	Financial literacy and retirement planning in Sweden.	Almenberg, J., & Säve-Söderbergh, J. (2011)	Many adults have a low level of financial knowledge. The groups with the lowest levels are the younger and older people, women, and the low income and low education individuals. A positive relation between financial literacy and retirement planning, although the link is not as strong as in other countries, possibly due to the design of the Swedish pension fund system.
Russia	Financial literacy and retirement planning: the Russian case.	Klapper, L., & Panos, G. A. (2011)	Significant and positive relationship between financial literacy and the preparation of retirement through private pension funds and schemes. There is a negative relationship between age and financial knowledge (the younger people are more likely to provide a correct answer than the elder). There isn't much difference in knowledge between genders.
New Zealand	Financial literacy and retirement planning in New Zealand.	Crossan, D., Feslier, D., & Hurnard, R. (2011)	The level of financial knowledge in New Zealand has incremented. The authors of this study have not found sufficient evidence of the relationship between financial literacy and retirement preparation. The hypothesis to explain this is the design of New Zealand's public pension system, which offers a significant level of income security.
Australia	Financial literacy and retirement planning in Australian.	Agnew, J. R., Bateman, H., & Thorp, S. (2012)	The levels of financial knowledge in Australia are in line with comparable countries. These levels increase with age. The study didn't find a definite answer for the country not having higher levels but presents some possible explanations.
Malaysia	Financial literacy key to retirement planning in Malaysia	Yoong, F. J., See, B. L., & Baronovich, D. L. (2012)	The study results show that individuals with higher financial knowledge levels are more prepared for retirement. It also displays a relationship between financial preparedness, age, education levels, and habits of investing.
The Netherlands	Financial literacy and retirement preparation in the Netherlands.	Alessie, R., Van Rooij, M., & Lusardi, A. (2011).	This research demonstrates a positive relationship between financial knowledge and retirement preparation. Despite that, the Dutch population does not prepare much for retirement. The authors also find evidence of the positive impact of education on young people regarding economic matters and financial knowledge.

Germany	Financial literacy and retirement planning in Germany	Bucher-Koenen, T., & Lusardi, A. (2011)	The authors found a positive relationship between financial literacy and retirement preparation. There is a gap in financial knowledge between East Germany (less knowledge) and West Germany. Also, there is not a difference in financial literacy between genders in East Germany.
France	Financial literacy and financial planning in France.	Arrondel, L., Debbich, M., & Savignac, F. (2013)	The study reports a positive correlation between higher financial literacy levels and propensity to financially plan for the future. The study is in line with others regarding the less educated: women, young adults, elderly people, and less educated individuals. An interesting finding was that the centrist voters have a higher financial literacy level than people with other political ideologies.
Austria and Switzerland	Financial literacy and retirement planning–a comparative study for Austria and Switzerland.	Aubrama, T., Kovarova-Simeceka, M., & Wanzenried, G. (2016)	The authors found a higher financial knowledge level in Switzerland in comparison with Austria. Once more, it states the positive relationship between higher financial literacy levels and retirement preparation. Women have a lower level of literacy regarding financial topics compared to men and the higher the age the higher the financial knowledge level.
Israel	Financial literacy and retirement planning: Evidence from Israel.	Meir, A., Mugerman, Y., & Sade, O. (2016)	This research has not found a correlation between financial knowledge and retirement literacy. Despite that, the authors found a positive correlation between financial literacy and the individual's propensity for financial information (such as bank statements) and possessing financial knowledge.
Vietnam	Preconditions of financial safety during lifecycle: the financial literacy and retirement planning in Vietnam.	Nguyen, T. A. N., Belás, J., Habánik, J., & Schönfeld, J. (2017)	This scientific paper contributes evidence of the existing positive association of retirement preparation and financial knowledge, applied in Vietnam. Another finding is the also positive correlation between financial literacy and an individual's constituting savings regularly. The authors also point that the workers in the public sector tend to answer more questions regarding financial literacy correctly than the ones in the private sector.
Puerto Rico	Financial literacy and retirement planning: Evidence from Puerto Rico.	Castro-González, K. C. (2014)	This study states the latent lack of literacy in financial and retirement planning. Despite that, respondents answered positively whenever they search for this type of information. The research was conducted on public workers and the author intends to include workers of the private sector in the future.
Kenya	Effect of financial literacy on retirement preparedness among employees in the insurance sector in Kenya.	Aluodi, E., Njuguna, A., & Omboi, B. (2017)	This research was conducted in Kenya in the insurance sector. The findings show the nonexistence of a positive relationship between financial knowledge and retirement preparation. This situation is most likely explained by the field of work of the survey respondents. The authors also refer that retirement savings are influenced by the income level.

Source: Author's preparation based on the literature.

2.1.3. An overview of the Portuguese Retirement System – Main historic changes

This section highlights the main foundations and changes of the Portuguese pensions system using the OECD Review of Pensions Systems – Portugal (OECD, 2019) as the basis, combined with other sources. In its inception, the Portuguese pension system was a funded type pension scheme. It was afterward changed, at the beginning of the 1960s, and transformed into a public pay-as-you-go defined benefit system. As time passed by, the requisite contributions heightened, as also the number of years incorporated in the reference wage. Overall, there has been a positive evolution in the minimum contribution period, resulting in its incrementation. It started in 1973, with the first minimum period of contribution being stipulated at 24 months. Nowadays, to claim a contributory old-age pension (*pensão por velhice*), individuals must have, at least, 15 years of registered contributions (not necessarily consecutive). The normal (full pension) retirement age is currently (2021) 66 years old and 6 months, but since 2013 it is automatically linked to unisex life expectancy increases at the age of 65 (Bravo & Herce, 2020; Bravo et al., 2021; Ayuso et al., 2021a,b, Bravo & Ayuso, 2020, 2021). In 1974 a Christmas payment (13th month) was introduced. In 1990, a Holiday payment (14th month) was created, both to reduce the country's old-age poverty.

In terms of the minimum age possible for a normal retirement without any penalty, it used to exist a discrepancy between men and women. In 1973 the retirement age for men was sixty-five years old, as for women it was sixty-two. The female retirement age continuously grew, until it matched with men's retirement age, at 65 years old, in 1999. The year 1984 sets the date where the purposes and foundations of social security were enacted in the Social Security Framework law. Later, in 1986, the single social security contribution was introduced.

Public employees that started their activity earlier than 1993 had a set of more beneficial pension regulations, compared to non-public officials. This situation was rectified in 2006 when newly hired public servants started contributing to the social security general scheme.

One can also mention the financial crisis that Portugal suffered, as one of the highlights in the history of the pension's system, having to ask for the financial aid of the IMF (International Monetary Fund) in 1977, 1983 and early 2010's. These periods led to some changes in the system, with financial unsustainability as the main driver of pension reforms. One of the more controversial reforms, back in the last IMF intervention, was the temporary application of an extraordinary solidarity contribution (Contribuição Extraordinária de Solidariedade). It aimed to address shortages in social security contributions. This new tool was a one-time provisory tax levied on pension payments. It was a dynamic type of tax, changing the minimum rate and the interval of pensions where the rates would be applied, yearly. It ended in 2016.

2.1.3.1.   Long-Term Financial Sustainability and forecasts

In the last decades some demographic phenomena have been influencing the retirement systems and policy making/decisions in a great part of the world's nations. The improvements in the life expectancy and growing longevity of individuals, the reduction of the fertility rate, the increasing ageing of the population (leading to inverted age pyramids) between other factors, have putted in check the sustainability of the pensions systems and so changes to them were made. Portugal is not an exception in this trend. An important ratio to consider, related to pension systems, is the old-age dependency ratio. This statistic is composed of the ratio of individuals that are older than 65 years old with 100 people in working age (between 20 and 64 years old).

Looking at Figure 2, one can see that Portugal suffered a considerable increase in the old-age dependency ratio, between 1975 and 2015, going from 19.6% to 34.6%. The projected value is that it will more than double until 2050, reaching 73.2%. This means that it is projected by 2050 that for every 100 persons in working age, there will be 73,2 individuals with more than 65 years old, in Portugal. Comparing with other countries available in this study, Portugal is one of the countries with the highest value on this statistic.
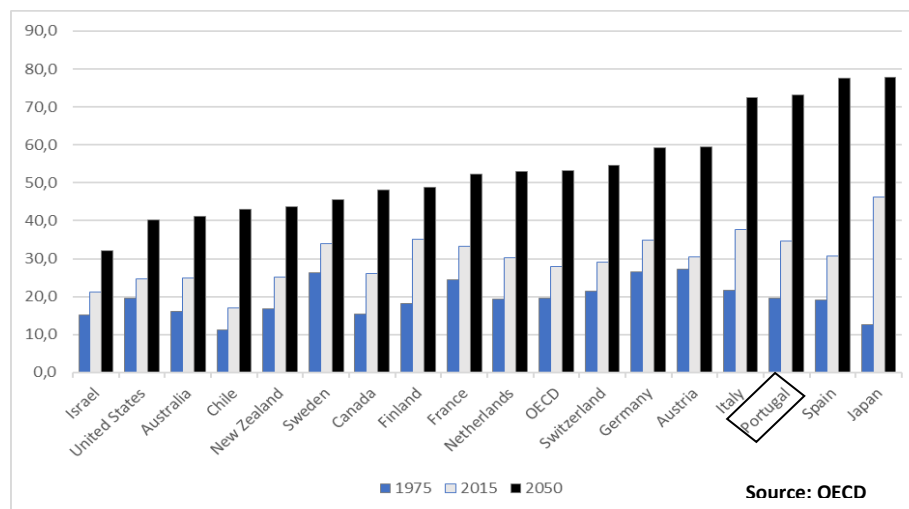
Figure 2 - **Old-age dependency ratio evolution**
Number of people older than 65 years per 100 people of working age (20-64), 1975-2050.
Portugal is projected to have one of the highest in OECD countries, by 2050

Other important statistic one can use is the public expenditure on pensions, in % of Gross Domestic Product (GDP). Using **Figure 3** - Projections of public expenditure on pensions (GDP %)

Portugal is projected to have a small increase in the public expenditure on pensions, on GDP%. Despite that it will still remain one of the highest in OECD countries, by 2050, as projected by the organization, one can see the expenditures on pensions in Portugal, between 2013 and 2016, as a % of the GDP. It was 13,5 %. Looking at the projection made by the OECD, it is expected to reach 13,7% in 2050. This

may not seem a big increase, but this projection has considered that some changes are made in the system.

The changes considered in the projections were the growth in the age a person retires, and the less expenditure that arises from the early retirement of individuals, who suffer a large penalty for retiring earlier. Another outcome mentioned is the unemployment effect. If these kinds of adjustments were not considered, the rise in the expenditure would be much higher.
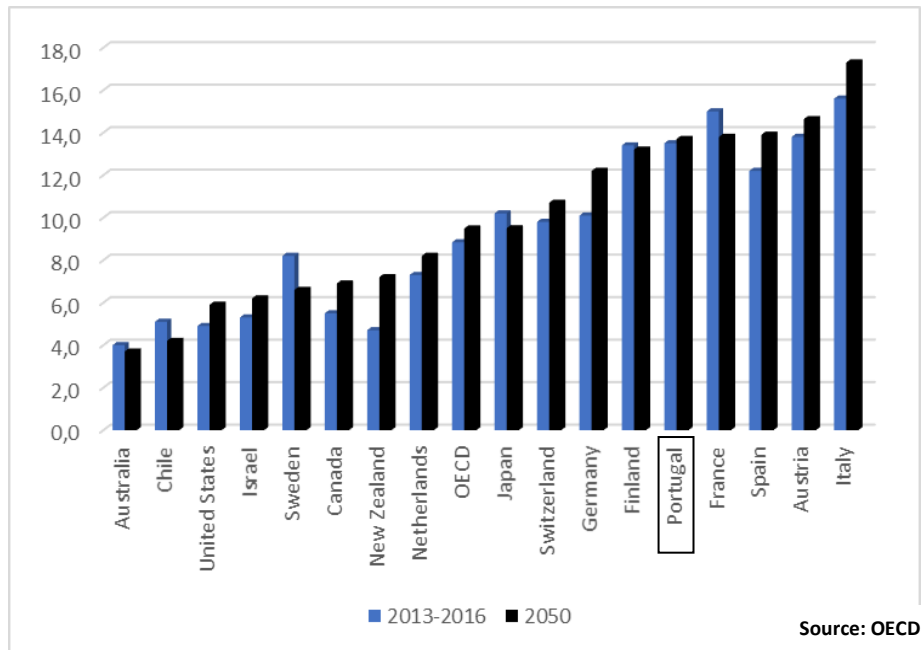
Figure 3 - Projections of public expenditure on pensions (GDP %)
Portugal is projected to have a small increase in the public expenditure on pensions, on GDP%. Despite that it will still remain one of the highest in OECD countries, by 2050, as projected by the organization

With all these demographic phenomena previously considered, and some other factors, the Portuguese public authorities already acted and started implementing measures to enhance the financial sustainability of the system. The already mentioned extraordinary solidarity contribution is an example of it. Another important reform made by the Portuguese Government, in 2016, was the already mentioned introduction of automatic indexation of pensions taking into account the developments in life expectancy. It is a common strategy used by many countries around the world, and allows to automatically update the retirement age, responding to the rise in longevity and helping to keep the sustainability of the pension systems.

One paper that focused on this topic was published by Bravo & Ayuso (2021). The study uses a Bayesian model ensemble of stochastic mortality models to forecast the life expectancy at retirement ages of four different countries (Portugal, The Netherlands, Denmark, and Slovakia). In all these countries the retirement ages have been automatically indexed to life expectancy. For Portugal, the authors forecast

that the normal pension age will increase in 2050 to 68,41 years and, by the end of the century, to 71,3 years.

Despite all parametric ad-hoc measures adopted (and some already reversed) in recent years, empirical studies show extensively that the Portuguese public pension schemes are unsustainable in both demographic, financial, and economic terms and will deliver insufficient retirement income at old-age, aggravating the already high old-age poverty risks (Bravo et al., 2012a,b; 2013, 2014).

2.1.4. The Portuguese Retirement System Nowadays

The Portuguese pension system is currently based on three pillars: the pivotal earnings-related old-age state pension system (first pillar), the occupational pension provision (second pillar), and the personal pension provision (third pillar). The first pillar combines an earnings-related, defined benefit (DB), mandatory public scheme, comprising two separate but convergent schemes: (i) a private-sector workers scheme (general social security scheme - RGSS) and (ii) a civil service pension scheme (CGA) covering public servants enrolled before December 2005 (Bravo, 2016; Bravo & Herce, 2020). Nearly three-quarters of people older than 65 received a pension from the RGSS in 2019. Contributory state pensions are financed on a pay-as-you-go (PAYG) basis by social contributions paid by both the employer and employee, complemented by a small fraction of the value-added tax (social VAT). Additionally, the state system includes non-contributory means-tested first-tier pension benefits, top-up minimum contributory benefits, and several targeted assistance programs, fully funded by general taxes. The state pension scheme comprises old age, early retirement, disability, and survivors' pensions. (OECD, 2019). Occupational pension schemes and accident insurance form the second pillar. Voluntary occupational pension plan coverage in Portugal is low compared to other OECD countries and has been relatively stable for the past 10 years. As of 2019, only 2.5% of Portugal's workforce is covered by occupational plans. The third pillar, personal pension provision, is voluntary and consists of various private personal funded schemes (Bravo & Herce, 2020).

"The Portuguese pensions system is public, universal and with binding character" (Junqueira, 2018). Nowadays, it is considered to have a mature level, with the capability to reach almost all population and granting pensions rights adjusted to the contributions of new pensioners. The private pensions schemes can be complementary or voluntary (Junqueira 2018). Junqueira (2018) points out that the system faces two main problems: (1) adequation, linked with the limitations and inequalities that arise from the labor market, and (2) sustainability, with the rise of life expectancy and the ageing of population asserting pressure on the viability of the system.

Considering only the public part of the pension system, one can consider other three pillars. The reference institution for the Portuguese pension system is the Social Security (Segurança Social). It performs a series of roles and it's founded on three big pillars (SGF,2019):

- **Welfare System (Sistema Previdencial)**

- **System of Social protection of citizenship (Sistema de Proteção Social de Cidadania)**

- **Complementary system (Sistema complementar)**

The first one gathers the contributive function of the social security system. It is based on the solidarity principal and to guaranty subsidies and pensions in case of some contingencies, has unemployment, illness, or oldness. It also includes the earnings-related old-age state pension system, previously mentioned, RGSS and the CGA. The second pillar concerns minimum rights of the citizens (poverty, disabled people, etc.) and it's financed by transfers from the State Budget and fiscal revenues. The third pillar, has a complementary function, articulating with the other two pillars. It contains the Social Security Trust Fund (FEFSS), that contained more than 21.000 million Euros by the end of 2020, and a private pension saving scheme. The FEFSS is funded by a small portion of the payments made to Social Security, in case of a surplus in the organization and/or public state budget. Besides the complementary purpose, it shall intervene when the contributive revenue is lower than the contributive expenses. The welfare system has mandatory contributions, with the other two being optional. The general basis of social security can be found on the Lei n. º 4/2007, of January 16th. The following scheme (Figure 4) helps understand this system:
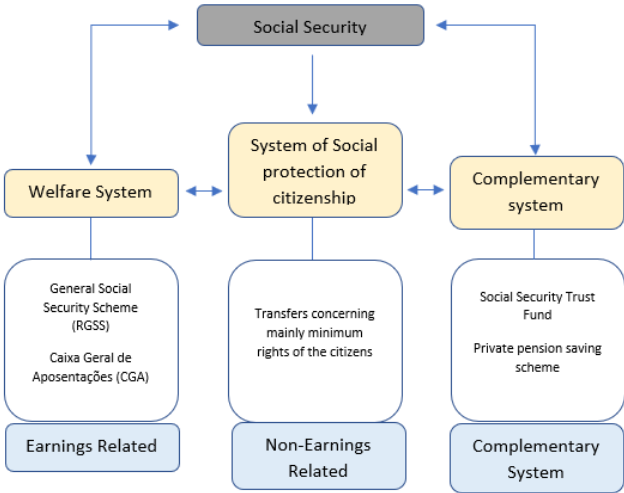
Figure 4 - The Portuguese Public Pension System Scheme
The 3 main pillars have interactions with each other and with Social Security.

Source: Based on Junqueira (2018) and Bravo & Herce (2020)

3. METHODOLOGY

3.1. METHOD DEFINITION

The method chosen to test the relationship between retirement preparation, financial literacy and the other independent variables is a logistic regression analysis. A Logistic Regression Model is a statistical model with the goal to predict that a response value has a value of 1 given a certain group of predictor values. In other words, a model to predict a certain variable having determined characteristic with a given number of influencing variables. It is utilized to illustrate the relationship between the one binary dependent variable and one or more independent ones (Hilbe, 2009).

For being able to fit the data in a logistic regression model, it has to comply the following assumptions:

1. There is no correlation between the predictors;

2. There is a significant relation between the predictors and the response variable;

3. The observations of the model are too uncorrelated (independent).

Another assumption is that the response variable follows a Bernoulli probability distribution. It means that the response variable is binary and follows a distribution of two possible outcomes (generally 1's and 0's).

Other tool used in the definition of the logistic regression model is the Wald Test. It is a likelihood-ratio test assessing the null hypothesis that a given value equals a determined parameter. If it rejects the null hypothesis, it recommends that removing the selected variable will improve the fit of the model (Bursac et. al ,2008 and Fox 1997).

Expressing the model in an equation

Following the linear predictor of the logistic model:

$$x_i b = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \cdots + \beta_p x_{ip}, \qquad \text{Eq. 1}$$

Has the predicted value in a logistic regression has the link function as basis we get the following:

With link function

$$log\left(\frac{\mu}{1 - \mu}\right) \qquad \text{Eq. 2}$$

One gets,

$$\ln\left(\frac{\mu_i}{1-\mu_i}\right) = x_i b = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \cdots + \beta_p x_{ip}$$

<div align="right">Eq.3</div>

Where $x_i b$ denotes the predicted variable. β_0 corresponds to the intercept value. x_{ip} relates to the predictor and β_p is the coefficient of it. A positive value of the last means a positive relationship and a negative one, a negative relationship. The term μ (also referable as p) matches as the probability of the response value being 1 (success).

One can also refer the equation for odds, given by:

$$\frac{\mu}{1-\mu} \text{ or } \frac{p}{1-p}$$

<div align="right">Eq. 4</div>

The odds of a given situation correspond to the probability of its occurrence divided by the probability of its unsuccess.

There is also the probability function of the Bernoulli Distribution, on a random sample, on which the binary response of the logistic regression is based:

$$f(y;p) = \prod_{i=1}^{n} p_i^{y_i}(1-p_i)^{1-y_i}$$

<div align="right">Eq.5</div>

In this, p is the probability that the response statistic (y) takes 1 as value.

3.2. PROGRAMMING THE MODEL

In this case, using the functionalities of the `R` software, the logistic regression will be done under the scope of a Generalized Linear Model (GLM). It's function `glm` comprises iterative reweighted least squares (IRLS) in its algorithm for the estimation of the predictor coefficients (Hilbe, 2015). Among its benefits one can refer the simplicity, little initial value problems and a robust estimation method. A GLM can, theoretically, be used to estimate any statistical model resulting from a probability distribution that makes part of the single parameter exponential family of distributions. Considering that the Bernoulli distribution has a binary response logistic regression, it is a GLM (Hilbe, 2009).

In the development of the model, a full model is built, considering all the predictors. To get the most significantly model from the data, the `backward` function is used. In this case, all the variables are considered initially, and, one by one, the ones that do not have a significant impact on the dependent variable (do not significantly predict the response variable) are removed from the model. This selection is made with the results of the Wald test, used in every parameter individually.

Taking this methodology in consideration, the final purpose is to obtain the logistic regression model which has the independent variables that better predict the response variable (the model which is more statistically significant). Three models were built under these assumptions.

3.3. THE VARIABLES

The data used to develop this dissertation was collected between the 2ⁿᵈ of January of 2021 and the 15ᵗʰ of May of 2021. It was gathered through an online survey, using the Google Forms platform, and collected 505 valid responses. It was directed to Portuguese individuals, living in Portugal, and with ages over 18 years. The survey adopted the methodology followed by the generality of the existing literature - with the appropriate amendments and adjustments to the Portuguese context. The study presented by Moure (2016), in Chile, sets a good example of the methods used. It is composed of two main sections. The sections regarding the Financial Literacy level and Retirement Savings, and the one with the collection of descriptive variables of the population (control variables).

The variables selected for the survey considered the conditioning of the greatest number of answers being collected, being it designed with simple, basic, and short questions in the financial literacy and retirement preparation sections. Also, it intends to have international comparability.

The questions asked to assess an individual's propensity to retirement preparation (for the dependent variable) are:

1. Have you ever thought about how much you/ your household require to save for retirement?
   (a) Yes; (b) No; (c) Don't Know; (d) Don't want to answer.

2. Have you constituted any saving/plan thinking about retirement?
   (a) Yes; (b) No; (c) Don't Know; (d) Don't want to answer.

3. How often were you able to execute this plan?
   (a) Always; (b) Almost Always; (c) Rarely; (d) Never; (e) Don't Know; (f) Don't want to answer.

In relation to the dependent variable, the individual is considered of being prepared for retirement if answered "yes" to the first two questions of this section, combined with "Always" and "Almost Always", in the last question. This means that individuals have already thought about how much money, approximately, is needed to save for retirement, if they have a plan to achieve that goal and if are capable of meeting that same plan. With that, an individual is considered a "Planner". If an individual answered "no" to at least one of the first two questions or one of the remaining options in the last one, it is considered not prepared for retirement preparation, and so making it a "No-Planner". So, the dependent variable is binary, with two possible results, "Planner" or "No-Planner". Considering the independent variables, specifically the financial literacy ones, 3 dummy variables were created, to be fitted into 3 different models. Model1 tests for all financial literacy correctly answered, or not, Model2 the number of correct answers and Model3 the correct answers separately.

This allows to compare with the Flat World project and to have three different measures in terms of

financial literacy.

The 3 questions asked regarding financial literacy were:

1. Interest Rate – Suppose you have 100€ in a savings account paying an interest rate of 2% yearly. After 5 years, how much money do you believe you will have in your account if you don't make any withdrawals?
   (a) More than 102€; (b) Exactly 102€; (c) Less than 102€; (d) Don't Know; (e) Don't want to answer.

2. Inflation – Consider that the interest rate of your savings is 1% per year and the inflation rate is 2% per year. After 1 year you would be allowed to:
   (a) Buy more products and services than now; (b) Buy the same products and services as now; (c) Buy fewer products and services than now; (d) Don't Know; (e) Don't want to answer

3. Risk – Do you consider the following question as true or false? "Buying stocks from only one company allows a safer return than buying a stock from a mutual fund"
   (a) True; (b) False; (c) Don't Know; (d) Don't want to answer.

Here is a summary table (**Table 2**) with all the variables collected in the survey and that were considered in the regression models:

Table 2 - Variable's definitions and descriptions

Variable Name	Description
"X3Correct"	if one answers correctly all 3 financial literacy questions. To fit model1
"NCorrect"	correspondent to the number of correct answers. To fit model2
"Interest"	if an individual correctly answers the interest question. To fit model3.
"Risk"	if an individual correctly answers the risk question. To fit model3.
"Inflation"	if an individual correctly answers the inflation question. To fit model3.
Control Variables	
Age	with groups between 18 and 35 years of age, 36 and 50, 50 and 65 and 65 plus years.
Gender	Male, female, other.
Civil Status	Single, married, widowed, or divorced.
Education	Primary level, 9th year, 12th year, bachelor, master/post-graduation, and doctorate.
Residence Area	North, Porto Metropolitan Area, Lisbon Metropolitan Area, Center, Alentejo, Algarve, Madeira and Azores.
Household	1 member, 2 ,3 ,4 or 5plus.
Job status	Student, unemployed, own Employed, employed by others, Retired.
Job sector	Primary, secondary, tertiary
Finance Area	Yes or No
Monthly Income (gross)	With groups from 0€ to 700€, 701€ to 1000€, 1001€ to 1500€ or 1500€plus

Source: Author based on the survey answers

3.4. PRELIMINARY DATA ANALYSIS

Some arrangements to data were made to obtain a more comparable output, and in line with the majority of the work performed by the researchers in the area. Moure (2016), in Chile, and Alessie (2011) are good examples of the characteristics of the population used. Of the total of 505 responses collected, the ones answered by retired people and students were not considered. The same process was made with possible invalid responses. These alterations led to 393 answers, to be used in our models.

The full Survey questions can be found in the **Appendix** section.

This descriptive statistics analysis takes into consideration the same database used in the logistic regression models, with 393 valid answers to the survey.

Population characterization

As shown in **Table 3**, regarding the descriptive statistics of the population on focus , 177 of these individuals are aged between 18 and 35 years old, 123 between 36 and 50, and 93 persons are more than 50 years old. In terms of gender, 219 are men and 174 are women. Considering the individual's civil status, 48% of the persons interviewed were single and 42% were married. The remaining part was divorced. When talking about the education level of the persons interviewed, 76,3% of the individuals had, at least, a bachelor. Most of the interviewed people were from the Lisbon Metropolitan Area, with 252 respondents, corresponding to 64,1%.

The most common household people number registered was 4, with 111 validated responses, equaling 28,2%. The most common employment status verified was employed by others, with 343 responses, 87,3% of the total. Unemployment was verified among 21 persons who answered the survey (5,3%). Relative to the job area, 50,1 % were not working in the Finance Area (Finance, Accounting, Banking,…), 33,9% were in the area and 16% did not answer or did not want to share this information. Regarding Gross Salary, 42,8% (168 individuals) earned more than 1500€ every month. Next in line, with 28,8%, are individuals (113) who earn between 1001€ and 1500€ of monthly income. To conclude, 23,7% of people (93) had between 701€ and 1000€ of monthly income and only 4,8% (19) of individuals earned less than 700€ monthly.

Table 3 - Survey population characteristics (number of observations and %)

		Number of Observations	Percentage (%)
Age			
	18 to 35	177	45,03
	36 to 50	123	31,3
	50+	93	23,66
Gender			
	Masculine	219	55,73
	Feminine	174	42,27
Civil Status			
	Single	189	48,09
	Married	165	41,98
	Divorced	39	9,92
Education			
	Basic	12	3,05
	Secondary	81	20,61
	Bachelor	145	36,90
	Masters	147	37,40
	Doctorate	8	2,04
Residence			
	AML	252	64,12
	AMP	24	6,11
	Centro	55	13,99
	Norte	30	7,63
	Alentejo	13	3,31
	Algarve	11	2,80
	Madeira	3	0,76
	Açores	5	1,27
Household			
	1	89	22,65
	2	82	20,87
	3	87	22,14
	4	111	28,24
	5+	24	6,11
Job status			
	Own Employed	29	7,38
	Employed	343	87,28
	Unemployed	21	5,34
Finance			
	Yes	133	33,84
	No	197	50,13
	Didn't answer	63	16,03
Income			
	0 to 700	19	4,83
	701 to 1000	93	23,66
	1000 to 1500	113	28,75
	1500+	168	42,75

Source: Author based on the survey answers

Financial Literacy in Portugal

The results gathered from the survey demonstrate a higher percentage of correct answers, compared with other literature. Regarding the first question on the Financial Literacy Level part, about the Interest Rate, 344 (87,5%) of the individuals responded correctly to the question. Concerning the second one, the question about inflation, 349 (88,8%) of the respondents had a correct answer. In the last question of the section, the more complex of the three and regarding investment risk and diversification, 336 (85,5%) of the answers were correct.

Table 4 - Financial Literacy (number of observations and %)

		Number of observations	Percentage (%)
Interest Rate			
	Correct	344	87,5
	Incorrect; Doesn't know/answer	49	12,5
Inflation			
	Correct	349	88,8
	Incorrect; Doesn't know/answer	44	11,2
Risk			
	Correct	336	85,5
	Incorrect; Doesn't know/answer	57	14,5
3 Correct			
	Correct	280	71,2
	Incorrect; Doesn't know/answer	113	28,8
Total		393	100%

Table 4 – The number of Correct answers compared with Incorrect answers or Didn't Know/Answer

The Overall hit rate is over 85% in the answers separately and 71,2% in the 3 answers combined.

Source: Author based on the survey answers

Financial Literacy across the population

This section intends to combine the financial literacy level with the characteristics of the population, to glimpse some relationships that might exist. Looking at Table 5 is possible to observe the distribution of correct and incorrect/didn't answer responses and the characteristics of the population. Looking at age, the younger population has an overall better hit rate, except for the inflation question.

Comparing these preliminary findings with the existing literature, some connections can be found. Considering the age of the respondents, the overall tendency is that younger people tend to have a lower success rate than older individuals (except for persons with over 65 years of age), as verified in Sweden by Almenberg and Säve-Söderbergh (2011) and in France by Arrondel et al (2013). Men tend to answer more successfully than women and the same pattern is verified in single people compared with married and divorced ones.

Relative to gender, Fornero and Monticone (2011) in Italy and Boisclair et al (2014) in Canada also have an overall better hit rate for men, compared with women in the observations in comparison with financial literacy section. Alternatively, overall, the opposite happens in Russia (Klapper and Panos, 2011). Regarding the area of residence, it is not very correct to take into account some options due to the very low number of responses, influencing significantly the accuracy. Counting on that, when looking at areas where 20 or more people answered, AML, AMP, Centro and Norte, the overall result is very good, and, as verified previously, the accuracy level decreases when considering the correct answer for all 3 questions.

Regarding the household, the hit rate with highest value was registered on people who leave alone, was lowest with a household of 2 persons (except in the inflation question) and tended to increase the more people a household has. People Employed by Others had the overall better hit rates and unemployed individuals had the lowest. An overall lower success rate in not employed people can be observed in Germany (Bucher-Koenen and Lusardi, A., 2011). It seems that individuals working in the Finance Area had an overall better hit rate than those who doesn't develop their professional activity in the area. There also appears to exist an overall connection between income and success rate answering the questions, with the higher the salary, the higher the hit rate, and vice-versa. The generalized idea that the more money a person makes, the more financial literacy it has, can be observed in the studies like Moure (2016), who produced his work in Chile and Agarwal et al. (2015), in India.

Regarding education level, the same preliminary assumptions can be found pretty much across the existing literature, that the higher the level of education, the higher is the financial literacy level. This study is no exception, and this tendency seems to also occur. Lusardi and Mitchell (2011), in the USA and Boisclair et al (2014) in Canada are two examples of studies that also verified this relationship between education and financial literacy.

Table 5 - Distribution of financial literacy across the population (%)

	N.Obs.		Interest Rate Correct	Interest Rate Incorrect/DA	Inflation Correct	Inflation Incorrect/DA	Risk Correct	Risk Incorrect/DA	3 Correct Correct	3 Correct Incorrect/DA
Age										
	177	18 to 35	92,66	7,34	91,53	8,47	89,27	10,73	80,23	19,77
	123	36 to 50	82,93	17,07	82,11	17,89	82,11	17,89	61,79	38,21
	93	50+	83,87	16,13	92,47	7,53	82,80	17,20	66,67	33,33
Gender										
	219	Masculine	91,78	8,22	93,15	6,85	89,95	10,05	80,82	19,18
	174	Feminine	82,18	17,82	83,33	16,67	79,89	20,11	59,20	40,80
Civil Status										
	189	Single	91,53	8,47	89,95	10,05	86,24	13,76	76,72	23,28
	165	Married	82,42	17,58	87,27	12,73	84,85	15,15	64,85	35,15
	39	Divorced	89,74	10,26	89,74	10,26	84,62	15,38	71,79	28,21
Education Level										
	12	Basic	58,33	41,67	66,67	33,33	75,00	25,00	33,33	66,67
	81	Secondary	81,48	18,52	82,72	17,28	74,07	25,93	56,79	43,21
	145	Bachelor	86,90	13,10	89,66	10,34	91,72	8,28	74,48	25,52
	147	Masters	94,56	5,44	92,52	7,48	88,44	11,56	80,27	19,73
	8	Doctorate	75,00	25,00	100,0	0,00	50,00	50,00	50,00	50,00
Residence Area										
	252	AML	86,11	13,89	88,49	11,51	84,13	15,87	68,65	31,35
	24	AMP	95,83	4,17	95,83	4,17	95,83	4,17	91,67	8,33
	55	Centro	89,09	10,91	83,64	16,36	87,27	12,73	74,55	25,45
	30	Norte	93,33	6,67	96,67	3,33	93,33	6,67	83,33	16,67
	13	Alentejo	69,23	30,77	92,31	7,69	76,92	23,08	53,85	46,15
	11	Algarve	100,00	0,00	72,73	27,27	72,73	27,27	54,55	45,45
	3	Madeira	100,00	0,00	100,0	0,00	100,00	0,00	100,0	0,00
	5	Açores	80,00	20,00	100,0	0,00	80,00	20,00	60,00	40,00
Household Number										
	89	1	96,63%	3,37	91,01	8,99	85,39	14,61	80,90	19,10
	82	2	80,49%	19,51	93,90	6,10	86,59	13,41	70,73	29,27
	87	3	86,21%	13,79	89,66	10,34	86,21	13,79	71,26	28,74
	111	4	86,49%	13,51	85,59	14,41	84,68	15,32	64,86	35,14
	24	5+	87,50%	12,50	75,00	25,00	83,33	16,67	66,67	33,33
Job status										
	29	Own Employed	86,21	13,79	79,31	20,69	82,76	17,24	65,52	34,48
	343	Employed by others	88,05	11,95	93,11	6,89	86,88	13,12	73,47	26,53
	21	Unemployed	80,95	19,05	71,43	28,57	66,67	33,33	42,86	57,14
Finance Area										
	133	Yes	90,98	9,02	96,24	3,76	96,99	3,01	84,96	15,04
	197	No	87,31	12,69	86,29	13,71	82,23	17,77	67,51	32,49
	63	Didn't	80,95	19,05	80,95	19,05	71,43	28,57	51,67	48,33
Monthly Income										
	19	0€ to 700€	78,95	21,05	73,68	26,32	78,95	21,05	57,89	42,11
	93	701€ to 1000€	83,87	16,13	80,65	19,35	74,19	25,81	55,91	44,09
	113	1000€ to 1500€	86,73	13,27	86,73	13,27	88,50	11,50	72,57	27,43
	168	1500€+	91,07	8,93	96,43	3,57	90,48	9,52	80,36	19,64

Table 5 – The overall accuracy in the answers is provided, combined with the characteristics of the population. The highest hit rate is found on men, younger people, single individuals, with a master's degree, employed by others, working in the finance area and with an income of over

Financial Literacy vs Retirement Preparation

In the second set of questions, retirement planning was the condition to be tested. It was split into 3 questions, and a person was considered to be a "Planner" if answered "Yes" to the first two questions and "Always" and "Almost Always" in the last one, regarding the fulfillment of a saving plan, with the main goal of saving for retirement. With this, 143 (36,4%) of the correspondents were a "Planner" and 250 (63,6%) "No-Planner".

Table 6 - Retirement Preparation Questions (number of observations and %)

		Number of observations	Percentage (%)
Question 1			
	Yes	228	58
	No; Doesn't know/answer	165	42
Question 2			
	Yes	163	41,5
	No; Doesn't know/answer	230	58,5
Question 3			
	Always/ Almost Always	143	36,4
	Other; Doesn't know/answer	250	63,6
		Planner	**Non-Planner**
Total		143	250

Table 6 – The number of individuals considered "planners" is 143 out of 393. This "means" that 36,4% of the persons who answered the survey are considered prepared for retirement.
Source: Author based on the survey answers

When combining the answer's accuracy and the "Planner" and "Non-Planners", there is an overall tendency that planners answer more correctly the financial literacy questions than the non-planners. In the interest rate question, if a person is considered a planner, 94,41% of them answered correctly, with 5,59% answering incorrectly or did not know the answer. The same question had an 83,6% correct answer accuracy for non-planners. Regarding the inflation question, the same percentage as the interest rate question apply for planners, 94,41% correct and 5,59% incorrect/didn't know. The non-planners' individuals had a hit rate of 85,6%. For last, the risk question, the question with an overall less hit rate of the 3, had a success rate of 90,91% for planners and 82,40% for non-planners.

Table 7 - Financial Literacy vs Retirement Preparation (%)

		Planners (%)	No Planners (%)
Interest Rate			
	Correct	94,41	83,6
	Incorrect; Doesn't know/answer	5,59	16,4
Inflation			
	Correct	94,41	83,6
	Incorrect; Doesn't know/answer	85,6	14,4
Risk			
	Correct	90,91	82,4
	Incorrect; Doesn't know/answer	9,09	17,6
N. of observations		143 (36,4%)	250 (63,6%)

Table 7 – The overall hit rate on individuals considered planners is higher than non-planners. This means that, overall, people who have better accuracy in the financial literacy questions are more prepared for retirement.

Source: Author based on the survey answers

Due to the design of the survey, specifically in the financial literacy questions, and similar in the definition of "planner" and "no-planner", it is relatively direct and intuitive to compare the results obtained in Portugal with the ones gathered in other countries. Looking at the overall results obtained in the other countries, the ones collected in this study tend to be at least equal, or better. This may happen due to the seniority of some of the previous existing works in the area. Compared with the previously available literature, the results obtained are, overall, substantially good.

When observing the possible connection between financial literacy and retirement preparation (Table 7) there seems to exist the tendency that "Planner" has a better hit rate than "No-Planner" individuals. This particularity is also observed in previous studies. In the studies performed by Fornero and Monticone (2011) in Italy, Bucher-Koenen and Lusardi (2011), in Germany, Boisclair, et al (2014) in Canada, Almenberg and Säve-Söderbergh (2011) in Sweden (with exception to the interest rate question), and for most of the previous literature, this trend is also verified. Contrarily, Kalmi and Ruuskanen (2018) concluded, for Finland, that it is not certain that planners tend to have better financial knowledge performance than no planners.

4. RESULTS AND DISCUSSION

The logistic regression model was developed using the R software (R version 3.6.1 used). The process of obtaining the final model result, with the most significant variables, starts with the insertion of the valid data in the working database (the 393 considered responses mentioned previously). After following all the assumptions for a logistic regression, one uses the `glm` function and the initial three models with all the selected variables are created. To make the final models, the `backward` function is used. The following table (Table 8) shows the results of the three models, with the given dataset.

Table 8 – Final Models

	Model 1		Model 2		Model 3	
	Estimate	p-value	Estimate	p-value	Estimate	p-value
X3Correct (reference correct)	-0.12510	0.0240*	-	-	-	-
1 Correct answer (0 as reference)	-	-	0.14027	0.5134	-	-
2 Correct answers (0 as reference)	-	-	0.26319	0.1866	-	-
3 Correct answers (0 as reference)	-	-	0.36314	0.0634.	-	-
Interest Rate (reference correct)	-	-	-	-	-0.17083	0.0265*
Inflation (reference correct)	-	-	-	-	-0.10280	0.0199*
Gender (feminine as reference)						
Masculine	0.09611	0.0530*	-	-	0.09770	0.0462*
Civil Status (married as reference						
Single	-	-	0.06151	0.2350	-	-
Divorced	-	-	-0.13635	0.1057	-	-
Monthly Income (0€ to 700€ as reference)						
Between 701€ and 1000€	-0.01379	0.9080	-0.1531	0.8993	-0.03235	0.7856
Between 1001€ and 1500€	0.13221	0.2601	0.11750	0.3229	0.12340	0.2929
More than 1500€	0.17222	0.1344	0.17999	0.1235	0.15574	0.1777
Intercept	0.23791	0.0335*	-0.08185	0.7155	0.24783	0.0265*
Number of observations	393		393		393	

Significance Codes: 0 – '***' 0.001 – '**' 0.01 – '*' 0.05 – (.)
Source: Author creation using the data survey and `R` software

The remaining variables not included in the final models: Age, Education, Residence Area, Household, Job Status and Finance Area.

Considering model one, without the effect of any predictive variables, there seems to exist a propension to preparing for retirement, given the positive and significant value of the intercept, with a coefficient of 0.23791 and a p-value of 0.0335. When looking at the descriptive statistics, one can associate this position, since the number of planners is far superior to the non-planners, indicating that, without considering financial literacy, there is a tendency of people to start preparing for

retirement. Looking at the final model, the more significant variables are having answered or not correctly to the three financial literacy questions, gender, and monthly income. The coefficient of having answered correctly or not to the three financial questions is significant, with a p-value of 0.0240, and a coefficient value of -0.12510. Considering that the reference is having answered correctly to the three questions, one can say that if an individual doesn't answer correctly to all the questions, it will, less likely, be prepared for retirement.

Considering the individual's gender, it has a significance value of 0.0530 and a coefficient of 0.09611. This indicates that male individuals are more prone to being ready for retirement, compared with female persons. The same conclusion was stated in the Italian study, obtained by Fornero and Monticone (2011). Despite not being statistically significant, the final models incorporate the monthly income variable. This happens due to the application of the `backward` function, having included this variable makes the model overall better, than not including it. Looking at the results gathered in Italy (Fornero and Monticone, 2011) and Sweden (Almenberg and Säve-Söderbergh, 2011), the more money an individual earns, the better prepared it will be for retirement.

The other variables removed from the initial model had different results in the existing literature. Regarding civil status, Fornero and Monticone (2011) in Italy, found that the divorced persons had a positive and significative relationship with retirement preparation. Nevertheless, this comparison must be taken with reservations, as the reference is not a single individual but a married one. Considering the education level, Kalmi and Ruuskanen (2018) in Finland, showed that the more educated an individual is, the more likely to be prepared for retirement.

Regarding model two, the reduced model contains the variables number of financial questions correctly answered, independently of which one, the civil status and the monthly income. The only significant variable found was having the three financial literacy questions correctly answered, when comparing with the other options, with a p-value of 0.0634. This indicates that an individual who answered correctly to the three financial literacy questions is more prone to be ready for retirement, compared with one who has answered correctly to two, or less. A similar result present in this model, regarding not having sufficient evidence of financial literacy and retirement preparation relationship, can be found in the results gathered by Crossan et.al (2011) in New Zealand. The opposite was found in Russia by Klapper and Panos (2011) despite the particularity of it being applied to private pension funds as schemes. One can also mention the positive relationship between the matters, found by Alessie et al. (2011) in the Netherlands.

In model three, once again, there is a propension for retirement preparation, excluding other variables impacts. This is observed by the positive and significant value of the intercept. In terms of significant variables, the interest rate and inflation ones are statistically significant, with p-values of 0.0265 and

0.0199 respectively. In the Japanese paper (Sekita, 2011), the risk question is the only significant, with a positive relation with retirement preparedness. On other hand, in Canada, Boisclair et al. (2014), concluded that in the country there is a positive relationship between retirement readiness and between people who answered correctly to the diversification risk and inflation question. Once again, gender is a significant predictor in retirement readiness. A male individual has a higher probability to be more prone to being ready for retirement than a female one. This is given by the significant relation and estimate value of 0.09770. Again, monthly income is not statistically significant but is included in the model. The study developed in Russia (Klapper and Panos, 2011) stated a positive relation between income and retirement readiness, in the 4th quartile of income, the highest income in the intervals. A country where this kind of relationship was not checked was in Australia (Agnew et al, 2012), being income not statistically significant for the preparation of retirement.

Regarding the variables excluded from all of the three models, existing literature has shown different conclusions. The variable age is not a significant variable in either of the models tested. The study conducted in Switzerland by Brown and Graf (2013) is one of the few where age is significant, in the older people. The education level variable, in Canada, according to the authors Boisclair et al (2014) influences significantly and positively the dependent variable, specially having a master's degree. The findings verified in Switzerland (Brown and Graf, 2013) display too this type of relation. One can also mention the geographic disparities between East and West Germany (Bucher-Koenen and Lusardi ,2011) and Centre – North and South Italy (Fornero and Monticone, 2011).

Odds Ratio

Using the Odds-Ratio, one can make other interpretation of the model's results previously presented. Once again, using the `R` Software (R version 3.6.1 used), one can compute the odds ratio, using this function:

```
exp(cbind(OR = coef(model), confint(model))
```

Once again, using the `R` software, the three previous models were computed to give the results of the odds-ratio of each one, as shown on table 9, table 10 and table 11.

Table 9 – Model 1 Odds Ratio

Model 1			
	OR	**5%**	**95%**
X3Correct (reference correct)	0.8824052	0.8058034	0.966289
Gender (feminine as reference)			
Masculine	1.1008824	1.0147673	1.194305
Monthly Income (0€ to 700€ as reference)			
Between 701€ and 1000€	0.9863050	0.8106664	1.199997
Between 1001€ and 1500€	1.1413451	0.9411766	1.384085
More than 1500€	1.1879392	0.8106664	1.434854
Intercept	1.2685937	1.0560263	1.523949

Source: Author creation using the data survey and R software

Table 10 – Model 2 Odds Ratio

Model 2			
	OR	**5%**	**95%**
1 Correct answer (0 as reference)	1.1505881	0.8086202	1.637175
2 Correct answers (0 as reference)	1.3010676	0.9380299	1.804609
3 Correct answers (0 as reference)	1.4378401	1.0431689	1.981831
Civil Status (married as reference			
Single	1.0634360	0.9767289	1.157840
Divorced	0.8725397	0.7598539	1.001937
Monthly Income (0€ to 700€ as reference)			
Between 701€ and 1000€	0.9848106	0.8087806	1.199153
Between 1001€ and 1500€	1.1246822	0.9251993	1.367176
More than 1500€	1.1972043	0.9882686	1.450312
Intercept	0.9214103	0.6370122	1.332780

Source: Author creation using the data survey and R software

Table 11 – Model 3 Odds Ratio

Model 3			
	OR	**5%**	**95%**
Interest Rate (reference correct)	0.8429667	0.7474795	0.9506519
Inflation (reference correct)	0.9023060	0.7932081	1.0264093
Gender (feminine as reference)			
Masculine	1.1026282	1.0175028	1.1948754
Monthly Income (0€ to 700€ as reference)			
Between 701€ and 1000€	0.9681632	0.7962138	1.1772465
Between 1001€ and 1500€	1.1313386	0.9330288	1.3717980

More than 1500€	1.1685224	0.9665846	1.4126489
Intercept	1.2812466	1.0669086	1.5386443

The previous analysis gives the coefficient with the log of the odds. By doing this transformation, one can give a different view of the results. So, given the existence dataset, the following conclusions are made:

Looking at the results shown on Table 9, it is possible to conclude that the odds of a person being prepared for retirement and answering incorrectly to the at least one of the financial literacy questions, decreases by 0.88 compared to an individual who answers all three correctly. It translates in a 12% less likely occurrence, in comparison. When considering the upper 95% confidence interval, the odds are 0.96. Considering the gender, a man possesses an odd of 1.10 in being prepared for retirement, comparing with a woman. This means that men are 10% more likely to be considered prepared for retirement, than women. In the lower 95% confidence interval, the value is 1.01.

Considering Table 10, and following the previous model, the only significant variable is answering correctly to the three financial literacy questions. By following this, the odds of a person answering correctly to all financial knowledge questions, compared to answering incorrectly to all, and being considered prepared for retirement are 1.43 higher. In other words, if an individual answers correctly to all the financial literacy questions, it has 43% more chance of being prepared for retirement than a person who responded correctly to zero questions. In the lower 95% interval confidence, the results translate an odd of 1.043.

In table 11, the results of the odds-ratio in model three are shown. Considering the incorrectly answered questions, by theme and separately, an individual who answered wrongly to the interest rate question has an odd of 0.84 in being prepared for retirement, comparing with a person who answered correctly to this question. It entails that the chances this individual is considered ready for retirement are 16% lower compared to someone who replied accurately. In the upper 95% interval of confidence, the odds are slightly better, with a value of 0.95. Regarding the question about inflation, the odds of a person answering incorrectly and being considered prepared for retirement are 0.90, matched to someone who appropriately responded. Once again, in terms of %, it means an individual who wrongly replied to the question has a less likely chance of being considered prepared for retirement of 10%, compared to a person who answered correctly. This, compared to a person who correctly answered the inflation question. About the gender valuable one can consider the odd of 1.10 of men being considered prepared for retirement, compared to woman. This can be interpreted as a 10% higher chance of men being considered retirement ready, comparing to the opposite gender.

5. CONCLUSIONS, LIMITATIONS AND FUTURE RECOMMENDATIONS

This study contributes to the existing literature by adding the results gathered in Portugal concerning the relationship between financial literacy and retirement preparation. This knowledge was obtained through a survey with international comparison, with 393 respondents.

The overall basic financial knowledge in Portugal is valued with good hit rates in the three basic financial literacy questions, regarding interest rate, inflation rate and risk diversification. Compared with the existing literature the level obtained in Portugal is, at least, equal, or better than the ones observed in other countries. This may happen due to them being outdated, or simply due to the very basic level of the questions that incorporated the survey.

The selected method to verify the association between retirement preparation, financial literacy and the other variables was a logistic regression, given the data characteristics and the binary dependent variable. When looking at the empirical results, a positive and significant relationship between financial literacy and retirement preparation is found in all the logistic regression models built. A significant predictor in two out of the three models is gender. There exists a discrepancy which reflects that man are better prepared for retirement than women. Monthly Income and Civil Status are the other two variables to make part of the reduced models, but neither is statistically significant. The results gathered from the existing literature show a mix of conclusions. The main trend is that a higher financial literacy leads to a higher retirement preparation.

Taking into consideration the more technical and statistical part of this study, one limitation that is common in this type of work is the ineptitude in measuring potential error issues in the financial literacy variable. As denoted by Alessie et al. (2011) it is complex to quantify financial knowledge, and so, categorical variables related to financial literacy may have classification errors.

When considering the developed work, one must understand the pedagogical environment where it is inserted. Also, the external externalities that were influencing our society and world while this research was being developed (mostly covid-19). When taking that into account, a basic, simple, and quick survey was developed to reach the most possible valid answers. Also, it was only available online, and the reachability was somehow limited, being shared through family, friends, and social media. Despite all that the information and answers collected were, at least, reasonable.

If one wants to take a different perspective on this type of study, with the aim to obtain information more relevant for decision making individuals, or entities, there are some suggestions that one can follow. The format of the survey can be more extensive and have a more complex financial literacy and retirement preparation section. This can possibly be achieved through a more complete and complex set of information, and include more descriptive statistics variables (political view, religion, for

example). Other recommendation is the possibility to reach more people and a better representation of answers from the different parts of the county, to reach a more suitable dataset in proportion to population distribution. And so, this study can serve as a starting point for a more complex, complete, and extensive investigation, that may be possible done, in case of interest.

The use of a national survey tool, like the Censos, with the inclusion of some financial literacy and retirement preparation questions, can also be a possible way to get more accurate and complete information regarding the topic.

The knowledge produced in this document may provide relevant contributions for the interested organizations and individuals in the topics. The policy advisors, pension funds, government, or even ordinary citizens can make informed decisions with the conclusions drawn.

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7. APPENDIX – QUESTIONÁRIO APLICADO

Questões Literacia Financeira

(Compreensão das **taxas de Juro)**
Suponha que tem 100€ numa conta poupança, cuja taxa de juro é 2% ao ano.
Após 5 anos, quanto acha que terá nesta conta, se não a movimentar?
A **Mais** de 102€
B **Exatamente** 102€
C **Menos** de 102€
D Não sei
E Não quero responder

(Compreensão da **Inflação)**
Imagine que a taxa de juro das suas poupanças é 1% ao ano e a taxa de inflação 2% ao ano.
Após 1 ano, seria capaz de:
A Comprar **mais** bens e serviços que atualmente
B Comprar os **mesmos** bens e serviços que atualmente
C Comprar **menos** bens e serviços que atualmente
D Não sei
E Não quero responder

(Compreensão do **Risco de Diversificação)**
Considera a seguinte afirmação verdadeira ou falsa?
Comprar ações de uma única empresa normalmente proporciona um retorno
mais seguro do que um fundo mútuo de ações.
A **Verdadeiro**
B **Falso**
C Não Sei
D Não quero responder

Questões Poupança/Reforma

1. **Alguma vez pensou quanto é que você/agregado familiar teria de poupar para a reforma?**
A. Sim
B. Não
C. Não sei
D. Não quero responder

A 2ª questão só pode ser respondida se a resposta á questão 1 for "Sim"

2. **Constituiu alguma poupança/plano de poupança a pensar na reforma?**
A. Sim
B. Não
C. Não sei
D. Não quero responder

A 3ª questão só pode ser respondida se a resposta á questão 2 for "Sim"

3. **Com que frequência conseguiu cumprir este plano de poupança a pensar na reforma?**
A. Sempre
B. Quase sempre
C. Raramente
D. Nunca
E. Não sei
F. Não quero responder

Questões Caraterização da População (Controle)

Idade   18-35
                 36-50
                 51-65
                 65 ou mais

Sexo   Masculino
                 Feminino
                 Outro

Estado Civil

Solteiro

Casado

Viúvo

Divorciado

Educação   Primário
                 9ºano
                 12ºano
                 Licenciatura
                 Mestrado/Pós Graduação
                 Doutoramento

Local de Residência   Norte
                               AMP
                               AML
                               Centro
                               Alentejo
                               Algarve
                               R.A Madeira
                               R.A Açores

Emprego Desempregado
Reformado
Trabalhador por c/ própria
Trabalhador por c/ outrem
Estudante

Setor de Atividade (explicar o significado?) Relacionado com finanças

Primário

Secundário

Terciário

Caso tenha respondido setor terciário na questão anterior, trabalha na área de Economia, Finanças, Gestão ou Contabilidade?

Sim

Não

Remuneração Mensal Bruta:

0€ e os 700€

701€ a 1000€

1001€ a 1500€

+1500€

Agregado Familiar

1 membro

2 membros

3 membros

4 membros

5 ou + membros